XI. Seasonal Salmonid Habitat Surveys

Seasonal Salmonid Habitat Surveys

2011

At the request of the Napa County Flood Control and Water Conservation District and in accordance with the Monitoring Plan for the Rutherford Reach Restoration of the Napa River, Napa County Resource Conservation District (RCD) completed assessments of recently-installed in-stream restoration features in Reaches 1,2, and 3 of the Rutherford Reach Restoration Project on the Napa River Two assessments were completed: one at a winter flow high enough to inundate new bench cuts, and one at a low spring flow to evaluate new wood and rock habitat structures. The assessments included site sketches of surface flow patterns, collection of photographs, water velocity measurements, water-level elevation surveys, and evaluation of habitat function by a fisheries biologist.

High-Flow Assessment

On February 16, 2011, Jonathan Koehler, RCD fisheries biologist, and Paul Blank, RCD hydrologist, visited select newly-installed west-bank restoration features in Reaches 1, 2 and 3. These included the Sutter Home/Ranch Winery Alcove, the Frogs Leap bench cut, and the four Caymus bench cuts. According to data obtained from USGS stream gaging station 11456000, located approximately 2 miles upstream, streamflows peaked 7.5 hours prior to our visit at 3,350 cubic feet per second (cfs). During our visit flows receded from 1,110 cfs at 10:00 AM PST to 930 cfs at 12:15 PM PST

Average water velocity was measured at select locations within the newly-installed features using a USGS Price AA current meter with a wading rod and the six-tenths depth method. RCD flagged the current water surface elevations (WSEL) and February 16, 2011 high water marks (HWMs) for surveying at a later time.

RCD returned to the reach on February 23, 2011 with a theodolite and stadia rod and surveyed the previously-flagged WSELs and HWMs, the current WSELs, and HWMs from a higher peak flow on February 17, 2011. Water levels were surveyed relative to four existing top-of-bank monuments, two of which had previously been surveyed relative to NAVD88. RCD could not obtain elevation data for the other two monuments and on March 1, 2011, RCD returned to the field and surveyed those points relative to NAVD88.

Low-Flow Assessment

On June 2, 2011, RCD re-visited the newly-installed fish-habitat restoration features in Reach 1, 2, and 3. According to data obtained from USGS stream gaging station 11456000, located approximately 2 miles upstream, streamflow was 20 cfs during our visit. Average water velocity was

measured at select locations near the newly-installed features using a USGS Price Pygmy current meter with a wading rod and the six-tenths depth method.

Snorkel Survey

On May 26, 2011 Jonathan Koehler and Paul Blank conducted an upstream snorkeling survey of the Rutherford Reach between Rutherford Road and Zinfandel Lane. The survey focused on presence/absence of juvenile salmonids throughout the reach and in the vicinity of each installed feature.

Results

Site sketches and photographs from each assessment are attached. Water velocity measurements are noted on the site sketches. The results of water surface elevation surveying completed during the high-flow assessment are presented in the Table below.

Narrative evaluations of the performance of each assessed feature are provided in the Table below. The results of the snorkel survey showed relatively low abundances of juvenile Chinook salmon throughout the reach. No steelhead were observed during the survey. Juvenile Chinook salmon in the 80-100mm range were observed primarily in swift moving water associated with riffles and runs. No juvenile salmon were observed in the vicinity of the installed structures. Juvenile salmonids may utilize these structures at earlier life stages during the winter, but we did not assess this due to the limited visibility and potential danger associated with being in the channel during high flows.

2012

At the request of the Napa County Flood Control and Water Conservation District and in accordance with the Monitoring Plan for the Rutherford Reach Restoration of the Napa River, Napa County Resource Conservation District (RCD) completed assessments of recently-installed in-stream restoration features in Reach 4 East bank of the Rutherford Reach Restoration Project on the Napa River. Reach 4 extends from the Rutherford Cross Road at river station 12,000, upstream 4,000 feet to river station 16,000. Restoration construction of the east bank took place in 2011. West bank construction is scheduled for summer 2012. Two assessments were completed: one at a winter flow high enough to inundate new bench cuts, and one at a low spring flow to evaluate new wood and rock habitat structures. The assessments included site sketches of surface flow patterns, collection of photographs, water velocity measurements, water-level elevation surveys, and evaluation of habitat function by a fisheries biologist. In addition, RCD conducted a snorkel survey to assess fish presence throughout the reach.

High-Flow Assessment

On January 23, 2012, Jonathan Koehler, RCD fisheries biologist, and Paul Blank, RCD hydrologist, visited select restoration features in Reach 4 installed in the summer and fall of 2011. These included Bench 7 and Bank Stabilization Area 1 on the Carpy-Conolly property, and Bank Stabilization Area 2, Bench 11, and Bench 13 on the Honig property, and Bench 14 on the Round Pond property. According to data obtained from USGS stream gaging station 11456000, located approximately 2 miles upstream, streamflows peaked 1.5 hours prior to our visit at 2,200 cubic feet per second (cfs). During our visit flows remained quite steady, varying from 1,970 to 2,100 cfs.

Average water velocity was measured at select locations within the newly-installed features using a USGS Price AA current meter with a wading rod and the six-tenths depth method (Table 1). RCD flagged the current water surface elevations (WSEL) for surveying at a later time.

RCD returned to the reach on May 10, 2012 with a theodolite and stadia rod and surveyed the previously-flagged January 23, 2012 WSELs. Water levels were surveyed relative to three existing monuments which had previously been surveyed relative to NAVD88 (Table 1).

Low-Flow Assessment

On May 1, 2012, RCD re-visited the newly-installed fish-habitat restoration features in Reach 4 East. According to data obtained from USGS streamgaging station 11456000, located approximately 2 miles upstream, streamflow was 36 cfs during our visit. Average water velocity was measured at select locations near the newly-installed features using a USGS Price Pygmy current meter with a wading rod and the six-tenths depth method.

Snorkel Survey

On May 17, 2012, Jonathan Koehler and Paul Blank conducted an upstream snorkeling survey of the Rutherford Reach between the Rutherford Cross Road and Zinfandel Lane upstream. According to data obtained from USGS stream gaging station 11456000, located approximately 2 miles upstream, streamflow was 16 cfs during our visit. The survey focused on presence/absence of juvenile salmonids throughout the reach and in the vicinity of each installed feature.

Residual Pool Depth

Following the protocol in the Monitoring Plan for the Rutherford Reach Restoration of the Napa River, RCD measures the residual pool depth associated with installed instream habitat structures as part of the annual channel survey of the 4.5 mile Rutherford Reach each June. The trend in the residual pool depth is used to assess the impact of instream structures on pool structure, including the effectiveness of the structures on causing pool scour, reducing the deposition of fines in pools, and creating habitat complexity. RCD first measured residual pool depth in 2011 at instream habitat structures installed from 2009-2010 in Reaches 1-3, between Rutherford Reach river stations 16,000 – 24,857. Residual pool depth is the difference between maximum pool depth and pool tail depth.

Results

Site sketches and photographs from each assessment are attached. Water velocity measurements are noted on the site sketches. The results of water surface elevation surveying completed during the high-flow assessment are presented in Table 1. Narrative evaluations of the performance of each assessed feature are provided in Table 2.

The results of the snorkel survey showed moderate abundances of juvenile steelhead throughout the reach. No juvenile Chinook salmon were observed during the survey. Juvenile steelhead ranging in length from approximately 80 – 100 mm were observed primarily in swift moving water associated with riffles and runs. No juvenile salmonids were observed in the immediate vicinity of the installed structures. Juvenile salmonids may utilize these structures during the winter, but we could not assess this due to limited visibility and potential danger associated with being in the channel during high flows.

Other fish species observed during the survey included California Roach (Lavinia symmetricus), Sacramento sucker (Catostomus occidentalis), Three-spine stickleback (Gasterosteus aculeatus), Sacramento pike minnow (Ptychocheilus grandis), tule perch (Hysterocarpus traski), and Pacific Lamprey (Entosphenus tridentatus). The adult Pacific lamprey was observed constructing a redd (spawning nest) just upstream of the tributary junction near BSA2: Honig Confluence. All fish species observed were native.

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

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

2011

	Discharge Napa River Near St. Helena at Pope Street Bridge	Water Surface Elevation (ft NAVD88)					
	(cfs)	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

2012

Water Surface Elevations at Constructed Instream Habitat Features During January 23, 2012 High-Flow Event

***Provisional data provided by USGS, subject to revision**

	Flow at Pope St*	Water Surface Elevation (ft NAVD88)					
	(cfs)	Bench 14: Round Pond	Bench 13: Honig	Bench 11: Honig	BSA 2: Honig	BSA 1: Carpy-Conolly	Bench 7: Carpy-Conolly
River Station		12400-L	12900-L	13600-L	13850-L	14400-L	15700-L
WSEL 1/23/2012 0940	2,040	143.20					
WSEL 1/23/2012 1000	2,060		143.99				
WSEL 1/23/2012 1040	2,100			144.95			
WSEL 1/23/2012 1050	2,100				145.73		
WSEL 1/23/2012 1117	2,050					146.87	
WSEL 1/23/2012 1130	1,970						149.81

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

Napa County Resource Conservation District Fisheries Biologist Evaluation of Performance of Each Assessed Instream Habitat Feature

2011

Feature Name	River Station	Feature Type	Assessment	Fisheries Biologist Evaluation
Sutter Alcove	21950-R	Alcove	High-flow	The alcove appears to be functioning very well to provide off-channel refuge habitat for juvenile salmonids during high flow events. Areas of slack water were observed in this feature during a large winter storm event.
Frogs Leap Bench 1	19680-R	Bench Cut	High-flow	This bench is only inundated during large winter events, during which time it offers a limited amount of lower velocity refuge habitat for juvenile salmonids. However, it is only engaged for a very short period in any given season. The bench appears to drain well as flows recede and does not create a significant stranding hazard for young fish.
Caymus Bench 0	18300-R	Bench Cut	High-flow	This bench is only inundated during large winter events, during which time it offers a limited amount of lower velocity refuge habitat for juvenile salmonids. However, it is only engaged for a very short period in any given season. The bench appears to drain well as flows recede and does not create a significant stranding hazard for young fish.
Caymus Bench 1	17500-R	Bench Cut	High-flow	This bench is functioning well to provide off-channel refuge habitat for juvenile salmonids during high-flow events. During intermediate winter flows, velocities through the secondary channel may be prohibitively fast to provide much habitat for juvenile salmonid rearing.
Caymus Bench 2	17290-R	Bench Cut	High-flow	This bench is functioning very well to provide off-channel refuge habitat for juvenile salmonids during high flow events. Areas of slack water were observed in this feature during a large winter storm event.
Caymus Bench 3	17050-R	Bench Cut	High-flow	This bench is functioning well to provide off-channel refuge habitat for juvenile salmonids during high-flow events. During high winter flows, velocities through the secondary channel remained in the favorable range for juvenile salmonid rearing.

WD-16110-L	**16110**	Woody Debris	Low-flow	This feature is functioning very well to provide cover and increase water velocities around the structure to create feeding lanes for juvenile salmonids. It has also recruited naturally-downed wood, further increasing its habitat complexity and value. No juvenile salmonids were observed around the feature during a snorkel survey on May 26, 2011.
WD-17175-R	**17175**	Woody Debris	Low-flow	This feature is functioning well to provide cover and localized pool scour. The feature does not appear to be increasing water velocities, thereby creating feeding lanes for juvenile salmonids. No juvenile salmonids were observed around the feature during a snorkel survey on May 26, 2011.
WD-17425-R	**17425**	Woody Debris	Low-flow	This feature is functioning well to provide instream cover. The feature does not appear to be inducing pool scour nor is it increasing water velocities, thereby creating feeding lanes for juvenile salmonids. No juvenile salmonids were observed around the feature
WD-17700-R	**17700**	Woody Debris	Low-flow	Dry. Not assessed.
WD-19525-R	**19525**	Toe-Log Structure	Low-flow	At typical spring flows, this feature primarily provides instream cover. It is situated on the right bank of a deep, low velocity pool, which is not a habitat type that is likely to attract rearing salmonids seeking feeding opportunities. At higher flows, the structure may provide a velocity shelter for small fish, but this was not assessed. No juvenile salmonids were observed around the feature during a snorkel survey on May 26, 2011.
WD-21700-L	**21700**	Spider Log	Low-flow	This feature is functioning well to provide cover and localized pool scour. The feature does not appear to be increasing water velocities, thereby creating feeding lanes for juvenile salmonids. No juvenile salmonids were observed around the feature during a snorkel survey on May 26, 2011.

WD-21850-R	**21850**	Toe-Log Structure	Low-flow	This feature appears to primarily provide instream cover. It is situated on the right bank of a long, low velocity pool, which is not a habitat type that is likely to attract rearing salmonids seeking feeding opportunities. At higher flows, the structure may provide a velocity shelter for small fish, but this was not assessed. No juvenile salmonids were observed around the feature during a snorkel survey on May 26, 2011.
WD-21900-L	**21900**	Spider Log	Low-flow	Buried. Not assessed.
WD-22100-R	**22100**	Spider Log	Low-flow	Buried. Not assessed.

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

Napa County Resource Conservation District Fisheries Biologist Evaluation of Performance of Each Assessed Instream Habitat Feature

2012

Feature Name	River Station	Feature Type	Assessment	Fisheries Biologist Evaluation
Bench 14: Round Pond	**12500-L**	Bench Cut	High-flow	This bench appears to be functioning very well to provide off-channel refuge habitat for juvenile salmonids during high flow events. Areas of slack water were observed in this feature during a large winter storm event.
Bench 13: Honig	**13000-L**	Bench Cut	High-flow	This bench is functioning very well to provide off-channel refuge habitat for juvenile salmonids during high-flow events. Extensive slow and slack water areas were observed during a large winter storm event. This feature contained a favorable mix of slow resting habitat and swift feeding habitat.
Bench 11: Honig	**13600-L**	Bench Cut	High-flow	This bench is functioning very well to provide off-channel refuge habitat for juvenile salmonids during high-flow events. Extensive slow and slack water areas were observed during a large winter storm event. This feature contained a favorable mix of slow resting habitat and moderate to swift feeding habitat.
BSA 2: Honig Confluence	**13850-L**	Bank Stabilization Area	High-flow	This bank stabilization area and tributary channel junction appear to provide high flow refugia in the form of a backwater and partially inundated tree trunks. Water velocities were generally low during a large winter storm event.
BSA 1: Carpy Conolly	**14400-L**	Bank Stabilization Area	High-flow	This bank feature appears to provide high flow refugia, primarily from willows and other riparian vegetation, which were partially inundated at the time of observation. Although water velocities could not be measured in the heavily vegetated area due to limited access, surface currents appeared to be very slow or completely slack throughout most of the feature.

Bench 7: Carpy Conolly	**15700-L**	Bench Cut	High-flow	This bench appears to be functioning very well to provide off-channel refuge habitat for juvenile salmonids during high flow events. Areas of slack water were observed in this feature during a large winter storm event.
BC-12400	**12400**	Boulder Cluster	Low-flow	These three boulders appear to provide a relatively small but effective velocity shelter during low to moderate flows. Measured velocities were significantly slower within the cluster than the surrounding currents. No salmonids were observed around this feature during the snorkel survey. All boulders were covered heavily with filamentous algae.
WD-12410-L	**12410**	Root Wad	Low-flow	This rootwad appears to provide good refuge habitat during low to moderate flows. A deep scour hole has developed immediately around the feature, and water velocities measured just downstream of the rootwad were significantly lower than the surrounding currents. During the snorkel survey, no salmonids were present around this feature, but several other native fish species were observed.
WD-12600-L	**12600**	Root Wad	Low-flow	This rootwad is located at the left edge of a deep (>4 feet) pool and creates a slow backwater habitat. No fish were observed around this feature during the snorkel survey.
WD-12780-L	**12780**	Root Wad	Low-flow	This rootwad appears to provide good refuge habitat during low to moderate flows. A distinct scour hole has developed immediately around the feature, and a sand deposit was observed just downstream of the rootwad. During the snorkel survey, no salmonids were present around this feature, but several other native fish species were observed.
WD-12850-M	**12850**	Root Wad	Low-flow	This rootwad was partially buried in the streambed and did not appear to provide much instream habitat value during the low-flow assessment. No fish were observed around this feature during the snorkel survey.
BC-12850	**12850**	Boulder Cluster	Low-flow	This group of five boulders was completely submerged during our low-flow assessment and snorkel survey. The boulders appear to provide an effective velocity shelter during low to moderate flows. Measured velocities were significantly lower within the cluster than the surrounding currents; however the streambed at this location is relatively flat with little topographic complexity. No salmonids were observed around this feature during the snorkel survey. All boulders were covered heavily with filamentous algae.

BC-12930	**12930**	Boulder Cluster	Low-flow	This group of four boulders was completely submerged during our low-flow assessment and snorkel survey. The boulders appear to provide an effective velocity shelter during low to moderate flows. Measured velocities were lower within the cluster than the surrounding currents. No salmonids were observed around this feature during the snorkel survey. All boulders were covered with a moderate amount of filamentous algae.
WD-13010-M	**13010**	Low-profile Log	Low-flow	This log was partially buried in the streambed and did not appear to provide much instream habitat value during the low-flow assessment. No fish were observed around this feature during the snorkel survey.
BC-13040	**13040**	Boulder Cluster	Low-flow	This group of four boulders appears to provide excellent feeding and resting habitat for juvenile salmonids. Measured water velocities were significantly slower behind each boulder, while swift current habitat was created between the individual stones. Juvenile steelhead (~80-100 mm) was observed around the boulder cluster and in the surrounding riffle habitat during the snorkel survey. In addition, a gravel deposit with favorably-sized salmonid spawning substrate was observed near this boulder cluster, which appeared to be the result of hydraulic sorting.
WD-13080-L	**13080**	Root Wad	Low-flow	This rootwad appears to provide good refuge habitat during moderate to high flows. A relatively shallow scour hole has developed immediately around the feature. During the snorkel survey, no salmonids were present around this feature, but other native fish species were observed.
WD-13650-L	**13650**	Root Wad	Low-flow	This rootwad appears to provide good refuge habitat during low to moderate flows. A distinct scour hole has developed immediately around the feature and a small backwater was present just upstream of the feature at low flow. During the snorkel survey, no salmonids were present around this feature, but other native fish species were observed.

2011
Velocity Monitoring Sketches and Photos

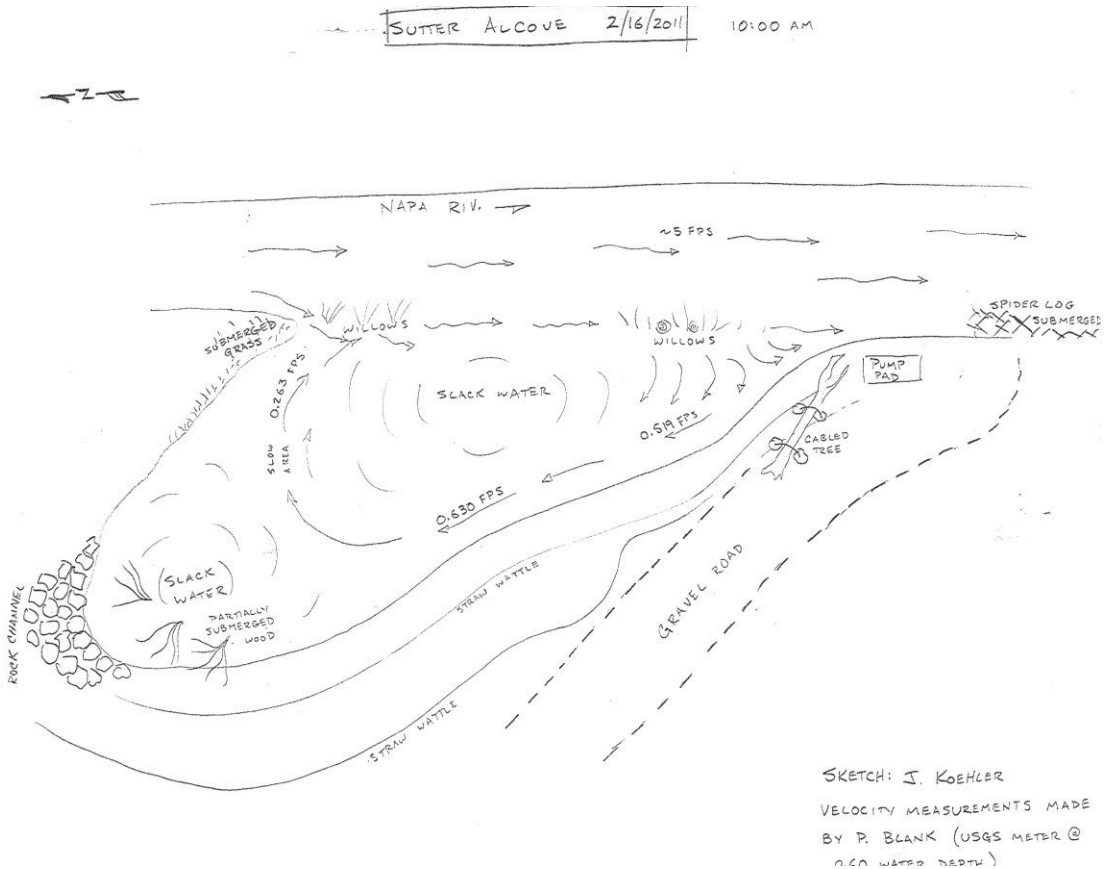
Alcove: Ranch Winery / Sutter Home: Right Bank Stations 22,225-21,900 Sketch

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 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)

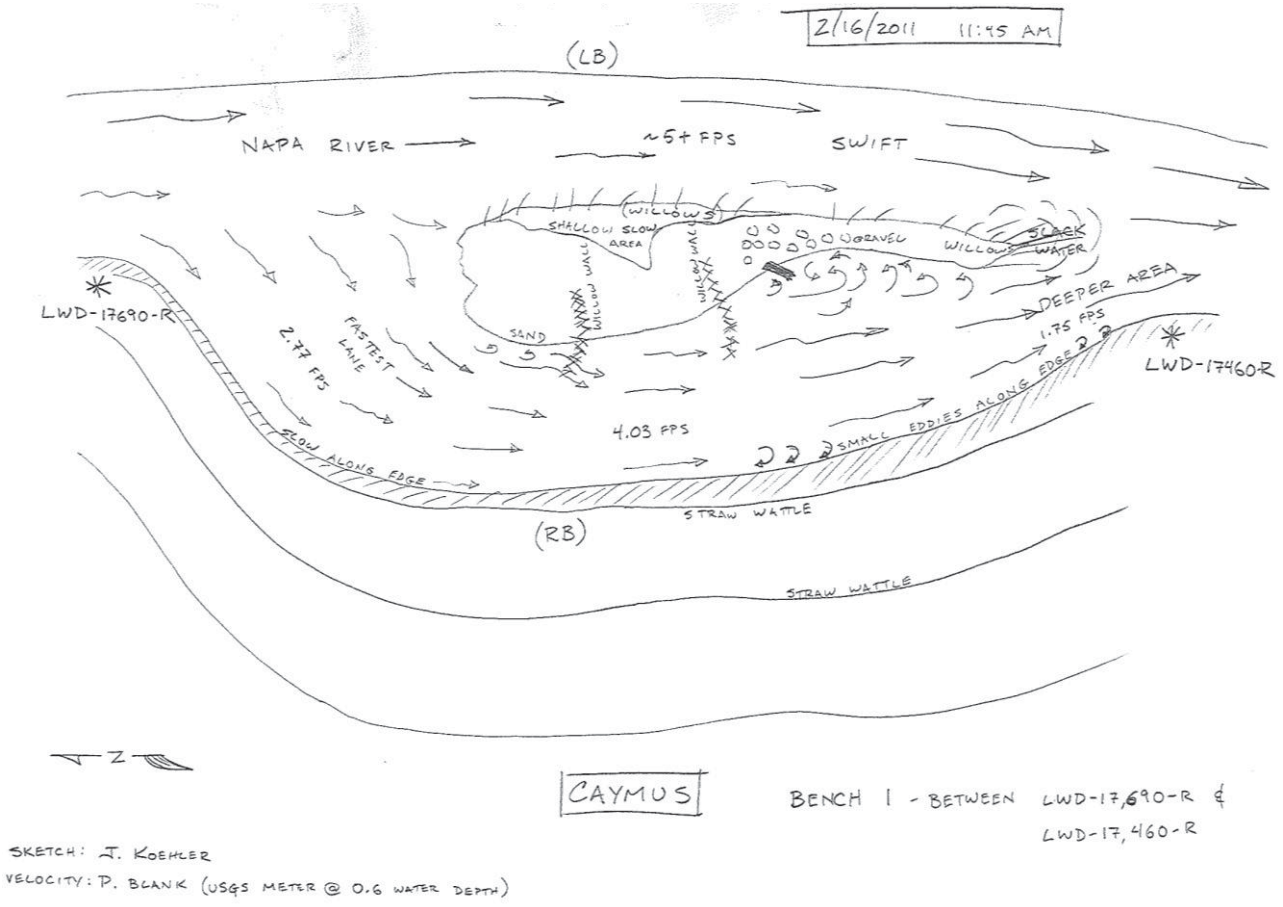
Bench 1: Caymus: Right/West Bank Stations 17,700-17,425 Sketch

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.



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)

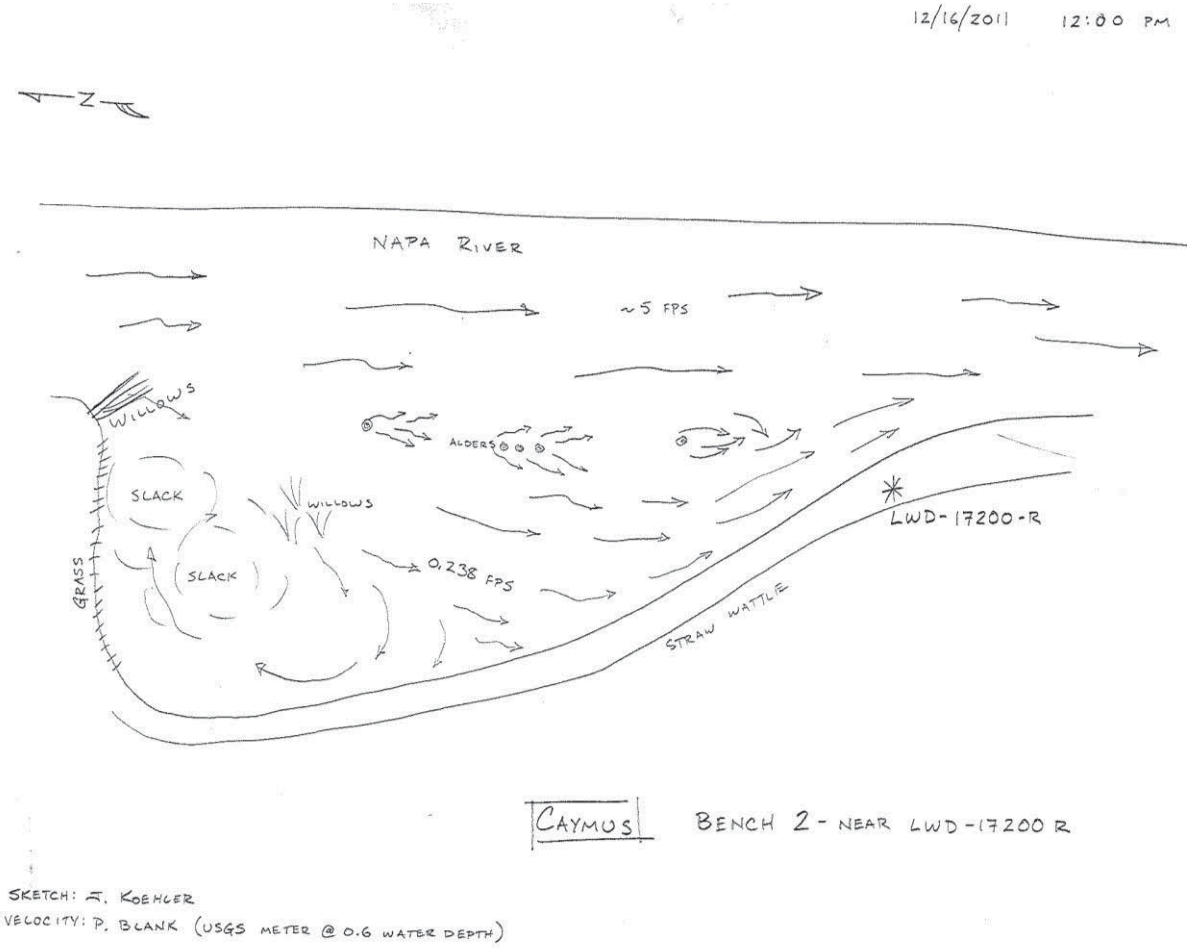
Water Surface Elevation: 150.18 ft (NAVD 88)

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.



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)

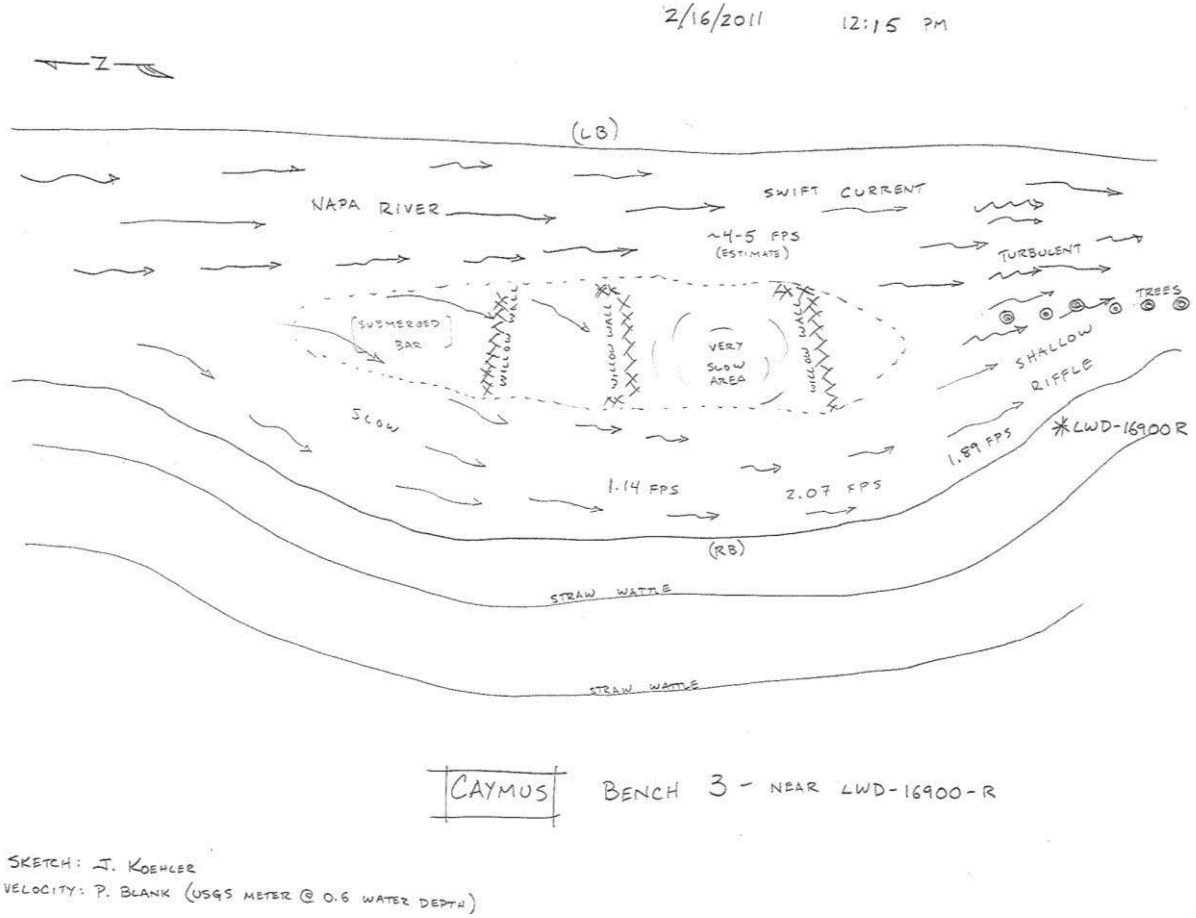
Bench 3: Caymus: Right/West Bank Stations 17,150-16,850 Sketch

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.

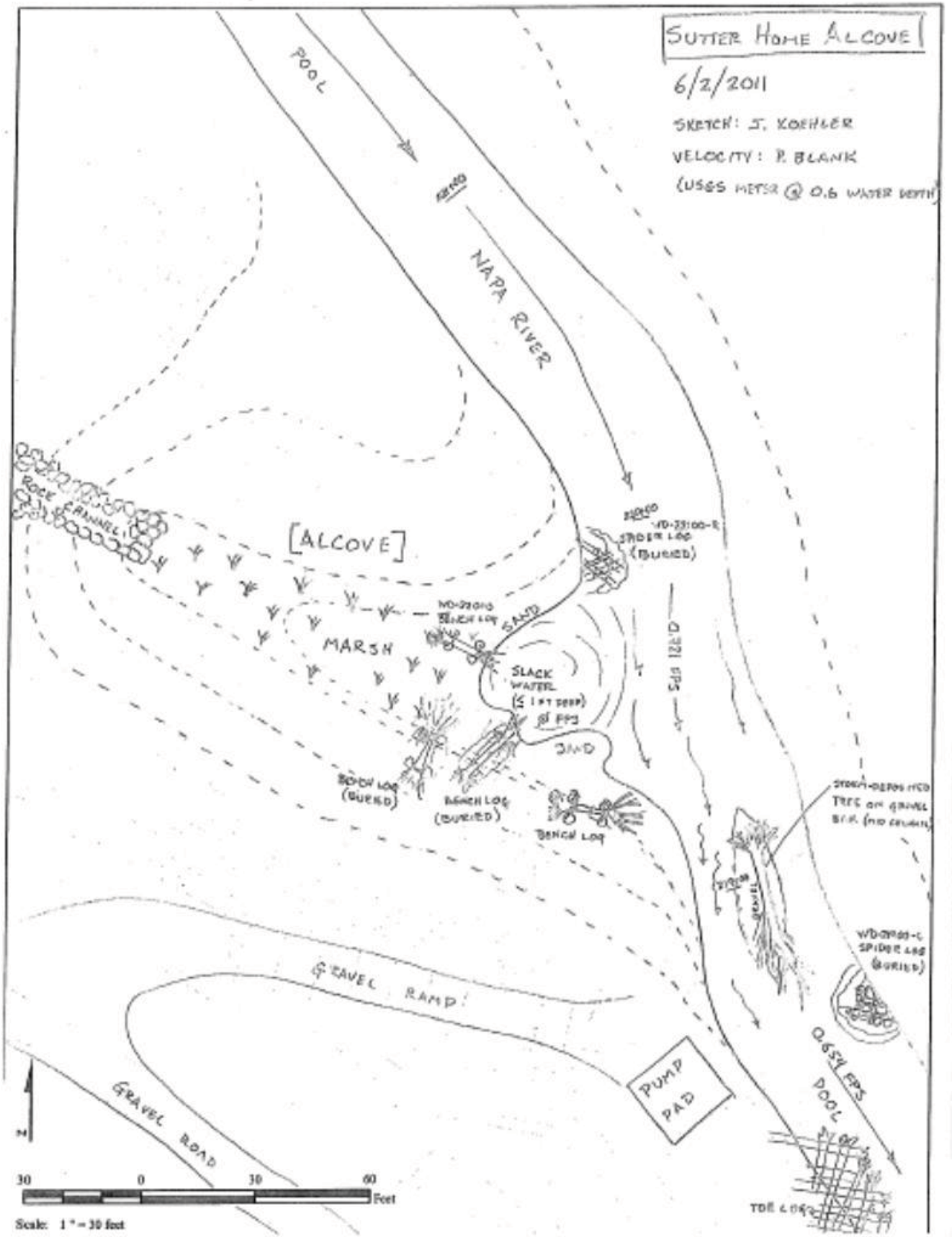


Bench 3: Caymus: Right/West Bank Stations 17,150-16,850 Photos

February 16, 2011

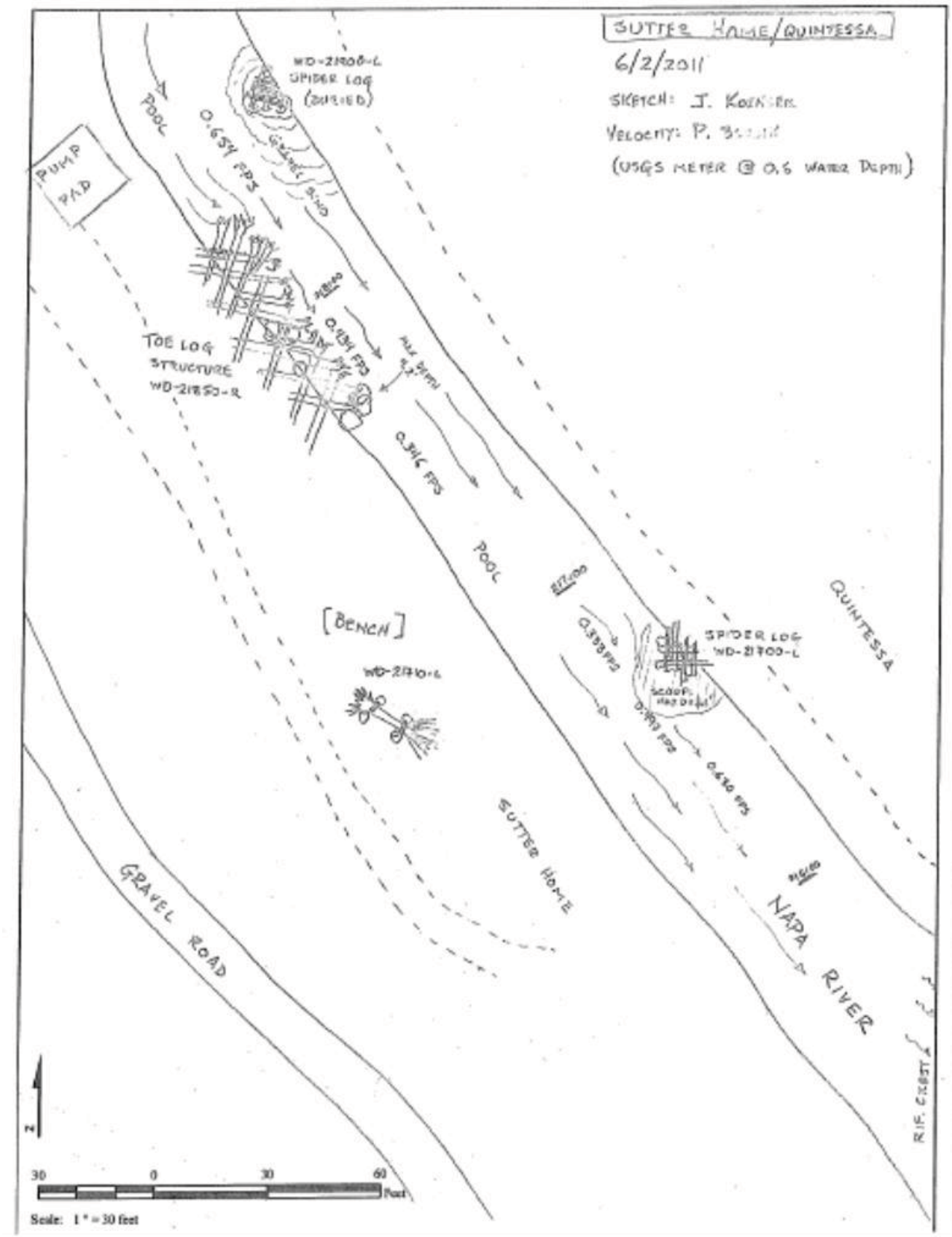
Discharge: 1,030 cfs (Napa River Near St. Helena at Pope Street)

Water Surface Elevation: 149.2 ft (NAVD 88)


SUTTER HOME ALCOVE
6/2/2011
SKETCH: J. KOEHLER
VELOCITY: P. BLANK
(USGS METER @ 0.6 WATER DEPTH)
POOL
RIFFLE
NAPA RIVER
ROCK FANNEL
[ALCOVE]
MARSH
SAND
SLACK WATER (≤ 1 FT DEEP) 0 FPS
SAND
BENCH LOG (BURIED)
BENCH LOG (BURIED)
BENCH LOG
GRAVEL
GRAVEL RAMP
PUMP PAD
GRAVEL ROAD
POOL
TOE
30
0
30
60
Feet
Scale: 1" = 30 feet

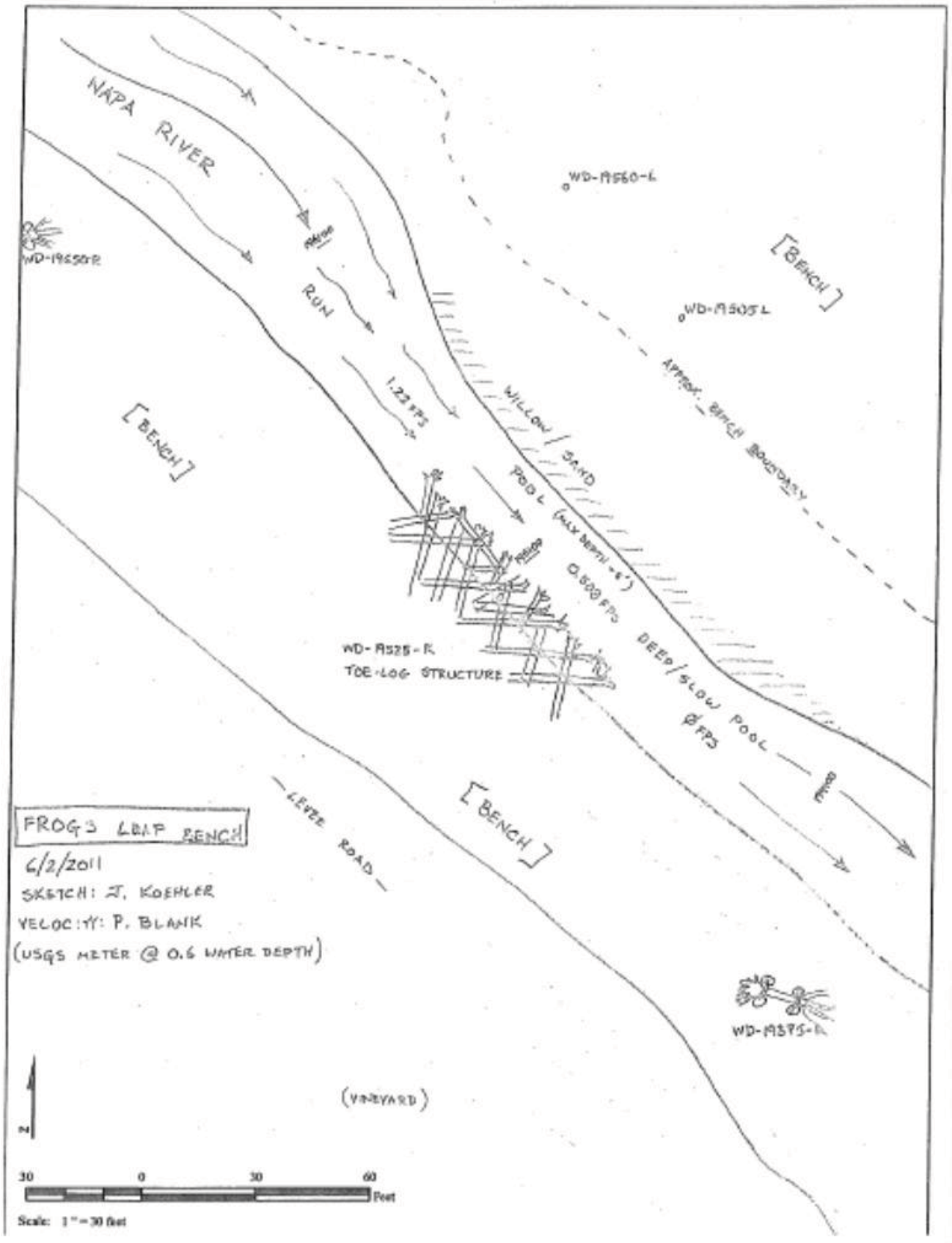
Sutter Home Alcove (WD-22100-R in foreground)
6/2/2011

WD-22100-R
6/2/2011

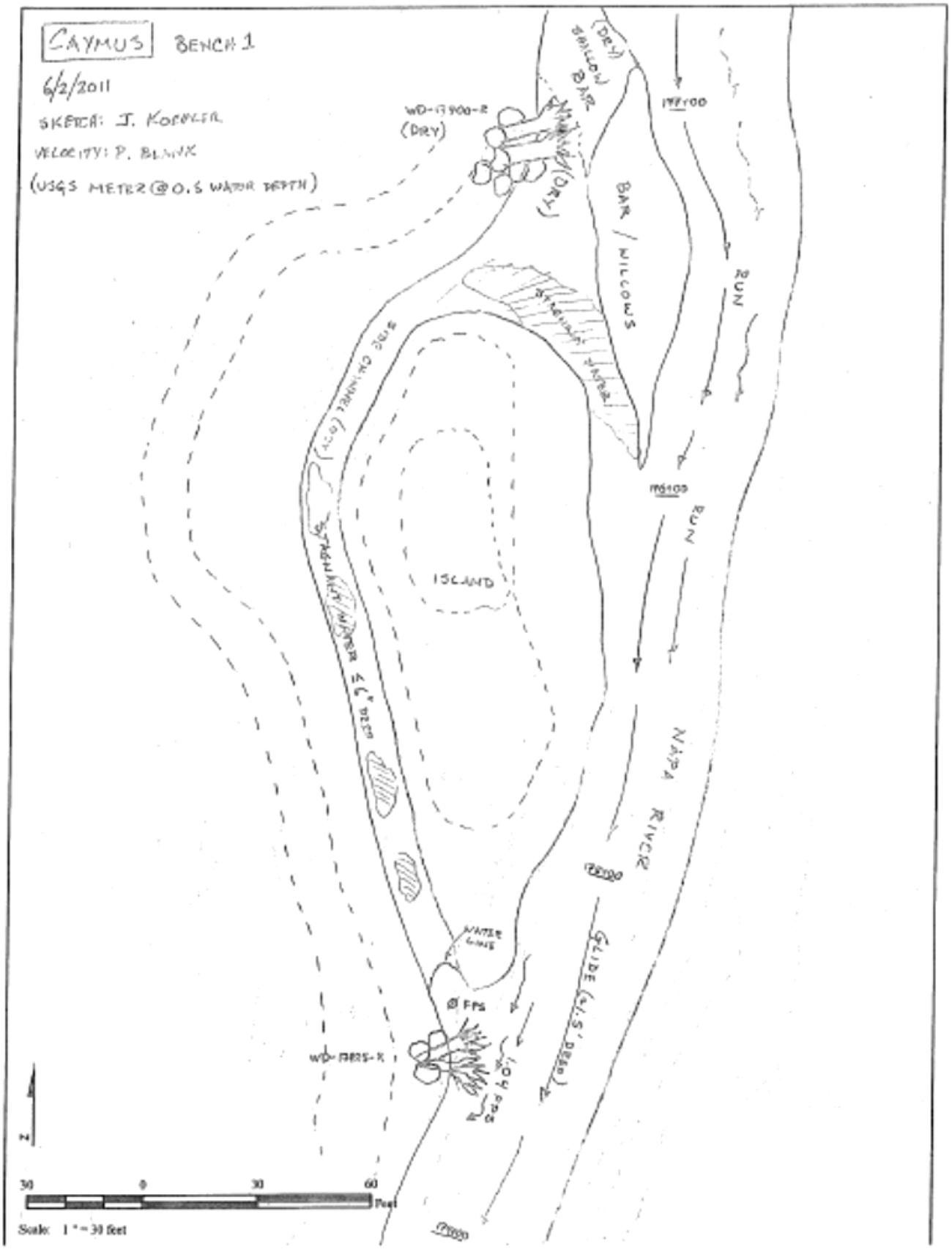

SUTTER HOME/QUINTESSA
6/2/2011
SKETCH: J. KOENIG
VELOCITY: P. BAUM
(USGS METER @ 0.6 WATER DEPTH)
WD-21800-L
SPIDER LOG
(2013 ED)
POOL
0.65 FPS
PUMP PAD
GRAVEL BAR
TOE LOG
STRUCTURE
WD-21850-R
0.4 FPS
0.3 FPS
POOL
[BENCH]
WD-21710-L
SPIDER LOG
WD-21700-L
0.3 FPS
0.4 FPS
SUTTER HOME
QUINTESSA
NAPA RIVER
GRAVEL ROAD
RIP. CREST
N
30 0 30 60
Feet
Scale: 1" = 30 feet

WD-21850-R
6/2/2011

WD-21700-L
6/2/2011

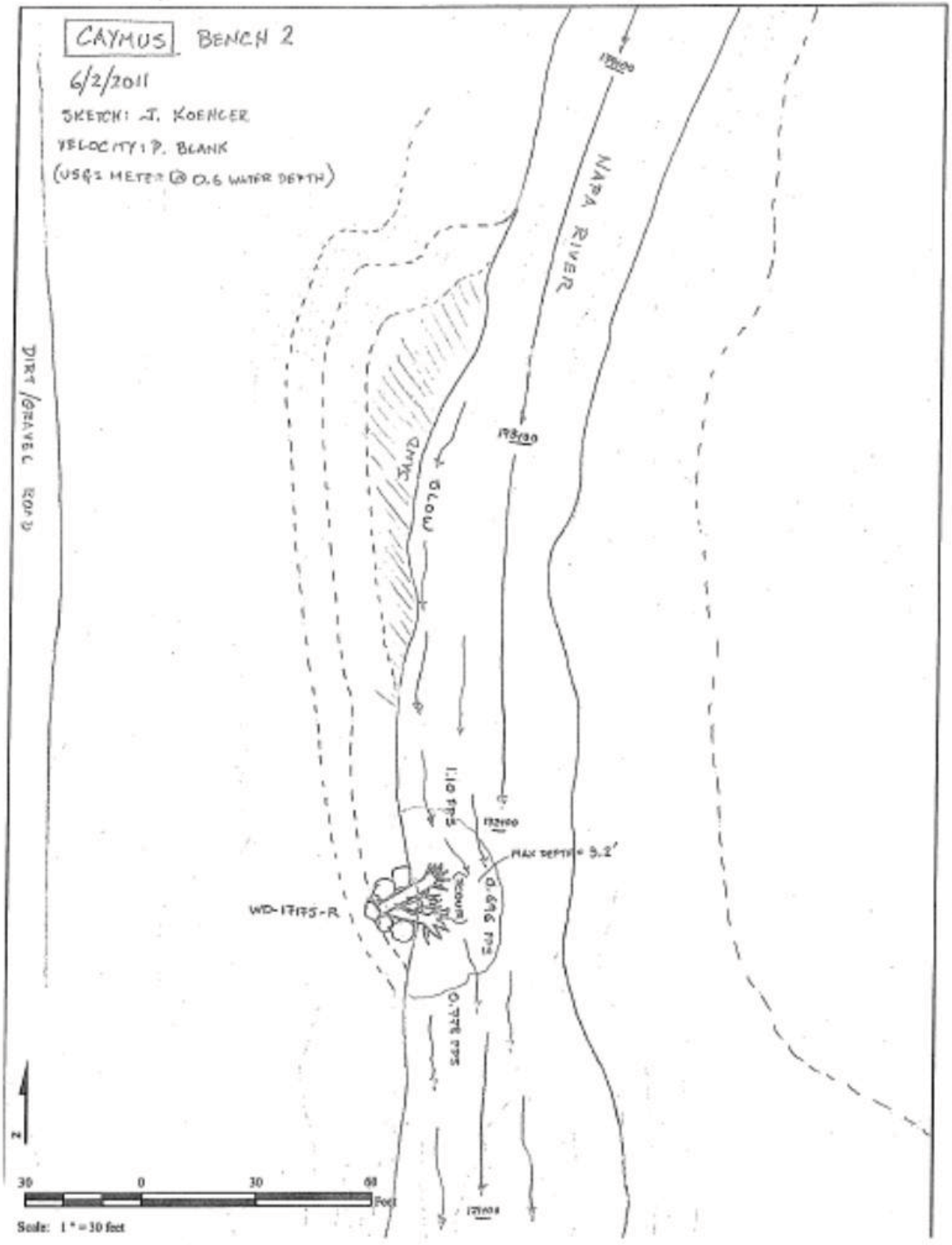

NAPA RIVER
WD-19550R
WD-19560-L
WD-19505-L
[BENCH]
RUN
1.22 FPS
WILLOW / SAND
POOL (MAX DEPTH ~6')
0.500 FPS
APPROX. BENCH BOUNDARY
WD-19525-R
TOE-LOG STRUCTURE
DEEP/SLOW POOL
0 FPS
[BENCH]
LEVEE ROAD
[BENCH]
WD-19575-L
(VINEYARD)
FROGS LEAP BENCH
6/2/2011
SKETCH: J. KOEHLER
VELOCITY: P. BLANK
(USGS METER @ 0.6 WATER DEPTH)
N
30 0 30 60
Feet
Scale: 1" = 30 feet

WD-19525-R
6/2/2011

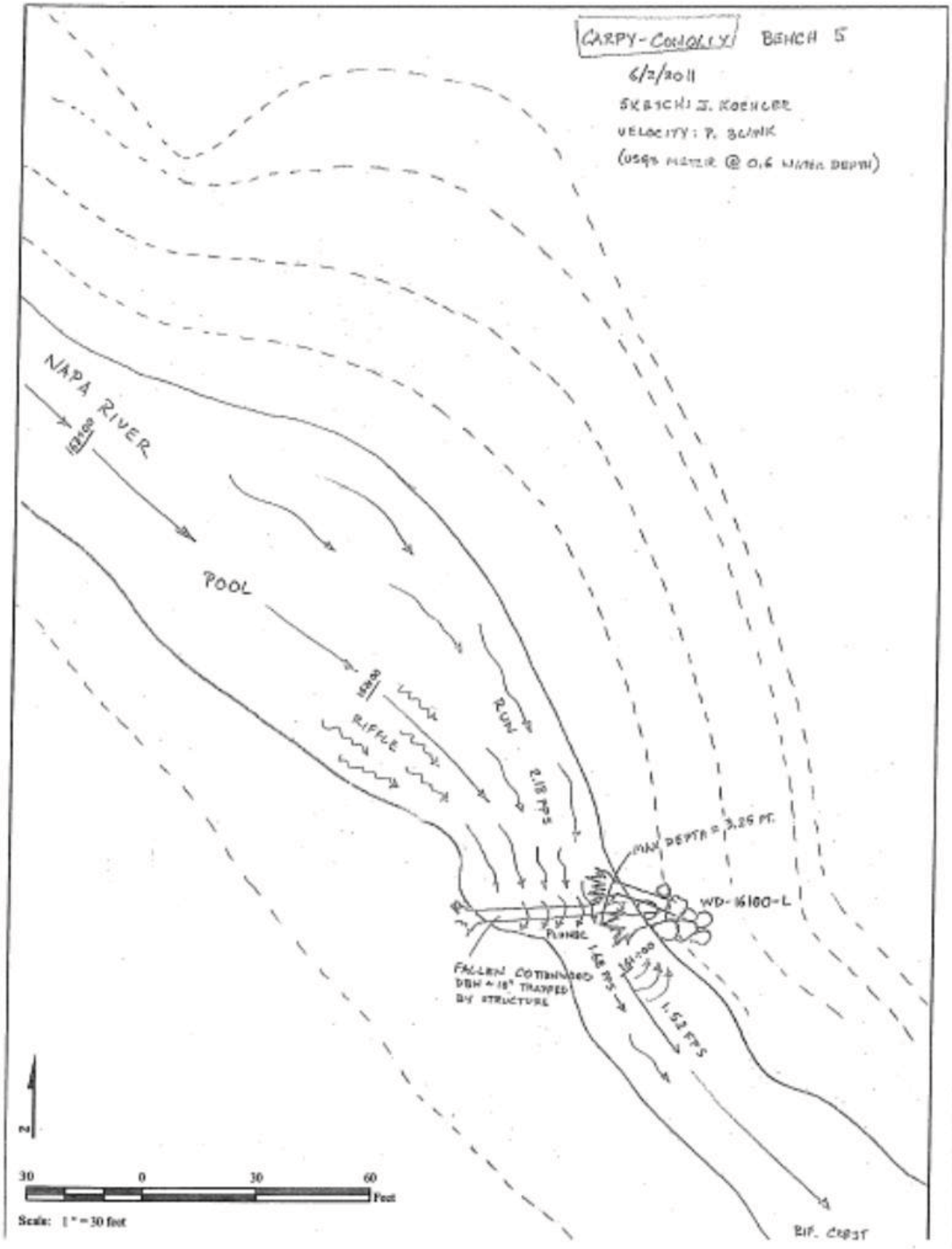

CAYMUS
BENCH 1
6/2/2011
SKETCH: J. KOEHLER
VELOCITY: P. BLANK
(USGS METER @ 0.5 WATER DEPTH)
WD-13900-R
(DRY)
(DRY)
BAR / WILLOWS
RUN
ISLAND
SIDE CHANNEL (DRY)
NAPA RIVER
SLIDE (U.S. 29)
WATER GAGE
@ FPS
WD-13825-R
Scale: 1" = 30 feet

WD-17700-R
6/2/2011

WD-17425-R
6/2/2011

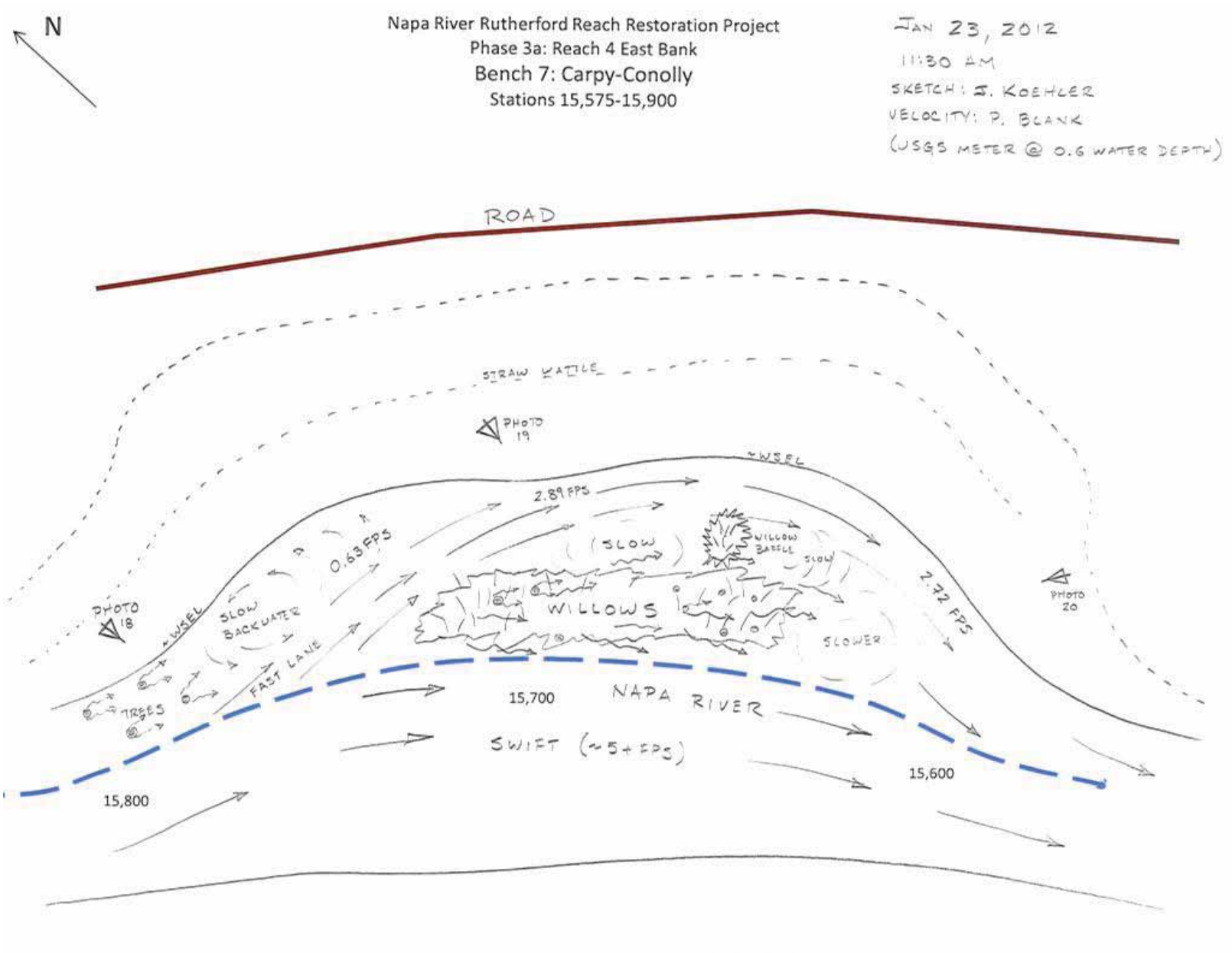

CAYMUS BENCH 2
6/2/2011
SKETCH: J. KOENGER
VELOCITY: P. BLANK
(USGS METER @ 0.6 WATER DEPTH)
NAPA RIVER
DIRT/GRAVEL ROAD
SAND
MUD
1.10 FPS
0.49 FPS
0.72 FPS
MAX DEPTH = 3.2'
WD-17175-R
N
30 0 30 60
Feet
Scale: 1" = 30 feet

WD-17175-R
6/2/2011


CARPY-COLLOLY BENCH 5
6/2/2011
SKETCH: J. KOEHLER
VELOCITY: P. BLINK
(USGS METER @ 0.6 WATER DEPTH)
NAPA RIVER
POOL
RIFFLE
RUN
2.18 FPS
MAX DEPTH = 3.25 FT.
WD-16100-L
PLUNGE
FALLEN COTTONWOOD
DBH = 18" TRAPPED
BY STRUCTURE
1.48 FPS
1.53 FPS
BIF. CREST
N
30 0 30 60
Feet
Scale: 1" = 30 feet

WD-16100-L
6/2/2011

2012
Velocity Monitoring Sketches and Photos


N
Napa River Rutherford Reach Restoration Project
Phase 3a: Reach 4 East Bank
Bench 7: Carpy-Conolly
Stations 15,575-15,900
JAN 23, 2012
11:30 AM
SKETCH: J. KOEHLER
VELOCITY: P. BLANK
(USGS METER @ 0.6 WATER DEPTH)
ROAD
STRAW WATTLE
PHOTO 19
~WSEL
2.89 FPS
0.63 FPS
(SLOW)
WILLOW BAFFLE
SLOW
WILLOWS
2.72 FPS
PHOTO 18
~WSEL
SLOW BACKWATER
FAST LANE
PHOTO 20
SLOWER
TREES
15,700
NAPA RIVER
SWIFT (~5+ FPS)
15,800
15,600

River Station 15,800
Bench 7: Carpy-Conolly
January 23, 2012 11:30 (Photo 17)

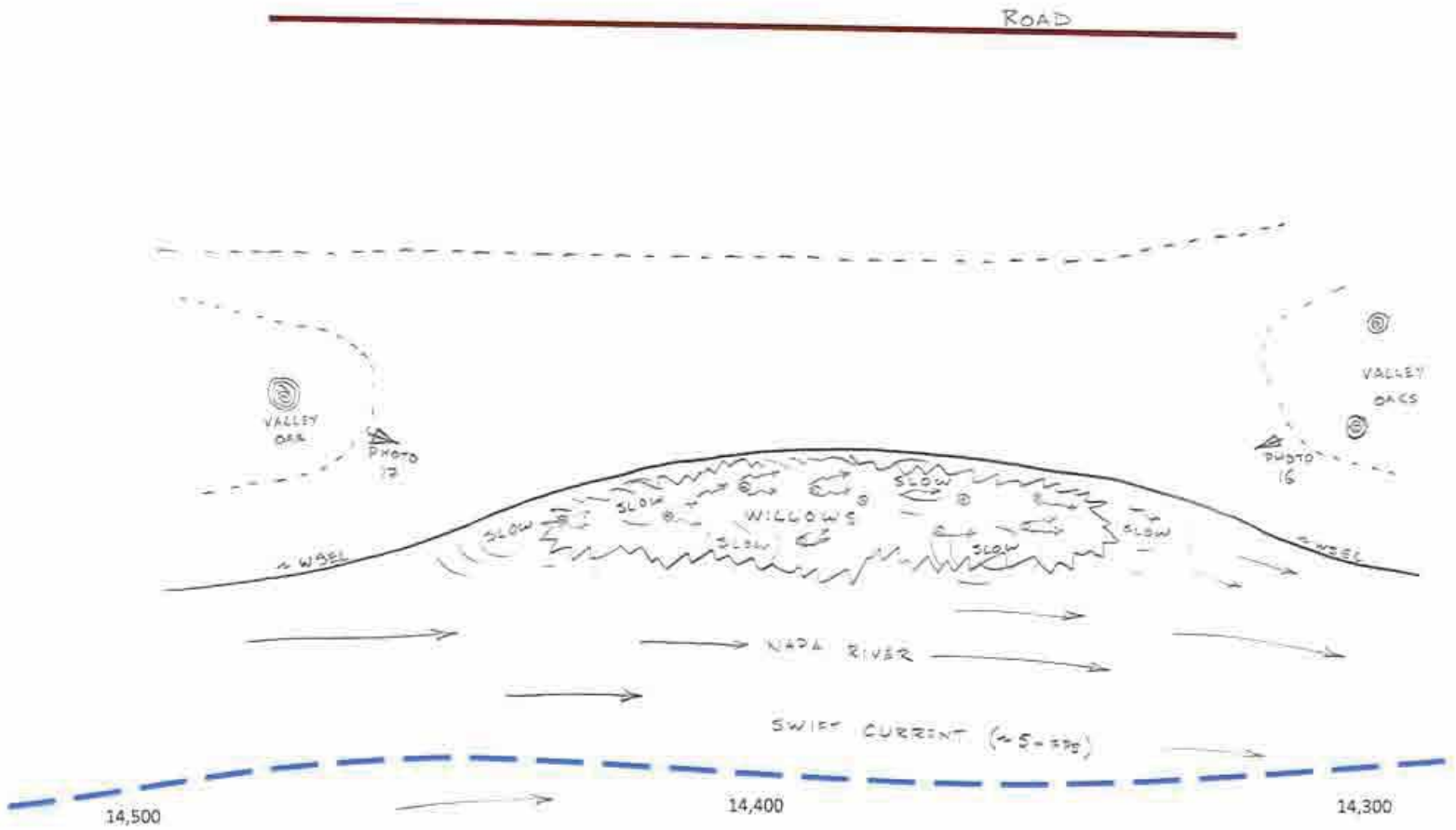
River Station 15,720
Bench 7: Carpy-Conolly
January 23, 2012 11:30 (Photo 18)

River Station 15,570
Bench 7: Carpy-Conolly
January 23, 2012 11:30 (Photo 19)

N

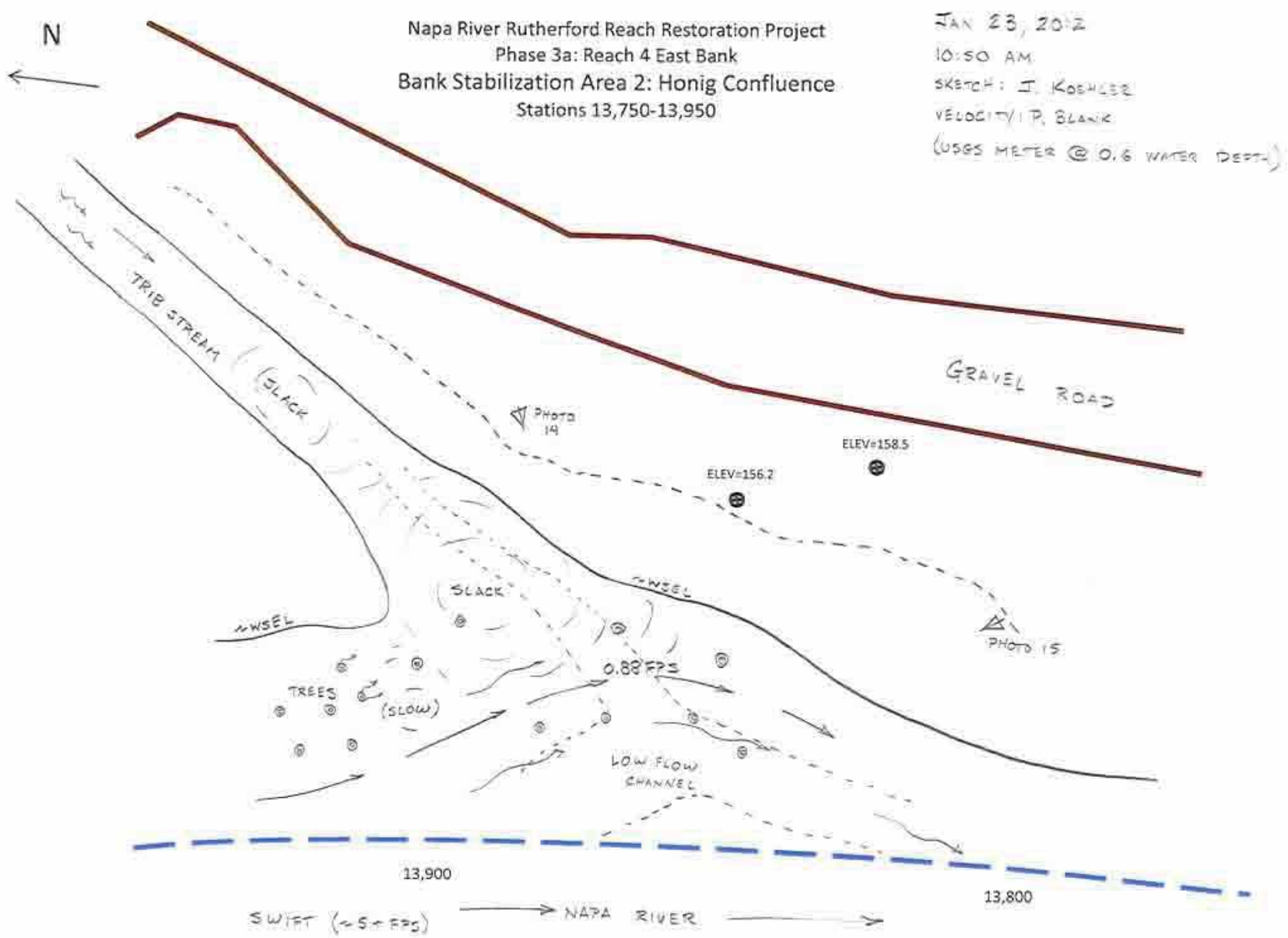
Napa River Rutherford Reach Restoration Project
Phase 3a: Reach 4 East Bank
Bank Stabilization Area 1: Carpy-Conolly
Stations 14,300-14,500

JAN 23, 2012
11:17 AM
SKETCH: T. KOEHLER
(WATER VELOCITIES NOT MEASURED)



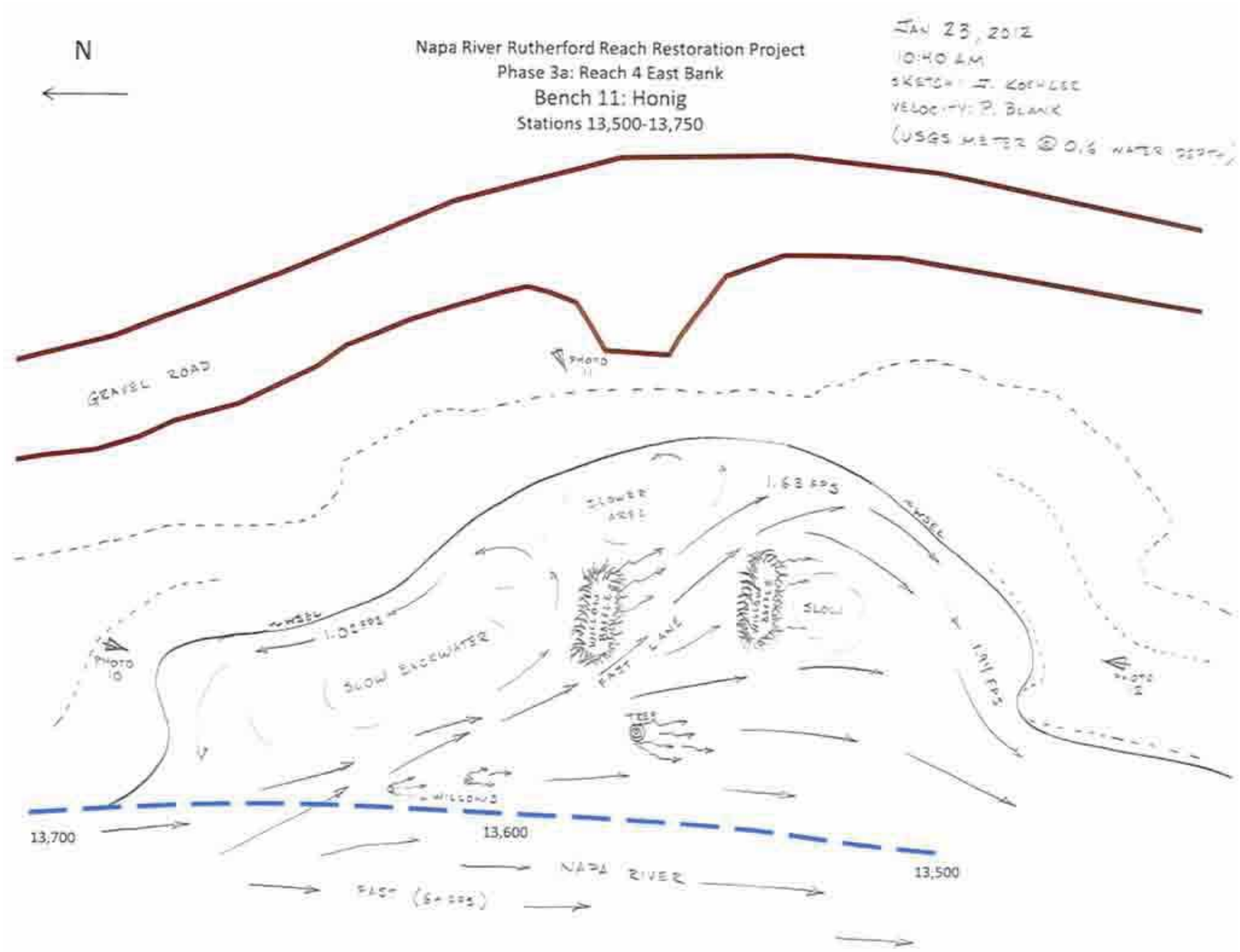
River Station 14,460
Bank Stabilization Area 1: Carpy-Conolly
January 23, 2012 11:17 (Photo 16)

River Station 14,310
Bank Stabilization Area 1: Carpy-Conolly
January 23, 2012 11:17 (Photo 15)


N
Napa River Rutherford Reach Restoration Project
Phase 3a: Reach 4 East Bank
Bank Stabilization Area 2: Honig Confluence
Stations 13,750-13,950
JAN 23, 2012
10:50 AM
SKETCH: J. KOEHLER
VELOCITY: P. BLANK
(USGS METER @ 0.6 WATER DEPTH)
TRIB STREAM
(SLACK)
GRAVEL ROAD
PHOTO 14
ELEV=158.5
ELEV=156.2
SLACK
~WSEL
~WSEL
PHOTO 15
0.88 FPS
TREES
(SLOW)
LOW FLOW CHANNEL
13,900
13,800
SWIFT (~5+ FPS)
NAPA RIVER

River Station 13,890
Bank Stabilization Area 2: Honig Confluence
January 23, 2012 10:50 (Photo 13)

River Station 13,890
Bank Stabilization Area 2: Honig Confluence
January 23, 2012 10:50 (Photo 14)


N
Napa River Rutherford Reach Restoration Project
Phase 3a: Reach 4 East Bank
Bench 11: Honig
Stations 13,500-13,750
JAN 23, 2012
10:40 AM
SKETCH: T. KOEHLER
VELOCITY: P. BLANK
(USGS METER @ 0.6 WATER DEPTH)
GRAVEL ROAD
PHOTO 11
PHOTO 10
PHOTO 9
SLOWER AREA
1.63 FPS
WHEEL
1.06 FPS
SLOW EDGEWATER
FAST LANE
SLOW
1.91 FPS
TREE
WILLOWS
13,700
13,600
13,500
NAPA RIVER
FAST (5+ FPS)

River Station 13,680
Bench 11: Honig
January 23, 2012 10:40 (Photo 10)

River Station 13,600
Bench 11: Honig
January 23, 2012 10:40 (Photo 11)

River Station 13,450
Bench 11: Honig
January 23, 2012 10:40 (Photo 12)

MAY 1, 2012

SKETCH: J. KOEHLER

VELOCITY: P. BLANK

(USGS METER @ 0.6 WATER DEPTH)

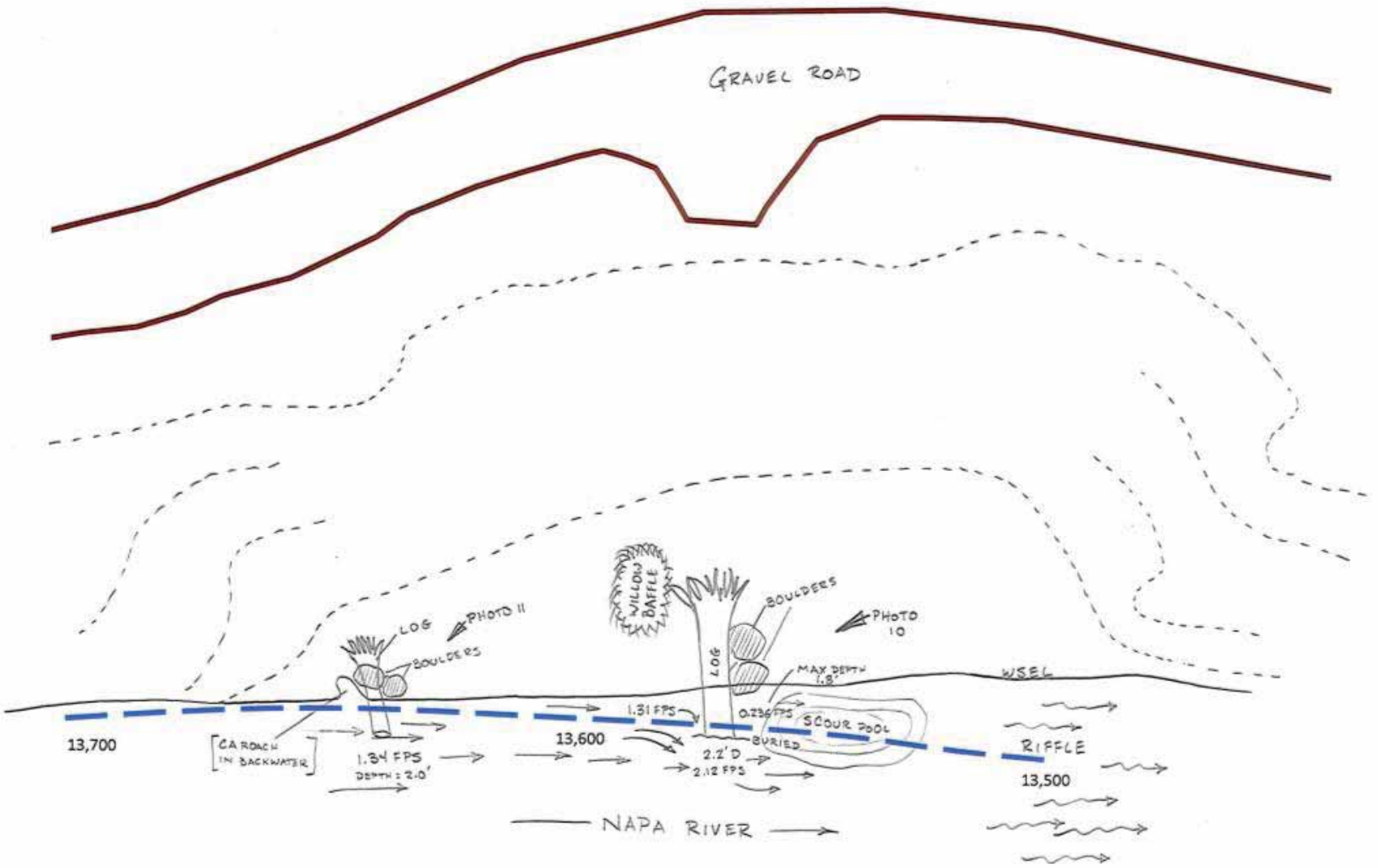
N

Napa River Rutherford Reach Restoration Project

Phase 3a: Reach 4 East Bank

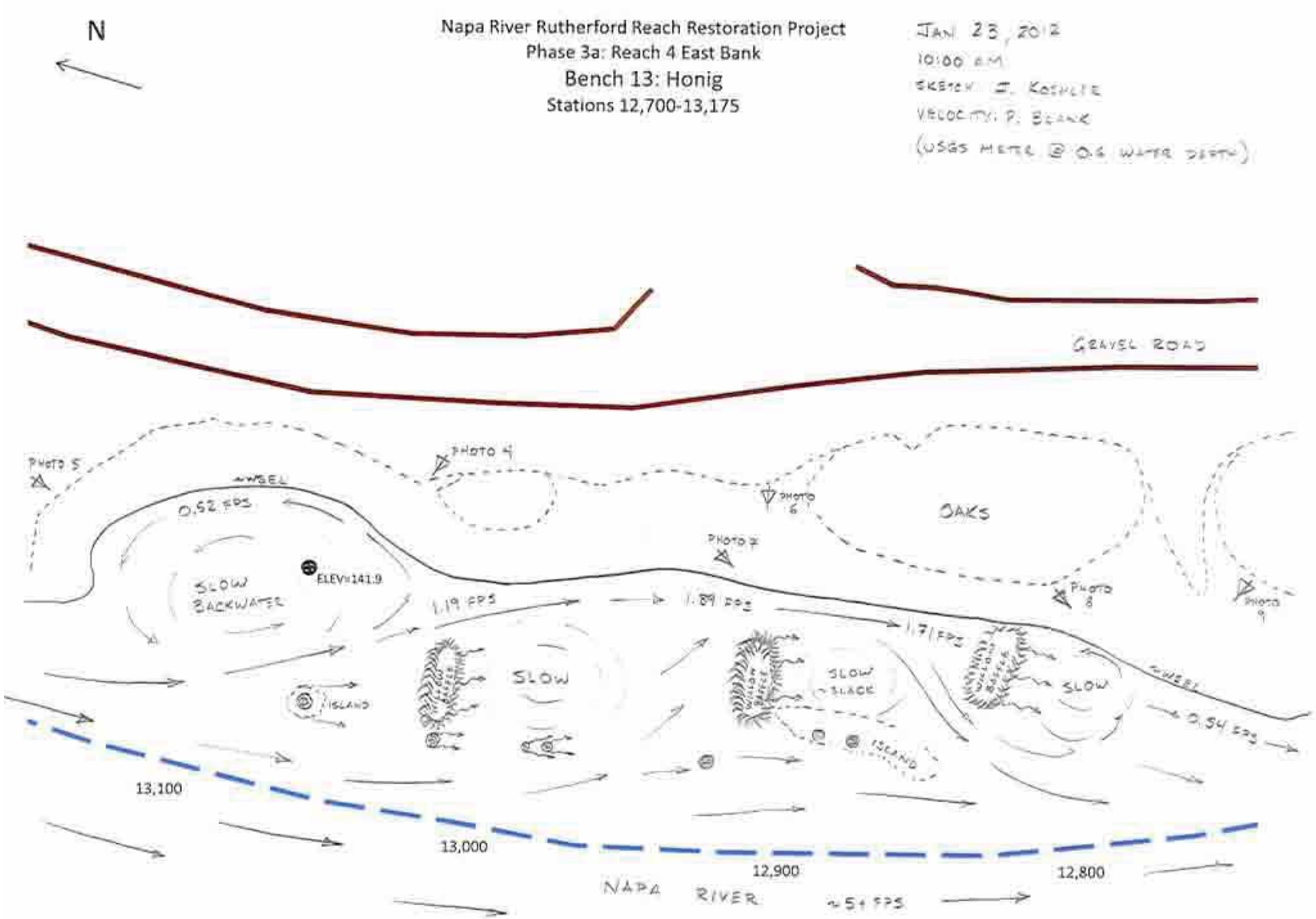
Bench 11: Honig

Stations 13,500-13,750



WD-13650-L Low Profile Log
Bench 11: Honig
May 1, 2012 (Photo 11)

WD-13590-L Low Profile Log
Bench 11: Honig
May 1, 2012 (Photo 10)


N
Napa River Rutherford Reach Restoration Project
Phase 3a: Reach 4 East Bank
Bench 13: Honig
Stations 12,700-13,175
JAN 23, 2012
10:00 AM
SKETCH: J. KOEHLER
VELOCITY: P. BLANK
(USGS METER @ 0.6 WATER DEPTH)
GRAVEL ROAD
PHOTO 5
PHOTO 4
PHOTO 6
PHOTO 7
PHOTO 8
PHOTO 9
OAKS
~WSEL
0.52 FPS
SLOW
BACKWATER
ELEV=141.9
1.19 FPS
1.89 FPS
1.7 FPS
ISLAND
SLOW
SLOW
SLACK
SLOW
~WSEL
0.54 FPS
13,100
13,000
12,900
12,800
NAPA RIVER
~5+ FPS

River Station 13,150
Bench 13: Honig
January 23, 2012 10:00 (Photo 5)

River Station 13,050
Bench 13: Honig
January 23, 2012 10:00 (Photo 4)

River Station 12,920
Bench 13: Honig
January 23, 2012 10:00 (Photo 7)

River Station 12,900
Bench 13: Honig
January 23, 2012 10:00 (Photo 6)

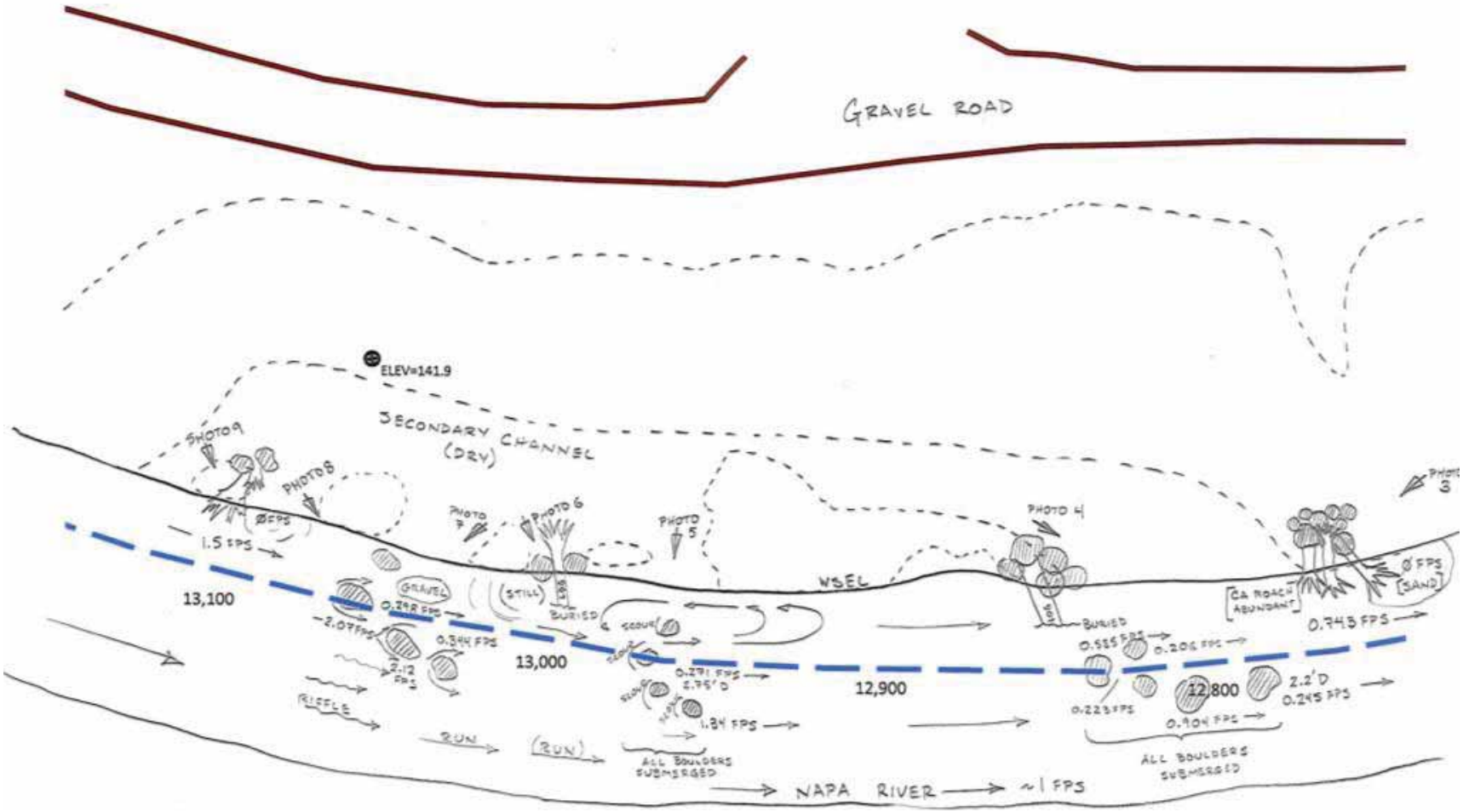
River Station 12,800
Bench 13: Honig
January 23, 2012 10:00 (Photo 8)

River Station 12,720
Bench 13: Honig
January 23, 2012 10:00 (Photo 9)

N

Napa River Rutherford Reach Restoration Project
Phase 3a: Reach 4 East Bank
Bench 13: Honig
Stations 12,700-13,175

MAY 1, 2012
SKETCH: J. KOEHLER
VELOCITY: P. BLANK
(USGS METER @ 0.6 WATER DEPTH)



WD-13070-L Root Wad
Bench 13: Honig
May 1, 2012 (Photo 9)

BC-13050-L Boulder Cluster
Bench 13: Honig
May 1, 2012 (Photo 8)

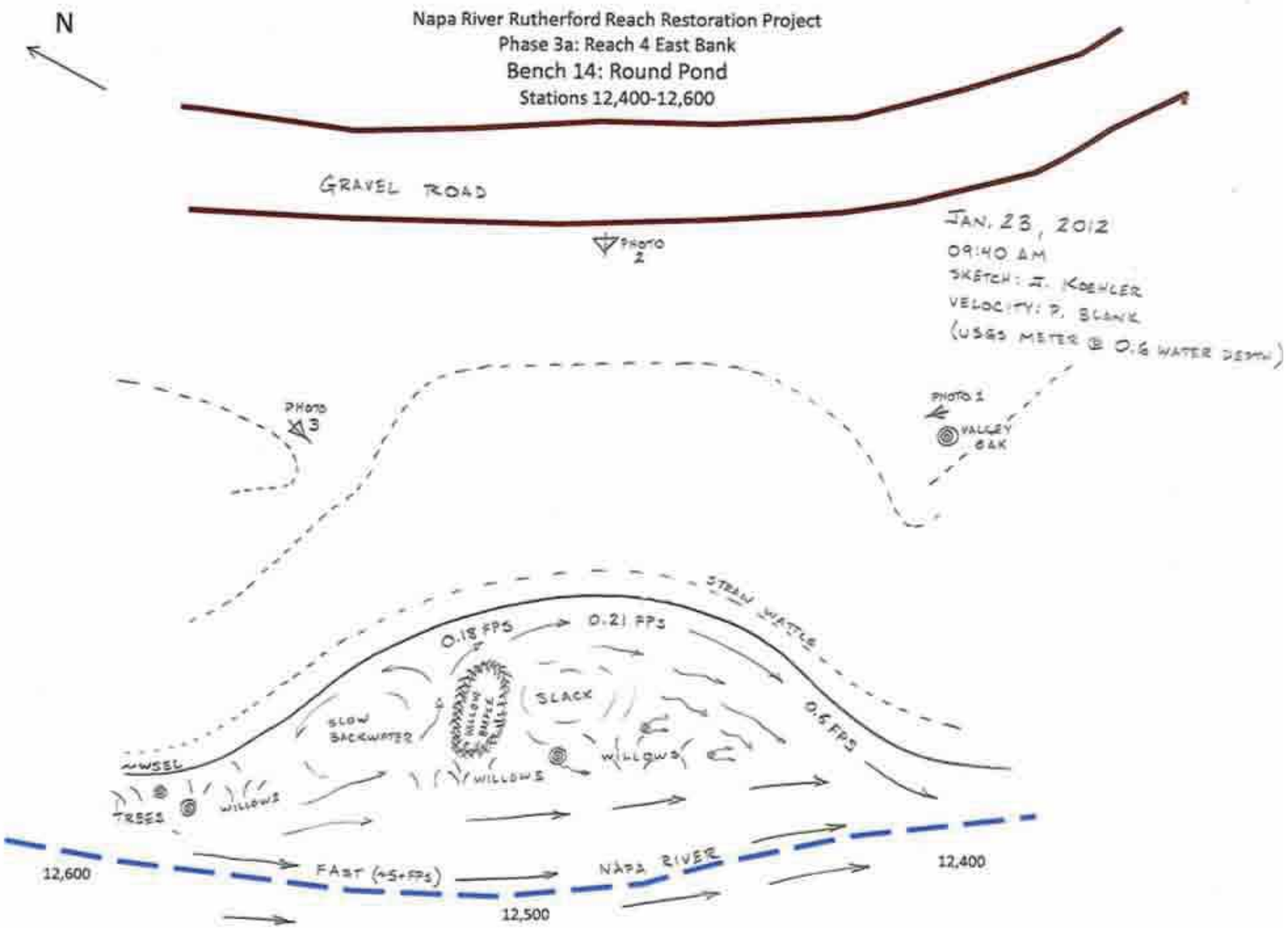
BC-13050-L Boulder Cluster
Bench 13: Honig
May 1, 2012 (Photo 7)

WD-12990-L Low Profile Log
Bench 13: Honig
May 1, 2012 (Photo 6)

WD-12950-M Boulder Cluster
Bench 13: Honig
May 1, 2012 (Photo 5)

WD-12850-L Low Profile Log
Bench 13: Honig
May 1, 2012 (Photo 4)

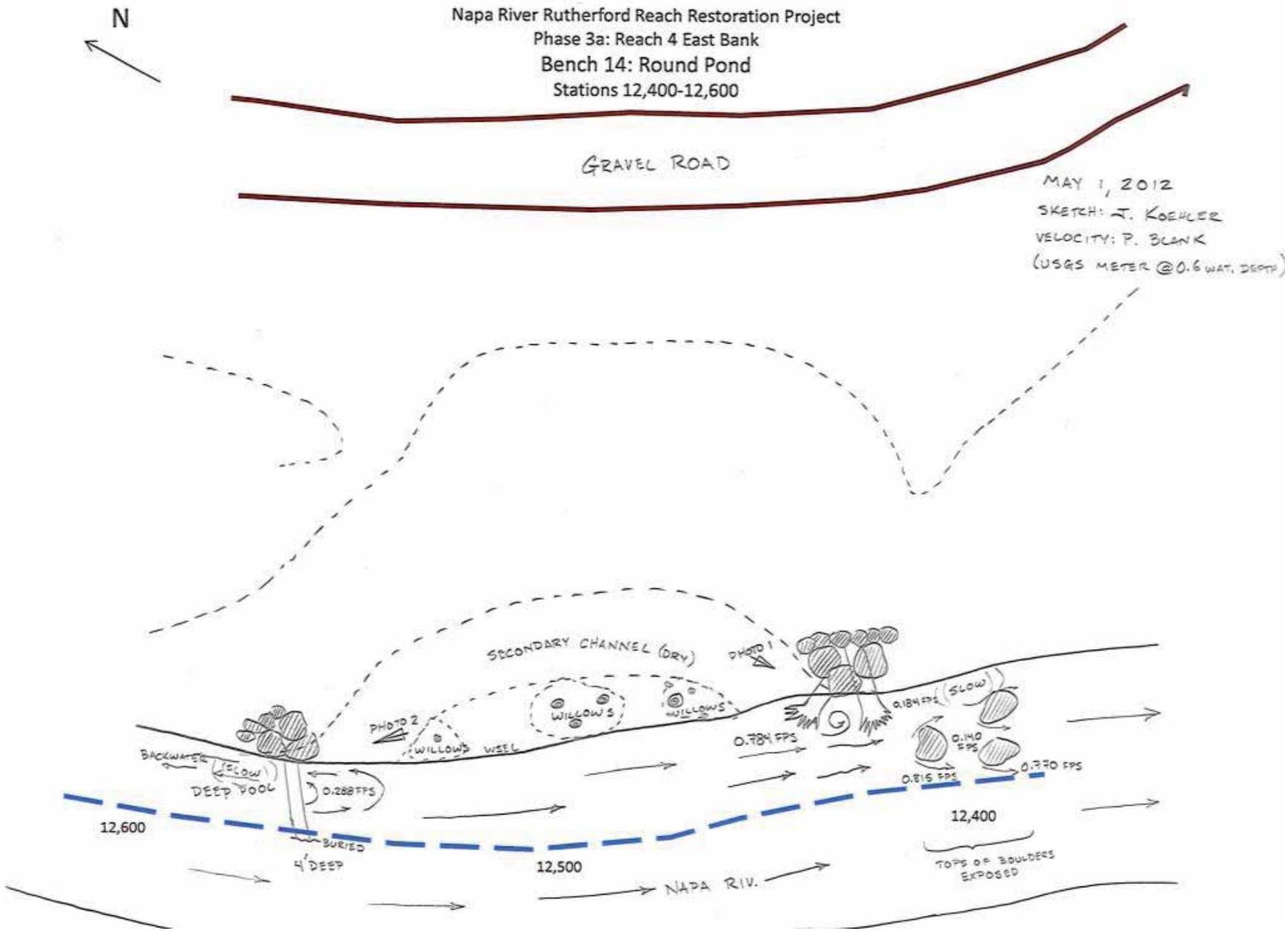
WD-12800-L Root Wad
Bench 13: Honig
May 1, 2012 (Photo 3)


N
Napa River Rutherford Reach Restoration Project
Phase 3a: Reach 4 East Bank
Bench 14: Round Pond
Stations 12,400-12,600
GRAVEL ROAD
PHOTO 2
JAN. 23, 2012
09:40 AM
SKETCH: A. KOEHLER
VELOCITY: P. BLANK
(USGS METER @ 0.6 WATER DEPTH)
PHOTO 3
PHOTO 1
VALLEY OAK
STRAW WATTLE
0.18 FPS
0.21 FPS
0.5 FPS
SLACK
SLOW BACKWATER
WILLOW BUFFER PLANTING
WILLOWS
WILLOWS
WILLOWS
TREES
NAPA RIVER
FAST (4.5+FPS)
12,600
12,500
12,400

River Station 12,550
Bench 14: Round Pond East
January 23, 2012 09:40 (Photo 3)

River Station 12,500
Bench 14: Round Pond East
January 23, 2012 09:40 (Photo 2)

River Station 12,400
Bench 14: Round Pond East
January 23, 2012 (Photo 1)


N
Napa River Rutherford Reach Restoration Project
Phase 3a: Reach 4 East Bank
Bench 14: Round Pond
Stations 12,400-12,600
GRAVEL ROAD
MAY 1, 2012
SKETCH: T. KOEHLER
VELOCITY: P. BLANK
(USGS METER @0.6 WAT. DEPTH)
SECONDARY CHANNEL (DRY)
PHOTO 1
PHOTO 2
WILLOWS
WILLOWS
WILLOWS
WEED
BACKWATER
(SLOW)
DEEP POOL
0.288 FPS
0.784 FPS
0.184 FPS
(SLOW)
0.140 FPS
0.815 FPS
0.770 FPS
12,600
BURIED
4' DEEP
12,500
12,400
TOPS OF BOULDERS EXPOSED
NAPA RIV.

WD-12550-L Low Profile Log
Bench 14: Round Pond East
May 1, 2012 (Photo 2)

WD-12420-L Root Wad, BC-12400-L
Bench 14: Round Pond East
May 1, 2012 (Photo 1)