Title
Looking forward, looking back : monitoring the Tassajara Creek Restoration Project

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Looking Forward, Looking Back:
Monitoring the Tassajara Creek Restoration Project

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Abstract

Project monitoring has become a subject of increasing importance within the river restoration field. This study was completed as a post-construction evaluation of a restoration project completed in 1999 along a one-mile reach of Tassajara Creek near Dublin, California. Several objectives guided the design and implementation of the project, including that of protecting existing native trees and providing improved water quality. However, the main goal of the project was to stop incision on the channel, which, over the last century, had produced a deeply incised channel. A monitoring plan for this reach of Tassajara Creek, contained in an initial post-project evaluation completed in 2001, was implemented to evaluate the incision occurring on the creek. That same report found evidence that the creek had continued to incise since the project's construction despite the restoration efforts. However, our study found that the project reach shows little or no evidence of incision, except for a few localized areas at the downstream end of the project reach. Although no evidence of incision was found, other evidence of deviations from the original restoration plan objectives were discovered. Our site work found several potential threats to the success of this project, including damage to existing native trees and a debris jam with the potential to degrade water quality in the creek. To account for these findings, and an appended monitoring plan was drafted so that the success of the project in meeting these additional objectives may be evaluated in the future. Because the study period for this project began only two years ago it is difficult to draw conclusions about the success of this project. Therefore, we recommend that project monitoring be continued in accordance with our monitoring plan so that the success of this restoration project can continue to be evaluated.

Introduction

The Tassajara Creek watershed is located just inland of the San Francisco Bay, approximately 25 miles southeast of Oakland, California (Figure 1). The creek itself flows from its headwaters on the south side of Mount Diablo in southern Contra Costa County to its confluence with the Arroyo de Laguna in northern Alameda County. It drains an area of approximately 23.2 square miles above I-580 in Dublin, California (Hudzik and Truitt, 2001) (Figure 2).

In the early 1990s, the City of Dublin initiated a plan to incorporate and develop the area adjacent to Tassajara Creek north of I-580. Under this plan, 645 acres of land surrounding the creek were to be developed for residential and commercial use (Hudzik and Truitt, 2001). To ensure that these new developments were protected from the flood waters of the creek, Brian Kangas Foulk Engineers (BKF) was retained to produce a general drainage and flood control plan for the creek in 1995.

As development plans moved along, there was a desire to do more with Tassajara Creek than to simply control its flood waters. The idea was to restore the portion of the creek within the development area and incorporate it as a linear park that would provide area residents with numerous recreational opportunities. As a result, Sycamore Associates, in cooperation with Balance Hydrologics and dk Associates, developed a restoration plan in 1996 for a 1-mile reach of Tassajara Creek between I-580 and just north of Gleason Avenue (Figure 3). The restoration goals, as outlined by the 1996 plan, included the following:

- Provide a natural open channel capable of providing for storm water conveyance and sediment loads, channel crossing, maintenance access, and the natural scour and meandering of the creek.
- Provide new and maintain existing riparian habitat for wildlife.

- Protect any existing native trees or other native vegetation within the stream corridor.
- Replace exotic vegetation with native vegetation.
- Provide water quality that meets best management practices and other standards.
- Provide safe public access and visibility of the stream corridor.

Concerns regarding the stability of Tassajara Creek were raised within the 1996 plan, and later that year G. Mathias Kondolf and Graham Matthews of the University of California, Berkeley, were retained to assess the stability of the creek within the project reach. Their analysis of historical topographic maps and aerial photographs revealed that the stream had not drastically changed course during the approximately 150 years of record. However, they did find that incision (the pronounced down-cutting of a stream or river channel) was a problem within the creek and a continuing threat to the stability of the creek. The incision most likely began sometime in the 19th century due to intensive livestock grazing on the surrounding lands (Hudzik and Truitt, 2001). The cattle grazing decreased the vegetation cover along the stream banks and reduced the quantity of runoff that infiltrated the soil before reaching the creek. This increased runoff caused greater stream flows, which, in turn, caused higher shear stresses on the stream bed and facilitated the erosion of the channel and its banks. As time went on, this process built upon itself and eventually created a deeply incised channel within the project reach (Lave, 2002).

Evidence of this deeply incised channel was documented in field surveys completed in 1996 and 1997 by Kondolf and Matthews in their investigation into the stability of the creek. Additional evidence of the extensive incision along Tassajara Creek was provided by broken fragments of the concrete that once lined the channel. From the early 1940s to the early 1950s, a United States naval base and hospital occupied most of the land surrounding the creek within the project reach. Sometime during this period, the U.S. Navy lined most of the channel with concrete

(Lave, 2002). Subsequently, the powerful erosive forces in the creek caused the concrete to fail and remnants of the concrete lining were found as much as six feet above the elevation of the current channel bed (Kondolf and Matthews, 1997).

The work of Kondolf and Matthews provided the incentive for the construction of the restoration project. To combat the channel incision and bring stability to Tassajara Creek, design drawings were produced that met the goals and objectives outlined in the 1996 plan and, in 1999, Alameda County implemented the restoration project on the 1-mile stretch of Tassajara Creek.

The restoration project divided the project reach into two smaller reaches. Reach one, located from I-580 upstream to the Dublin Boulevard bridge, was completely reconstructed. A meandering, low-flow channel was set inside a larger trapezoidal channel designed to carry the 100-year flow (Sycamore Associates, et al., 1996). The stretch of Tassajara Creek from the Dublin Boulevard bridge upstream to slightly beyond the Gleason Avenue bridge was designated as reach two. Within this reach, most of the channel was left intact from the level of the thalweg up to the level of the 15-year flood. Above the level of the 15-year flood, however, the channel was pulled back into a broad floodplain terrace capable of carrying the 100-year flood (Sycamore Associates, et al., 1996). To combat incision and prevent it from spreading upstream, five grade control structures were placed across the creek at various points within the project reach. Additionally, the restoration plans identified several old-growth oak trees located on the channel slopes within the project reach and designated them for preservation. In some areas, new low-flow channels were created to bypass and protect the centuries-old oak trees. The channel slopes and floodplain were re-vegetated with native plants and public trails were built along the tops of the outer stream banks (BKF, 1995).

In fall of 2001, Cathy Hudzik and Jocelyn Truitt of the University of California, Berkeley, conducted a post-project appraisal of the Tassajara Creek restoration project and found evidence of continued incision along the project reach. Because the restoration project was meant to stop incision, a monitoring plan was created to evaluate the changes in channel form over time and to ensure that the goals of the restoration project are met (Hudzik and Truitt, 2001). The monitoring plan suggested the implementation of eight cross-section surveys and a long-profile survey within the project reach (Figure 4). The cross-sections were surveyed by Hudzik and Truitt in 2001 and, the following year, Rebecca Lave, also of the University of California, Berkeley, completed the long-profile survey which tied into the Hudzik and Truitt cross-sections. These surveys were compared with design and pre-construction data to estimate the amount of incision that had occurred in the project reach.

Based on the history of the creek and the past studies mentioned above, two primary objectives of our study were delineated. The first objective was to monitor changes in channel morphology since the project's completion in 1999 in accordance with the monitoring plan created by Hudzik and Truitt (2001) (Figure 5). The second objective was to expand and improve the monitoring plan to encompass several additional restoration objectives stated in the 1996 restoration plan and ease the implementation of future project monitoring.

Methods

Monitoring Changes in Channel Morphology

To monitor and document how the channel morphology of Tassajara Creek has changed since 1999, we followed the monitoring plan completed by Hudzik and Truitt (2001) (Figure 5) who established eight transects in the project reach. We completed long-profile and cross-section surveys within the project reach and took photographs that we compared with existing post-restoration photographs.

We re-surveyed four of the eight transects established by Hudzik and Truitt (2001) using an automatic level, a 25-foot rod, and a 300-foot tape for stationing, recording elevations at all slope breaks and at some intermediate points along stretches of constant grade. We established elevations relative to mean sea level (MSL) using transect benchmarks established by Hudzik and Truitt during their 2001 field work. These benchmarks were tied into a benchmark of known elevation located on the southwest corner of the Dublin Boulevard bridge (Hudzik and Truitt, 2001) (Figure 6). The other four Hudzik and Truitt transects were surveyed in March 2003 by Rebecca Lave (R. Lave, University of California, personal communication, 2003). The data from Lave's cross-section surveys were collected and added to our data.

We plotted our cross-sections against the design and 2001 cross-sections contained in the report by Hudzik and Truitt (2001) by aligning the stationing with respect to the transect benchmark on the river left. The design cross-sections were available only in graphical form, so we had to recreate the data by reading the data points off of the graphs. The graphs were marked in ten-foot station intervals and one-foot elevation intervals, so the location of each point required some interpolation. This method likely resulted in an error of +/- 0.1 foot in each direction for each data point.

We also completed a long-profile survey of the creek's thalweg between the Dublin Boulevard bridge and a footbridge/grade control structure located between the Central Parkway bridge and the Gleason Avenue bridge (Figure 4). Using the same surveying equipment utilized for the cross-sectional survey, we recorded elevations at all slope breaks, at some intermediate points along stretches of constant grade, and at the upstream, downstream, and deepest (or shallowest) points of pools (or sediment bars). Elevations relative to MSL were established by tying into the Dublin Boulevard bridge benchmark (Figure 6). The portion of the channel between the footbridge/grade control structure and the Gleason Avenue bridge was surveyed by Lave in March of 2003 (R. Lave, University of California, personal communication, 2003). These data were collected and added to our long-profile survey data.

Our long-profile survey data were plotted against the 1996, 1997, design, as-built, and 2002 data contained in the report by Lave (2002) using survey notes to align points at permanent landmarks within the project reach. For example, our 2003 data was aligned with the pre-existing data at several points, including the Central Parkway bridge and the footbridge/grade control structure located between Central Parkway and Gleason Avenue.

To supplement the quantitative evidence of changes in channel form since 1999 with some qualitative evidence, we took photographs looking across each cross-section and visually compared them with photographs of the same views taken by Hudzik and Truitt in 2001.

Expansion and Improvement of Existing Monitoring Plan

We expanded and improved the monitoring plan created by Hudzik and Truitt (2001) to ease future project monitoring and to address several additional restoration objectives outlined in the 1996 plan. Several of the transect benchmark descriptions provided by Hudzik and Truitt in their 2001 report were rather vague and somewhat confusing. To eliminate this confusion, we witnessed the benchmarks of the four upstream-most transects to nearby points. The location of each of these transects and a description of each of the benchmarks and their corresponding witness points was included on a sketch of the project site (Figure 7). To further expand the monitoring plan, we photographed any observed deviations from the project objective outlined in the 1996 plan to provide baseline data for future monitoring. These deviations included damage to the old-growth oak trees located throughout the project reach and evidence of degraded water quality. The locations of the photographed deviations were included on the sketch that identified the transect benchmarks (Figure 7). In addition, an appended monitoring plan, based on the one created by Hudzik and Truitt (2001), was created to encompass these additional restoration objectives.

Results and Discussion

The plots of the cross-sections illustrate how the channel geometry of Tassajara Creek has changed since the restoration project was completed in 1999 (Figures 8-15). It should be noted that design cross-sections were only available for the six-downstream most transects. Therefore, the plots for cross-sections AA' and BB' contain no design data. Additionally, there is a significant alignment error in the plot of cross-section HH' (Figures 15). The 2003 cross-section in this plot does not correspond well with the pre-existing cross-sections, as both elevations and stationing are noticeably different. Because this data was collected by Rebecca Lave, it is difficult to speculate on the source of this discrepancy, although it is likely the result of survey error. As for the cross-sections that do align well, comparison of the 2003 cross-sections to the 2001 cross-sections shows that very little has changed at the transects in the past two years (Figures 8-15). The elevation differences seen in the figures are most readily explained by the fact that we were not able to occupy and survey the exact same cross-sections that Hudzik and Truitt did in 2001.

In their 2001 paper, Hudzik and Truitt reported that they had found sufficient evidence of continuing incision in Tassajara Creek within the project reach. However, our results show that little or no incision has occurred since that time. Additionally, we found that incision may not have actually been occurring in 2001, as Hudzik and Truitt had suggested. They pointed to the comparison of their cross-section survey data to the pre-existing data as definite evidence that incision was occurring in the project reach. Indeed, when compared to the pre-existing cross-section, the cross-sections surveyed by Hudzik and Truitt in 2001 reveal some significant elevation differences that would lead one to believe that incision was taking place. However, the pre-existing cross-section data were not as-built information, as Hudzik and Truitt had suggested, but were, in fact, the design plans (Lave, 2002). Furthermore, these design plans were not tied to specific locations along the channel, but were generalized for sizeable portions of the project reach. It is important to note that construction of these types of projects is rarely performed to the precision called for in the design plans. Thus, it is not uncommon for post-construction elevations to vary slightly from what they were designed to be. And even if construction were performed to the precision called for by the design plans, the fact that the designs were generalized for sizeable portions of the project reach makes the comparison of the 2001 Hudzik and Truitt cross-sections and the design cross-sections rather difficult. These findings provide a reasonable alternative explanation for the elevation differences found in the work done by Hudzik and Truitt (2001). Therefore, we believe that the elevation differences between the 2001 cross-sections and the design cross-section were caused by these factors and not by continuing incision within the project reach, as Hudzik and Truitt had suggested.

In contrast to the cross-section comparisons, the comparison of our long-profile data to the existing long-profile data shows a bed profile that has changed noticeably through the years (Figure 16). Our long-profiles align fairly well with the pre-existing data. However, there are a couple of descrepancies that need to be explained. First, the fact that our long-profile extended slightly farther than the 2002 long-profile in each of the surveyed reaches can be explained by the fact that it we were not able occupy and survey the exact same points that Lave did in 2002. Likely, the 300-foot tape used for stationing was placed in a different location and resulted in the slightly longer long-profiles. Second, the long-profile surveyed by Lave in 2003 does not align with the pre-existing data very well at all. This is probably a result of measurement errors during the surveying of this reach (R. Lave, University of California, personal communication, 2003).

In her 2002 report, Lave found evidence of several localized cases of continuing incision on the long-profile. These areas of incision were located mainly between the Central Parkway bridge and the Dublin Boulevard bridge. Our data shows evidence of the persistence of these areas of incision, but it appears that the incision has remained localized and that it is not traveling upstream nor increasing in magnitude. However, our long-profile data does reveal some significant incision since 2002 upstream of this area, near the vicinity of station 1400. The cause of this incision is likely not the instability of the restoration project, but the presence of a large debris jam in the channel (Figure 21). This debris jam is the most likely cause of the elevation differences between our 2003 long-profile and the 2002 long-profile in the portion of the creek between station 1100 and 1400. No other significant incision could be delineated from the long-profile data, but as with the cross-section data, small variations in elevation at certain points can be attributed to minor variations in the locations surveyed.

While the comparison of the survey data contributes significant insight into the changes in channel morphology since 1999, the visual comparison of the historical and current photographs (Figures 17-20) did not reveal any meaningful information regarding how the channel has changed. The successful re-vegetation efforts on the site have blocked what have historically been clear views of the channel and the dense vegetation made it impossible to exactly occupy some of the old photograph locations. Because the photographs taken by Hudzik and Truitt in 2001 were only available to us in photocopied form, they did not scan well and very little could be seen in the photographs after they were scanned. For this reason, these photos were not included in this report.

Although we found no evidence that Tassajara Creek is continuing to incise and that the creek appears to be stable, at least at this point in time, our field work did identify several conditions that threaten the stated goals of the restoration project. We observed portions of the root masses of several of the old-growth oak trees that were exposed (Figure 21). Survival of these oak trees is critical to the success of this project, as the demise of the trees would conflict with the previously stated objective of native plant preservation. In their 1997 site investigation, Kondolf and Matthews stated, “While some trees increase bank stability with their root masses, if trees are undercut and fall into the channel, they may divert flow into banks, leading to increased bank erosion” (Kondolf and Matthews, 1997). As the roots of these trees become increasingly exposed, the trees become prone to falling into the stream during high flow events. Therefore, preservation of these trees is also in the best interest of bank stability.

As discussed above, our field work also identified a debris jam caused by large wood in the vicinity of station 1400 (Figure 16). Large wood was also found in other portions of the channel, although it had not caused a jam such as that seen in this area. In addition to the large wood, the jam contained numerous cans, bottles, household debris, and construction waste (Figures 21 and 22). There is the potential that some of this debris, including debris not visible from the surface, may degrade the water quality within the creek, which would conflict with the previously stated objective of improving water quality in the stream.

Conclusions and Recommendations

The 2001 post-project appraisal of the Tassajara Creek restoration project completed by Hudzik and Truitt found significant incision within the low flow channel. Our results, however, show little evidence to support the conclusion that the creek is continuing to incise and show that the creek may not have actually been incising in 2001. Measurement error and slight variations in the location of surveyed points may have skewed our results, but it is possible that the incision control measures included during the project construction have worked and that Tassajara Creek has adjusted to its new configuration. However, it is also possible that Tassajara Creek has not experienced a rainfall event large enough to produce bed shear forces great enough to create significant incision during the past few years. Therefore, it is difficult to speak about the success of this restoration project in stopping the incision at this point in time. With a wet rainy season and corresponding high flow events, we may once again see significant incision in the project reach. Therefore, it is recommended that monitoring of channel form in the Tassajara Creek restoration project be continued.

The monitoring should not only continue to track changes in channel morphology, as proposed in the original monitoring plan by Hudzik and Truitt (2001), but should also track the additional objectives highlighted in our appended monitoring plan (Figure 23). This is due to the fact that our field work revealed several potential threats to the success of the Tassajara Creek restoration project. The exposed oak tree roots have the potential to undermine the survival of these trees as well as the stability of the channel banks. It is recommended that these trees be monitored in subsequent studies of Tassajara Creek. It may even be appropriate for a professional arborist to assess the current health of these trees and provide measures to save them and maintain channel bank stability. The debris jam consisting of numerous solid waste items has the potential to degrade water quality in the creek. It is recommended that the debris jam should be monitored during future studies of the restoration project. If it persists, it should assessed by an engineer to determine the hydraulic effects of removing debris from the jam. After this assessment has been completed, it is recommended that all material with the potential to degrade water quality be removed.

References

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<www.GlobeXplorer.com>. 2003 Aerial Photograph. October 26, 2003.

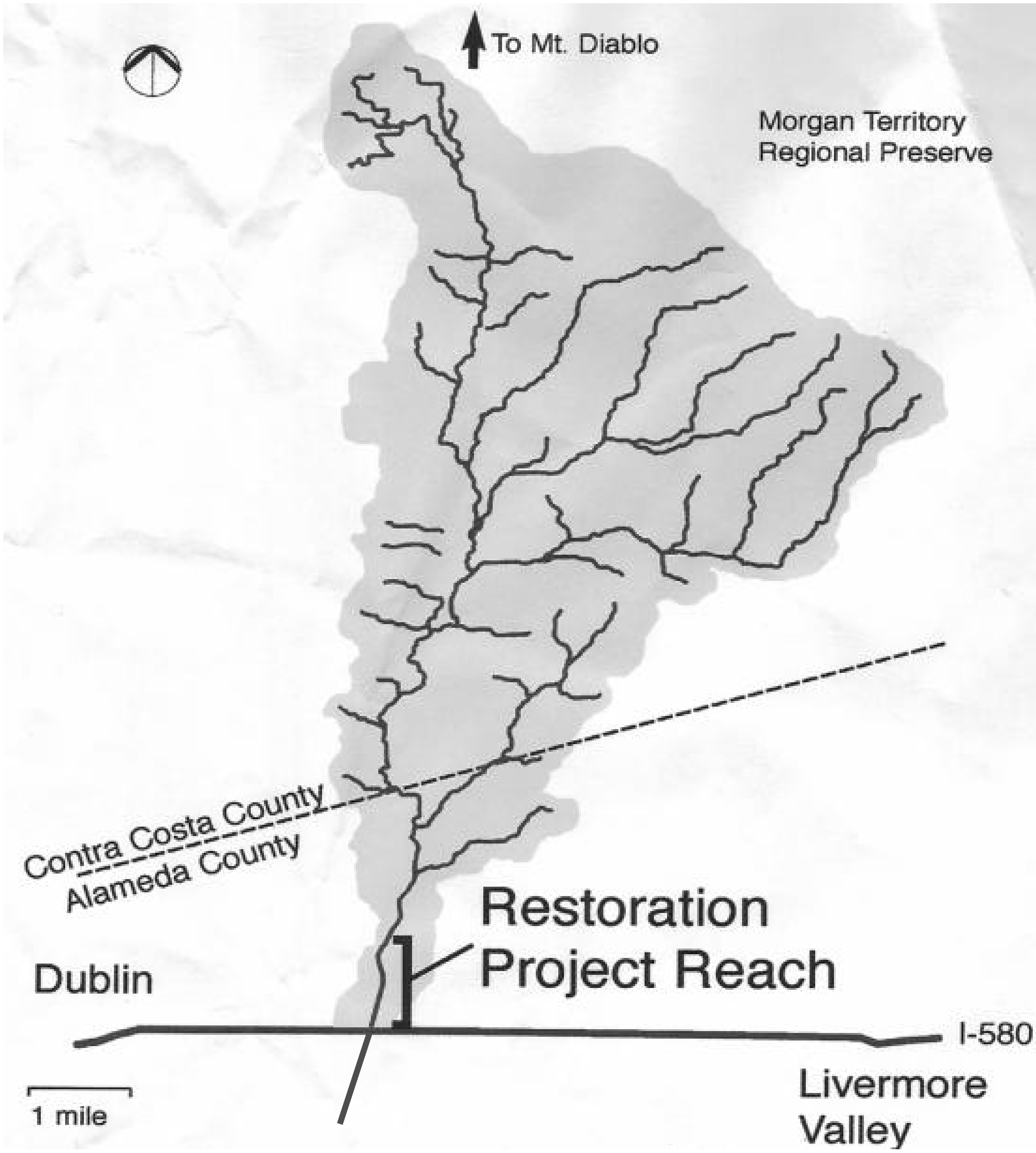
<www.mapquest.com>. Street Map. October 26, 2003.

Figures

Figure 1.

0
100 mi
N
Sacramento
Oakland
San Francisco
PROJECT AREA
Los Angeles
San Diego

Figure 2.

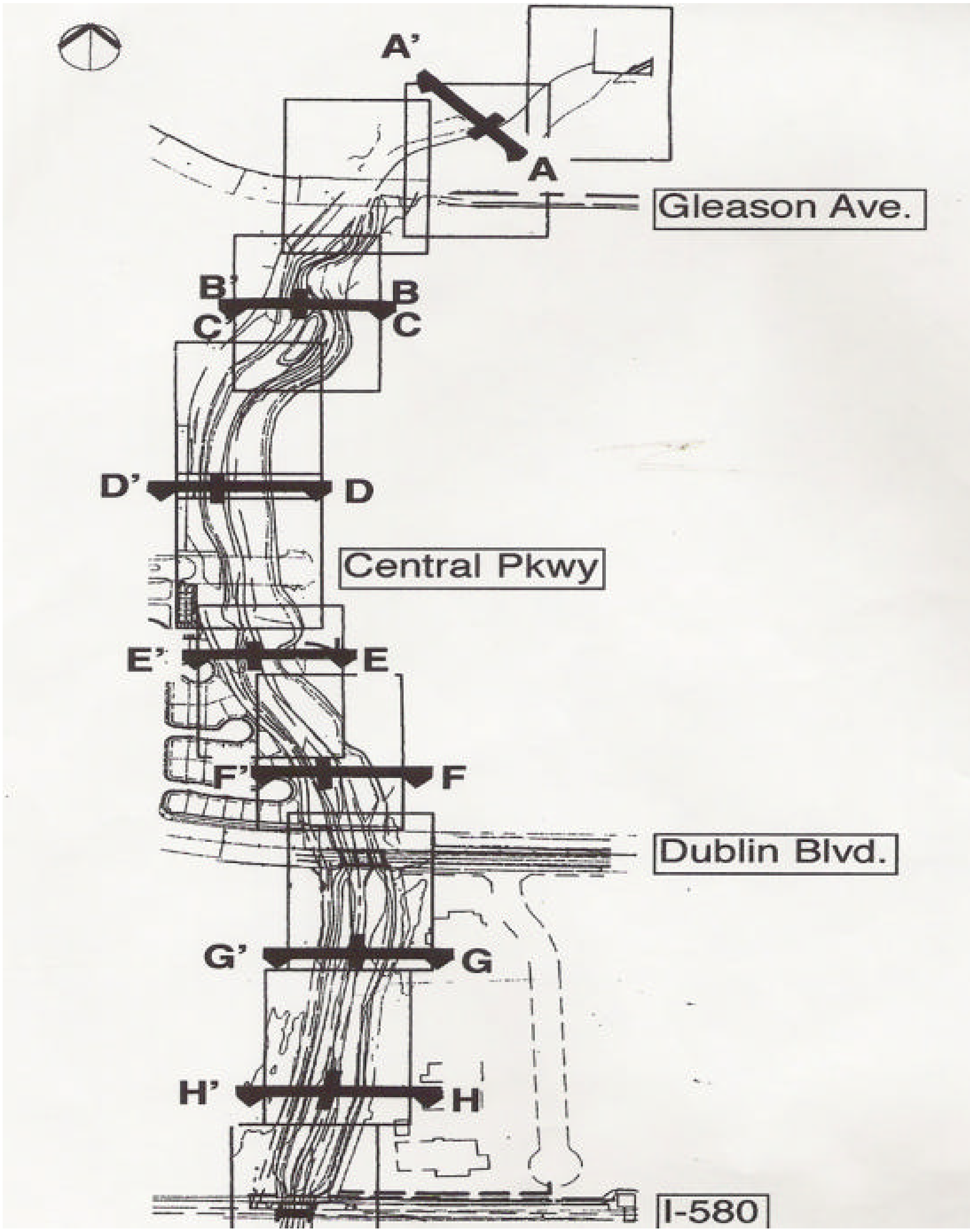


(Hudzik and Truitt, 2001)

Figure 3.

(www.GlobeXplorer.com, 2003)

Figure 4.



(Hudzik and Truitt, 2001)

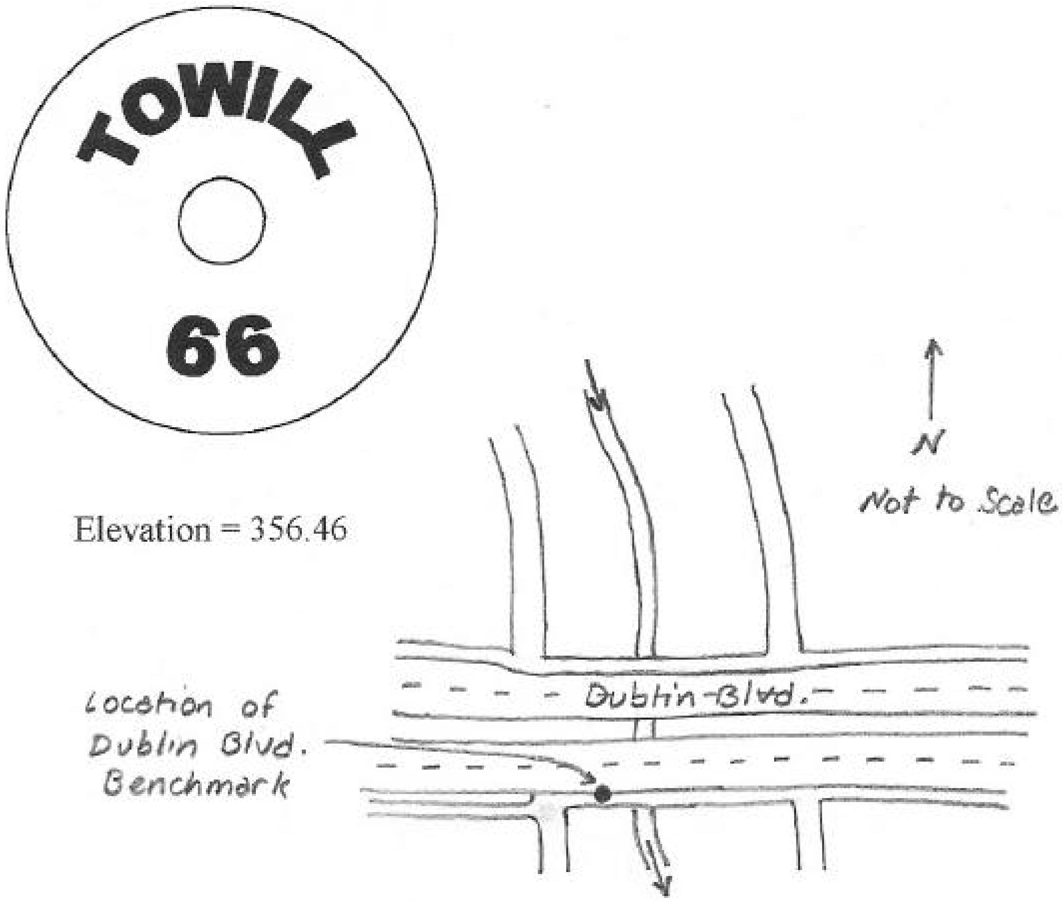
Figure 5.

Recommended Actions:
Development of a Monitoring Plan for Channel Morphology in the Tassajara Creek Restoration Project Area.

Action	Tassajara Creek Monitoring Plan	Completed as part of this paper
Establish objectives: Set specific goals that will guide the development of a plan	Objective: Evaluate changes in channel form over time.	✓
Establish a database of existing data: Identify data necessary to fulfill objectives	• 1996 and 1997 long profile • Historical cross sections surveyed in 1995, 1999, and 2000 (not tied to landmarks) • Pre-project photos	✓
Analyze data: Identify and fill gaps in data	Data needed: • Long profile tied in to 2001 cross section locations	
Establish Baseline Data	• Cross sections surveyed in 2001 (tied to replicable landmarks) • Photos documenting cross section locations	✓
Establish Sampling and Data Protocols: Replicability will ensure that data are comparable over time	<u>Quantitative</u> • Survey cross sections in the same pre-established locations • Plot survey data against pre-existing cross sections to identify any changes in channel form	✓
	<u>Qualitative</u> • Take photographs of the channel at each cross section • Compare photographs to pre-existing images to identify any noticeable changes in channel form	✓
Determine frequency of Collection	• Monitoring should be completed at least once per year, as well as after significant floods	✓
Develop implementation plan	• Identify agency or organization and staff person responsible for overseeing monitoring and providing assistance • Create a regular schedule for monitoring • Identify people responsible for field monitoring. The surveying methods used for this paper are relatively simple. Monitoring objectives could be met by volunteers with minimal training, provided they have access to equipment.	

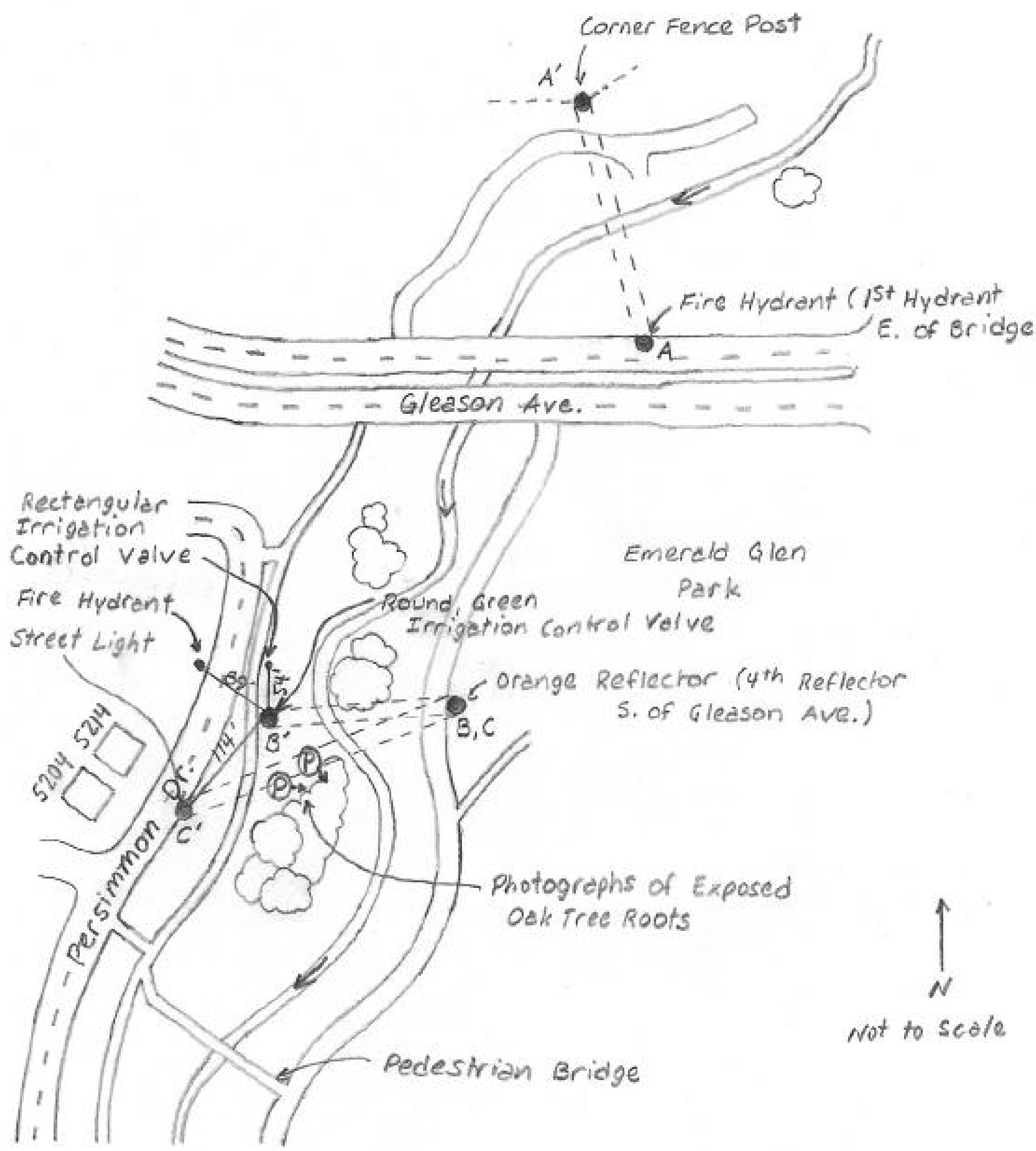
(Hudzik and Truitt, 2001)

Figure 6.



TOWILL
66
Elevation = 356.46
N
Not to Scale
Dublin Blvd.
Location of
Dublin Blvd.
Benchmark

Figure 7.



Corner Fence Post
A'
Fire Hydrant (1st Hydrant E. of Bridge)
A
Gleason Ave.
Rectangular Irrigation Control Valve
Fire Hydrant
Street Light
Emerald Glen Park
Round, Green Irrigation Control Valve
Orange Reflector (4th Reflector S. of Gleason Ave.)
B,C
B'
C'
114'
15'
5214
5204
Persimmon Dr.
Photographs of Exposed Oak Tree Roots
N
Not to Scale
Pedestrian Bridge

Figure 7 (Continued).

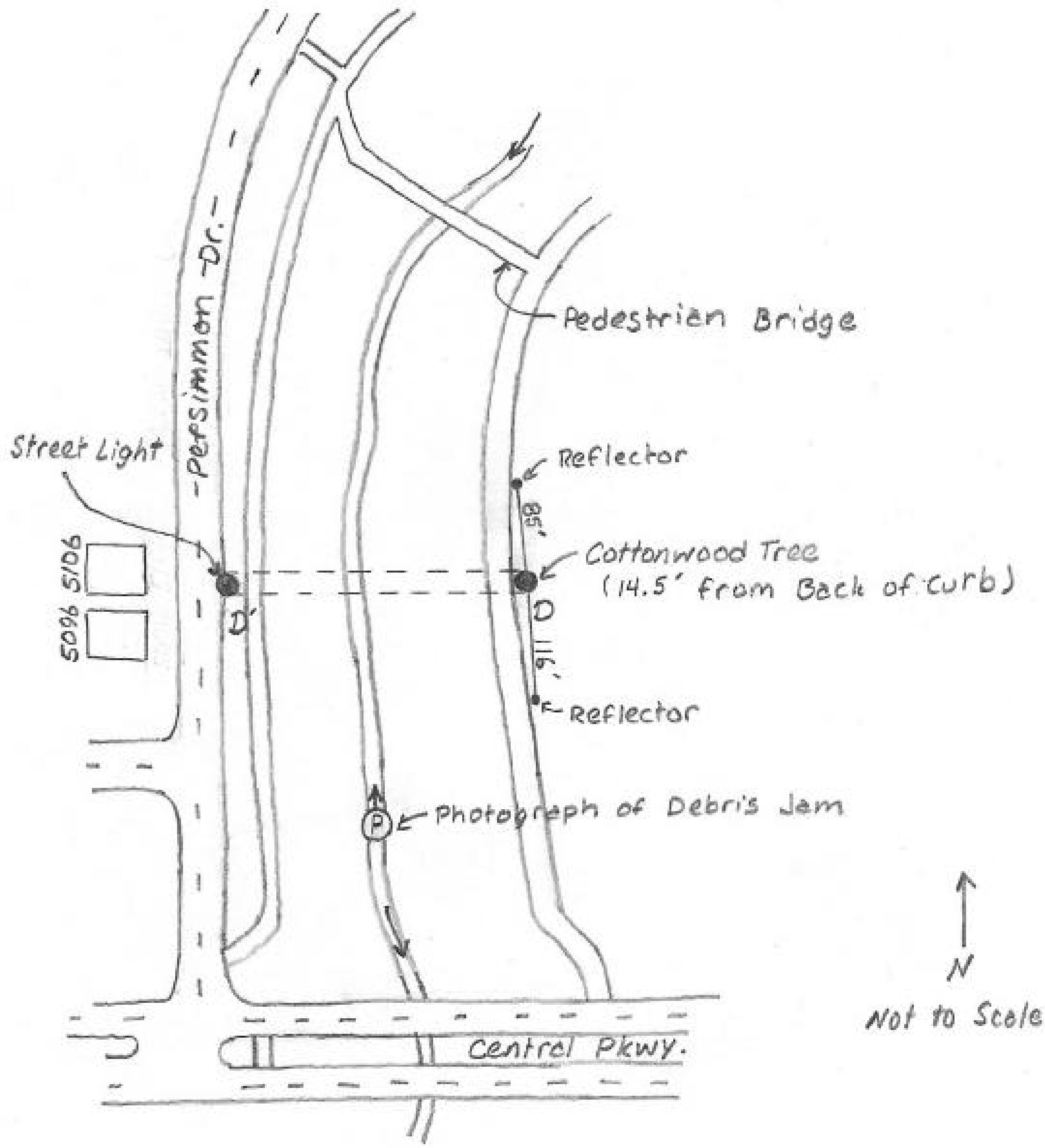


Figure 8.

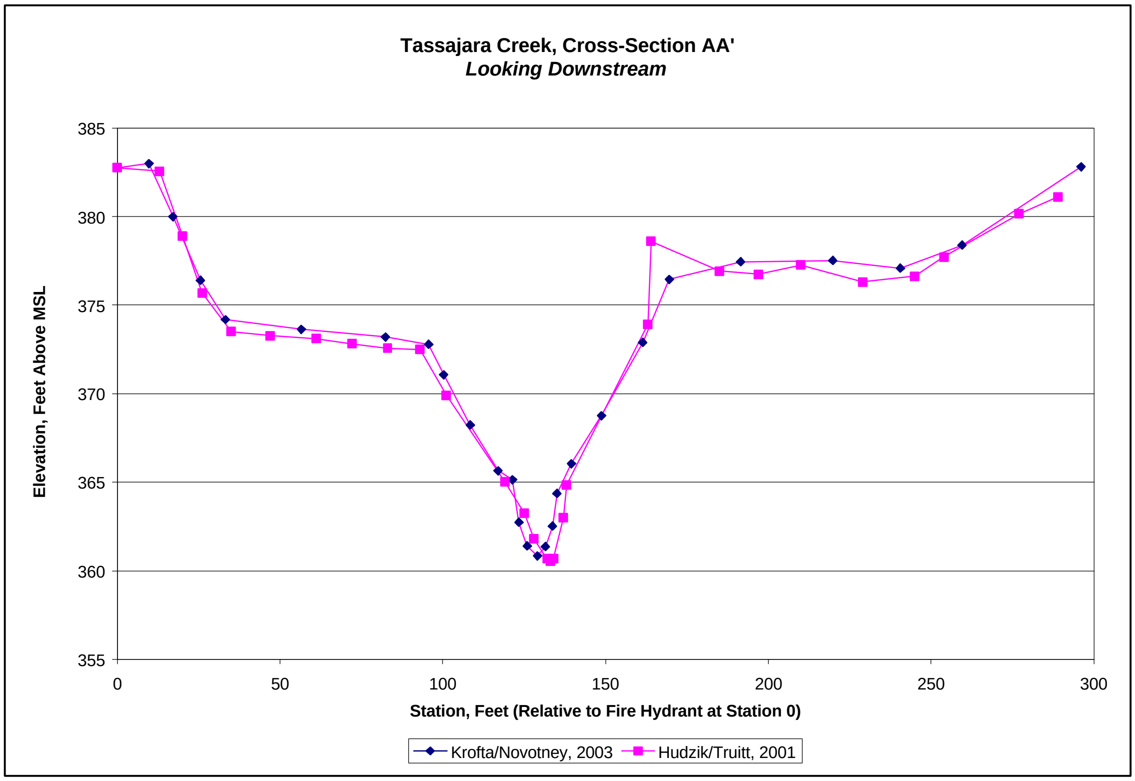


Figure 9.

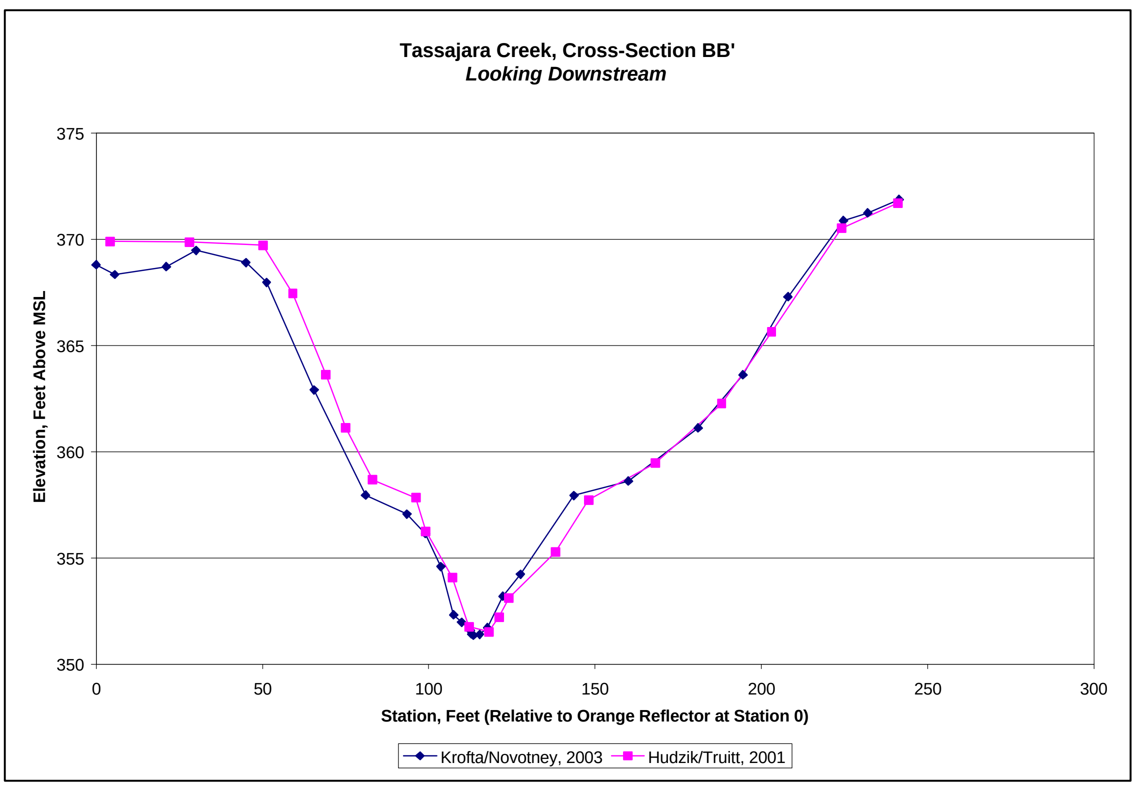


Figure 10.

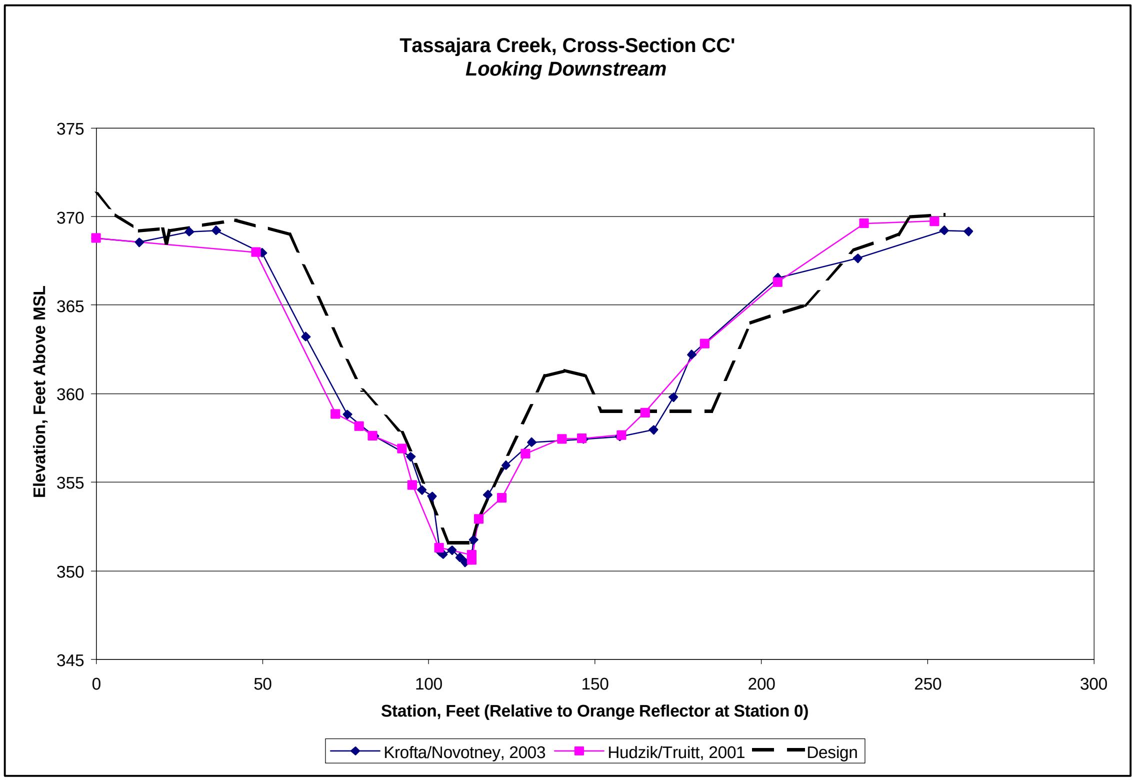


Figure 11.

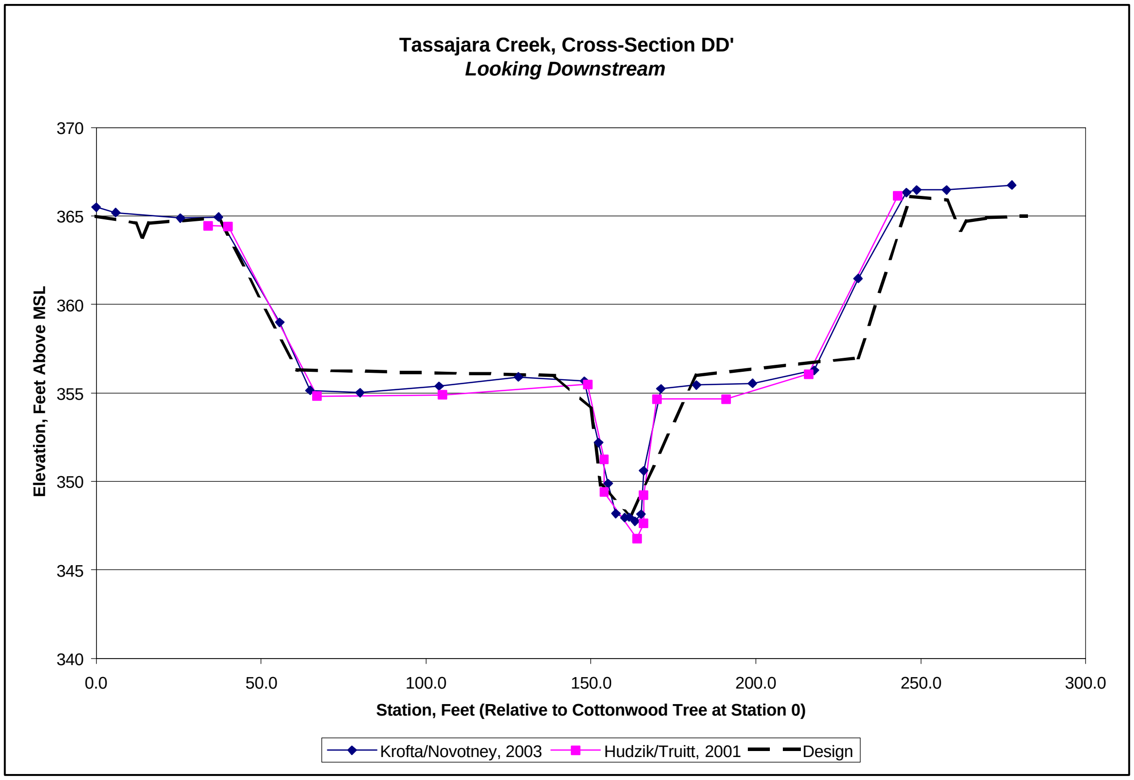


Figure 12.

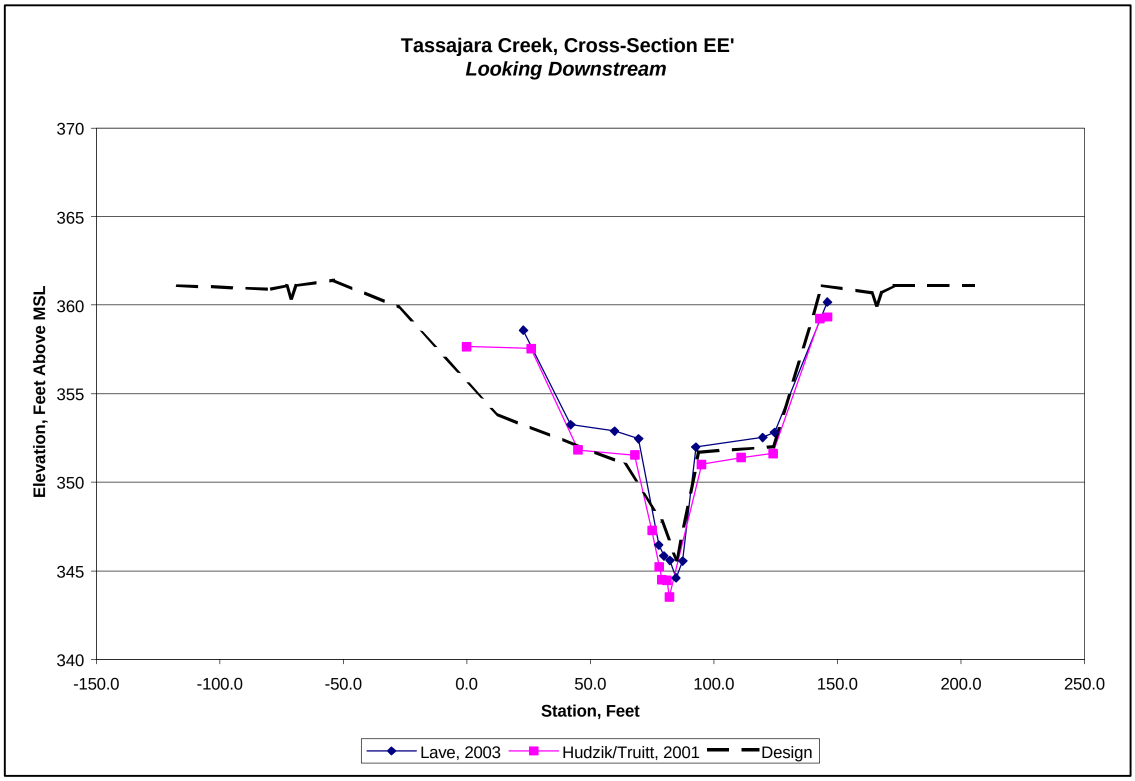


Figure 13.

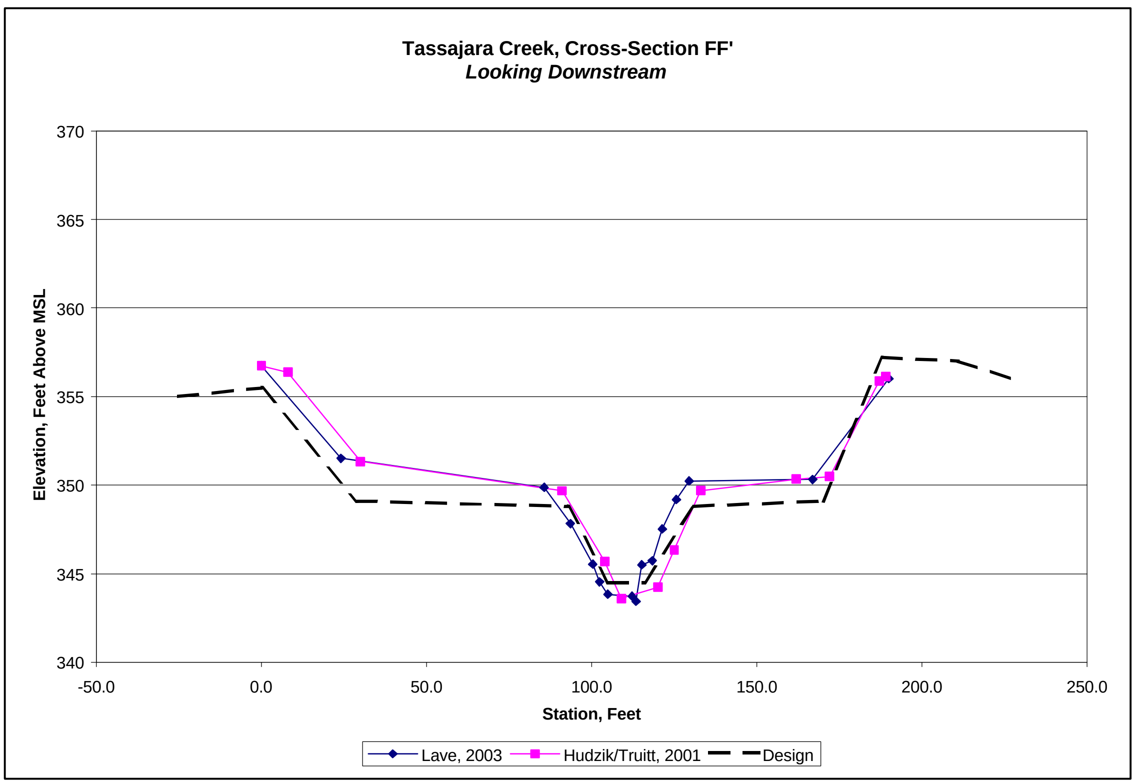


Figure 14.

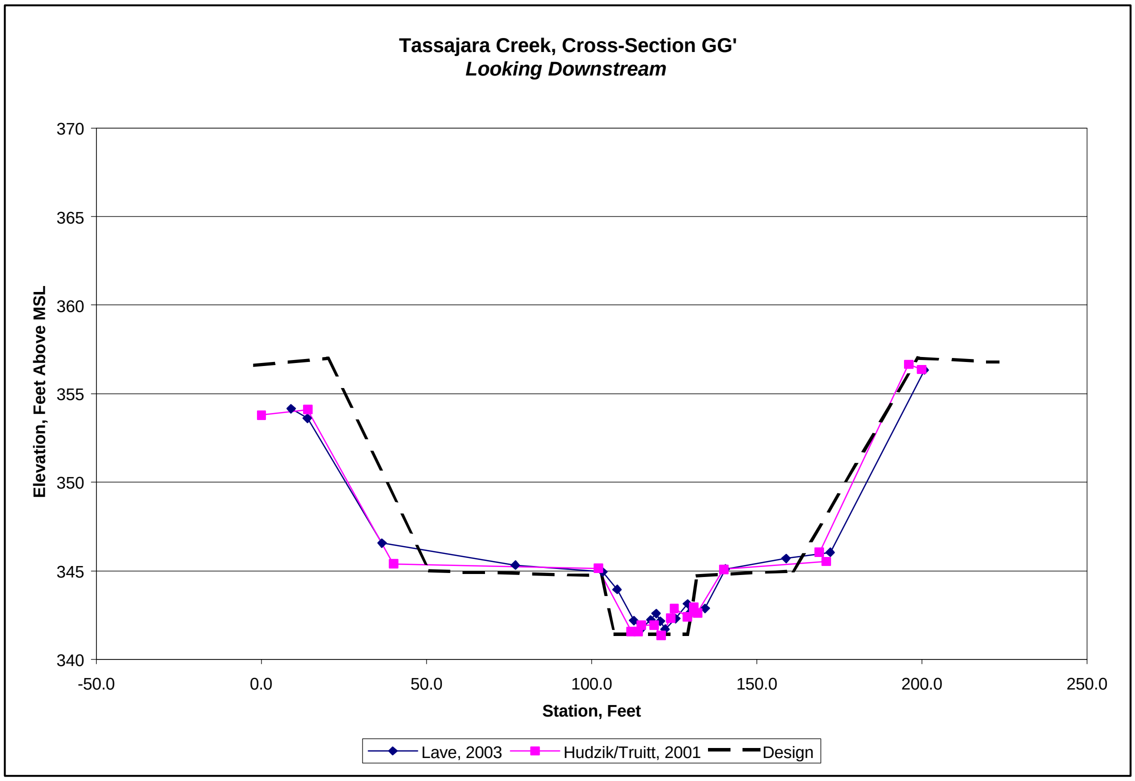


Figure 15.

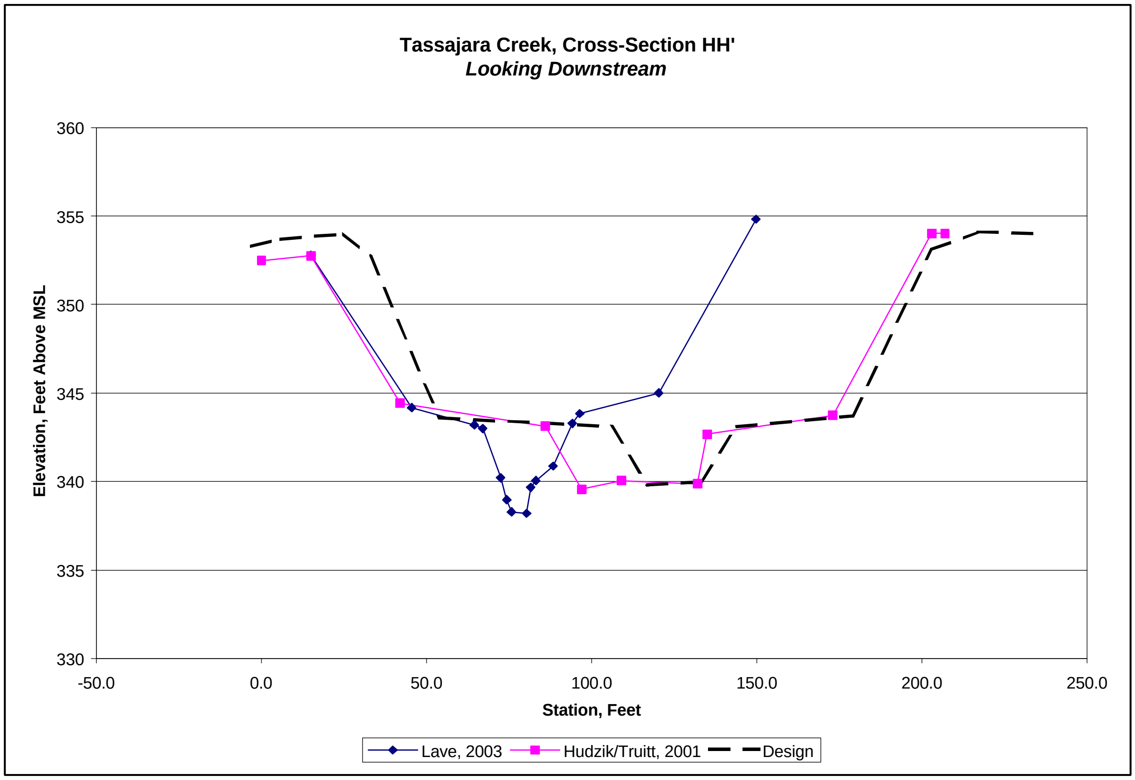


Figure 16.

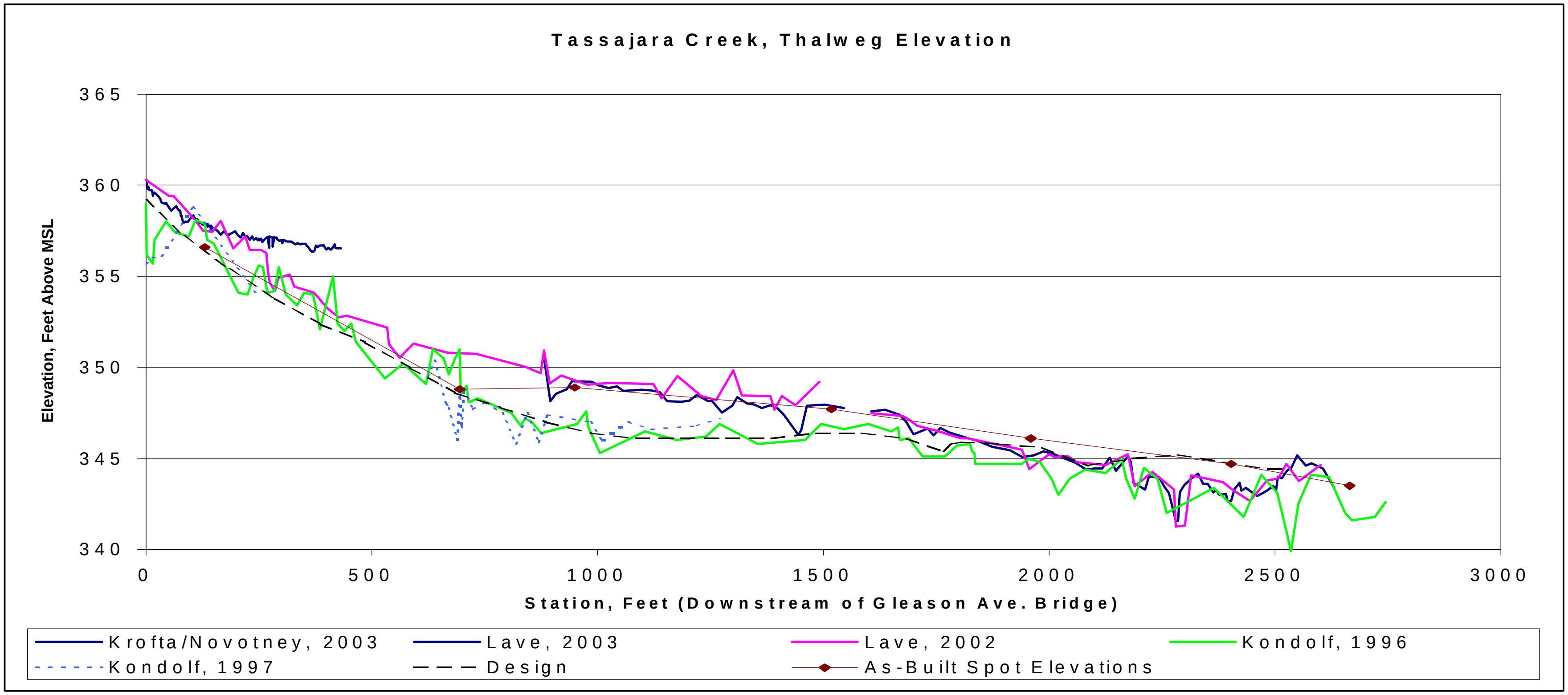

Tassajara Creek, Thalweg Elevation
365
360
355
350
345
340
0
500
1000
1500
2000
2500
3000
Elevation, Feet Above MSL
Station, Feet (Downstream of Gleason Ave. Bridge)
Krofta/Novotney, 2003
Lave, 2003
Lave, 2002
Kondolf, 1996
Kondolf, 1997
Design
As-Built Spot Elevations

Figure 17.

Transect AA', looking north. October 11, 2003.

Transect AA' from thalweg, looking east. October 11, 2003.

Figure 18.

Transect BB', looking east from reflective marker. Image is rotated counter-clockwise 90 degrees. October 11, 2003.

Transect BB' from thalweg. Image is rotated counter-clockwise 90 degrees. October 11, 2003.

Figure 19.

Transects BB' and CC', looking east from reflective marker. October 11, 2003.

Transect CC' from thalweg. October 11, 2003.

Figure 20.

Transect DD', looking east. October 11, 2003.

Transect DD', looking south from thalweg. October 11, 2003.

Figure 21.

A debris jam upstream of Central Parkway. October 12, 2003.

An oak tree with exposed roots. Photo is rotated counter-clockwise 90 degrees. October 12, 2003.

Figure 22.

An oak tree with exposed roots. October 12, 2003.

Tassajara Creek, looking northeast from Central Parkway. October 12, 2003.

Figure 23.

Recommended Monitoring Plan for the Tassajara Creek Restoration Project: Modified from Hudzik and Truitt (2001)		
Action	**Tassajara Creek Monitoring Plan**	**Completed as part of our study**
Establish objectives: Set goals that will guide the evolution of this plan.	Objective: Evaluate the success of the project in meeting the restoration objectives outlined in the 1996 plan.	X
Establish a database of baseline and existing data: Identify the data necessary to evaluate the success of the project.	Cross-section and long-profile surveys, site photos, and site observations tied into nearby landmarks and benchmarks.	X
Analyze data: Identify and fill in gaps in data.	Data needed: Professional assessment of the exposed oak tree roots health and the debris jam .	
Establish Sampling and Data Protocols: Ensure that data are comparable over time.	Quantitative: Survey cross sections in the same pre-established locations and plot survey data against pre-existing cross sections to identify any changes in channel form.	X
	Qualitative: Take photographs of the channel at each cross section and compare photographs to pre-existing images to identify noticeable changes in channel form. Take photographs of exposed roots and compare to pre-existing photos to determine if root exposure is persisting. Monitor debris jam for substances that may degrade water quality.	X
Determine frequency of monitoring events	Monitoring should be completed at least once per year, as well as after significant floods.	X
Development of implementation plan	Identify agency or organization and staff person resposible for overseeing monitoring. Create a regular schedule for monitoring. Identify people responsible for field monitoring.	

Appendix A: 2003 Survey Data

Project:	Tassajara Creek	**Level:**	CJK
	Cross-Section AA'	**Rod:**	MEN
Date:	10/11/03	**Recorder:**	RL
Weather:	75 deg F, Sunny		

Station	BS	HI	FS	SS	Elev	Description
297.6	0.06	382.89			382.83	Corner Fencepost/BM1
261.0				4.50	378.39	Slope ∆
242.0				5.80	377.09	Middle of Gravel Road
221.3				5.36	377.53	Slope ∆
193.0				5.45	377.44	
171.1				6.44	376.45	Top of Bank, River Right
162.9				10.00	372.89	
150.2				14.14	368.75	
141.0				16.85	366.04	
136.6				18.52	364.37	Top of Bank, Low Flow Channel, River Right
135.2				20.38	362.51	Waterline, River Right
133.0				21.52	361.37	In Channel
130.6				22.06	360.83	Middle of Channel/Thalweg
127.4				21.50	361.39	In Channel
124.8				20.16	362.73	Waterline, River Left
122.9				17.74	365.15	Top of Bank, Low Flow Channel, River Left
118.5				17.26	365.63	Slope ∆
109.9	19.55	387.78	14.66		368.23	TP1
101.8				16.71	371.07	
97.2				14.99	372.79	Top of Bank, River Left
83.9				14.58	373.20	
58.0				14.15	373.63	
34.7				13.59	374.19	Toe of Slope
27.0				11.38	376.40	
18.6				7.78	380.00	
11.2				4.79	382.99	Fenceline/Top of Slope
1.5				5.02	382.76	Base of Fire Hydrant/BM2
297.6			4.97		382.81	Corner Fencepost/BM1
Σ	19.61		19.63			

Project:	Tassajara Creek	**Level:**	CJK
	Cross-Section BB'	**Rod:**	MEN
Date:	10/23/03		
Weather:	80 deg F, Sunny		

Station	BS	HI	FS	SS	Elev	Description
1.0	7.93	376.72			368.79	Base of Orange Reflector/BM1
6.6				8.38	368.34	S. Edge of Road
22.0				8.01	368.71	N. Edge of Road
31.0				7.25	369.47	
46.0				7.81	368.91	Top of Bank
52.2				8.75	367.97	Slope ∆
66.5				13.82	362.90	Toe of Bank
82.0				18.77	357.95	Slope ∆/S. Edge Grade Control Structure
94.4				19.66	357.06	
100.0				20.58	356.14	
104.6				22.13	354.59	Top of Bank, Low Flow Channel, River Left
108.5				24.40	352.32	Toe of Bank, Low Flow Channel/Middle Grade Control Structure
110.9				24.75	351.97	In Channel, S. Edge of Silt Bar
TP1	17.84	375.71	18.85		357.87	
113.5				24.13	351.58	In Channel, N. Edge of Silt Bar/Waterline
113.9				24.30	351.41	In Channel
114.5				24.35	351.36	Thalweg
116.3				24.32	351.39	In Channel
118.6				23.99	351.72	Toe of Bank, Low Flow Channel, River Right/Waterline
123.3				22.52	353.19	
128.6				21.48	354.23	
144.6				17.78	357.93	Top of Bank, Low Flow Channel, River Right
161.0				17.10	358.61	N. Edge Grade Control Structure/Toe of Bank
182.0				14.59	361.12	
195.5				12.09	363.62	Slope ∆
209.0				8.41	367.30	
225.7				4.83	370.88	Top of Bank, River Right
233.0				4.47	371.24	
242.4				3.83	371.88	Center Irrigation Control Valve/BM2
1.0			6.92		368.79	BM1
Σ	25.77		25.77			

Project:	Tassajara Creek	**Level:**	CJK
	Cross-Section CC'	**Rod:**	MEN
Date:	10/11/03	**Recorder:**	RL
Weather:	75 deg F, Sunny		

Station	BS	HI	FS	SS	Elev	Description
263.3	4.84	374.00			369.16	S. Edge of Path, River Right
256.0				4.79	369.21	Top of Slope
230.0				6.36	367.64	
206.0				7.46	366.54	
180.1				11.79	362.21	Slope Δ
174.6				14.20	359.80	
168.6				16.04	357.96	Toe of Slope
158.4				16.43	357.57	
147.5				16.57	357.43	
132.0				16.75	357.25	
124.2				18.05	355.95	Top of Bank, Low Flow Channel, River Right
118.8				19.71	354.29	Slope Δ
114.4				22.26	351.74	Toe of Bank, Low Flow Channel, River Right
114.0				23.07	350.93	In Channel
113.8				23.40	350.60	In Channel
111.9				23.53	350.47	In Channel
110.4				23.25	350.75	In Channel
108.0				22.83	351.17	In Channel/Waterline
105.3				23.07	350.93	In Channel, No Water
104.4				22.93	351.07	Toe of Bank, Low Flow Channel, River Left
102.0				19.80	354.20	Top of Bank, Low Flow Channel/Toe of Bank
99.0				19.44	354.56	
95.6				17.56	356.44	Slope Δ
84.6				16.39	357.61	
76.5				15.18	358.82	
64.0				10.77	363.23	
50.9				6.05	367.95	Top of Bank, River Left
37.0				4.77	369.23	
29.0				4.85	369.15	Slope Δ
14.0				5.46	368.54	Middle of Road
1.0				5.21	368.79	Orange Reflector/BM1
263.3			4.84		369.16	S. Edge of Path, River Right
Σ	4.84		4.84			

Project:	Tassajara Creek	**Level:**	CJK
	Cross-Section DD'	**Rod:**	MEN
Date:	10/11/03	**Recorder:**	RL
Weather:	75 deg F, Sunny		

Station	BS	HI	FS	SS	Elev	Description
278.6	3.30	370.04			366.74	Base Street Light/BM1
258.8				3.57	366.47	N. Edge of Path
249.8				3.56	366.48	S. Edge of Path
246.7				3.72	366.32	Top of Bank
232.0				8.57	361.47	
218.7				13.75	356.29	Toe of Bank
200.0				14.50	355.54	On Terrace
183.0				14.60	355.44	
172.2				14.79	355.25	Top of Bank, Low Flow Channel, River Right
167.0				19.43	350.61	Slope Δ
166.2				21.88	348.16	Toe of Bank, Low Flow Channel, River Right
164.4				22.28	347.76	In Channel
162.6				22.06	347.98	In Channel
161.3				22.09	347.95	In Channel
158.6				21.86	348.18	Toe of Bank, Low Flow Channel, River Left
156.2				20.16	349.88	Slope Δ
153.3				17.84	352.20	
149.0				14.36	355.68	Top of Bank, Low Flow Channel
129.0				14.14	355.90	On Terrace
105.0				14.65	355.39	On Terrace
81.0				15.02	355.02	On Terrace
65.8				14.90	355.14	Toe of Bank
56.6				11.05	358.99	
38.1				5.11	364.93	Top of Bank, River Left
26.5				5.15	364.89	Middle of Road
7.0				4.84	365.20	S. Side of Road
1.0				4.54	365.50	Base Cottonwood Tree/BM2
278.6			3.30		366.74	Base Street Light/BM1
Σ	3.30		3.30			

Project:	Tassajara Creek	**Level:**	MEN
	Long Profile Survey	**Rod:**	CJK
	Dublin St. Bridge to Central Pkwy. Bridge		
	From D/S end of reach (Station 0 = Dublin St. Bridge)		
Date:	10/12/03		
Weather:	80 deg F, Sunny		

Station	BS	HI	FS	SS	Elev.	Description*
BM1	5.33	361.79			356.46	Dublin St. Bridge BM
TP1	4.72	361.48	5.03		356.76	
50.0				16.73	344.75	No defined creek, damp soil and dispersed pools
63.0				16.87	344.61	No defined creek, damp soil and dispersed pools
82.0				16.31	345.17	No defined creek, damp soil and dispersed pools
94.5				16.96	344.52	S. edge of defined stream
105.3				17.16	344.32	
115.4				17.57	343.91	
124.2				17.48	344.00	Rocky stream bed
128.0				18.18	343.30	Deep pool, 1-1/2'
135.0				17.99	343.49	
147.0				18.21	343.27	Pool, 1-1/2'
157.5				18.38	343.10	Pool, 1-3/4'
170.4				18.53	342.95	2'
184.9				18.27	343.21	1-3/4'
195.1				18.09	343.39	1-1/2'
205.5				18.24	343.24	1-3/4'
209.1				17.81	343.67	Riffle, 1-1/4'
219.8				18.14	343.34	1-1/2'
228.8				18.80	342.68	2-1/4'
235.0				18.85	342.63	2-1/4'
239.5				18.42	343.06	Boulders in stream bed, 1-3/4'
254.5				18.46	343.02	1-3/4'
261.0				18.23	343.25	1-1/2'
267.5				18.35	343.13	1-3/4'
279.5				17.88	343.60	1-1/4'
289.7				17.87	343.61	Vegetation upstream
302.0	18.02	362.18	17.32		344.16	TP2, 3/4'
315.0				18.27	343.91	Vegetated channel (grass), 1/2'
331.5				18.65	343.53	Vegetated channel (grass), 1-1/2'
340.0				18.98	343.20	Vegetated channel (grass), 1/2'
342.5				19.08	343.10	Channel clear of vegetation, 2'
346.0				20.61	341.57	3-1/4'
350.0				20.62	341.56	3-1/4'
366.1				19.06	343.12	2-3/4'
376.5				18.73	343.45	
388.1				18.22	343.96	Vegetation upstream
409.5				18.16	344.02	
419.5				18.90	343.28	Thin vegetation
435.0				18.64	343.54	
443.7				18.54	343.64	D/S end of riffle
447.0				18.05	344.13	
450.0				17.35	344.83	Center of riffle, high stream velocity
456.5				17.06	345.12	D/S of thick cattails
483.5				17.84	344.34	
496.5				17.13	345.05	Large clump of cattails
513.3				17.71	344.47	
531.0				17.73	344.45	1'
548.5				17.80	344.38	1'
572.3[A]				17.42	344.76	
TP3	11.95	364.26	9.87		352.31	
623.4[A]				18.99	345.27	Vegetation in channel
644.0				18.85	345.41	1/2'
664.5				19.08	345.18	1/2'
690.0				19.19	345.07	1/2'
718.0				18.81	345.45	1/4'
757.2				18.62	345.64	
791.5				18.28	345.98	Thick vegetation
806.5				18.19	346.07	
TP4	2.29	364.82	1.73		362.53	
851.7				18.38	346.44	Large boulders in stream bed, < 1/4'
871.3				18.13	346.69	1/3', high stream velocity
887.3				18.55	346.27	1'
900.0				18.19	346.63	1/2'
931.0				18.49	346.33	1'
947.0				17.79	347.03	Thick vegetation
961.6				17.42	347.40	Very thick vegetation, high stream velocity
995.0				17.16	347.66	1/4'
TBM				0.49	364.33	Rock due S of SW bridge abutment (Central Pkwy)
TP5	3.48	364.30	4.00		360.82	
TP6	4.87	361.32	7.85		356.45	
BM1			4.81		356.51	Dublin St. Bridge BM
Σ	50.66		50.61			

Notes:

* - Elevations given in shot description represent water level elevations

[A] - Thick willows were located in between Station 572.3 and Station 623.4. No major elevation changes were found in this reach upon visual inspection.

Project:	Tassajara Creek	**Level:**	MEN
	Long Profile Survey	**Rod:**	CJK
	Dublin St. Bridge to Central Pkwy. Bridge		
	From D/S end of reach (Station 0 = Dublin St. Bridge)		
Date:	10/12/03		
Weather:	80 deg F, Sunny		

Station	BS	HI	FS	SS	Elev.	Notes
BM1	5.64	362.10			356.46	Dublin St. Bridge BM
0.0				18.71	343.39	At Dublin St. Bridge
25.0				17.66	344.44	
BM1			5.64		356.46	Dublin St. Bridge BM
Σ	5.64		5.64			

Notes:
This section was surveyed seperately from the left bank because we could not see into the stream from the right bank, where the first long profile survey was performed.

Project:	Tassajara Creek	**Level:**	MEN
	Long Profile Survey	**Rod:**	CJK
	Central Parkway Bridge to Pedestrian Bridge		
	From D/S end of reach (Station 0 = Central Parkway Br.)		
Date:	10/12/03		
Weather:	80 deg F, Sunny		

Station	BS	HI	FS	SS	Elev.	Description*
TBM	4.84	369.17			364.33	Rock due S of SW bridge abutment (Central Pkwy)
1025.0[A]				21.58	347.59	On D/S side of Central Pkwy Br.
TP1	5.24	370.40	4.01		365.16	BM on SW bridge abutment (Central Pkwy Br.)
0.0				22.62	347.78	
42.0				22.45	347.95	Heavy vegetation
81.2				22.49	347.91	U/S edge of vegetation
94.3				23.86	346.54	
99.5				24.11	346.29	Debris jam directly U/S, 3'
134.0[B]				22.97	347.43	U/S of debris jam
147.4				22.63	347.77	3/4'
163.0				22.47	347.93	3/4'
181.0				22.64	347.76	3/4'
197.5				22.45	347.95	1/2'
213.5				22.39	348.01	D/S of vegetation
235.0				22.03	348.37	U/S of vegetation
247.0				22.49	347.91	
269.5				22.87	347.53	1'
290.5				22.25	348.15	
300.0	22.78	370.92	22.26		348.14	TP2
325.9				22.44	348.48	vegetation in channel
341.6				22.74	348.18	U/S of vegetation, 3/4'
359.1				22.80	348.12	3/4'
390.9				22.77	348.15	Vicinity of of X-Sec DD'
407.1				22.28	348.64	Vicinity of of X-Sec DD'
426.6				22.18	348.74	
449.0				22.15	348.77	Vegetation, 1/4'
487.5				22.21	348.71	Vegetation, 1/4'
501.2				21.96	348.96	U/S of vegetation
520.8				22.05	348.87	Vegetation (grass)
543.0				21.89	349.03	Vegetation (cattails)
557.0				21.72	349.20	Vegetation (cattails)
602.0				21.67	349.25	U/S of vegetation
613.0				22.13	348.79	3/4'
637.0				22.36	348.56	1'
649.2				22.77	348.15	D/S edge of culvert under pedestrian br.
663.0				20.39	350.53	Midpoint of pedestrian bridge
TP3	3.79	370.88	3.83		367.09	
TP4	3.97	369.40	5.45		365.43	
TBM			5.11		364.29	Rock due S of SW bridge abutment (Central Pkwy)
Σ	40.62		40.66			

Notes:
* - Elevations given in shot description represent water level elevations
[A] - This point was on the long-profile section between Dublin St. and Central Pkwy.
[B] - Water level elevation in the vicinity of Station 115.0 and Station 120.0 was 3'.

Appendix B: Compiled Survey Data

Tassajara Creek
Cross-Section AA'
Compiled Survey Data

Hudzik and Truitt, 2001

Station	Corrected Station	Elev. (HI)	Elev.*
0	13	-5.52	382.56
7	20	-9.18	378.90
13	26	-12.38	375.70
22	35	-14.56	373.52
34	47	-14.81	373.27
48	61	-14.96	373.12
59	72	-15.27	372.81
70	83	-15.51	372.57
80	93	-15.58	372.50
88	101	-18.18	369.90
106	119	-23.06	365.02
112	125	-24.84	363.24
115	128	-26.28	361.80
119	132	-27.41	360.67
120	133	-27.55	360.53
121	134	-27.41	360.67
124	137	-25.07	363.01
125	138	-23.22	364.86
150	163	-14.15	373.93
151	164	-9.48	378.60
172	185	-11.16	376.92
184	197	-11.33	376.75
197	210	-10.81	377.27
216	229	-11.76	376.32
232	245	-11.45	376.63
241	254	-10.36	377.72
264	277	-7.92	380.16
276	289	-6.96	381.12

Krofta and Novotney, 2003

Station	Corrected Station	Elev.
297.6	296.1	382.83
261.0	259.5	378.39
242.0	240.5	377.09
221.3	219.8	377.53
193.0	191.5	377.44
171.1	169.6	376.45
162.9	161.4	372.89
150.2	148.7	368.75
141.0	139.5	366.04
136.6	135.1	364.37
135.2	133.7	362.51
133.0	131.5	361.37
130.6	129.1	360.83
127.4	125.9	361.39
124.8	123.3	362.73
122.9	121.4	365.15
118.5	117.0	365.63
109.9	108.4	368.23
101.8	100.3	371.07
97.2	95.7	372.79
83.9	82.4	373.20
58.0	56.5	373.63
34.7	33.2	374.19
27.0	25.5	376.40
18.6	17.1	380.00
11.2	9.7	382.99
1.5	0.0	382.76

Notes:
* - Includes a correction of 2.66 feet added to each elevation reported by Hudzik and Truitt. The survey data provided by Hudzik and Truitt does not report elevations as relative to MSL for Cross-Secion AA'. Instead, they provide the elevation of the ground relative to the height of the instrument (HI). Their data is difficult to decipher, however it appears that they recorded their elevations 2.66 feet below the actual elevation of the ground at each point, because of their failure to account for the height of the instrument, which was 2.66 feet above the fire hydrant located at Station 0. This appears to be the case, as the corrected elevation align relatively well with our data.

Tassajara Creek
Cross-Section BB'
Compiled Survey Data

Hudzik and Truitt, 2001

Station	Corrected Station	Elev.
0	4.1	369.90
24	28.1	369.86
46	50.1	369.72
55	59.1	367.44
65	69.1	363.62
71	75.1	361.12
79	83.1	358.68
92	96.1	357.83
95	99.1	356.24
103	107.1	354.08
108	112.1	351.76
114	118.1	351.51
117	121.1	352.21
120	124.1	353.11
134	138.1	355.27
144	148.1	357.72
164	168.1	359.46
184	188.1	362.26
199	203.1	365.64
220	224.1	370.51
237	241.1	371.71

Krofta and Novotney, 2003

Station	Corrected Station	Elev.
1.0	0.0	368.79
6.6	5.6	368.34
22.0	21.0	368.71
31.0	30.0	369.47
46.0	45.0	368.91
52.2	51.2	367.97
66.5	65.5	362.90
82.0	81.0	357.95
94.4	93.4	357.06
100.0	99.0	356.14
104.6	103.6	354.59
108.5	107.5	352.32
110.9	109.9	351.97
113.5	112.5	351.58
113.9	112.9	351.41
114.5	113.5	351.36
116.3	115.3	351.39
118.6	117.6	351.72
123.3	122.3	353.19
128.6	127.6	354.23
144.6	143.6	357.93
161.0	160.0	358.61
182.0	181.0	361.12
195.5	194.5	363.62
209.0	208.0	367.30
225.7	224.7	370.88
233.0	232.0	371.24
242.4	241.4	371.88

Tassajara Creek
Cross-Section CC'
Compiled Survey Data

Hudzik and Truitt, 2001

Station	Corrected Station	Elev.
0	252	369.74
21	231	369.61
47	205	366.31
69	183	362.81
87	165	358.94
94	158	357.66
106	146	357.48
112	140	357.45
123	129	356.59
130	122	354.13
137	115	352.94
139	113	350.62
139	113	350.89
149	103	351.30
157	95	354.84
160	92	356.91
169	83	357.63
173	79	358.18
180	72	358.86
204	48	367.99
252	0	368.79

Krofta and Novotney, 2003

Station	Corrected Station	Elev.
263.3	262.3	369.16
256.0	255.0	369.21
230.0	229.0	367.64
206.0	205.0	366.54
180.1	179.1	362.21
174.6	173.6	359.80
168.6	167.6	357.96
158.4	157.4	357.57
147.5	146.5	357.43
132.0	131.0	357.25
124.2	123.2	355.95
118.8	117.8	354.29
114.4	113.4	351.74
114.0	113.0	350.93
113.8	112.8	350.60
111.9	110.9	350.47
110.4	109.4	350.75
108.0	107.0	351.17
105.3	104.3	350.93
104.4	103.4	351.07
102.0	101.0	354.20
99.0	98.0	354.56
95.6	94.6	356.44
84.6	83.6	357.61
76.5	75.5	358.82
64.0	63.0	363.23
50.9	49.9	367.95
37.0	36.0	369.23
29.0	28.0	369.15
14.0	13.0	368.54
1.0	0.0	368.79

Design Section

Station	Corrected Station	Elev.
123	0	371.3
117	6	370.1
110	13	369.2
103	20	369.3
102	21	368.5
101	22	369.2
81	42	369.8
65	58	369.0
43	80	360.2
31	92	357.8
17	106	351.6
10	113	351.6
8	115	353.0
-12	135	361.0
-18	141	361.3
-24	147	361.0
-29	152	359.0
-62	185	359.0
-74	197	364.0
-90	213	365.0
-105	228	368.1
-118	241	369.0
-122	245	370.0
-132	255	370.1

Tassajara Creek
Cross-Section DD'
Compiled Survey Data

Hudzik and Truitt, 2001

Station	Corrected Station	Elev.
209	243	366.14
182	216	356.07
157	191	354.65
136	170	354.66
132	166	349.23
132	166	347.64
130	164	346.78
120	154	349.40
120	154	351.26
115	149	355.49
71	105	354.89
33	67	354.82
6	40	364.41
0	34	364.44

Krofta and Novotney, 2003

Station	Corrected Station	Elev.
278.6	277.6	366.74
258.8	257.8	366.47
249.8	248.8	366.48
246.7	245.7	366.32
232.0	231.0	361.47
218.7	217.7	356.29
200.0	199.0	355.54
183.0	182.0	355.44
172.2	171.2	355.25
167.0	166.0	350.61
166.2	165.2	348.16
164.4	163.4	347.76
162.6	161.6	347.98
161.3	160.3	347.95
158.6	157.6	348.18
156.2	155.2	349.88
153.3	152.3	352.20
149.0	148.0	355.68
129.0	128.0	355.90
105.0	104.0	355.39
81.0	80.0	355.02
65.8	64.8	355.14
56.6	55.6	358.99
38.1	37.1	364.93
26.5	25.5	364.89
7.0	6.0	365.20
1.0	0.0	365.50

Design Section

Station	Corrected Station	Elev.
187	-24	365.1
163	0	365.0
151	12	364.6
149	14	363.8
147	16	364.6
126	37	364.9
102	61	356.3
24	139	356.0
13	150	354.1
10	153	349.8
1	162	348.1
-19	182	356.0
-68	231	357.0
-84	247	366.1
-95	258	365.9
-99	262	364.2
-101	264	364.7
-107	270	364.9
-119	282	365.0

Tassajara Creek
Cross-Section EE'
Compiled Survey Data

Hudzik and Truitt, 2001

Station	Corrected Station	Elev.
146	359.33	146
143	359.24	143
124	351.62	124
111	351.38	111
95	351.00	95
82	343.51	82
81	344.46	81
79	344.48	79
78	345.21	78
75	347.26	75
68	351.53	68
45	351.82	45
26	357.55	26
0	357.66	0

Lave, 2003

Station	Corrected Station	Elev.
123.1	146.0	360.18
101.7	124.6	352.81
96.9	119.8	352.53
69.8	92.7	351.97
64.5	87.4	345.55
61.8	84.7	344.58
59.3	82.2	345.58
56.9	79.8	345.83
54.9	77.8	346.45
46.7	69.6	352.45
36.9	59.8	352.89
19.2	42.1	353.26
0.0	22.9	358.58

Design Section

Station	Corrected Station	Elev.
200	-117	361.1
162	-79	360.9
156	-73	361.1
154	-71	360.4
152	-69	361.1
137	-54	361.4
111	-28	359.9
70	13	353.8
19	64	351.0
4	79	347.8
-2	85	345.6
-11	94	351.7
-41	124	352.0
-61	144	361.1
-81	164	360.7
-83	166	360.0
-85	168	360.7
-90	173	361.1
-122	205	361.1

Tassajara Creek
Cross-Section FF'
Compiled Survey Data

Hudzik and Truitt, 2001

Station	Corrected Station	Elev.
189	189	356.14
187	187	355.86
172	172	350.48
162	162	350.33
133	133	349.69
125	125	346.34
120	120	344.22
109	109	343.59
104	104	345.69
91	91	349.68
30	30	351.34
8	8	356.38
0	0	356.74

Lave, 2003

Station	Corrected Station	Elev.
190.0	190.0	356.02
166.9	166.9	350.32
129.5	129.5	350.22
125.6	125.6	349.19
121.4	121.4	347.53
118.4	118.4	345.72
115.2	115.2	345.48
113.4	113.4	343.43
112.2	112.2	343.71
104.9	104.9	343.84
102.4	102.4	344.53
100.4	100.4	345.53
93.5	93.5	347.81
85.6	85.6	349.87
24.1	24.1	351.50
0.0	0.0	356.75

Design Section

Station	Corrected Station	Elev.
136	-25	355.0
111	0	355.5
82	29	349.1
18	93	348.8
6	105	344.5
-5	116	344.5
-20	131	348.8
-59	170	349.1
-77	188	357.2
-100	211	357.0
-116	227	356.0

Tassajara Creek
Cross-Section GG'
Compiled Survey Data

Hudzik and Truitt, 2001

Station	Corrected Station	Elev.
200	200	356.37
196	196	356.65
169	169	346.03
171	171	345.52
140	140	345.08
132	132	342.61
131	131	342.92
131	131	342.67
129	129	342.39
125	125	342.86
124	124	342.33
121	121	341.33
119	119	341.93
115	115	341.91
114	114	341.57
112	112	341.57
102	102	345.13
40	40	345.38
14	14	354.10
0	0	353.79

Lave, 2003

Station	Corrected Station	Elev.
0.0	9.0	354.16
4.9	13.9	353.60
27.5	36.5	346.55
67.9	76.9	345.32
94.3	103.3	344.93
98.8	107.8	343.94
103.8	112.8	342.18
105.9	114.9	341.68
108.9	117.9	342.22
110.5	119.5	342.59
111.8	120.8	342.14
113.3	122.3	341.70
116.5	125.5	342.29
120.1	129.1	343.13
120.5	129.5	342.58
125.3	134.3	342.88
131.5	140.5	345.09
149.8	158.8	345.69
163.3	172.3	346.03
191.8	200.8	356.33

Design Section

Station	Corrected Station	Elev.
122	-2	356.6
100	20	357.0
69	51	345.0
17	103	344.7
13	107	341.4
-9	129	341.4
-12	132	344.7
-41	161	345.0
-79	199	357.0
-103	223	356.8

Tassajara Creek
Cross-Section HH'
Compiled Survey Data

Hudzik and Truitt, 2001

Station	Corrected Station	Elev.
207	207	354.01
203	203	354.02
173	173	343.73
135	135	342.67
132	132	339.87
109	109	340.04
97	97	339.55
86	86	343.12
42	42	344.41
15	15	352.75
0	0	352.49

Lave, 2003

Station	Corrected Station	Elev.
0.0	15.0	352.79
30.5	45.5	344.17
49.5	64.5	343.19
52.0	67.0	343.00
57.4	72.4	340.21
59.3	74.3	338.96
60.7	75.7	338.27
65.3	80.3	338.19
66.5	81.5	339.67
68.1	83.1	340.05
73.3	88.3	340.87
79.2	94.2	343.28
81.4	96.4	343.83
105.3	120.3	345.00
134.8	149.8	354.83

Design Section

Station	Corrected Station	Elev.
128	-3	353.3
119	6	353.7
100	25	354.0
92	33	352.7
71	54	343.6
19	106	343.1
8	117	339.8
-8	133	340.0
-19	144	343.1
-54	179	343.7
-78	203	353.1
-92	217	354.1
-109	234	354.0

Tassajara Creek
Long Profile
Compiled Survey Data

Krofta/Novotney, 2003

Station	Corrected Station	Elev.
0.0	2631.0	343.39
25.0	2606.0	344.44
50.0	2581.0	344.75
63.0	2568.0	344.61
82.0	2549.0	345.17
94.5	2536.5	344.52
105.3	2525.7	344.32
115.4	2515.6	343.91
124.2	2506.8	344.00
128.0	2503.0	343.30
135.0	2496.0	343.49
147.0	2484.0	343.27
157.5	2473.5	343.10
170.4	2460.6	342.95
184.9	2446.1	343.21
195.1	2435.9	343.39
205.5	2425.5	343.24
209.1	2421.9	343.67
219.8	2411.2	343.34
228.8	2402.2	342.68
235.0	2396.0	342.63
239.5	2391.5	343.06
254.5	2376.5	343.02
261.0	2370.0	343.25
267.5	2363.5	343.13
279.5	2351.5	343.60
289.7	2341.3	343.61
302.0	2329.0	344.16
315.0	2316.0	343.91
331.5	2299.5	343.53
340.0	2291.0	343.20
342.5	2288.5	343.10
346.0	2285.0	341.57
350.0	2281.0	341.56
366.1	2264.9	343.12
376.5	2254.5	343.45
388.1	2242.9	343.96
409.5	2221.5	344.02
419.5	2211.5	343.28
435.0	2196.0	343.54
443.7	2187.3	343.64
447.0	2184.0	344.13
450.0	2181.0	344.83
456.5	2174.5	345.12
483.5	2147.5	344.34
496.5	2134.5	345.05
513.3	2117.7	344.47
531.0	2100.0	344.45
548.5	2082.5	344.38
572.3	2058.7	344.76
623.4	2007.6	345.27
644.0	1987.0	345.41
664.5	1966.5	345.18
690.0	1941.0	345.07
718.0	1913.0	345.45
757.2	1873.8	345.64
791.5	1839.5	345.98
806.5	1824.5	346.07
851.7	1779.3	346.44
871.3	1759.7	346.69
887.3	1743.7	346.27
900.0	1731.0	346.63
931.0	1700.0	346.33
947.0	1684.0	347.03
961.6	1669.4	347.40
995.0	1636.0	347.66
1025.0	1606.0	347.59
0.0	1545.0	347.78
42.0	1503.0	347.95
81.2	1463.8	347.91
94.3	1450.7	346.54
99.5	1445.5	346.29
134.0	1411.0	347.43
147.4	1397.6	347.77
163.0	1382.0	347.93
181.0	1364.0	347.76
197.5	1347.5	347.95
213.5	1331.5	348.01
235.0	1310.0	348.37
247.0	1298.0	347.91
269.5	1275.5	347.53
290.5	1254.5	348.15
300.0	1245.0	348.14
325.9	1219.1	348.48
341.6	1203.4	348.18
359.1	1185.9	348.12
390.9	1154.1	348.15
407.1	1137.9	348.64
426.6	1118.4	348.74
449.0	1096.0	348.77
487.5	1057.5	348.71
501.2	1043.8	348.96
520.8	1024.2	348.87
543.0	1002.0	349.03
557.0	988.0	349.20
602.0	943.0	349.25
613.0	932.0	348.79
637.0	908.0	348.56
649.2	895.8	348.15
663.0	882.0	350.53

Lave, 2003

Station	Corrected Station	Elev.
1.0	1.0	360.30
3.4	3.4	359.94
4.3	4.3	359.81
5.5	5.5	359.91
8.7	8.7	359.74
12.5	12.5	359.73
13.7	13.7	359.65
15.1	15.1	359.43
18.2	18.2	359.60
21.7	21.7	359.55
26.8	26.8	359.42
30.7	30.7	359.29
32.6	32.6	359.28
33.6	33.6	359.15
34.4	34.4	359.07
36.3	36.3	359.05
39.7	39.7	359.02
44.3	44.3	358.99
45.0	45.0	359.05
51.4	51.4	358.80
56.6	56.6	358.59
67.0	67.0	358.86
70.3	70.3	358.74
72.5	72.5	358.65
76.9	76.9	358.59
77.4	77.4	358.33
78.8	78.8	358.34
79.7	79.7	358.23
81.9	81.9	358.07
83.7	83.7	357.93
87.5	87.5	358.01
93.2	93.2	357.96
100.0	100.0	358.21
105.3	105.3	358.34
109.1	109.1	358.13
112.2	112.2	358.11
114.6	114.6	358.14
118.1	118.1	357.92
122.5	122.5	357.98
125.7	125.7	357.84
129.2	129.2	357.82
135.6	135.6	357.90
137.3	137.3	357.73
138.3	138.3	357.86
139.9	139.9	357.77
141.7	141.7	357.76
144.3	144.3	357.62
145.0	145.0	357.78
149.0	149.0	357.62
153.6	153.6	357.62
159.8	159.8	357.49
165.3	165.3	357.30
173.3	173.3	357.48
177.8	177.8	357.33
183.4	183.4	357.27
185.3	185.3	357.34
188.5	188.5	357.35
191.6	191.6	357.37
197.3	197.3	357.49
199.2	199.2	357.43
204.3	204.3	357.26
209.5	209.5	357.14
215.5	215.5	357.37
220.0	220.0	357.20
224.1	224.1	357.24
230.1	230.1	357.02
234.9	234.9	357.21
239.5	239.5	357.02
244.1	244.1	357.09
247.5	247.5	356.98
250.5	250.5	357.07
251.9	251.9	356.98
255.5	255.5	357.07
257.9	257.9	356.87
263.0	263.0	357.03
270.3	270.3	357.17
273.6	273.6	356.55
273.7	273.7	357.19
281.0	281.0	357.12
281.2	281.2	356.62
284.1	284.1	357.15
285.4	285.4	357.10
290.0	290.0	357.14
291.3	291.3	357.03
295.9	295.9	356.95
300.0	300.0	357.01
302.7	302.7	356.83
305.3	305.3	357.00
311.7	311.7	356.90
316.8	316.8	356.90
322.5	322.5	356.91
323.9	323.9	356.88
331.4	331.4	356.76
336.9	336.9	356.82
342.0	342.0	356.77
345.8	345.8	356.79
353.6	353.6	356.78
356.6	356.6	356.67
359.4	359.4	356.63
364.1	364.1	356.45
367.3	367.3	356.35
373.5	373.5	356.37
377.1	377.1	356.69
380.7	380.7	356.61
384.4	384.4	356.71
389.2	389.2	356.70
391.7	391.7	356.69
393.8	393.8	356.72
399.0	399.0	356.47
404.3	404.3	356.55
407.8	407.8	356.47
410.4	410.4	356.48
415.5	415.5	356.65
418.4	418.4	356.75
420.1	420.1	356.55
423.9	423.9	356.54
428.0	428.0	356.53
432.8	432.8	356.53
439.9	439.9	356.52
443.9	443.9	356.38
448.3	448.3	356.09
462.2	462.2	356.51
466.6	466.6	356.56
470.7	470.7	356.49
481.3	481.3	356.54

Lave, 2002

Station	Corrected Station	Elev.
0	0	360.30
51	51	359.43
62	62	359.41
86	86	358.72
112	112	358.00
127	127	357.52
147	147	357.46
166	166	358.05
193	193	356.54
220	220	357.19
230	230	356.46
256	256	356.46
267	267	356.27
271	271	355.23
274	274	354.67
286	286	354.19
293	293	354.92
319	319	355.09
329	329	354.44
373	373	354.09
402	402	353.24
427	427	352.75
445	445	352.84
534	534	352.17
539	539	351.29
562	562	350.53
593	593	351.31
668	668	350.81
732	732	350.73
841	841	350.03
874	874	349.69
882	882	350.94
894	894	349.12
919	919	349.57
977	977	349.06
1028	1028	349.16
1080	1080	349.11
1124	1124	349.10
1142	1142	348.30
1177	1177	349.53
1230	1230	348.44
1263	1263	348.20
1301	1301	349.84
1319	1319	348.46
1383	1383	348.43
1392	1392	347.69
1408	1408	348.43
1438	1438	347.93
1491	1491	349.22
1606	1606	347.49
1675	1675	347.33
1690	1690	347.15
1707	1707	346.80
1751	1751	346.53
1805	1805	346.10
1820	1820	346.12
1940	1940	345.50
1956	1956	344.43
2000	2000	345.22
2012	2012	345.09
2041	2041	345.15
2062	2062	344.80
2125	2125	344.65
2175	2175	345.24
2190	2190	343.48
2228	2228	344.28
2277	2277	343.29
2280	2280	341.27
2301	2301	341.31
2314	2314	344.09
2385	2385	343.70
2405	2405	343.31
2445	2445	342.68
2482	2482	343.78
2497	2497	343.87
2507	2507	343.92
2525	2525	344.70
2553	2553	343.76
2601	2601	344.63

Kondolf, 1996

Station	Elev.
0	359.00
2	356.20
15	355.70
20	357.00
45	358.00
65	357.40
95	357.20
110	358.10
130	357.90
135	357.00
150	356.80
205	354.10
225	354.00
240	355.00
250	355.60
260	355.50
270	354.10
285	354.20
295	355.50
310	354.00
335	353.40
350	354.10
370	354.00
385	352.10
415	355.00
425	352.40
440	352.00
455	352.40
465	351.40
530	349.40
570	350.20
620	349.10
635	351.00
660	350.50
670	349.60
685	350.50
695	351.00
697	348.60
710	349.00
715	348.10
735	348.30
810	347.50
830	346.80
840	347.20
855	347.00
875	346.40
955	346.90
975	347.60
980	346.70
1005	345.30
1105	346.50
1175	346.00
1240	346.20
1270	346.90
1355	345.80
1460	346.00
1495	346.90
1545	346.60
1600	346.90
1650	346.50
1665	346.70
1670	346.00
1690	346.10
1720	345.10
1770	345.10
1795	345.70
1825	345.80
1830	345.40
1835	345.30
1836	344.70
1940	344.70
1955	345.00
1980	344.80
2005	343.90
2020	343.00
2045	343.90
2080	344.40
2125	344.20
2160	345.00
2170	343.90
2190	342.80
2210	344.50
2240	343.90
2260	342.00
2365	343.40
2430	341.80
2470	344.10
2505	343.10
2525	341.00
2535	339.90
2552	342.50
2580	344.10
2620	344.00
2655	342.00
2670	341.60
2720	341.80
2745	342.60

Kondolf, 1997

Station	Elev.
0	355.70
15	356.00
35	356.10
105	358.80
250	353.90
625	349.50
640	350.40
665	348.00
670	347.80
690	346.00
695	348.80
699	346.70
705	348.80
725	347.70
750	348.10
790	347.50
820	345.80
845	347.50
870	345.90
890	347.40
985	347.00
1010	346.00
1070	347.00
1120	346.60
1220	346.80
1270	347.20
2380	342.80
2485	343.10
2515	341.70
2545	342.10
2570	343.60
2598	343.00
2620	344.00
2655	342.00
2670	341.70
2695	343.00
2705	343.10
2735	341.90
2745	341.80

BKF Design Drawings

Station	Elev.
0	359.20
85	357.20
185	355.40
285	353.80
385	352.40
485	351.40
585	350.00
685	348.60
785	347.80
885	347.00
985	346.40
1085	346.10
1185	346.10
1285	346.10
1385	346.10
1485	346.40
1585	346.40
1685	346.10
1765	345.40
1785	345.80
1805	345.90
1885	345.80
1985	345.60
2085	344.60
2185	345.00
2285	345.20
2385	344.80
2485	344.40
2535	344.40
2665	

BKF As-Built Spot Elev

Station	Elev.
131	356.6
695	348.8
950	348.9
1518	347.7
1959	346.1
2403	344.7
2665	343.5