

This report is part of the Staff Report – Basin Plan Amendments- Revisions to Recreational Standards for Inland Fresh Surface Waters in the Santa Ana Region, January 12, 2012

#### 5.6.4 UAA Analysis: Greenville-Banning Channel

The following discussion summarizes and references data and information contained in the “Use Attainability Analysis Technical Report for Greenville-Banning Channel”, CDM, August 2010 (GB Technical Report). Maps, tables and photographs included in the GB Technical Report are reproduced here directly or adapted and referenced appropriately. Additional observations and photographs made by Regional Board staff are also included in the analysis.

##### 5.6.4.1 Watershed Description/Location

The Greenville-Banning Channel watershed (approximately 9 mi<sup>2</sup>) is located in Orange County and includes portions of the Cities of Costa Mesa and Santa Ana. See Figure GB-1. The channel length addressed in this UAA analysis extends approximately 3.35 miles from the confluence of the channel with the Santa Ana River upstream to the California Street crossing in the City of Costa Mesa. The UAA does not address tributaries to the channel, which include the Fairview Channel.

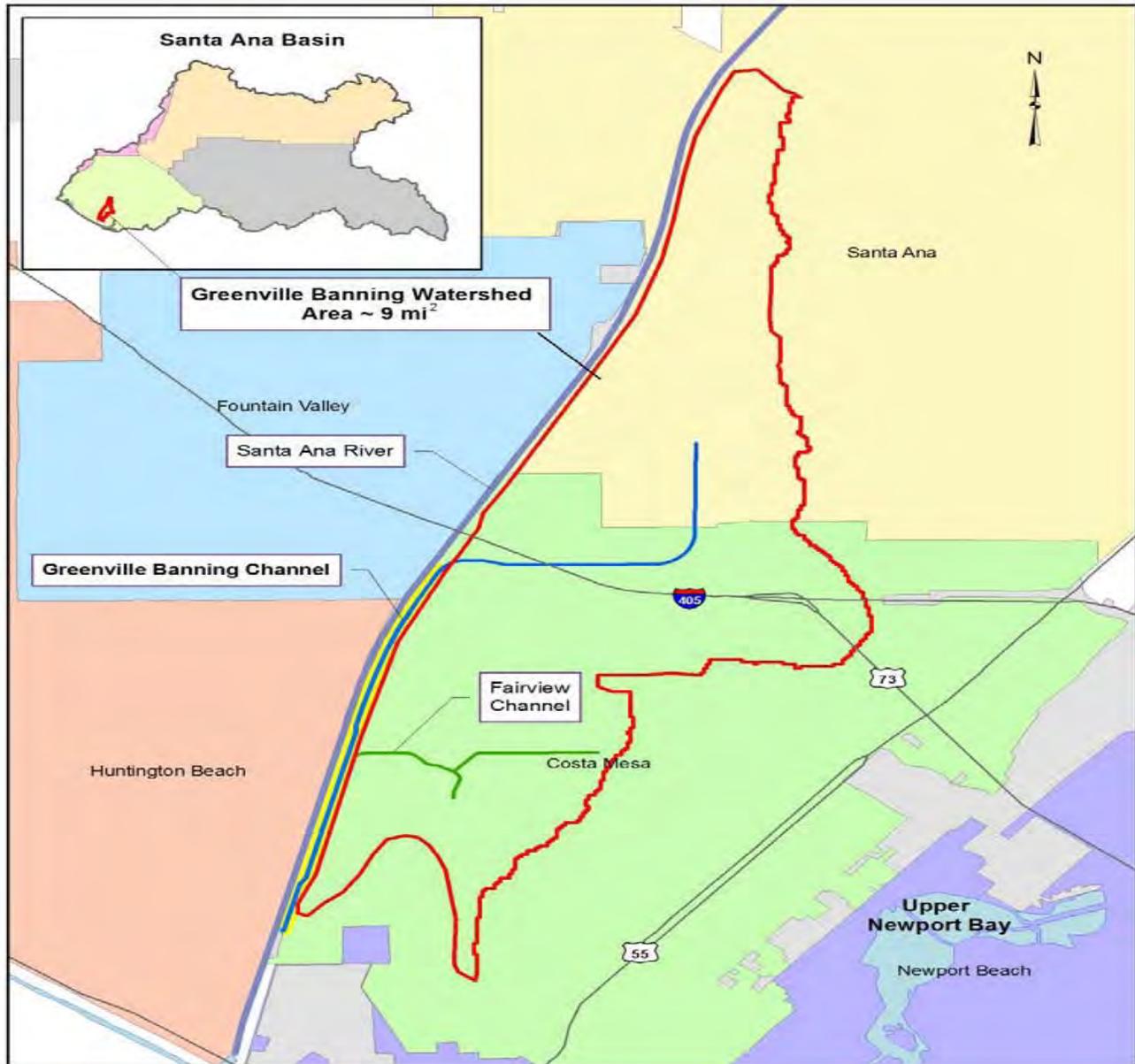
##### 5.6.4.2 Reach Identification

The GB Technical Report identifies and analyzes one reach of the Greenville-Banning Channel, which extends from the confluence of the channel with the Santa Ana River upstream to 1125 ft. upstream of Gisler Avenue in the City of Costa Mesa. Regional Board staff proposes a revised approach to reach identification, as described below. However, the data and analyses provided in the GB Technical Report with respect to channel morphology, surrounding land use, evidence of recreational activity, etc. in the channel are not substantively affected by this revised approach.

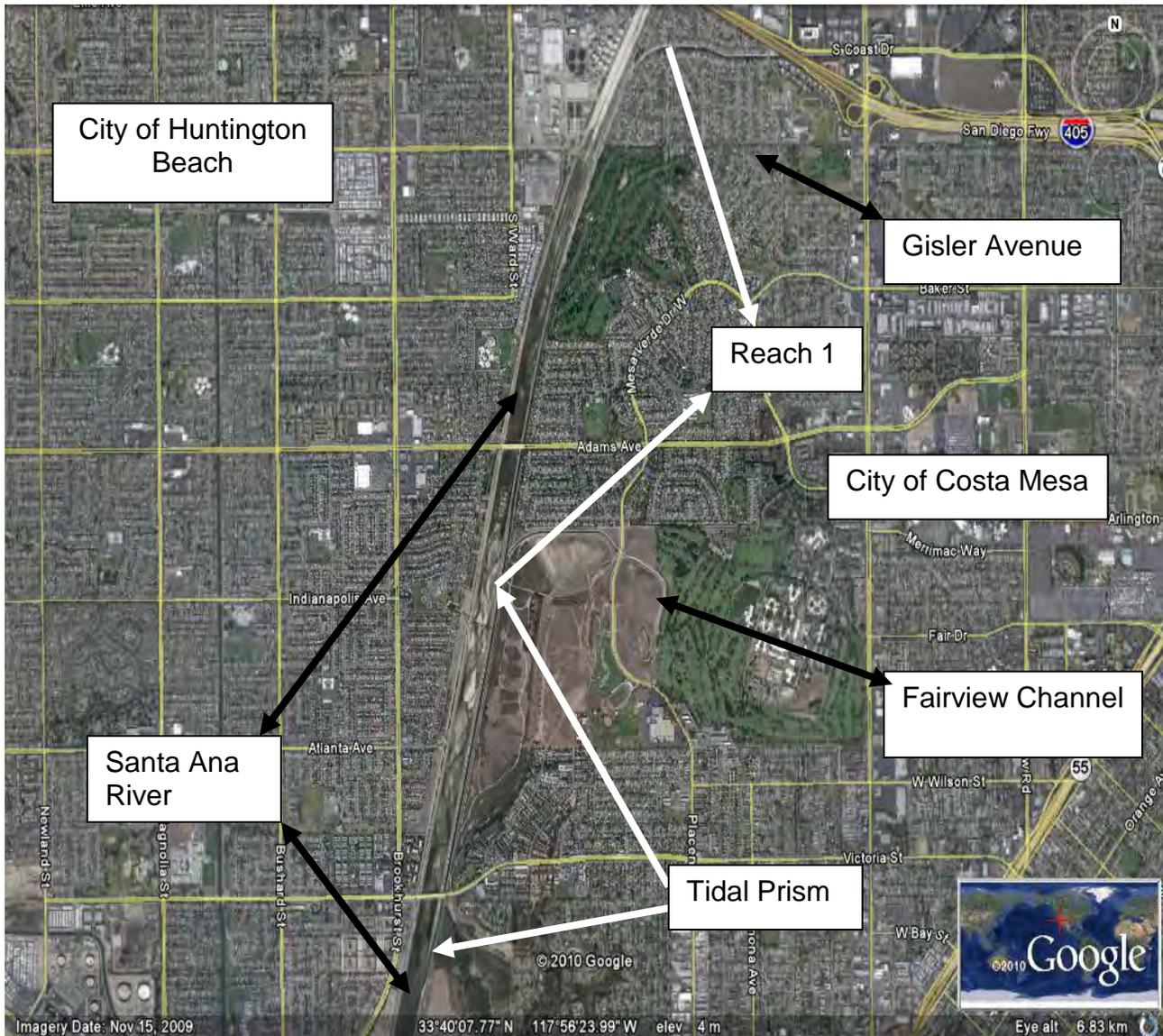
For the purpose of designating water quality standards, staff proposes that the channel be divided into a tidal prism segment and one upstream reach (Reach 1). (Table GB-1: see also Section 5.8)

**Table GB-1  
Reach Identification**

Reaches	GB Technical Report	Regional Board Staff Report
Tidal Prism	Not identified	Santa Ana River confluence upstream 1.2 miles to inflatable diversion dam. The diversion dam is 0.23 mile downstream of confluence with the Fairview Channel.
Reach 1	Santa Ana River confluence to 1125 ft (0.21 mile) upstream of the Gisler Avenue Pedestrian Bridge, a distance of 3.15 miles.	Diversion dam upstream to California Street crossing, a distance of 2.15 miles. California Street is approximately 0.20 mile upstream of the GB Technical Report upper boundary for Reach 1 (i.e., 1125 ft. upstream of Gisler Avenue pedestrian bridge).



**Figure GB-1, Map of Greenville-Banning Channel watershed.** (Source: Use Attainability Analysis Technical Report for Greenville-Banning Channel, CDM, August 2010, Figure 2-1)



**Figure GB-2 Proposed Tidal Prism and Reach 1 of the Greenville-Banning Channel.** The Channel lies adjacent to the Santa Ana River from its confluence with the River to upstream of Gisler Avenue at the California Street crossing.

**5.6.4.3 Reach Descriptions**

Channel characteristics for each of the proposed reaches are summarized in Table GB-2. Representative photographs are included as Figures GB-4, 5, 6 and 7. The GB Technical Report includes additional photographs of the channel (See GB Technical Report, Figures 2-6 through 2-9).

**Table GB-2 Greenville Banning Channel Characteristics**

<b>Reach</b>	<b>Description</b>	<b>Identification</b>
Tidal prism	Vertical, fully concrete-lined, 60 ft. bottom width	Confluence with Santa Ana River to low flow diversion dam (~ 1.2 miles)
Reach 1	Vertical, fully concrete-lined, 60 ft. bottom width	Low flow diversion dam to 1125 ft (0.21 mi.) upstream of Gisler Ave. (~ 1.95 mi.)
	Trapezoidal, fully concrete-lined, slopes >45°	1125 ft (0.21 mile) upstream of Gisler Avenue to California Street (~0.20 mile)

The area surrounding the current Greenville-Banning Channel originally drained to the Santa Ana River. The channelization of the Santa Ana River created flooding in the area in the early 1900's. A channel, known as the Talbert Ditch, was constructed in the early 1900's to resolve these flooding issues. In 1959 the Greenville-Banning Channel was completed as an earthen trapezoidal channel to replace the Talbert Ditch. Over time the Tidal Prism and the proposed Reach 1 sections of the channel were converted to concrete-lined.

#### **5.6.4.3.1 Tidal Prism**

The Greenville-Banning channel is subject to tidal influence due to its proximity to the Pacific Ocean and low elevation. The terminus of the Greenville-Banning channel was originally at the Pacific Ocean. However, the terminus has been relocated approximately 1.3 miles upstream of the ocean, to a confluence point with the Santa Ana River just downstream of the Hamilton Avenue/Victoria Street Bridge in the City of Costa Mesa. The proposed tidal prism segment of the Greenville-Banning channel begins at the Santa Ana River confluence and extends upstream approximately 1.2 mile to the inflatable rubber dam operated by the Orange County Flood Control District. Dry weather flows that pool up behind the dam are diverted to the sanitary sewer system for treatment. See Figure GB-3.

With an estimated great diurnal range (GT) or difference in height between mean higher high water and mean lower low water of 5.41 ft<sup>1</sup>, the typical range of tidal influence varies significantly on a daily basis in the channel. Since the channel bottom gains elevation very slightly from the Santa Ana River upstream, if the dam is not inflated, tidal flows can push up further than the dam, located 2.5 miles inland from the Ocean and 1.2 miles from the Santa Ana River confluence. However, when the dam is inflated, it prevents tidal movement upstream. The dam is typically inflated, except for maintenance and during wet weather conditions (see "Expected Water Quality Improvement", below). Therefore, as noted, the upstream boundary of the tidal prism is proposed to be located at the inflatable dam.

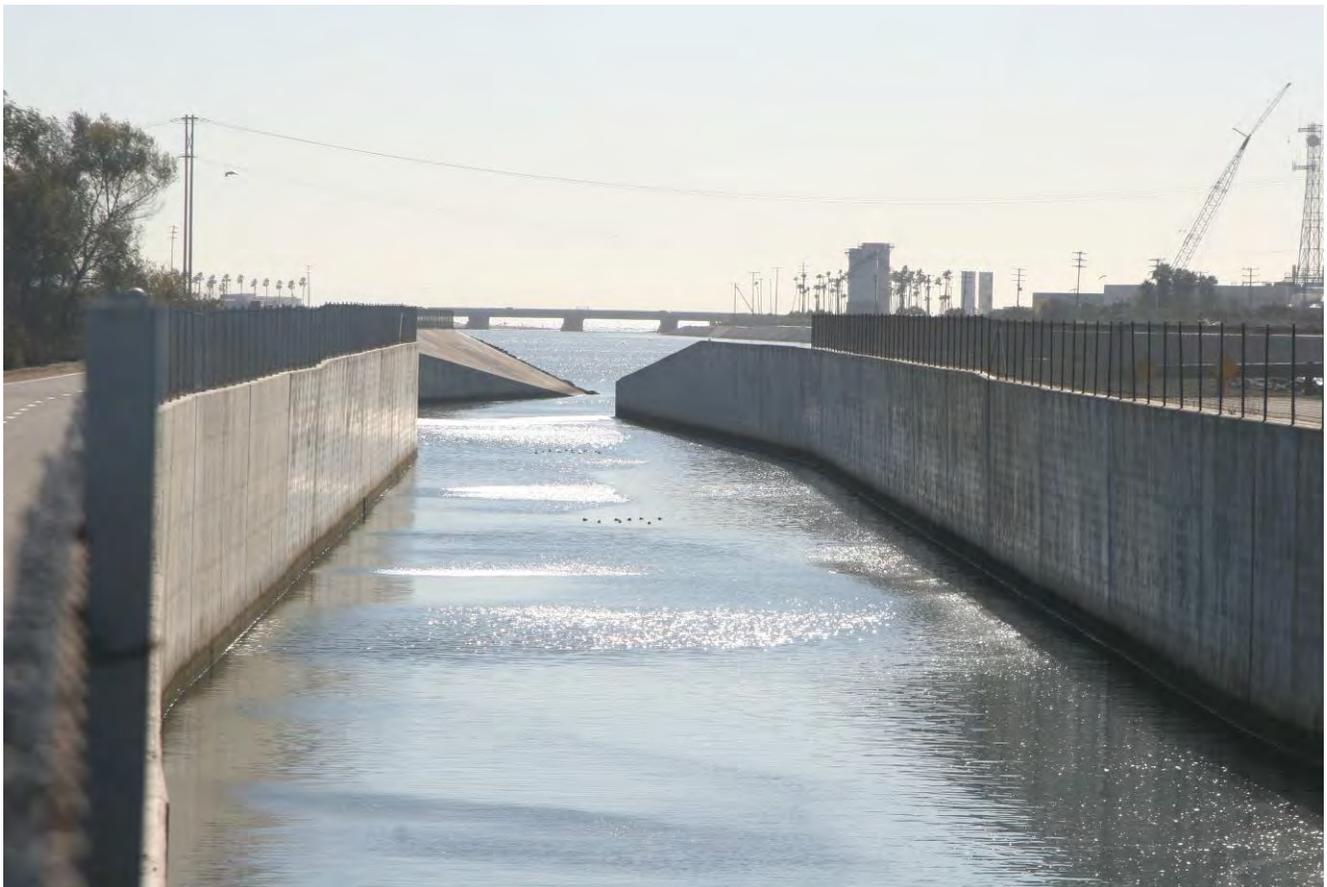
As described in Table GB-2, the channel in the proposed tidal prism reach is vertical walled, fully concrete-lined, with a 60 ft. bottom width. Representative photographs are shown in Figures GB-4 and 5.

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<sup>1</sup> The GT range for this channel is estimated from data collected by NOAA at the Newport Bay Entrance Historical Tide Data Summary, Epoch 1983-2001. The shape of bays and estuaries can magnify the intensity or dissipate incoming tides. In addition, fresh water flows can severely alter or mask the incoming tide.



**Figure GB-3. Rubber dam diversion at Greenville-Banning Channel.** The inflatable rubber dam impounds low flows, shown in the background of the photo, which are pumped to the sanitary sewer system for treatment. (Photograph from Orange County Public Works)



**Figure GB-4 Proposed Tidal Prism Reach of the Greenville-Banning Channel Facing Downstream.** The Santa Ana River (tidal prism), Pacific Coast Highway Bridge, and Pacific Ocean are in the distance. (Regional Board Staff photograph, June 2010)



**Figure GB-5**

**Proposed Tidal Prism Reach of the Greenville-Banning Channel. facing upstream.** Santa Ana River Bicycle Trail and Talbert Nature Reserve to the right and the Santa Ana River to the left of the channel. The inflatable dam is upstream just before channel curves. (Regional Board Staff Photograph, October 2010)

#### **5.6.4.3.2 Reach 1**

As noted in Table GB-1, the proposed Reach 1 is composed of a vertical walled, fully concrete-lined channel with a 60 ft. bottom width for almost the entire length. The uppermost 0.20 mile of channel in Reach 1 consists of trapezoidal walls and is fully concrete-lined. Representative photographs are shown in Figures GB-6 and 7. The channel walls in this short upstream segment are steep, with greater than a 45° slope. As shown in Table GB-1, the downstream boundary of Reach 1 is the inflatable diversion dam and the upstream boundary is the California Street crossing, a distance of 2.15 miles. The entire reach is located in the City of Costa Mesa. There appears to not be a defined low flow channel except for the trapezoidal wall section.



**Figure GB-6. Proposed Reach 1 of the Greenville-Banning Channel. Facing Downstream. Trapezoidal to Vertical Channel Transition.** (Source: Use Attainability Analysis Technical Report for the Greenville-Banning Channel, CDM, August 2010, Figure 2-9)



**Figure GB-7 Proposed Reach 1 of Greenville-Banning Channel. Looking upstream during dry weather.** Regional Board staff photograph, December 2010.

#### **5.6.4.4 Flow Conditions and Water Levels**

As noted above, the proposed tidal prism is subject to tidal influence and, accordingly, the depth of flow in the channel in this area can vary widely. Regional Board staff has observed that typical tidal flow depths range from several feet deep at the Santa Ana River confluence to little or no depth (i.e., dry conditions) at the inflatable dam. During a higher high tide in May 2011, Regional Board staff observed the depth of water at the downstream side of the inflatable dam to be about 20 inches. As noted earlier, the mean daily tidal differences in the channel may be able to create daily differences in depth of approximately 5.41 ft.

Given the hydrologic patterns in Southern California, dry weather flow is the predominant condition most of the time in proposed Reach 1 of the channel, with precipitation-derived runoff typically occurring for only relatively short episodic periods during and shortly after rainfall events within the tributary watershed. These events typically occur almost entirely during the wet season. Dry weather flows consist of urban runoff. Regional Board staff has observed that Reach 1 dry weather flows generally sheet flow across the bottom of the channel at very shallow depths. Water impounded upstream of the inflatable dam may be ~1.5 feet deep and forms a pool that extends upstream beyond the confluence with Fairview Channel as observed

in May of 2011 by Regional Board staff. See Figure GB-9. There are no stream gauges on the channel and flow depth/volume has not been measured routinely.

#### **5.6.4.5 Access and Safety**

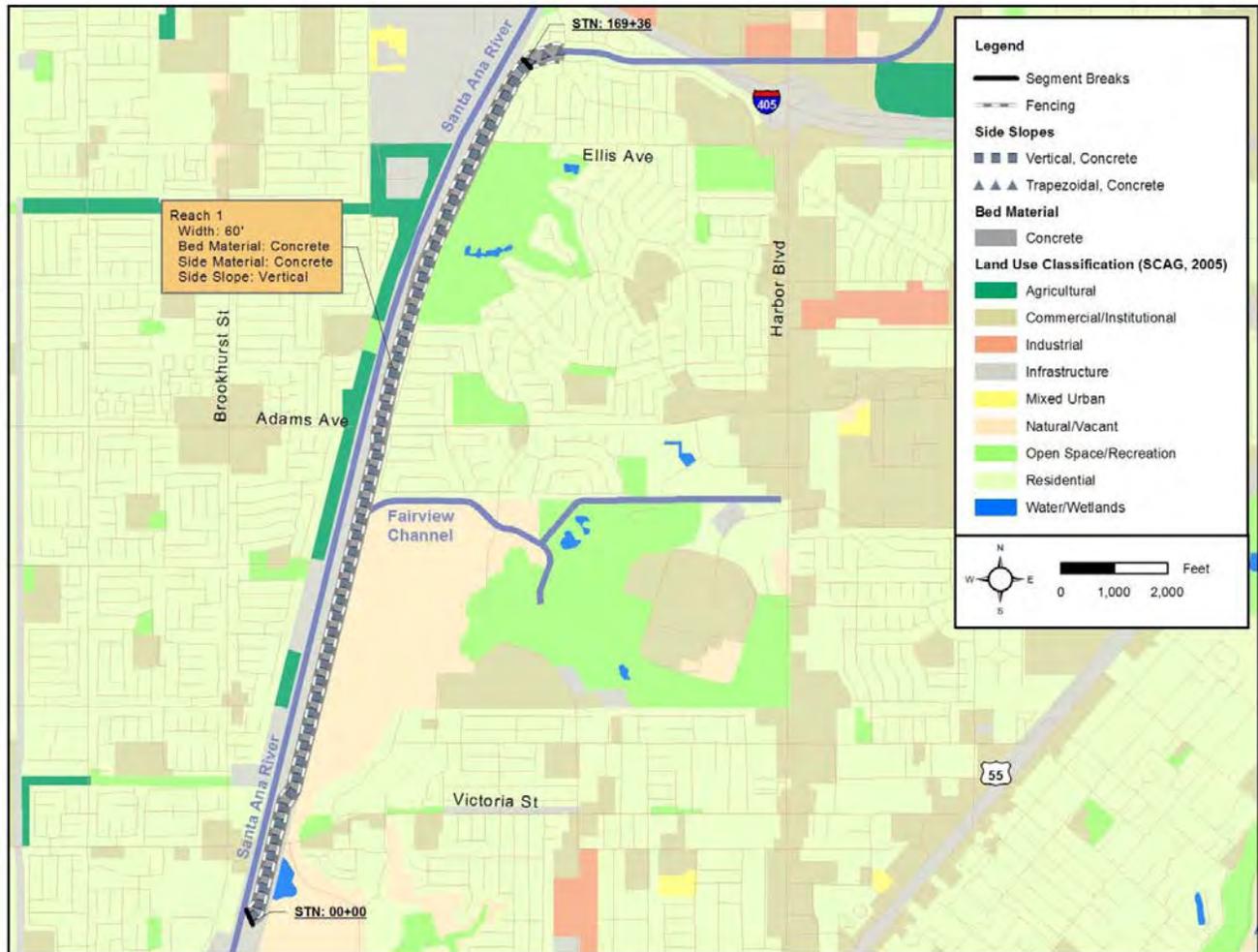
The Orange County Flood Control District prohibits access to the channel. The entire length of the proposed Tidal Prism and Reach 1 are fenced and gated to deny access. Signs are displayed that state that access is prohibited.

A popular bicycle trail follows the channel the entire length of the proposed Tidal Prism and almost the entire length of Reach 1, except for the uppermost 0.20 mile. The bicycle trail is separated from the channel by fencing and the vertical walls of the channel.

Access to the water in the channel is also extremely difficult and hazardous due to the channel morphology, i.e., vertical concrete walls along much of the length of the channel and steep-sided concrete walls in the uppermost part of Reach 1. The potential for extremely high wet weather flows makes it very dangerous for individuals to enter the channel during those times.

#### **5.6.4.6 Adjacent Land Use**

Figure GB-8 depicts the land uses in the Greenville-Banning Channel drainage area. The watershed draining to Reach 1 is largely developed as residential, with some open space. The Talbert Nature Preserve borders the lower eastern side of the proposed Tidal Prism. Single family homes and a private golf course lie on the eastern side of Reach 1. Single family homes are adjacent to the uppermost 0.20 miles of proposed Reach 1 on both sides of the channel. The Santa Ana River Channel borders the western side of the proposed Tidal Prism and almost all of Reach 1. To the west of this section of the Santa Ana River Channel are portions of the City of Huntington Beach that are dominated by residential units. One of the sewage treatment facilities operated by the Orange County Sanitation District is also found on the west side of the Santa Ana River Channel, across from the uppermost section of the proposed Reach 1.



**Figure GB-8 Greenville-Banning Channel Characteristics and Adjacent Land Uses** (Source: Use Attainability Analysis Technical Report for the Greenville Banning Channel, CDM, August 2010 Figure 2-4)

#### 5.6.4.7 Water Quality Conditions

Water quality samples were collected in the Greenville-Banning Channel from 2001 to 2004 and in August and September of 2011.

From May 16, 2001 to October 15, 2004 water quality samples were collected at 200 ft. upstream of the inflatable diversion dam and 200 ft. downstream of the diversion dam. The sampling location 200 ft. upstream of the diversion dam is in the proposed Reach 1 and the sampling location 200 ft. downstream of the diversion dam is in the proposed Tidal Prism segment of the Channel. See Tables GB-2 and GB-3. Over the 2001-2004 time period, samples were collected on an approximate weekly basis. For a variety of reasons, sampling was not conducted during some weeks of this period and no sampling was conducted between October 2001 and May 2002. Sample analysis included total and fecal coliform.

Table GB-3 shows the results for fecal coliform for 2001-2004. When 5 or more samples were collected in a 30 day period (calendar month, not rolling 30 day periods), a geometric mean (geomean) was calculated and compared to the existing REC1 fecal coliform objective (200 organisms/100mL based on five or more samples/30 day period.) When, as in most cases, insufficient data were available to calculate geometric means, the fecal coliform data were compared generally to that part of the existing REC1 fecal coliform objective that specifies that not more than 10% of the samples exceed 400 organisms/100mL for any 30-day period.

Table GB-4 shows running 5-sample geometric mean results for the data collected during 2001-2004. Geometric means were calculated based on the results of discrete groups of 5 consecutive samples, collected over periods of 28-30 days. A total of 82 sets of 5 consecutive samples were evaluated. While direct comparison of many of these results to the established Basin Plan objective may be considered inappropriate given the less than 30-day period over which the samples were collected, the results are indicative of the likely frequency of violation of the geomean objective.

In addition to fecal coliform data collected, enterococcus data were collected during the same sampling period as shown in Tables GB3 and GB4 for both the downstream and upstream sampling locations. The downstream enterococcus data were used to determine anti-degradation targets for the proposed tidal prism section of the channel (see Section 5.2). The enterococcus data are shown in Appendix 1.

**Table GB-3: Monthly Fecal Coliform Data Summary  
Greenville-Banning Channel, 2001-2004**

Year & Month	Downstream (200' below diversion dam)					Upstream (200' above diversion dam)					
	Count	Min	Max	% > 400	GeoMean	Count	Min	Max	% > 400	GeoMean	
May-01	1	800	800	100%		1	3000	3000	100%		
Jun-01	4	4	300	0%		4	2	230	0%		
Jul-01	4	4	7	0%		4	2	8	0%		
Aug-01	5	2	17	0%	4	5	2	8	0%	3	
Sep-01	4	2	8000	25%		4	2	110	0%		
May-02	2	70	300	0%		4	40	230	0%		
Jun-02	2	2	2400	50%		2	80	130	0%		
Jul-02	2	4	300	0%		2	300	800	50%		
Aug-02	4	2	30	0%		4	50	800	25%		
Sep-02	5	8	500	20%	33	5	9	1100	40%	114	
Oct-02	3	23	700	33%		3	2	110	0%		
Nov-02	3	40	3000	33%		3	23	220	0%		
Dec-02	4	50	700	25%		4	50	400	0%		
Jan-03	4	13	80	0%		4	90	700	25%		
Feb-03	4	4	1100	25%		4	23	3000	25%		
Mar-03	5	4	1700	20%	107	5	4	800	20%	74	
Apr-03	3	500	8000	100%		3	300	5000	67%		
May-03	4	50	3000	40%		5	70	5000	40%	528	
Jun-03	2	7	30	0%		5	13	240	0%	43	
Jul-03	2	7	11	0%		5	7	50	0%	21	
Aug-03	4	14	20	0%		4	20	1600	25%		
Sep-03	4	40	160000	50%		4	17	170	0%		
Oct-03	5	23	5000	20%	138	5	23	5000	40%	244	
Nov-03	4	80	2400	50%		4	50	5000	25%		
Dec-03	3	23	110	0%		4	13	110	0%		
Jan-04	4	11	240	0%		4	17	300	0%		
Feb-04	4	90	3000	25%		4	70	24000	25%		
Mar-04	5	20	300	0%	58	5	20	300	0%	36	
Apr-04	4	11	16000	50%		4	4	6008	25%		
May-04	3	4	13	0%		3	2	110	0%		
Jun-04	4	2	6	0%		4	2	8	0%		
Jul-04	3	8	300	0%		3	2	300	0%		
Aug-04	2	4	70	0%		4	2	8	0%		
Sep-04	0	DRY	DRY	0%		5	2	570	40%	28	
Oct-04	0	DRY	DRY	0%		2	2100	5400	100%		
Total No. of Months with Violations:				16	0	Total No. of Months with Violations:				16	2
Total No. of Months:				33	33	Total No. of Months:				35	35
Notes: Percent:				48%	--	Percent:				46%	6%

1. Units are colony forming units per 100 milliliters (CFU/100 mL), except for samples collected in 2001, which are reported as most probable number per 100 mL (MPN/100mL)

2. Reporting limit used for results above or below reporting limit when calculating geomean

3. Geometric mean shown only for calendar months with 5 or more samples

4. Basin Plan water quality objectives:

(a) logmean < 200 organisms/100 mL based on five or more samples/30 day period

(b) Not more than 10% of samples exceed 400 organisms/100 mL for any 30-day period

**Table GB-4: Running 5-Sample Geometric Means - Fecal Coliform  
Greenville-Banning Channel, 2001-2004**

Downstream (200' below diversion dam)				Upstream (200' above diversion dam)			
Date1	Date2	No. of Days	GeoMean	Date1	Date2	No. of Days	GeoMean
21-Mar-03	17-Apr-03	28	774	7-Aug-02	4-Sep-02	29	327
26-Mar-03	24-Apr-03	30	959	23-Aug-02	17-Sep-02	26	310
17-Apr-03	15-May-03	29	1081	17-Jan-03	10-Feb-03	25	217
24-Apr-03	23-May-03	30	656	21-Mar-03	17-Apr-03	28	771
1-May-03	29-May-03	29	339	26-Mar-03	24-Apr-03	30	633
8-May-03	4-Jun-03	28	255	17-Apr-03	15-May-03	29	1239
25-Aug-03	22-Sep-03	29	345	24-Apr-03	23-May-03	30	706
4-Sep-03	1-Oct-03	28	518	1-May-03	29-May-03	29	528
9-Oct-03	3-Nov-03	26	247	8-May-03	4-Jun-03	28	229
16-Oct-03	10-Nov-03	26	300	9-Oct-03	3-Nov-03	26	428
22-Oct-03	20-Nov-03	30	359	16-Oct-03	10-Nov-03	26	428
31-Oct-03	28-Nov-03	29	711	22-Oct-03	20-Nov-03	30	678
3-Nov-03	1-Dec-03	29	283	31-Oct-03	28-Nov-03	29	458
2-Feb-04	1-Mar-04	29	351	3-Nov-03	1-Dec-03	29	200
9-Feb-04	8-Mar-04	29	287	26-Jan-04	23-Feb-04	29	217
17-Feb-04	15-Mar-04	28	212	2-Feb-04	1-Mar-04	29	386
22-Mar-04	19-Apr-04	29	207	9-Feb-04	8-Mar-04	29	265
29-Mar-04	27-Apr-04	30	200	17-Feb-04	15-Mar-04	28	206
				17-Sep-04	15-Oct-04	29	481
Total No. of Geomeans > 200			18	Total No. of Geomeans > 200			19
Total No. of 5-Sample Data Sets:			82	Total No. of 5-Sample Data Sets:			82
Percent:			22%	Percent:			23%
<b>Notes:</b>							
1. Units are colony forming units per 100 milliliters (CFU/100 mL), except for samples collected in 2001, which are reported as most probable number per 100 mL (MPN/100mL)							
2. Reporting limit used for results above or below reporting limit when calculating geomean							
4. Basin Plan water quality objectives:							
logmean < 200 organisms/100 mL based on five or more samples/30 day period							

Table GB-3 indicates that 200 ft. downstream of the diversion dam, the current Basin Plan objective that specifies that no more than 10% of samples collected in a 30-day period are to exceed 400 organisms/100mL was or would likely be violated in sixteen of the thirty-three months of samples, or 48% of the months sampled. The results were similar upstream of the diversion dam, where the objective was or was likely violated in 46% of the months sampled. The results presented in Table GB-4 indicate that there are frequent violations of the geomean fecal coliform objective in both of the proposed reaches of the Greenville-Banning channel.

In August and September of 2011, Orange County Public Works Department staff collected samples from three locations in the proposed Reach 1: California Street (GB3), Gisler Street (GB4), and at the diversion dam (GB5). The sampling locations are described in Table GB-5 and shown in Figure GB-9. The results are presented in Table GB-6. Geometric means were calculated with and without sample results from September 12, 2011; the results on that day were likely affected by rainfall on September 10, 2011. The geometric means are shown in Table GB-7. During this period, the diversion dam was deflated and flow in the channel was seaward. The results show that, with the exception of the area at the diversion dam, the geometric means for both fecal coliform and *E. coli* exceed the established and proposed objectives. See Table GB-7.

**Figure GB-9 Map of Bacteria Sampling Locations on the Greenville-Banning Channel August-September 2011 (This Figure and the accompanying Tables adapted from OC Public Works Greenville-Banning Channel Sampling Results August-September, 2011 Report)**



**Table GB-5**

**Description of Sampling Locations, Greenville-Banning Channel- August-September 2011.**

Site Code	Location	Channel Type	Substrate	Surrounding Land-Use	Sampling Detail
GB3	California Street	Trapezoidal	Concrete	Residential	
GB4	Gisler Avenue	Rectangular	Concrete, deposited mud	Residential, bike path	Sampled on south side of channel
GB5	Diversion Dam	Rectangular	Concrete, deposited mud	Fairview Park and bike path	Sampled upstream of dam

**Table GB-6**

**Greenville- Banning Channel Sampling Data, August-September 2011**

Site Code	Date	Time	Fecal Coliform (CFU/100 mL.)	<i>E. coli</i> (CFU/100 mL)
GB3	8/18/2011	08:44	930	1,130
GB3	8/24/2011	12:10	350	770
GB3	8/24/2011	12:10	300	630
GB3	8/31/2011	11:10	960	1,100
GB3	9/7/2011	10:35	2,600	2,700
GB3	9/7/2011	10:35	2,300	2,400
GB3	9/12/2011	10:20	2,500,000	460,000
GB3	9/14/2011	09:15	18,000	3,700
GB3	9/21/2011	12:00	2,000	1,800
GB3	9/21/2011	12:00	2,100	1,700
GB3	9/22/2011	10:38	10,200	9,300
GB4	8/24/2011	11:45	80	100
GB4	8/31/2011	10:50	410	430
GB4	9/7/2011	10:55	1,700	1,620
GB4	9/12/2011	10:35	1,500,000	170,000
GB4	9/14/2011	09:40	5,700	2,700
GB4	9/21/2011	11:40	1,900	1,600
GB4	9/22/2011	10:50	4,300	4,500
GB5	8/18/2011	07:55	< 9	< 9
GB5	8/31/2011	11:40	< 9	< 9
GB5	8/24/2011	11:00	< 9	< 9
GB5	9/7/2011	10:00	< 9	< 9
GB5	9/12/2011	11:05	>= 7,300,000	>= 3,600,000
GB5	9/21/2011	10:55	20	< 10

Samples at the same date and time are duplicate samples

**Table GB-7 Geomean Summary: August-September 2011**

Site Code	Dates	# Samples	Geomean Fecal Coliform (CFU/100 mL)	Geomean <i>E. coli</i> (CFU/100 mL)
GB3	8/28 - 9/14/2011	5	1,690	1,553
GB3 w/ 9/12 sample*	8/24 - 9/22/2011	6	5,704	4,009
GB3	8/24 - 9/22/2011	6	2,728	2,251
GB3 w/ 9/12 sample*	8/24 - 9/22/2011	7	8,503	4,813
GB4	8/24 - 9/22/2011	6	1,172	1,034
GB4 w/ 9/12 sample*	8/24 - 9/22/2011	7	3,358	2,142
GB5	8/18 - 9/14/2011	4	9	9
GB5 w/ 9/12 sample*	8/18 - 9/14/2011	5	137	119
GB5	8/24 - 9/22/2011	6	11	9
GB5 w/ 9/12 sample*	8/24 - 9/22/2011	7	99	79

\*Rainfall on September 10 likely influenced the bacteria concentrations on September 12. The diversion dam was deflated on this date, with high tides in the dam area, and remained deflated until September 15.

#### 5.6.4.7.1 Expected Water Quality Improvement

Currently, BMPs are being employed to reduce fecal indicator bacteria, including fecal coliform, in the Greenville Banning Channel and downstream receiving waters. As described above, the Orange County Public Works Department implemented the diversion of dry weather flows impounded by an inflatable dam located 1.2 miles upstream of the confluence with the Santa Ana River. The dam is the upstream terminus of the proposed tidal prism. The impounded flows are transported via pipeline across the Santa Ana River to the Orange County Sanitation District treatment facility. In anticipation of and during stormflow conditions, the dam is deflated and the diversion is stopped. Flows in the channel pass unimpeded downstream into the Santa Ana River and thence the Pacific Ocean. Data from Orange County Public Works show that from January 2006 to October 2010 diversions occurred in 36 of the 58 months in that period and averaged approximately 400,000 gallons per day. On average, approximately 12,200,000 gallons were diverted to the sanitary sewer during a month in which flows were diverted. The diversions reduced bacteria and nutrient<sup>2</sup> loading to downstream receiving waters, which include ocean coastal beaches that are heavily used for water contact recreation, particularly during the dry summer months. Full diversion of urban runoff under all weather conditions would be economically and technically infeasible.

Other BMPs are being implemented in response to pertinent requirements in the Orange County Areawide Urban Storm Water Runoff Management Program NPDES permit (Order No. R8-2009-0033, NDPEs CA 8618030, as amended). BMPs evaluated and implemented by the Orange County Stormwater Program include wet ponds, wetlands and source control programs, including septic system inventory and assessment and portable toilet oversight. The

<sup>2</sup> Recent studies have shown that nutrients at excessive levels in urban runoff have been found to encourage regrowth of fecal indicator bacteria in streambed sediments and salt marshes (Grant et al. 2001 and Litton et al. 2010).

existing development in the drainage area limits the effectiveness of many of these BMPs. The area tributary to the Greenville Banning Channel is sewered and septic tanks are not considered a source of bacteria inputs. Sewer system leaks have not been demonstrated to be a contributor to bacteria densities in the Channel. In short, absent the dry weather diversion, significant water quality improvement that results in consistent compliance with bacteria quality objectives as the result of BMP implementation is likely to be highly problematic.

#### **5.6.4.8 Recreation Use Surveys**

This section provides information on current, historical, and probable future recreational activity.

##### **5.6.4.8.1 Evidence of Actual Recreational Use**

As described in Section 5.6.2.2 (SWQSTF UAA Methodology) extensive photographic evidence was gathered to assess whether and what type of existing recreational use occurs in the Greenville-Banning Channel. In addition, field surveys were conducted by members of the Task Force and the consultant staff responsible for camera installation and maintenance. Information was also obtained from county personnel responsible for monitoring and channel maintenance.

##### **5.6.4.8.2 Digital Field Observation Camera Recreation Survey**

From July 2005 through January 2006, recreational use surveys were performed to obtain information regarding current levels of recreational use. Digital field observation cameras and data transfer technology, coupled with weekly on-location physical surveys were used to collect the data. Two locations within the Greenville-Banning Channel were surveyed. See Figure 3-1 in the Technical Report and Figure GB-6.

- Greenville-Banning Channel at Pedestrian Bridge (camera facing upstream)
- Greenville-Banning Channel at Adams Avenue Bridge (camera facing downstream)

Both camera locations are located in the proposed Reach 1 of the Greenville-Banning Channel.

The pedestrian bridge location is 1,000 feet (0.19 mile) upstream of the inflatable dam and below the confluence with the Fairview Channel. The camera view is shown in Figure GB-9. The Fairview Channel mouth is in the center of the photograph. As shown in this Figure and discussed above (see Table GB-2), the Greenville-Banning channel is dominated by vertical, concrete lined walls and bottom, making public entry difficult and dangerous and therefore highly problematic. Land use in the vicinity of the Fairview Channel includes natural/open space and a park (see Figure GB-8). This camera location was selected on the basis that persons entering the Greenville-Banning Channel, if any, would be more likely to do so from the park via the Fairview Channel than to scale the vertical walls of the channel. Unfortunately, the pedestrian bridge camera was stolen at the end of its third week of operation. A

replacement camera was subsequently installed at the Adams Avenue Bridge, which was considered more secure and had the same general physical characteristics as the pedestrian bridge location. The Adams Avenue Bridge is ~0.66 mi. upstream of the inflatable dam. The camera view at this location is shown in Figure GB-10.



**Figure GB-10. Photo of the Camera View at the Recreational Use Survey Location for Greenville-Banning Channel at Pedestrian Bridge** (Source: Use Attainability Analysis Technical Report for the Greenville Banning Channel, CDM, August 2010 Figure 3-2)



**Figure GB-11 Photo of the Camera View at Adams Street Bridge looking downstream.**

(Source: Use Attainability Analysis Technical Report for the Greenville Banning Channel, CDM, August 2010, Figure 3-3)

The duration of survey and number of images collected for each location on the channel are shown in Table GB-5. An image was collected every fifteen minutes during daylight hours throughout the study duration unless signal strength fluctuations or equipment failures precluded collection and transmission. Images were not collected at night due to darkness.

**Table GB-8**

**Recreational Use Survey Duration and Number of Images Collected**

<b>Survey Location</b>	<b>Start Date*</b>	<b>End Date*</b>	<b>Number of Images</b>
Pedestrian Bridge	7/7/05	7/27/05	425
Adams Avenue Bridge	11/17/05	1/3/06	2,552

\* Due to signal strength fluctuation issues and other equipment functionality issues, periodic, short-term gaps in image collection occurred between the start and end dates. The gaps ranged from relatively minor single fifteen-minute interval image gaps (on numerous days) to gaps in image collection spanning several days. The more significant gaps occurred during November and December. (See discussion in the Recreational Use Survey Data Report – Greenville Banning Channel, CDM, November 29, 2006)(Source: Use Attainability Analysis Technical Report for the Greenville Banning Channel, CDM, August 2010, Table 3-1)

Any image containing a person or persons within channel fencing or boundaries was defined as a recreation event. If a person or persons were observed meeting these same conditions during the weekly on-site surveys, these were also considered events. An event could include one or more persons. For each event, each person’s activity (type) and the estimated duration of the event were logged. If an activity was captured on only one image, the activity duration was reported as < 30 minutes. Likewise, if the same activity by the same person or persons was observed in two consecutive fifteen-minute interval images, the duration was reported as <45 minutes.

For camera locations at Greenville-Banning Channel at the pedestrian bridge and the Adams Avenue Bridge, no recreational activities were observed in collected images. Table GB-6 presents a summary of the activity recorded at the Greenville-Banning Channel survey locations over the duration of the survey. The seasonal periods defined in southern California NPDES stormwater permits were used to categorize the observations by season (April 1 to September 30 for the dry season; October 1 to March 31 for the wet season). Full recreational use survey information can be found in the *Recreational Use Survey Data Report – Greenville-Banning Channel* prepared for the Task Force by CDM in November 2006<sup>3</sup>.

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<sup>3</sup> It should be noted that in this Recreation Use Survey Data Report (and those prepared for the other waters for which UAAs are discussed in this staff report), a use/activity protocol was employed to log and categorize any observed activity from both image and on-site physical surveys. Within this protocol, recreational events (if any) were differentiated as contact or non-contact events. Where it appeared that there was or might be contact activity in an image, the type of that contact was categorized as: incidental contact, contact below the ankle, contact between the ankle and waist, contact between the waist and neck, contact above the neck, or non-recreation contact. However, subsequent analyses, discussed in the GB Technical Report (and the other Technical Reports prepared for the UAAs addressed in this staff report), abandoned this characterization scheme. It was decided that the consultants’ determination in the recreational use survey reports of whether an event should be categorized as contact or non-contact imposed a pre-determination of the nature of the event that was intended instead to be considered by the Task Force. As reflected in Table GB-6 and noted in the preceding text, the characterization scheme employed in the GB Technical Report (and the other Technical Reports) employed a different approach, identifying recreation events and the type of activity witnessed, rather than asserting conclusions regarding the contact versus non-contact nature of those activities. As a practical matter, for the

<b>Table GB-9 Recreation Activity Recorded for Greenville-Banning Channel</b>					
<b>Location</b>	<b>Number of Individuals</b>			<b>Estimated Duration (min)</b>	<b>Types of Activities</b>
	<b>Total</b>	<b>Dry Season</b>	<b>Wet Season</b>		
Pedestrian Bridge	0	0	0	0	None
Adams Avenue Bridge	0	0	0	0	None

(Source: Use Attainability Analysis Technical Report for Greenville-Banning Channel, CDM. August 2010, Table 3-2)

#### **5.6.4.8.3 Physical Surveys and Other Information**

Task Force members visited the Greenville-Banning Channel at Adams Avenue on six weekends during the July and August 2006 recreation survey. This is in addition to the weekly physical surveys associated with maintenance of the digital cameras. Task Force members were asked to stay at the location for half an hour and record what recreational activities, if any, they observed. The Task Force members described the number and activity of people they saw in the area, the weather, depth and clarity of the water, and any evidence of activity in the area. No people were observed in the water or within the channel during this time period. Numerous people were observed on the bike trail alongside the Greenville-Banning Channel.

Orange County Flood Control District (OCFCD) staff who regularly conduct maintenance activities on the channel have reported no incidents of individuals in the channel or inside the fences. OCFCD staff regularly visit the area to operate the inflatable dam and diversion. Further, Orange County Harbors, Beaches, and Parks employees working at the Talbert Nature Preserve have reported never observing any individuals in the channel in either the proposed Tidal Prism or Reach 1. Finally, Regional Board staff have made periodic visits to Reach 1 and the tidal prism since the work of the Stormwater Quality Standards Task Force began in 2003. No one was observed in the channel during those visits.

#### **5.6.4.8.4 Evidence of Historical Recreational Use**

To collect information regarding historical recreational use, CDM conducted inquiries to local jurisdictional agencies, online searches of California newspaper archives, databases (engineering and environmental trade journals), and search engines such Google News archive and Lexis-Nexis to identify any accounts or reference to recreational activities in the channel. No historical use information was identified from these searches.

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Greenville-Banning Channel, this change in analytical protocol was not significant as no recreational activities of any sort were recorded in the channel. (See Table GB-6).

#### **5.6.4.8.5 Probable Future Use**

Information regarding potential future recreational uses for the Greenville-Banning Channel was obtained through discussions with local agencies. The City of Costa Mesa was contacted as well as Orange County (OC) Public Works. From these agency inquiries, proposed use plans were identified. The City of Costa Mesa developed concept plans as part of the Blue Ribbon Committee for the Santa Ana River Trail Vision Study. These plans include improvements to the existing bicycle trail along the channel. Improvements include new access points to the existing bicycle trail, rest areas, improved signage, and pocket parks. The project is at a concept plan level and is not currently funded (via communication with Robert Staples, Fairview Park Plan Administrator, City of Costa Mesa, June 25, 2009). These plans do not include changes to improve access to the Greenville-Banning channel itself.

OC Public Works was also contacted regarding any potential projects in the Greenville-Banning Channel. No additional projects were identified apart from the concept plans developed by the City of Costa Mesa. Per communications with Jeff Dickman, Regional Recreational Trail Coordinator, OC Public Works (April 22 and July 20, 2009), facilities supporting water contact recreational use are not planned for the channel.

Information concerning potential future recreational facilities was reviewed again in 2011 and no substantive changes were identified. Subsequent triennial reviews may identify future probable uses.

#### **5.6.4.8.6 Summary – Evidence of Recreational Use**

##### **5.6.4.8.6.1 REC1**

In summary, there is no evidence of actual current or historic REC1 use in the proposed reaches of the Greenville-Banning Channel addressed by this UAA. Photographic surveys, field surveys and information provided by public agency staff members who routinely visit the proposed reaches of the Channel provided no evidence of current REC1 use. Nor is there any evidence of historic use of the proposed reaches for REC1 use.

As with the Santa Ana-Delhi Channel (see Section 5.6.3), the lack of REC1 use is a reflection of the various characteristics of the channel reaches described in detail in the preceding sections of this report. These include the morphology of the channel, which is characterized by heavily modified vertical concrete-lined walls and channel for the entire length of the tidal prism and almost all of Reach 1. The upper end of Reach 1 is also heavily modified but as a steep-walled concrete lined trapezoidal shaped channel (see Figure GB-11).



**Figure GB-12. The upper 0.20 mile segment of Reach 1 looking upstream** Just upstream of the curve of the channel shown in this photograph is the proposed upstream boundary of Reach 1, the California Street crossing located in the city of Costa Mesa. (Regional Board staff photograph, May 2010).

Coupled with fencing along the length of the channel on both sides, these channel characteristics make access generally difficult and dangerous. In addition, for the entire length of the two proposed reaches there are no maintenance access points (no gates or ramps to allow access into the channel), making access into the channel even more difficult. Generally, flow conditions in the channel reaches are very low under most conditions, making water contact leading to ingestion unlikely. High flows during storm events, which typically occur during the wet season, make recreational activity in the channel unsafe (temporary suspension of recreation standards during certain high flow conditions is proposed; see Section 5.5 of the staff report).

While it is theoretically possible to enter the proposed tidal prism from the Santa Ana River, it is very unlikely considering the lack of accessibility and the expected preference to remain at or near the ocean beach, which is approximately 1.5 miles from the mouth of the Greenville-Channel. No one has been observed paddling, wading, walking, or swimming in any section of the Greenville-Banning Channel.

A bicycle trail parallels almost the entire length of the proposed reaches. However, fencing, channel morphology, flow conditions and the close proximity of recreational areas at the

nearby ocean beaches of the city of Newport Beach and Huntington Beach State Park make recreational activity in the channel itself highly unlikely. Again, this is documented by the photographic and field survey information presented above.

Taking into consideration the suite of factors described above, as well as master planning information, there is no evidence that REC1 use in the future is probable.

It should be noted that determinations regarding the appropriate recreational use designations are subject to review and revision during future triennial reviews.

#### **5.6.4.8.6.2 REC2**

Regional Board staff proposes designating the proposed Tidal Prism segment of the Greenville-Banning channel as REC2. There are opportunities for recreational activities involving proximity to water in this segment. As previously described, a bicycle path parallels the channel for much of the proposed tidal prism segment and Reach 1. The tidal flows in the channel create some wildlife viewing opportunities by individuals on that path. A variety of birds have been observed feeding at low tide in the shallow water and mudflat areas<sup>4</sup> near the diversion dam. Thus, Board staff recommends that the proposed Tidal Prism be designated REC2.

Conversely, the concrete-lined channel and its predominant low flow do not allow the attainment of REC 2 in Reach 1. For the entire reach, the shallow depth, concrete bottom and lack of accessibility discourage non-contact recreational activities. Lows flows in the channel sheet flow over the channel bottom, often supporting a thick algae mat. The low flows and lack of vegetation other than algae growing in the channel have created poor habitat for wildlife. Thus, Board staff recommends that Reach 1 not be designated REC2.

#### **5.6.4.9 UAA Evaluation**

As discussed in Section 5.6.2.1 (Regulatory Background – UAAs), per federal regulation at 40 CFR 131.10 (h), a designated use may be removed or modified to allow the application of less stringent water quality objectives provided that the use is not an “existing use” and that the use cannot be attained by implementing effluent limits on point source discharges and/or cost-effective and reasonable best management practices for nonpoint source control.

The preceding evidence demonstrates that REC1 is not an “existing use” for the proposed tidal prism and Reach 1. There is no evidence of actual REC1 use, either now or historically. Water quality objectives to protect REC1 have not been consistently attained. Best management practices to improve water quality conditions are being implemented but the ability of these BMPs to achieve consistent compliance with the objectives (those now in the Basin Plan and those proposed herein) is highly problematic. This determination is based on evaluation of the efficacy of bacteria control BMPs in other areas (see GB Technical Report,

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<sup>4</sup> A thin layer of sediment over the concrete channel bottom creates this condition.

3.3.2; Stormwater Bacteria BMPs evaluation by Orange County<sup>5</sup>). As noted, low flows are currently diverted to the sewer from the channel. Even with this action, water quality standards are not consistently met in the channel below the diversion. BMPs, such as the diversion, are being implemented in response to requirements of the applicable areawide urban stormwater NPDES permit. There are no point source discharges of bacteria to the channel and thus there are no additional effluent limitations for bacteria that could or should be imposed to improve water quality conditions in the Channel.

Since there is no evidence that REC1 is an “existing use”, and since there is now no evidence that the use could be attained through the implementation of effluent limitations or additional cost-effective and reasonable BMPs, then one or more of the UAA factors in 131.10(g) may justify the removal of the REC1 use<sup>6</sup>. As stated previously, the 131.10(g) factors define the circumstances under which designated “swimmable” (REC1) (and “fishable”) uses may be removed or subcategorized to allow the application of less stringent water quality objectives. The UAA factor evaluation is discussed next.

The following describes the evaluation of the data and information presented above relevant to two of the UAA factors identified in 40 CFR 131.10(g). These are:

- Natural, ephemeral, intermittent or low flow conditions or water levels prevent the attainment of the use, unless these conditions may be compensated for by the discharge of sufficient volume of effluent discharges without violating State water conservation requirements to enable uses to be met. (131.10(g)(2))
- Dams, diversions or other types of hydrologic modifications preclude the attainment of the use, and it is not feasible to restore the water body to its original condition or to operate such modifications in a way that would result in the attainment of the use. (131.10(g)(4))

#### **5.6.4.9.1 Natural, Ephemeral, Intermittent or Low Flow Conditions or Water Levels [40 CFR 131.10(g)(2)]**

Flow conditions in the proposed tidal prism are highly variable, subject to the tidal cycle. The dominant dry weather low flows in Reach 1 create perennial flows of up to a few inches deep in most areas; some areas of this proposed reach are generally dry, apart from precipitation-driven flows. When the inflatable dam is up, water is impounded but depths remain shallow. It is infeasible to discharge a sufficient volume of effluent discharges to compensate for these flow conditions given limitations on the availability of adequately treated effluent. Wastewater effluent is already in high demand for direct use and groundwater recharge in Orange County. It would be nonsensical to discharge effluent, even if available, to a waterbody such as the Greenville-Banning Channel, where recreational activities do not and have no reasonable

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<sup>5</sup> “Stormwater Bacteria BMPs” (Excel spreadsheet and related references). Prepared for the Stormwater Quality Standards Task Force, April 2009 – Prepared by Stuart Goong, PhD, County of Orange, Orange, CA

<sup>6</sup> Since the Greenville-Banning Channel is not now listed in the Basin Plan, the REC1 use has not been formally designated for the channel. However, pursuant to federal law and regulation, REC1 is presumed to be a beneficial use of the channel, unless demonstrated otherwise through a UAA.

probability to occur because of other considerations (e.g., access, safety and channel morphology).

Flow conditions in the Channel render the REC1 use unattainable, especially when considered in concert with the other relevant factors discussed above (access, safety, proximity to recreational areas, etc).

#### **5.6.4.9.2 Dams, diversions or other types of hydrologic modifications preclude the attainment of the use [131.10(g)(4)]**

The Greenville-Banning Channel has been significantly modified for flood control purposes. As described above and summarized in Table GB-2, the channel is almost completely a vertical walled, concrete channel with a short segment of trapezoidal sided concrete channel. The channel bottom is generally flat, causing dry weather flows to sheet flow across the bottom. Representative photographs of the modified channel are shown in this report in Figures GB-4-7, 10 and 11. Given the level of development in the vicinity of the channel and the ongoing need to provide flood protection, it is not considered feasible to convert the channel to a condition that would allow the attainment of the REC1 use.

#### **5.6.4.10 Conclusions and Recommendations**

The preceding evidence and analyses demonstrate that:

- REC1 is not an “existing use” in the proposed tidal prism reach or Reach 1 of the Greenville-Banning Channel and the use cannot be attained by implementing effluent limits on point source discharges and/or cost-effective and reasonable best management practices for nonpoint source control.
- The REC1 use designation is not appropriate for the proposed tidal prism or Reach1 of the Greenville-Banning Channel because flow conditions and hydrologic modifications preclude the use. Flow conditions cannot be compensated for by effluent discharges, nor is it feasible to restore the water body or operate the hydrologic modifications of the Channel in order to attain the use [40 CFR 131.10 (g) (2) and (4)].
- When considering a “suite of factors” such as safety and the lack of access to the channel due to access prohibitions, fencing, lacking of maintenance access entry and high vertical channel walls, it is further apparent that the REC1 use is not and has no reasonable probably to be attained in the proposed tidal prism and Reach 1 of the Greenville-Banning Channel.
- It is appropriate to designate the proposed tidal prism REC2, given that the channel in this area is visible to the public and offers the opportunity for wildlife observation.
- The REC2 designation is not justified for the proposed Reach 1.

Recommendations regarding the REC1 and REC2 designations for the proposed tidal prism and Reach 1 of the Greenville-Banning Channel are summarized in Table GB-10.

**Table GB-10  
Recommendations for REC1 and REC2 Designations for Proposed Tidal Prism and Reach 1 of the Greenville-Banning Channel**

	Reaches	Reach Boundaries	REC1	REC2	Current Beneficial Use Designations
Greenville-Banning Channel	Tidal Prism	Confluence with Santa Ana River to 0.23 mile downstream of confluence of Fairview Channel at Diversion Dam	No	Yes	Not listed in the Basin Plan; Assumed REC 1
	Reach 1	Diversion Dam to California Street crossing	No	No	

**5.6.4.11 References**

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**Appendix 1**  
**Monitoring Results for Enterococcus**  
**Greenville-Banning Channel**  
**200' Downstream of Diversion (tidal influence)**  
**Data Provided by: OC Public Works-**  
**OC Watersheds**

Date	Enterococcus (CFU/100 mL)
5/16/01	50
6/6/01	60
6/13/01	<10
6/20/01	120
6/27/01	10
7/3/01	20
7/11/01	<5
7/18/01	23
7/25/01	60
8/1/01	<20
8/8/01	5
8/15/01	<5
8/22/01	10
8/29/01	10
9/5/01	25
9/12/01	<5
9/19/01	15
9/26/01	40
5/21/2002	100
5/31/2002	60
6/25/2002	30
6/20/2002	630
7/12/2002	10
7/17/2002	<1
8/1/2002	740
8/7/2002	<1
8/23/2002	<10
8/28/2002	30
9/11/2002	150
9/4/2002	150
9/17/2002	20
9/25/2002	80
9/30/2002	50

Date	Enterococcus (CFU/100 mL)
10/8/2002	30
10/17/2002	30
10/31/2002	700
11/13/2002	60
11/22/2002	70
11/29/2002	280
12/4/2002	240
12/16/2002	690
12/13/2002	580
12/23/2002	710
1/7/2003	220
1/17/2003	80
1/21/2003	80
1/29/2003	50
2/6/2003	10
2/10/2003	110
2/21/2003	60
2/24/2003	80
3/3/2003	100
3/10/2003	20
3/21/2003	50
3/26/2003	70
3/31/2003	15
4/8/2003	<10
4/17/2003	900
4/24/2003	60
5/1/2003	40
5/8/2003	500
5/15/2003	6
5/23/2003	DRY
5/29/2003	12
6/4/2003	NA
6/12/2003	80

Date	Enterococcus (CFU/100 mL)
6/20/2003	DRY
6/24/2003	DRY
6/30/2003	60
7/9/2003	DRY
7/11/2003	DRY
7/16/2003	30
7/23/2003	20
7/30/2003	DRY
8/7/2003	30
8/15/2003	<20
8/21/2003	10
8/25/2003	70
9/4/2003	80
9/10/2003	<10
9/19/2003	40
9/22/2003	20
10/1/2003	50
10/9/2003	10
10/16/2003	70
10/22/2003	10
10/31/2003	160
11/3/2003	63
11/10/2003	80
11/20/2003	530
11/28/2003	90
12/1/2003	20
12/11/2003	20
12/19/2003	60
1/7/2004	20
1/13/2004	130
1/19/2004	240
1/26/2004	11
2/2/2004	300

**Appendix 1 (continued)**  
**Monitoring Results for Enterococcus**  
**Greenville-Banning Channel**  
**200' Downstream of Diversion (tidal influence)**  
**Data Provided by: OC Public Works-**  
**OC Watersheds**

<b>Date</b>	<b>Enterococcus (CFU/100mL)</b>	<b>Date</b>	<b>Enterococcus (CFU/100mL)</b>	<b>Date</b>	<b>Enterococcus (CFU/100mL)</b>
2/9/2004	900	2/17/2004	130	2/23/2004	22000
3/1/2004	300	3/8/2004	500	3/15/2004	500
3/22/2004	23	3/29/2004	23	4/5/2004	170
4/12/2004	50	4/19/2004	11	4/27/2004	2
5/3/2004	4	5/10/2004	8	5/24/2004	18
6/2/2004	80	6/14/2004	17	6/21/2004	23
6/28/2004	2	7/6/2004	<2	7/12/2004	<2
7/19/2004	23	8/13/2004	80	8/19/2004	470