Appendix E – Technical Report on Iowa Hill Pumped-storage Development Turbidity Analysis

SACRAMENTO MUNICIPAL UTILITY DISTRICT
UPPER AMERICAN RIVER PROJECT
(FERC PROJECT NO. 2101)

TECHNICAL REPORT ON
IOWA HILL PUMPED-STORAGE DEVELOPMENT
TURBIDITY ANALYSIS

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1.0 EXECUTIVE SUMMARY

The proposed Iowa Hill Pumped-storage Development (Development) is a new component of the Upper American River Project (UARP). The Development will consist of a new reservoir built on top of Iowa Hill, adjacent to the existing UARP Slab Creek Reservoir. The Development is expected to draw a maximum of 4,200 cfs (pumping mode) from the Slab Creek Reservoir to the upper reservoir. Uphill pumping would occur during periods of low power demand; the water would be released back to Slab Creek Reservoir through turbines for power generation at a maximum rate of 5,200 cfs (generating mode) during periods of high-energy demand. This report addresses: 1) potential inundation and burial of the Development intake/outlet structure by the sediment delta in Slab Creek Reservoir associated with water management during Development operation; and 2) potential increases in reservoir and downstream turbidity levels due to the Development Operation by disturbing the sediment delta and/or decreasing reservoir bank stability. Hydrologic, bathymetric and water quality data were analyzed to evaluate the likelihood of these events.

The operation of the Development will result in more frequent water surface fluctuations and increased down-ramping rates in the Slab Creek Reservoir within the current range. The bank slopes that are currently stable along Slab Creek Reservoir are expected to remain stable, while the areas with bank slumping will persist with a possible short-term increase in activity during initial Development operation due to increased water surface fluctuation frequency.

Regardless of Development operation, the existing delta sediment front located in the upstream portion of Slab Creek Reservoir will not reach the Development intake/outlet structure within the expected lifetime of the project (100 years) as long as the reservoir is operated above the typical drawdown elevation of 1,815 ft at all times. It is impossible for the sediment delta to bury the intake/outlet structure within the next 40 years no matter how Slab Creek Reservoir is operated assuming future sediment supply rate to Slab Creek Reservoir remains the same as observed between 1967 and 2007. However, after 40 years have elapsed, the structure could be buried within the next 60 years if the reservoir is drawn down to a level well below 1,800 ft (1,776 ft was examined in this report) for an extended period of time due to unforeseen reasons such as emergencies. If such an emergency circumstance were to arise after 40 years, burial of the intake/outlet structure could be prevented by drawing Slab Creek Reservoir water surface to below the intake/outlet invert elevation.

The discharge of water by the Development into Slab Creek Reservoir will not result in long-term turbidity, although a short-term turbidity event may occur if sediment deposit moves to the vicinity of the intake/outlet structure associated with a drawdown event. Under this circumstance, the water discharge from the Development will result in local scour and the development of adjusted local topography in equilibrium to the water discharge, preventing further sediment erosion during subsequent discharge events.

2.0 INTRODUCTION

This technical report is a 2008 update to a report originally produced in 2004 as part of the Sacramento Municipal Utility District's (SMUD) License Application to the Federal Energy Regulatory Commission (FERC) for a new license for the Upper American River Project (UARP). This report addresses turbidity issues in Slab Creek Reservoir with the proposed addition of the Iowa Hill Pumped-storage Development (Development). Staff of the California State Water Resources Control Board requested the update in February 2007 for the purposes of issuing a 401 Water Quality Certificate associated with the new license for the UARP. The request of the SWRCB was to revise the 2004 report with new bathymetry for Slab Creek Reservoir, an existing reservoir of the UARP that will serve as a key component of the Development. The SWRCB also requested that SMUD receive comments on the updated report from a panel of three peer reviewers (see Appendix B). This report includes the following sections:

- Background– includes when the applicable study plan was approved by the UARP Relicensing Plenary Group; a brief description of the issue questions addressed, in part, by the study plan; the objectives of the study plan; and the study area. This section also gives historical information on Slab Creek Reservoir;
- Methods – a description of the methods used in the study;
- Analysis and Results – an analysis and a description of the salient data results;
- Discussion and Conclusions – a discussion of the results and the conclusions drawn from them, where appropriate;
- Literature Cited – a listing of all literature cited in the report.

3.0 BACKGROUND

On February 4, 2004, the UARP Relicensing Plenary Group approved the Iowa Hill Development Turbidity Analysis Study Plan that was developed and approved by the Aquatic Technical Work Group (via email) on January 21, 2004.

The study plan was designed to address the following nine questions in four broad categories:

1. Whether the operation of the Development will further draw down Slab Creek Reservoir (Q1), and thus result in erosion of the delta sediment (Q2). If yes, how long will it last and will it become a chronic problem (Q3)? What are potential remedies to prevent it from becoming a chronic problem (Q4)?

2. How long will it take the delta deposit to migrate to the Development intake/outlet structure with (Q5) and without (Q6) the operation of the Development? What are the remedies to delay the arrival of the delta deposit at the Development intake/outlet structure to an acceptable level if the predicted time is not long enough (Q7)?

3. Whether the operation of the Development, and the discharge from Iowa Hill Reservoir to the Slab Creek Reservoir in particular, will result in local turbidity increases in Slab Creek Reservoir and downstream from the reservoir (Q8)?

4. Whether the more frequent ramping in Slab Creek Reservoir with the Development will result in bank slumping (Q9)?

Specifically, the objective of this study is to describe the potential for operation of the Iowa Hill Development to significantly increase turbidity in, and downstream of, Slab Creek Reservoir as a result of facility operations. The study area extends from the Camino Powerhouse which discharges into the upper end of Slab Creek Reservoir, to immediately below Slab Creek Dam.

4.0 METHODS

The study methods conform to those approved by the Plenary Group, and are described briefly below:

- Analyze the hydrologic record (inflow to and outflow from Slab Creek Reservoir, reservoir level record, etc.), turbidity record (both inflow and outflow), and past Slab Creek Reservoir operation records to identify past turbidity problems (Section 4.1). All of these data were obtained from SMUD'S UARP Relicensing or hydro operations staff;
- Estimate the potential future operation rules with the addition of the Iowa Hill Development based on the functionality of the project, and use the information to predict its potential effect on turbidity (Section 4.1);
- Analyze the 1992 and 2007 bathymetry data to develop an estimate of sedimentation rate in the Slab Creek Reservoir (e.g., volume of sediment deposit in the reservoir) and the delta advancement under the current conditions (Sections 4.2, 4.3, and 4.4). Sedimentation rate is estimated based on the volume of sediment deposition within Slab Creek Reservoir between dam closure and the 1992 and 2007 bathymetry survey (Section 4.3). Delta advancement is estimated based on the estimated sedimentation rate, mass conservation of sediment, and the principles of sediment transport and geomorphology (Section 4.4);
- Predict the potential impact of future reservoir drawdown on sediment delta advancement (Section 4.5);
- Discuss potential chronic high turbidity due to Iowa Hill operation (Section 4.6);
- Discuss Slab Creek Reservoir slope stability (Section 5.0).

5.0 ANALYSIS AND RESULTS

5.1 Relevant Information on Slab Creek Reservoir and the Iowa Hill Development

Slab Creek Dam is located on the South Fork American River approximately 1.5 river miles downstream of the confluence with Slab Creek (Figure 1)[1]. Under current operations of the existing UARP, Slab Creek Reservoir is used by SMUD as a forebay, where water surface elevations ramp up and down depending on the need to optimize power generation at the 224 MW White Rock Powerhouse, coupled with the variable inflow to the 16,600 acre-ft reservoir (Figure 1). Inflow to Slab Creek Reservoir consists of flows in the South Fork American River and discharge from Camino Powerhouse, located at the upstream end of the reservoir. Discharge from Camino Powerhouse can range from zero to 2,100 cfs, while inflow from the river ranges from roughly 100 cfs in summer/fall to several thousand cfs during winter/spring storms and snowmelt. Outflow from the reservoir to White Rock Powerhouse ranges from zero to 3,950 cfs, while a continuous flow of 36 cfs is released into the South Fork American River downstream of Slab Creek Dam (under the terms of the recent Settlement Agreement, releases into the South Fork American River could range from 70 to 415 cfs, pending FERC approval).

A time series plot of hourly water surface elevations for the period of 1 January 2002 through 9 October 2007 shows the range of fluctuations in water surface elevation at the reservoir (Figure 2). As seen in Figure 2, the real-time operation of Slab Creek Reservoir results in a wide range of reservoir fluctuations. A reservoir pool level range of 1,830 to 1,850 is typical of summer and fall months, when inflow from the South Fork American River is low and SMUD exerts full control over water management in the reservoir. However, in winter and spring, when inflow of the South Fork American River can change quickly and reaches peak values well above 5,000 cfs, reservoir pool level can drop below 1,830 ft, as SMUD attempts to create space in the reservoir to capture anticipated high flow events. It can also rise above 1,850 ft when river inflow overwhelms SMUD's water management capabilities and water spills over the dam. One-hour interval water surface elevation data for Slab Creek Reservoir between 1 January 2002 and 9 October 2007 show that reservoir levels have generally been kept above a normal drawdown water surface elevation of approximately 1,815 ft, except on a few occasions when the water surface dropped as low as 1,804 ft (Figure 2). Despite the seemingly large range in reservoir water surface elevation, the rate of water surface fluctuation in Slab Creek Reservoir is relatively small most of the time (Figures 3 and 4). Fluctuations are typically less than 0.5 ft/hr, with eleven up-ramp events between 1 January 2002 and 9 October 2007 where the fluctuation was greater than 2 ft/hr (Figure 3). The rate of down-ramping is restricted by the maximum discharge (3,950 cfs) that can be released from the Slab Creek Reservoir, and the maximum potential down-ramping rate is shown in Figure 5.

The lowest water surface level on record occurred during the last week in October 1991 when the reservoir elevation dropped to 1,761.6 ft as a result of two penstock maintenance outages that occurred at White Rock and Camino powerhouses for a one-week period. The Camino Penstock (upstream of Slab Creek) was not supplying water to Slab Creek Reservoir during the outage,

[1] All Figures referenced in this document are found in Appendix A.

while the White Rock Penstock was drawing water out of the reservoir (Lonn Maier, SMUD, personal communication). As a result of this extremely low reservoir water surface elevation, sediment in the delta at the upstream portion of the reservoir was mobilized and transported downstream, resulting in high turbidity levels in both the reservoir and the reaches downstream of Slab Creek Dam (CDFG 1992). As a result of this incident SMUD and the California Department of Fish and Game agreed in 1994 to maintain Slab Creek Reservoir above 1,800 ft at all times (CDFG 1994). As a practical matter, SMUD generally keeps the reservoir above 1,810 ft.

To monitor future turbidity impacts from Slab Creek Reservoir, Jordan and Brown (1993) began measuring turbidity on 2 November 1992, when Slab Creek Reservoir water surface elevation was approximately 1,846 ft (just below the maximum normal water surface elevation), about a year after the October 1991 drawdown event. A permanent summer/fall turbidity monitoring plan, agreed to by SMUD and CDFG, began in 1994 with stations above and below the reservoir: 1) South Fork American River at Camino Powerhouse; 2) South Fork American River below the Slab Creek Reservoir Dam; and 3) the White Rock Powerhouse penstock. Turbidity data were collected at these three stations during the low flow season to monitoring UARP operation related turbidity events, and no turbidity data were collected during winter storm events. As an example, turbidity data collected in summer 2007 are presented in Appendix C at the three stations. Based on the TSS data collected to date, it appears that the October 1991 incident was the last documented summer/fall high turbidity event within Slab Creek Reservoir caused by UARP operation.

The intake/outlet structure of the proposed Development, shown in Figures 6 and 7, will be located approximately 0.7 miles upstream of Slab Creek Dam, halfway between Slab Creek Dam and the confluence with Slab Creek (Figure 6). The proposed invert elevation of the Development intake/outlet structure is located at an elevation of 1,770 ft, 80 ft below the maximum normal water surface elevation, 45 ft below the normal drawdown water surface elevation, and approximately 90 ft above the bottom of the impoundment (Figures 7 and 8). The final design of the outlet structure has not been completed, but will consist of an octagonal structure with sufficient surface area to minimize approach velocities during pumping mode for the protection of resident fish species. As a result, the velocity at the outlet structure during the period of water discharge into Slab Creek Reservoir is also small (estimated to be less than 1 ft/s).

The proposed Development operational plan will not alter the existing range of water surface elevation in Slab Creek Reservoir, i.e., between 1,815 and 1,850 feet. These levels are 53-88 feet above the 1,762 ft elevation that caused turbidity problems in October 1991. The Development will, however, increase short-term water surface fluctuation in the reservoir. According to SMUD simulations, for example, the water surface in Slab Creek Reservoir typically will drop approximately 2 ft/hr when water is pumped to the Iowa Hill storage area (Figure 4). This may continue for approximately 9 hours before Slab Creek Reservoir begins refilling to its initial water surface elevation due to the release of water from Iowa Hill storage for power generation.

5.2 Slab Creek Bathymetry

Three bathymetric surveys have been conducted to date following the completion of Slab Creek Dam, one each in 1992, 1999 and 2007. The thalweg profiles in the reservoir derived from the 1992 and 2007 bathymetric surveys are presented in Figure 8 and are used to derive long-term average sediment accumulation rates in Slab Creek Reservoir. The long-term accumulation rate derived from the 2007 profile is subsequently used to estimate the potential advancing rate of the depositional delta into future project operations. The 1999 survey data are not presented or used for the analyses because they were available only on a small-scale contour map, making it difficult to read and interpret. Detailed examinations of the thalweg profiles shown in Figure 8 indicate that there are discrepancies between the 1992 and 2007 surveys in the reach between Slab Creek Dam and approximately 1.8 miles upstream, as indicated in Figure 8 in the reach marked "A", where the comparison of the two profiles shows approximately 10 ft of deposition between 1992 and 2007 that is distributed almost uniformly throughout the reach. This type of deposition, however, is not expected in this reach because of the presence of the submerged PG&E American River Intake Dam that was likely infilled with sediment prior to the construction of Slab Creek Dam (Figure 8). It is expected that no deposition would have occurred at the Intake Dam site, and thus, sediment deposition between 1992 and 2007, if any, should decrease in the downstream direction and become zero at the Intake Dam. The above discrepancies indicate that the benchmark for one of the surveys was probably off by approximately 10 ft near the dam. Comparison of the two profiles in the upstream half of the reservoir indicates that there has been significant channel aggradation between 1992 and 2007 but the bed elevation near the upstream end of the reservoir has remained nearly constant as expected, suggesting that the benchmarks for the two surveys were most likely similar at the upstream end of the reservoir. Considering the available survey technology in the 1990s, it is possible that the 1992 survey was conducted using the reservoir water surface as its benchmark, which may have changed during the survey. Based on the assumption that the datum for the 1992 profile was either internally inconsistent or different from the 2007 survey, we adjusted the 1992 profile by rotating the thalweg profile slightly to match the 2007 profile. This was done by keeping the 1992 profile unchanged at the upstream end of the reservoir and increasing the elevation linearly downstream so that there is a 10 ft increase at Slab Creek Dam site. The adjusted 1992 profile and the 2007 profile are presented in Figure 9, showing that the adjusted 1992 profile matches the 2007 profile except where significant sediment deposition has occurred in the upstream end of the reservoir. The good match between the two profiles shown in Figure 9 indicates that the adjustment to the 1992 profile is reasonable.

Below we briefly discuss the general sediment deposition process in reservoirs in order to help identify some of the features in the profiles shown in Figure 9. Once sediment enters a deep water body such as the Slab Creek Reservoir, most of the sediment will settle onto the bed quickly due to the suddenly decreased shear stress, forming a deltaic deposit that gradually aggrades upward and migrates downstream due to the increased volume of sediment deposit in time (e.g., Vanoni 1975), while a small portion of fine sediment may pass the deltaic front and deposit in the downstream portion of the reservoir, or pass directly to the downstream river through the dam's outlet structure. Under high suspended sediment concentration conditions, the highly turbid flow may form turbidity currents due to the higher density of the turbid flow in comparison with the clear water in the reservoir, allowing the suspended sediment to pass to the downstream portion of the reservoir or downstream of the dam with very little deposition (e.g., Parker et al., 1986). Due to the generally low suspended sediment concentration in the South Fork American River, no turbidity currents are expected to form in Slab Creek Reservoir. In addition, the minimal sediment deposition downstream of the submerged Intake Dam between 1992 and 2007, as shown in Figure 9, indicates that there has been minimal fine sediment deposition downstream of the deltaic front, assuming our adjustment of the 1992 survey data is correct. Thus, we conclude that the main sediment deposition form in Slab Creek Reservoir as an aggrading and downstream migrating deltaic front.

There are three features with deltaic like shapes in the sediment deposit shown in Figure 9: one at approximately 0.8 mile upstream of the dam labeled “A”, one at approximately 1.7 miles upstream of the dam labeled “B”, and one at approximately 2.5 miles upstream of the dam in the 2007 profile labeled “C”. The feature labeled “A” is not a deltaic deposit but rather the submerged Intake Dam, which was completely filled with sediment before Slab Creek Dam was constructed. The sediment deposit upstream of the Intake Dam is of particular interest, which has a reach-average slope of 0.0016 (labeled “D” in Figure 9) that is identical to the reach-average slope of the sediment deposit in the 2007 profile upstream of the deltaic front labeled “C” (Figure 9). This slope represents the equilibrium slope of the sediment deposit if the reservoir pool is kept at a constant level, or if pool level fluctuates regularly (such as daily and seasonally) within a certain range (such as between the maximum normal pool level and normal drawdown pool level). The deltaic front labeled “B” is considerably lower than the normal drawdown pool level and the sediment deposit upstream of this deltaic front is much steeper than the equilibrium slope of 0.0016. This deltaic deposit was most likely formed during the last week of October 1991 when the reservoir was lowered to a pool level of 1,761.6 ft (Figure 9). This drawdown event presumably mobilized the original topset sediment deposit upstream of the original depositional front, forming a deltaic front with an elevation 10 to 20 ft below the drawdown pool level. Because the drawdown did not last long enough to allow the sediment to transport farther downstream to form an equilibrium deposit, the resulting sediment deposit, as shown in the 1992 profile upstream of deltaic front “B”, is considerably steeper than the equilibrium slope of 0.0016.

5.3 Long-term Sediment Accumulation Rate in Slab Creek Reservoir

In order to estimate the volume of the sediment deposit in the reservoir and, hence the rate of sediment deposition in Slab Creek Reservoir, a typical cross section was selected and used to estimate channel widths and cross-sectional areas at different depths. In general, the canyon that contains Slab Creek Reservoir has a relatively consistent width, which suggests the primary volumetric difference in sediment storage along the length of the deposit is the thickness of the sediment deposit relative to the canyon bottom. The selected cross section (shown in Figure 10) is located approximately 0.5 miles upstream of Slab Creek Dam. Channel width and cross-sectional area, as functions of depth (shown in Figure 11), are derived using this cross section.

The topography of the area inundated by Slab Creek Reservoir prior to construction of the dam is not available. It is, however, possible to estimate the pre-dam longitudinal profile based on the current depositional profile. The estimated pre-dam profile shown in Figure 9 was constructed by linearly connecting the bottom of the submerged Pacific Gas and Electric Company American River Intake Dam with a point immediately upstream of the sediment deposit. Using this estimated pre-dam profile, the 1992 and 2007 bathymetry data, and the cross-section area-depth relation given in Figure 11, the volume of the sediment deposit in the Slab Creek Reservoir was estimated to be approximately 230,000 yd^3 prior to Slab Creek Dam construction (primarily sediment stored behind the Intake Dam), 985,000 yd^3 in 1992, and 1,760,000 yd^3 in 2007. Based on the above values, the estimated sediment deposition volumes and sediment accumulation rates for different periods are presented in Table 1.

Table 1. Estimated sediment accumulation rate in Slab Creek Reservoir, based on topographic survey data in 1992 and 2007

Period	Bulk Volume of Sediment Deposited During the Period (yd^3)	Sediment Accumulation (bulk volume) Rate (yd^3/yr)
Pre-Slab Creek Dam	230,000	N/A
1967 - 1992	755,000	30,000
1992 - 2007	775,000	52,000
1967 - 2007	1,530,000	38,000

Calculations summarized in Table 1 demonstrate that the sediment accumulation rate in Slab Creek Reservoir increased from 30,000 yd^3/yr for the period of 1967 – 1992 to 52,000 yd^3/yr for the period of 1992 – 2007. This substantial increase in sediment accumulation rate is most likely attributed to the January 24, 1997 Mill Creek landslide event at approximately 15 miles upstream of the project site, which temporarily dammed the South Fork American River (Sydnor 1997). Although no official estimate of the amount of sediment delivered to South Fork American River from the 1997 Mill Creek landslide is available, it was estimated that Highway 50, which runs along one of the banks of the South Fork American River, was buried under 75-ft deep of fluid mud for an 800-ft reach (Sydnor 1997), suggesting that the amount of sediment delivered to the channel was significant. Attributing the increased sediment accumulation in Slab Creek Reservoir for the period between 1992 and 2007 to the 1997 Mill Creek landslide is reasonable because the increased accumulation rate between the two periods only represents an additional 325,000 yd^3 of additional sediment accumulation (i.e., 775,000 yd^3 – 30,000 yd^3/yr × 15 yr = 325,000 yd^3, in reference to Table 1). For example, if the landslide material delivered to the river was similar in dimension to the landslide deposit on Highway 50 (assuming sediment was not washed downstream during the event), it would have been approximately 800-ft long and 75-ft deep, and a 150-ft river valley width would have contained 330,000 yd^3 of landslide material.

In the analysis provided hereafter, we assume that the future sediment accumulation rate in Slab Creek Reservoir will be equal to the sediment accumulation rate for the period of 1967 and 2007, or 38,000 yd^3/yr. This value should represent a higher end of an estimated long-term-averaged sediment accumulation rate because of the recent Mill Creek landslide event. This notwithstanding, some unpredictable catastrophic events that deliver large amount of sediment into the South Fork American River within the project life are possible. Impacts from such unpredictable catastrophic events are considered in the analysis presented below with a sensitivity analysis simulation.

5.4 Advancement of the Delta Front under Normal Reservoir Operation Conditions

A deltaic deposit is composed of a steeper foreset and a gentle topset beds as shown in Figure 12. Maintaining the water surface elevation in the current range, and disregarding the short-term sediment transport dynamics as a result of reservoir pool level fluctuation (discussed below in Section 4.6), the sediment accumulation in Slab Creek Reservoir will take the form of a slow aggradation of the topset bed and faster progradation of the foreset bed while keeping the foreset/topset break point at the same elevation (Figure 12). Examples of sediment accumulation similar to what would occur in the Slab Creek Reservoir under normal reservoir operation can be found in many flume experiments and numerical simulations (e.g., Cui et al. 1996; Seal et al. 1997; Cui and Parker 1997). Based on the 2007 profile, the sediment deposit in Slab Creek Reservoir has a foreset bed slope of 0.065 and a topset bed slope of 0.0016, and the foreset/topset break point is located at an approximate elevation of 1,809 ft, or about 6 ft below the normal drawdown pool level of 1,815 ft. In addition, we assume that reservoir trapping efficiency remains unchanged in the future, which is reasonable because very little sediment passes beyond the delta front (as evidenced by minimal aggradation downstream of the delta front in Figure 9), and with the progressive deepening of the reservoir downstream of the current delta front, even less sediment will be able to pass downstream in the future until the delta front advances to a position very close to the dam.

We applied a simple numerical model of sediment mass conservation (developed in MS-Excel with Visual Basic Analysis) to predict the future conditions of the sediment deposit. The model allows sediment to deposit along the foreset and topset slopes described above with the break point elevation located at 6 ft below the normal drawdown pool level, while advancing in the downstream direction with a constant sediment accumulation rate. The model was validated with the 2007 profile using the 1992 profile as an initial condition, and assuming a constant sediment accumulation rate of 52,000 yd^3/yr. Results of this simulation are compared with the surveyed 2007 profile in Figure 13, showing excellent agreement between the predicted data and surveyed data. Although the excellent match between the simulated and surveyed profile (Figure 13) is expected because the model was set up based on the surveyed 2007 profile, it confirms that the parameters used in the model (e.g., foreset and topset slopes and foreset/topset break point elevation) were calculated correctly.

Running the model with the 2007 surveyed profile as the initial condition, the potential sediment deposition over the next 150 years using the estimated long-term sediment accumulation rate of 38,000 yd^3/yr is predicted and presented in Figure 14. This simulation assumed Slab Creek Reservoir will be operated so that its water surface will fluctuate between the maximum normal pool level and the normal drawdown pool level. Results in Figure 14 indicate that the deltaic front will be approximately 0.5 mile upstream from the Iowa Hill intake/outlet structure at the end of the 100-yr project life. The simulation indicates the deltaic front will barely reach the intake/outlet structure after 150 years of normal Slab Creek Reservoir operation. Note that the 38,000 yd^3/yr sediment accumulation rate was estimated based on the 1967 and 2007 profiles, and thus, the potential error in the 1992 survey data does not affect the simulation results presented in Figure 14.

As discussed previously in Section 4.3, unpredictable catastrophic events that deliver large amount of sediment into the South Fork American River within the project life are possible. A sensitivity analysis was conducted by increasing the estimated long-term sediment accumulation rate by 50% to 57,000 m^3/yr, which is slightly higher than the 1992 to 2007 accumulation rate (Table 1) that accentuates the high input rate from the 1997 Mill Creek slide. Simulated depositional profile under normal reservoir operation with a long-term average sediment accumulation rate of 57,000 m^3/yr is presented in Figure 15, suggesting that the delta front will not reach the Iowa Hill intake/outlet structure in the next 100 years under normal reservoir operation even if sediment accumulation rate becomes 50% higher than the estimated value. It is important to point out that the 57,000 m^3/yr sediment accumulation rate used for sensitivity analysis is 5,000 yd^3/yr higher than that for the period of 1992 – 2007 value, and thus, the chance for the future sediment accumulation rate to top this value is low.

The assumption that no sediment passes through the deltaic front (foreset bed) is based on the adjustment to the 1992 profile and subsequent lack of apparent aggradation between 1992 and 2007 beyond the delta front (Figure 9). Thus, slightly more sediment may have passed the deltaic front if there are misinterpretations in adjusting the 1992 profile. If more sediment passes through the deltaic front, the deltaic front will advance slightly more slowly than predicted above (Figures 14 and 15), and there will be slightly more deposition downstream of the deltaic front but at elevations well below the proposed Iowa Hill intake/outlet structure.

5.5 Impact of Future Reservoir Drawdown on the Reservoir Sediment Deposit

As discussed earlier, Slab Creek Reservoir was drawn down several times to elevations lower than the normal drawdown water surface elevation of 1,815 ft over the past 40 years, including the extreme case of 1,761.6 ft in October 1991. Although SMUD has revised its operating rules to prevent Slab Creek Reservoir water surface from dropping to below the normal drawdown reservoir level of 1,815 ft, it is reasonable to assume that drawdown events similar to that of October 1991 or less are still possible in the future due to unforeseen circumstances. Due to the existence of fine-grained particles in the sediment deposit in Slab Creek Reservoir, a reservoir drawdown beyond the normal drawdown reservoir level will cause rapid remobilization and transport of the sediment deposit, and create high suspended sediment concentrations and turbidity levels regardless of whether the proposed Development is being operated. The majority of the mobilized sediment will be re-deposited in the downstream portions of the reservoir where the reservoir is deeper, while a small (but potentially ecologically significant) portion may pass through the dam outlet and be transported further downstream. With the increase in volume of the sediment deposit and the corresponding decrease in available water storage and depth through time, the impact of reservoir drawdown on sediment suspension will slowly increase regardless of whether the Development is constructed. Operation of the Development would have no effect on this process because it will not alter the normal operational range of water surface elevations in Slab Creek Reservoir, as noted in Section 4.1. Therefore, this report focuses on the potential for excessive drawdown to cause the intake structure of the Development to become buried.

As discussed in Section 4.4, the foreset/topset break point is located at approximately 6 ft below the normal drawdown water surface elevation. Thus, the worst-case-scenario for burying the intake/outlet structure will likely occur if the reservoir is drawn down to an elevation approximately 6 ft above the intake/outlet structure invert elevation (approximately 1,776 ft), and is held constant there for an extended period of time until a new equilibrium profile for the sediment deposit is realized. Adapting a reservoir pool level of 1,776 ft, the mass conservation model developed in Section 4.4 is applied to simulate the potential sediment deposition if a drawdown as described above occurs in year 2007, 2027, 2047, 2067, 2087, or 2107, and the results are presented in Figure 16. Results shown in Figure 16 indicate that a drawdown of the reservoir pool level to 1,776 ft shortly after 2047 will result in potential intake/outlet burial, if the drawdown lasts for a significant period of time (note that quantification of this time period is not relevant to this study), allowing the reservoir sediment deposit to redistribute in the reservoir to form a new equilibrium profile associated with this pool level. This represents an extreme worst case scenario as drawing the reservoir water surface down to an elevation above 1,776 ft will result in a shorter advancement of the depositional front, and drawing the reservoir surface down to a lower level will produce a sediment deposit lower than the intake/outlet structure invert elevation.

5.6 Potential Chronic High Turbidity Due to Iowa Hill Development Operation

There are two potential sources of concern for chronically high turbidity levels due to the Iowa Hill Development operations: 1) the daily reservoir fluctuation as a result of drawdown and refilling of Slab Creek Reservoir; and 2) potential disturbance of the reservoir sediment deposit due to Iowa Hill discharge into Slab Creek Reservoir if the sediment deposit has pro-graded close to the intake/outlet structure of the Development.

During the refilling period, pool level in the reservoir rises, resulting in decreased shear stress within the backwater zone that gradually expends upstream. The decreased shear stress in the backwater zone allows increased fraction of sediment particles to deposit on the topset bed (and thus, decreased fraction of sediment particles to transport passing through the topset/foreset break point). Because of the decreasing shear stress and increased sediment deposition at the topset bed, there should be decreased suspended sediment concentration (and turbidity) in the reservoir area during the 15-hr refilling period. During the drawdown period, pool level gradually decreases, resulting in increased shear stress associated with the gradually reduced backwater zone that allows for the sediment deposited on the topset bed during reservoir refilling period to transport downstream to deposit on the foreset bed. Suspended sediment concentration within Slab Creek Reservoir during the 9-hr drawdown period will be increased due to the mobilization of the sediment deposited on the topset bed during reservoir refilling period. Assuming a constant inflow discharge and constant background suspended sediment concentration during a 24-hr period and the worst-case-scenario that no sediment particles pass through the topset/foreset break point during reservoir refilling, for example, the suspended sediment concentration during the 9-hr drawdown period will be up to 2.7 times of the background suspended sediment concentration (i.e., sediment supplied in a 24-hr period is transported in a 9-hr period, and 24/9 ≈ 2.7). Other than the newly deposited sediment during the 15-hour refilling period, the rest of the sediment deposit will not be mobilized because it is resting at an equilibrium profile associated with the lowest water surface elevation of the previous 15-hours when reservoir pool level was low.

Not considering the possibility of disturbing the sediment deposit if it was near the intake/outlet structure due to water discharge from the Development, the 15-hr period of refill of Slab Creek Reservoir will not result in erosion of the sediment deposit because the gradually increasing water surface will result in more incoming sediment from South Fork American River to settle in the upstream end of the reservoir.

Disturbing the sediment deposit on the reservoir bottom by discharge from the proposed Development is unlikely because the Development Intake/outlet structure is 90 ft above the reservoir bottom, and the discharge into Slab Creek Reservoir will be through a multi-port, Octagonal diffuser. A potential turbidity event as a result of water discharge from the Development if the sediment deposit has pro-graded close to the intake structure is a legitimate concern. However, under the normal Slab Creek Reservoir operation that restricts reservoir pool level to between the maximum normal pool level and the normal drawdown pool level, the sediment deposit will not reach the vicinity of the intake/outlet structure within the 100-yr life of the project, according to model simulations. Thus, turbidity events are not expected to be generated by water discharge released from the Development during its proposed lifespan.

If unforeseen circumstances cause the shut down of the Development and a subsequent Slab Creek Reservoir drawdown that results in sediment deposition near the Development intake/outlet structure or a complete burial of the intake/outlet structure, the re-operation of Iowa Hill facility will likely produce a significantly high turbidity event. However, a turbidity event caused by these unforeseen circumstances is expected to be short-lived because the discharge from Iowa Hill facility will result in local scour of the sediment deposit near the intake/outlet structure. This will re-adjust the local topography such that the local topography is in equilibrium with the water discharge from the intake/outlet structure and will not produce additional erosion during subsequent discharge releases from the Development. An analogy for the scour of the deposit can be observed in rivers downstream of all spillways, where local scour holes form once spillways are first put into operation. The scour holes gradually become stabilized over time with the continued use of the spillways so that minimal or no scour will occur in the future. The time needed for a scour hole to stabilize is primarily dependent on the erodability of the channel bed. If a case arose at the Slab Creek Reservoir where the sediment deposit is eroded near the intake/outlet structure of the Development, the scour hole is expected to stabilize very quickly because the deposit is composed of rather fine particles that are readily mobilized.

6.0 SLAB CREEK RESERVOIR SLOPE STABILITY

An assessment of current shoreline conditions and a literature review of projects in similar topographic and geologic terrains were conducted to assess the shoreline erosion and slope stability along the Slab Creek Reservoir. Slab Creek Reservoir is sited within a steeply incised bedrock canyon typical of the mid-Sierra western foothills. The bedrock consists primarily of metamorphosed marine sedimentary rocks that have been jointed and strongly foliated by tectonic compressional forces along the continental margin. This consists of steep hillslopes with slope values ranging from 30 percent to over 100 percent slopes (2.5:1 to greater than 1:1 horizontal to vertical slope). The geology consists of quartzite, schist and shale bedrock and interbedded metavolcanic rocks with strong, angular joint patterns and a predominant north-northwest trending nearly-vertical foliation. Shear zones occur frequently in 1-2 feet thick zones trending parallel to the foliation and are consistent with the overall structural fabric of the region.

The shoreline consists of exposed bedrock (approximately 42 percent of the shoreline), coarse colluvial rock talus deposits over bedrock (approximately 53 percent of the shoreline), and fine sediment deposits over bedrock (approximately 5 percent of the shoreline) (Stillwater Sciences, 2004). Areas of the shoreline dominated by bedrock are characterized by an angular, rocky, thin soil with a shrub herbaceous cover, except where steep slopes prevent soil development. Areas of coarse sediment deposits are characterized by vegetation cover, with vegetation cover being sparser in the areas of finer sediment deposition. Localized, shallow slumping is evident in areas of shoreline characterized by bedrock and/or a coarse substrate with steep slopes (30-45 percent), thin soil development, and sparse shrub cover, and bank erosion is evident in the areas along the shoreline with fine (sand/silt) deposits. Overall, over three-quarters of the shoreline of the Slab Creek Reservoir can be considered meta-stable to stable and will not be affected by reservoir water surface fluctuation, while the portion of the shoreline with steep slopes/thin soils and mobile sediments that are susceptible to erosion constitutes less than one-quarter of the total shoreline area (Stillwater Sciences, 2004).

Reconnaissance assessment of the reservoir shoreline shows it to be typical of reservoirs constructed throughout the foothills within this terrain. Limited shallow slumping in those areas susceptible to erosion is localized and appears not to be associated with larger-scale slope instability. Shallow rockfall and debris flows are associated with the shear zones within the bedrock and steep inner canyon topography. Bedrock outcrops are exposed throughout the canyon, and are also frequently covered by a thin soil/rock talus that lies at its natural angle of repose.

Operation of the Development will result in frequent water surface fluctuations in Slab Creek Reservoir (see Section 4.1) within the current historical range of water surface levels. The rates of withdrawal will increase from the current typical value of less than 1 ft/hr to up to approximately 3 ft/hr (Figure 4). The rocky nature of the slopes at the reservoir shoreline are anticipated to sustain this increase in drawdown rate without significant added instability because they are able to rapidly drain in response to changing water levels. If significant slope stability conditions were present that were susceptible to activitation by fluctuating pore pressures within the slopes, this activation would have already been experienced at the reservoir. One area of slope instability was noted during reconnaissance on the left reservoir bank immediately upstream of the proposed intake location. Cursory inspection of this area indicates that the slope is underlain by competent bedrock, and the existing slide features represent shallow soil sloughing off the bedrock surface. This feature may require additional study to determine if any remedial stabilization measures may be required during construction of the project. However, this area doesn't appear to present the potential for delivery of materials to the reservoir in quantities that could significantly affect reservoir turbidity.

A literature survey was conducted to determine if marginal slope stability is a frequent condition on reservoirs in similar geologic and topographic terrain. No significant instances of slope stability problems were identified in these areas on other similar reservoirs. One significant instance is present where a major landslide deposited debris within the South Fork American River upstream of the project, but this slide occurred in deeply weathered decomposed granitic terrain, which is dissimilar to the geology at Slab Creek. Aerial photo analysis was performed to look for major, deep seated areas of slope instability, but none were identified along Slab Creek Reservoir.

It is expected that the slopes along the Slab Creek Reservoir that are currently stable will remain stable following the proposed Development operation. The bedrock types and steeply dipping foliation oriented approximately perpendicular to the reservoir centerline should contribute to overall continued slope stability. Localized zones of finer-grained soils along the reservoir will continue to exhibit localized slope instability. Known areas of slope instability are limited to the slide identified near the proposed intake structure on the left bank. Additional inspection and analysis of this slide area near the proposed intake may require additional investigation, but significant sediment delivery that may affect reservoir turbidity is not anticipated. Areas that are currently observed with bank slumping will likely exacerbate over a short period of time during initial operation of the proposed Development until the slopes stabilize with respect to the new water surface fluctuation rates. These instances are not anticipated to contribute significantly to reservoir turbidity in the future.

7.0 DISCUSSION AND CONCLUSIONS

The operation of the Iowa Hill Pumped-storage Development will not change the range of current water surface fluctuations in the Slab Creek Reservoir. It will, however, increase daily water surface fluctuation, including the rate of drawdown in Slab Creek Reservoir (Q1). The increase in daily water surface fluctuation in the Slab Creek Reservoir due to the operation of the new facility will not increase surface erosion of the upstream sediment deposit or promote advancement of the delta sediment (Q2).

Regardless of operation of the new facility, the delta front will not reach the Development intake/outlet structure within the lifetime of the project (100 years) if Slab Creek Reservoir is operated above the normal drawdown elevation of 1,815 ft at all times and the sediment accumulation continues at a rate of 38,000 yd^3/yr (Q5 and Q6). Under the same assumptions, the sediment delta will not bury the Development intake/outlet structure within the next 40 years even if Slab Creek Reservoir is drawn down to very low levels and maintained at these low levels for an extended period of time, but after year 2047, it is possible for the sediment delta to bury the Development intake/outlet structure within the project life if Slab Creek Reservoir water surface is drawn down to lower levels (Q6). Drawing down the Slab Creek Reservoir water surface to levels below the intake/outlet invert elevation, if a drawdown is not preventable, will prevent the potential burial of the Development intake/outlet structure (Q7).

Discharge from the Iowa Hill Development to Slab Creek Reservoir will produce local topography that is in equilibrium with operational conditions, and will not result in long-term turbidity problems caused by disturbing the local sediment deposit. A short-term turbidity event is expected if the sediment front pro-grades to the vicinity of the intake/outlet structure or if a low-level drawdown event occurs (Q8).

The operation of the proposed Development will result in more frequent water surface fluctuations with higher rates within the same range in the Slab Creek Reservoir. The bank slopes that are currently stable are expected to remain stable, while the areas currently with bank slumping are expected to continue and likely exacerbate for a short period following the proposed project operation (Q9).

Of the nine questions posed, Questions 3 and 4 were not addressed because of the conclusion to Questions 1 and 2. We believe this analysis is adequate to define the potential impacts to turbidity levels with the operation of proposed Iowa Hill Development, and more detailed analysis is not necessary.

8.0 LITERATURE CITED

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***Acknowledgement*:** The useful comments from Ms. Sharon Stohrer (provided during a meeting), Dr. Michael Singer, Professor Andrew Wilcox and Professor Leonard Sklar to previous drafts have been incorporated into this report.

Appendix A - Figures

Figure 12 A simplified model of future delta front advancement under normal reservoir operation (i.e., pool level will be maintained between the maximum normal pool level of 1,850 ft and the normal drawdown pool level of 1,815 ft).

Figure 13 Comparison of predicted 2007 profile with survey data. Simulation used the 1992 surveyed profile as an initial condition and assumed a foreset slope of 0.065, a topset slope of 0.0016, a foreset/topset break point elevation of 1,809 ft, and a sediment accumulation rate of 52,000 yd^3/yr.

Figure 14 Predicted sediment deposit profiles in the reservoir over the next 150 years under normal reservoir operation (i.e., maintaining water surface elevations between the maximum normal pool level and the normal drawdown pool level) and a sediment accumulation rate of 38,000 yd^3/yr.

Figure 15 Predicted sediment deposit profiles in the reservoir over the next 100 years under normal reservoir operation (i.e., maintaining water surface elevations between the maximum normal pool level and the normal drawdown pool level) and assuming a sediment accumulation rate that is 50% higher than the estimated 1967 – 2007 sediment accumulation rate, or 57,000 yd^3/yr, which is even 5,000 yd^3/hr higher than the extremely high sedimentation rate in the period of 1992 - 2007.

Figure 16 Predicted sediment deposit profiles if a Slab Creek Reservoir drawdown is to occur in 2007, 2047, 2067, 2087, or 2107. Simulation assumes a sediment accumulation rate of 38,000 yd^3/yr. The drawdown event lowers Slab Creek water surface to 1,776 ft (6 ft above the Iowa Hill Facility Intake/Outlet invert elevation), and is held constant for an extended period until a new equilibrium for the sediment deposit is reached. This scenario depicts the worst-case-scenario for burying the intake/outlet structure.

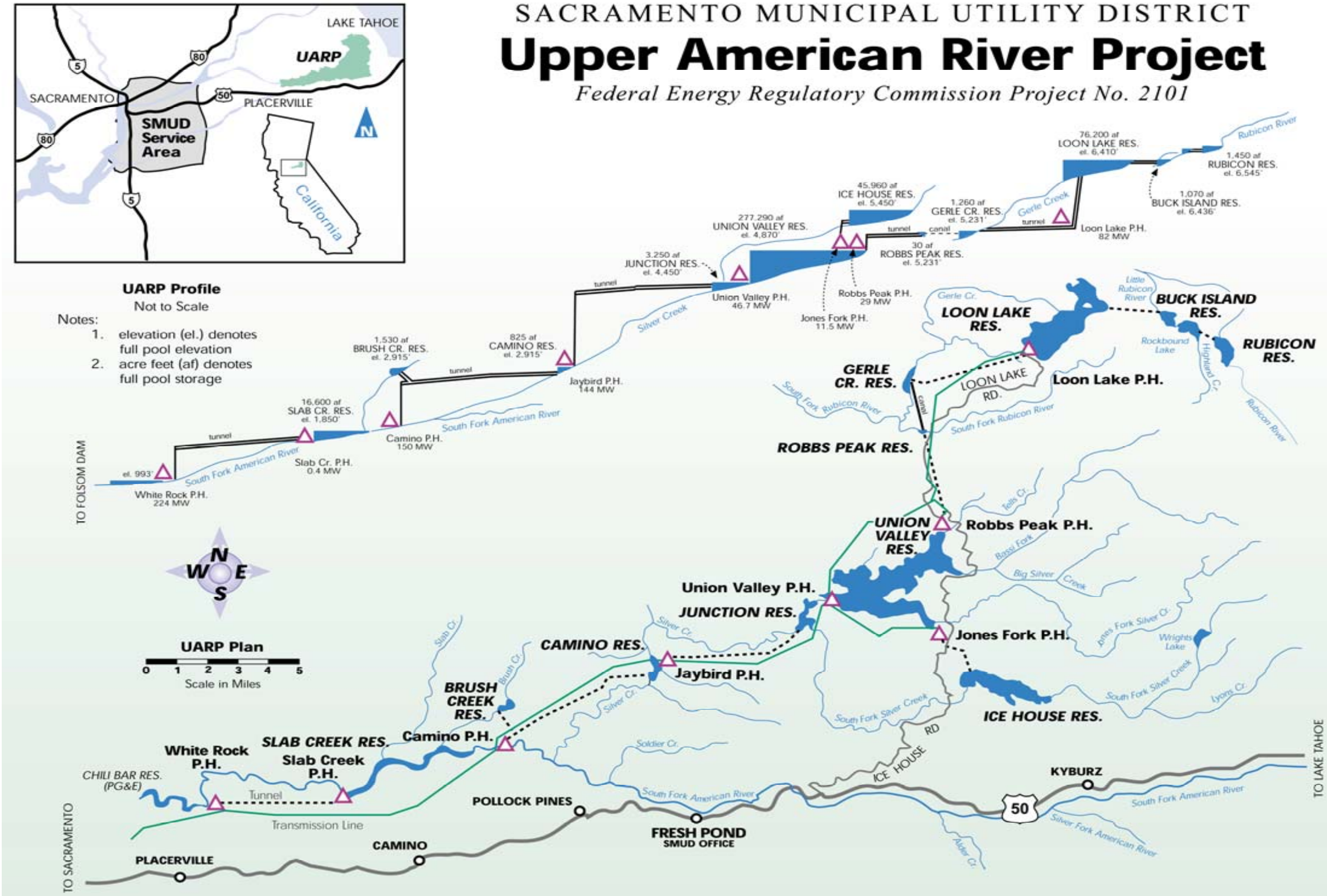


Figure 1: Area Map for Slab Creek Reservoir and the Upper American River Project (UARP).

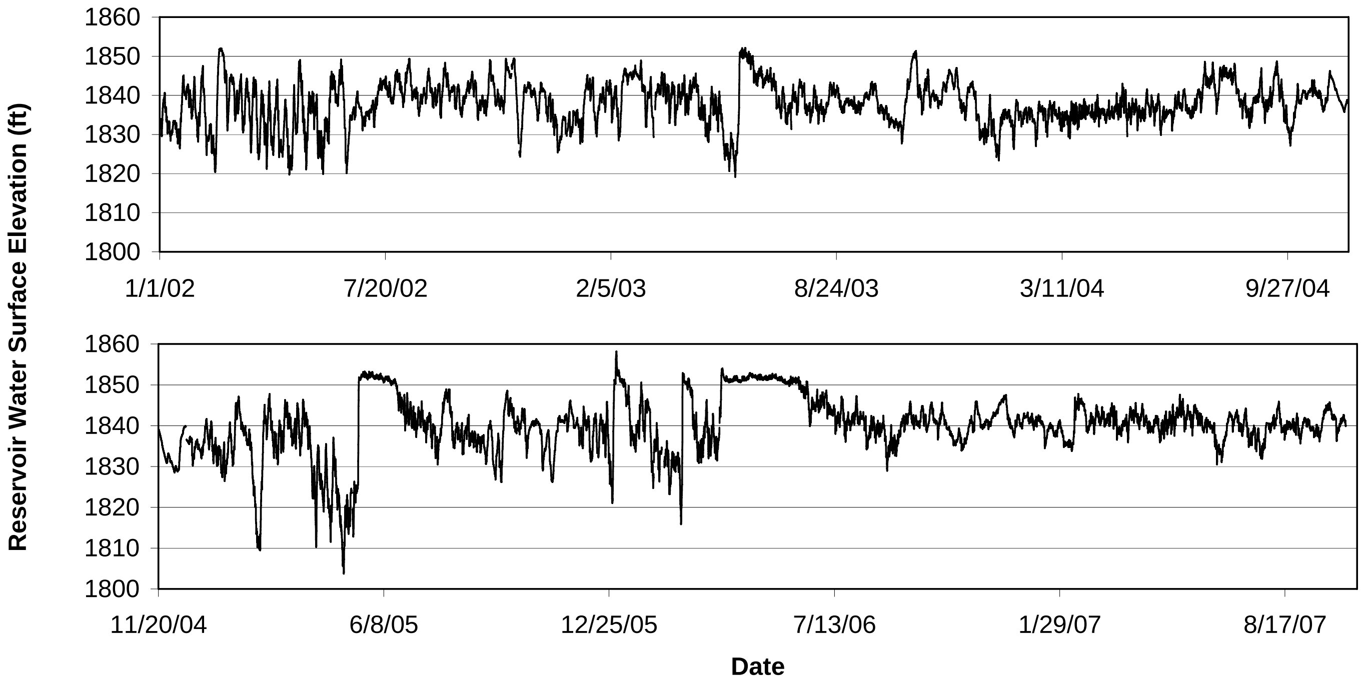


Figure 2: **Slab Creek Reservoir 1-hour interval water surface elevations between 1 January 2002 and 19 October 2007, based on SMUD record.**

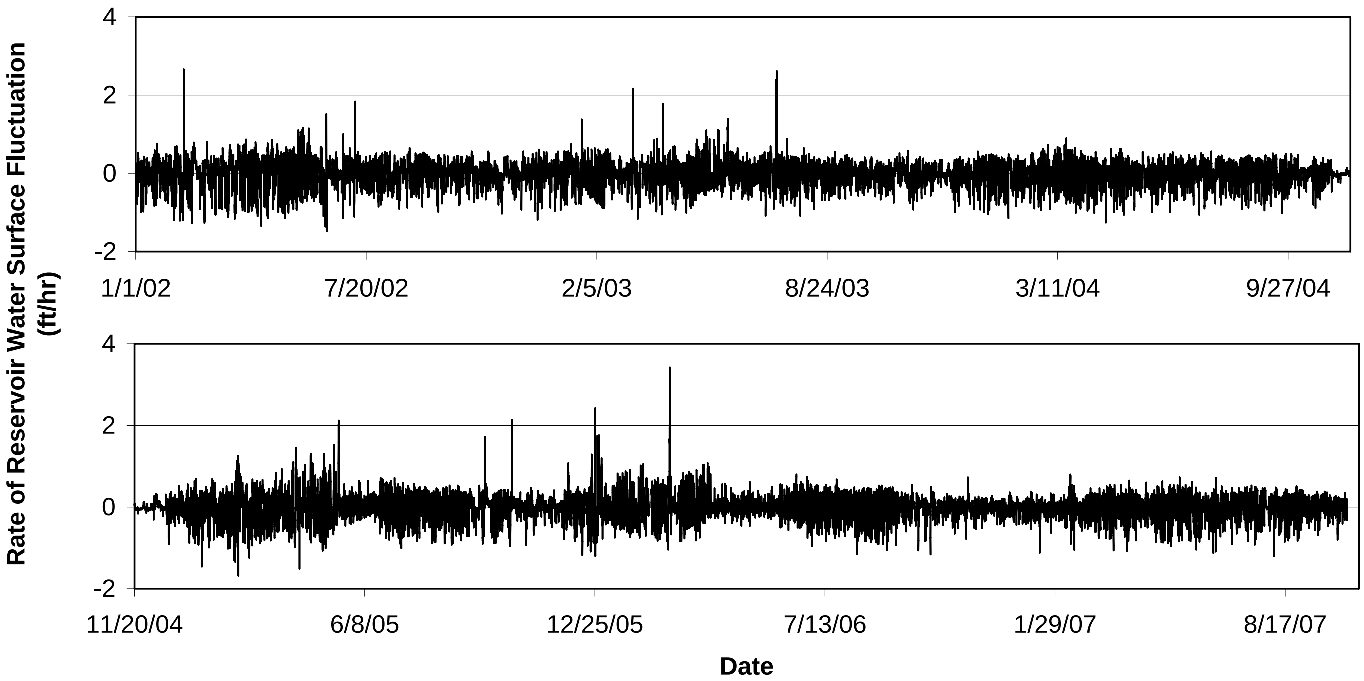


Figure 3: **Slab Creek Reservoir hourly rate of water surface fluctuation between 1 January 2002 and 19 October 2007, based on SMUD record.**

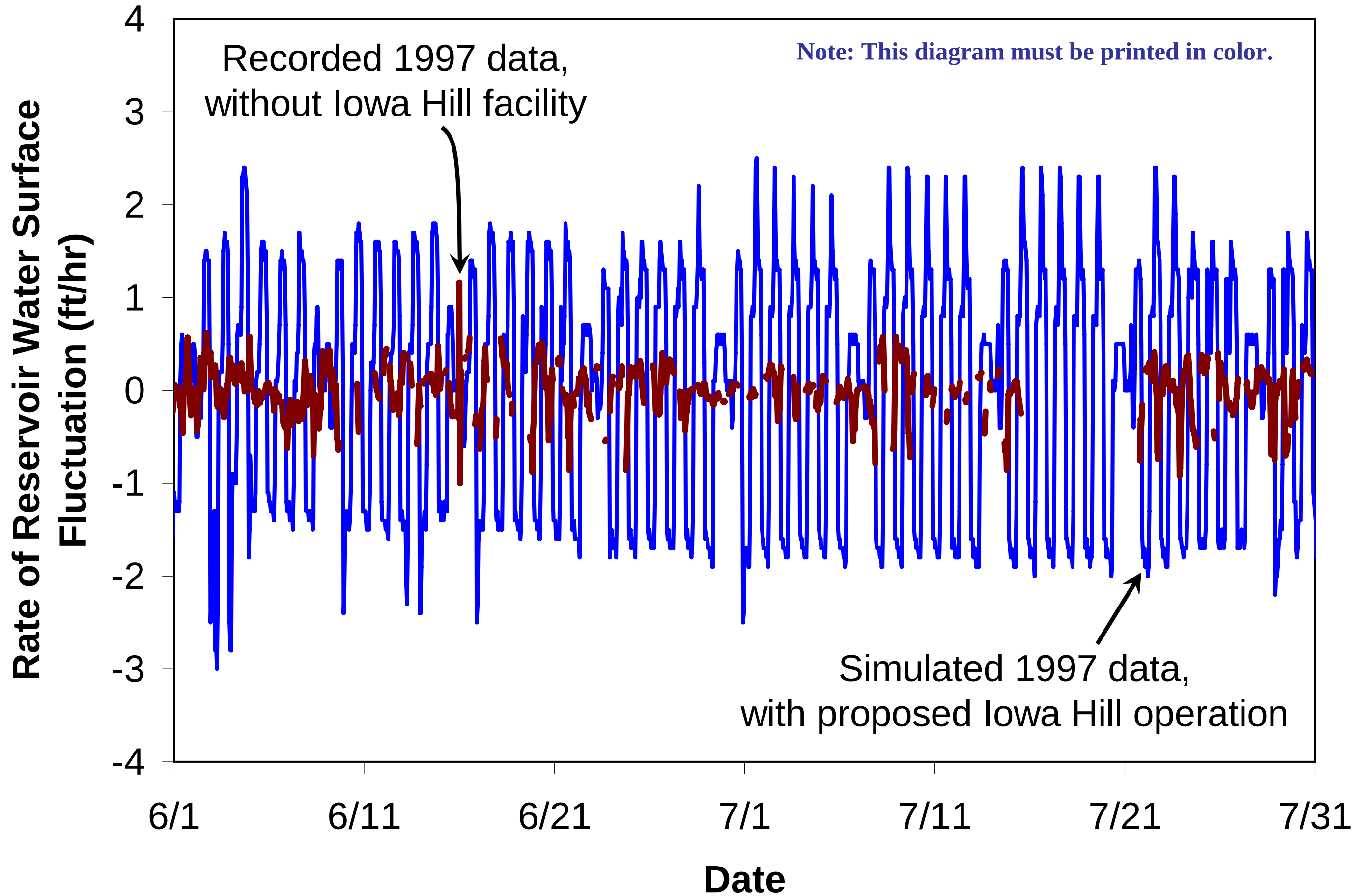


Figure 4: **Simulated Slab Creek Reservoir water surface fluctuation rates with the addition of the Iowa Hill Development for the months of June and July of 1997, in comparison with the recorded rates without the Iowa Hill facility. Results for other months are similar to June and July and are not presented to maintain the legibility of the diagram. Year 1997 was an average annual run-off year. Results for other water year types (e.g., drier or wetter) are similar. Simulated data were provided by Dudley McFadden (SMUD) in June 2004. Recorded data were downloaded from http://cdec.water.ca.gov/ in April 2004 and checked by SMUD staff for accuracy in October 2007.**

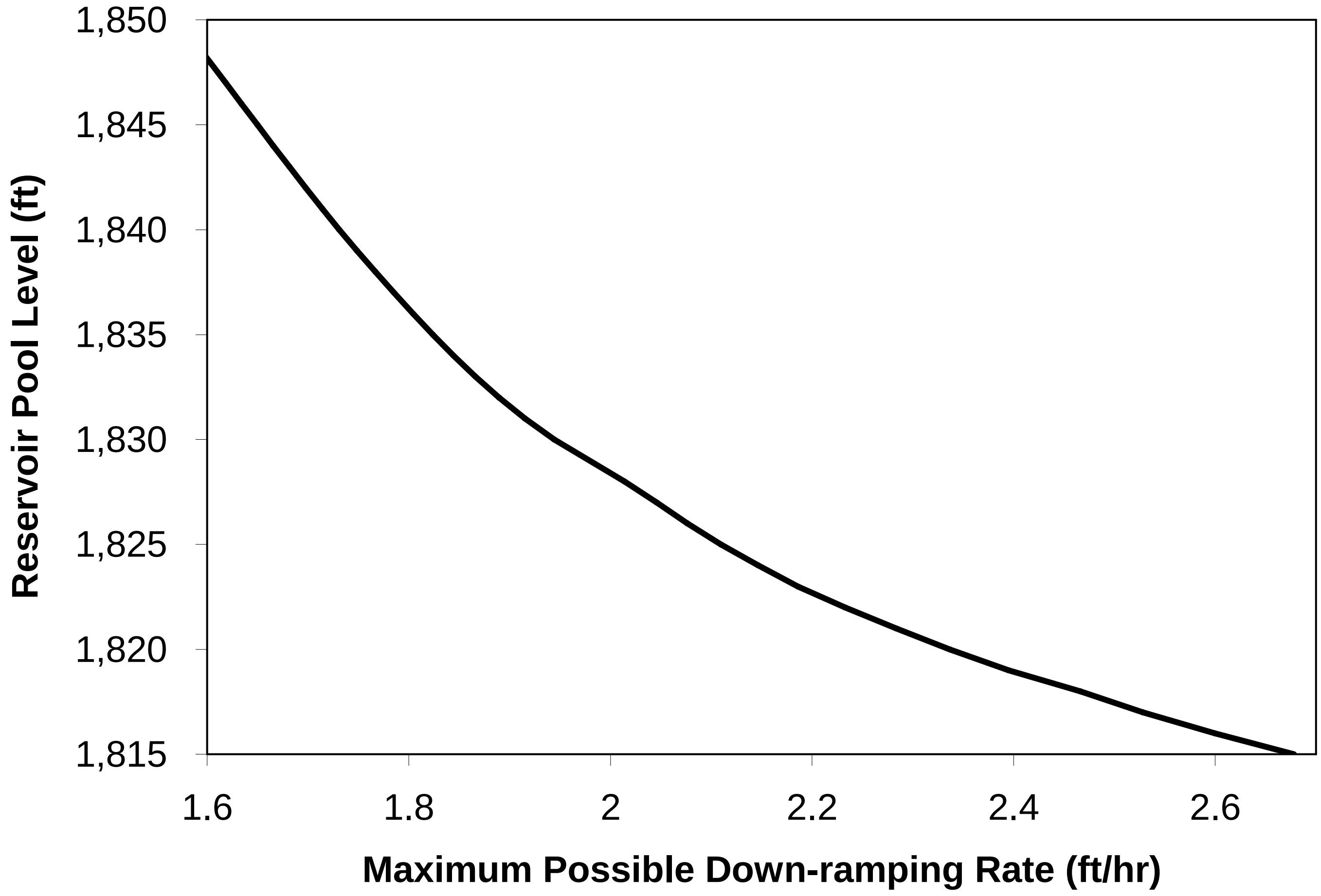


Figure 5: **Slab Creek Reservoir maximum possible down-ramping rate without the Iowa Hill Development within the normal range of reservoir pool levels , based on the assumptions of zero inflow, 3,950 cfs maximum outflow, and the 2007 Slab Creek Reservoir storage capacity curve.**

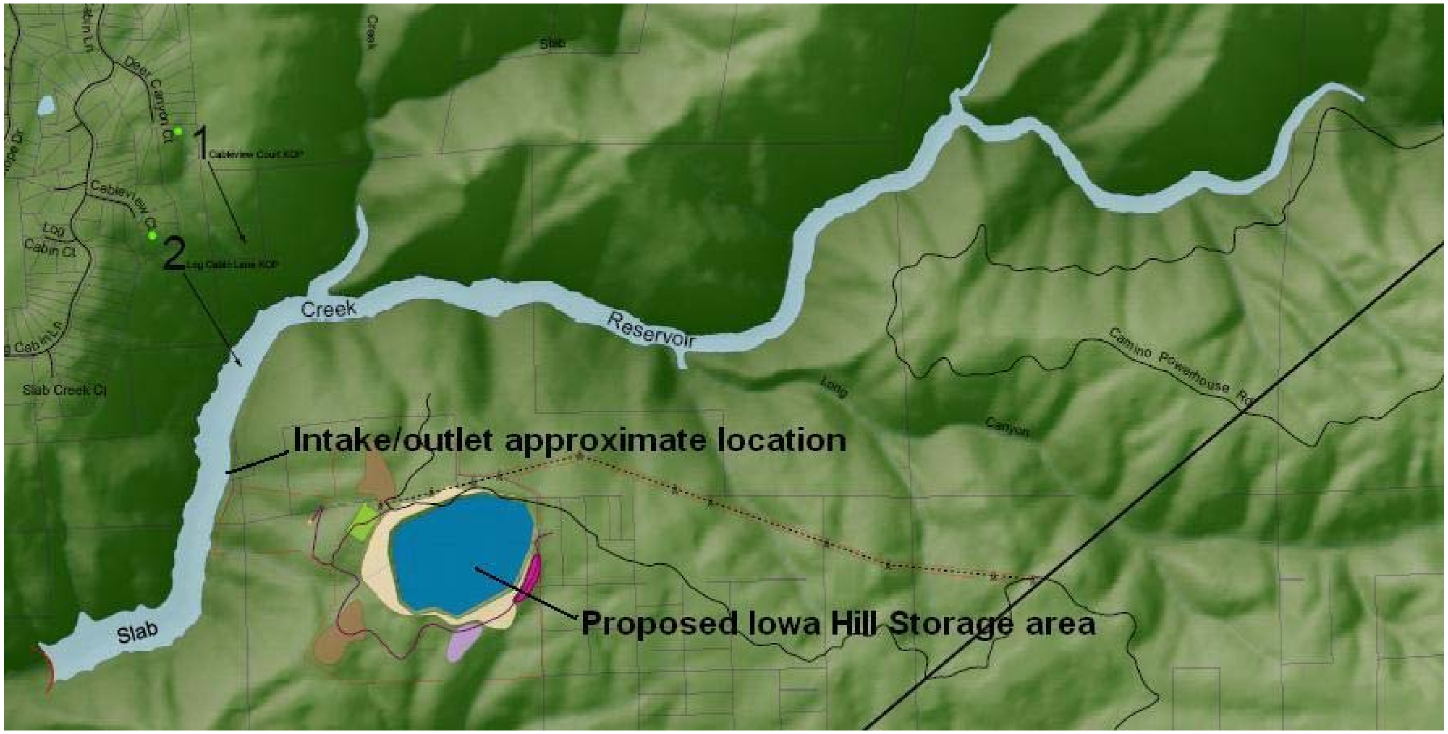


Figure 6: **General area map for the Iowa Hill Development, showing the location of the intake/outlet structure in Slab Creek Reservoir (SMUD 2003).**

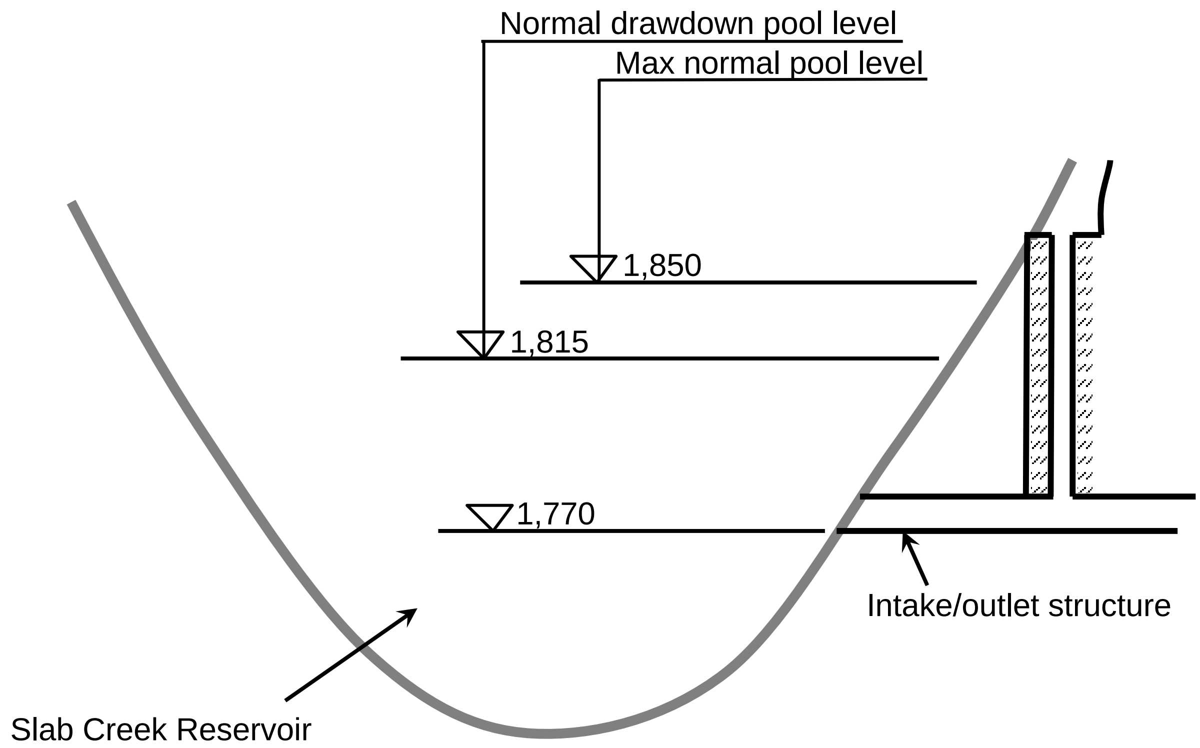


Figure 7: **Schematic sketch depicting the vertical location of the Iowa Hill Development intake/outlet structure (not to scale), modified from SMUD (2003). Design specifications of the intake/outlet structure have not been finalized. Conceptually, the structure is described as an octagonal, multi-port facility that diffuses discharge water into the reservoir.**

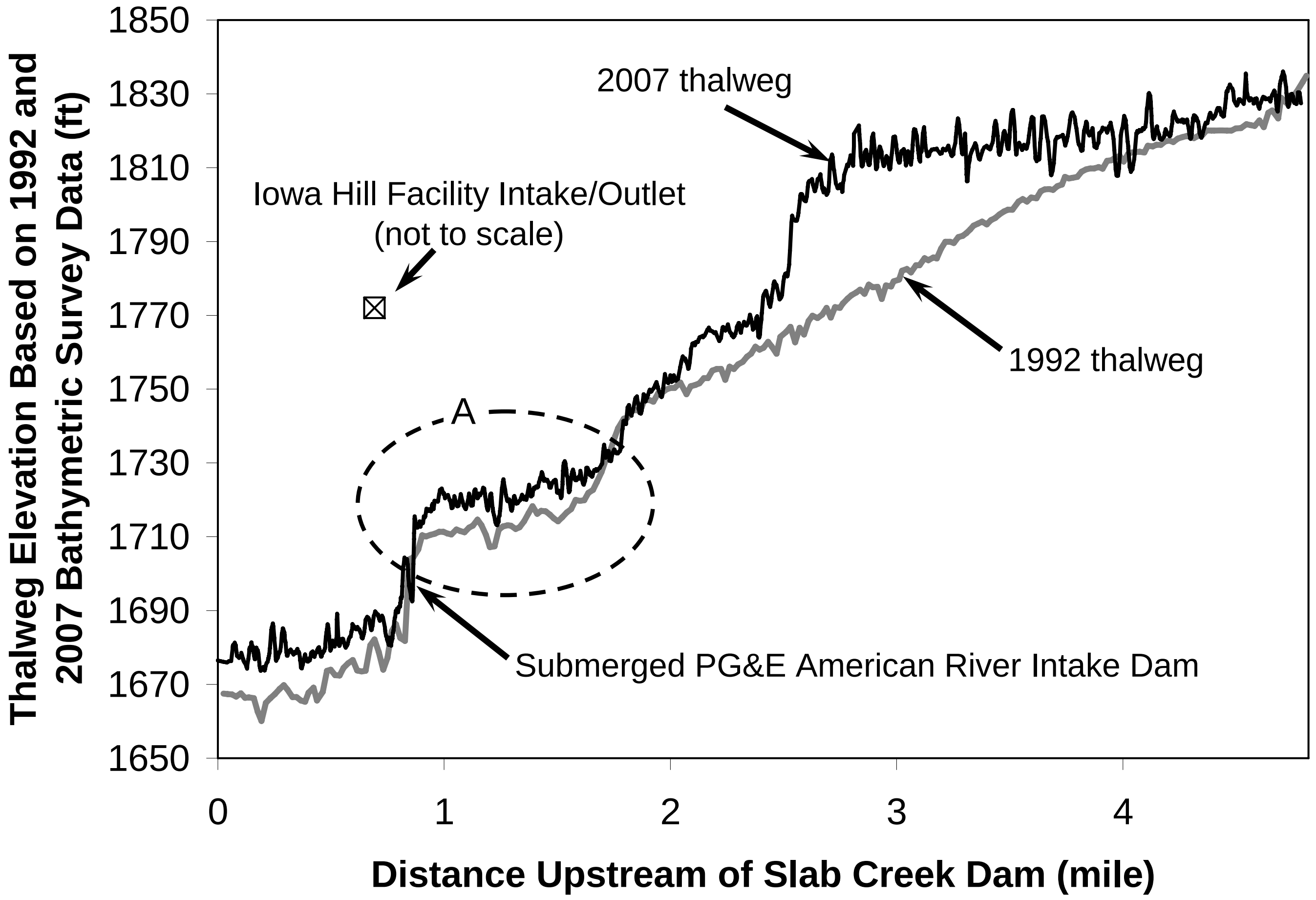


Figure 8: **Longitudinal profile of Slab Creek Reservoir, showing the location of the Iowa Hill Development intake/outlet structure. The two thalweg profiles were derived from the 1992 and 2007 bathymetric survey data. Area marked "A" indicates inconsistency in the two surveys, which was used to adjust the 1992 survey data. The 1992 profile depicted here is unadjusted.**

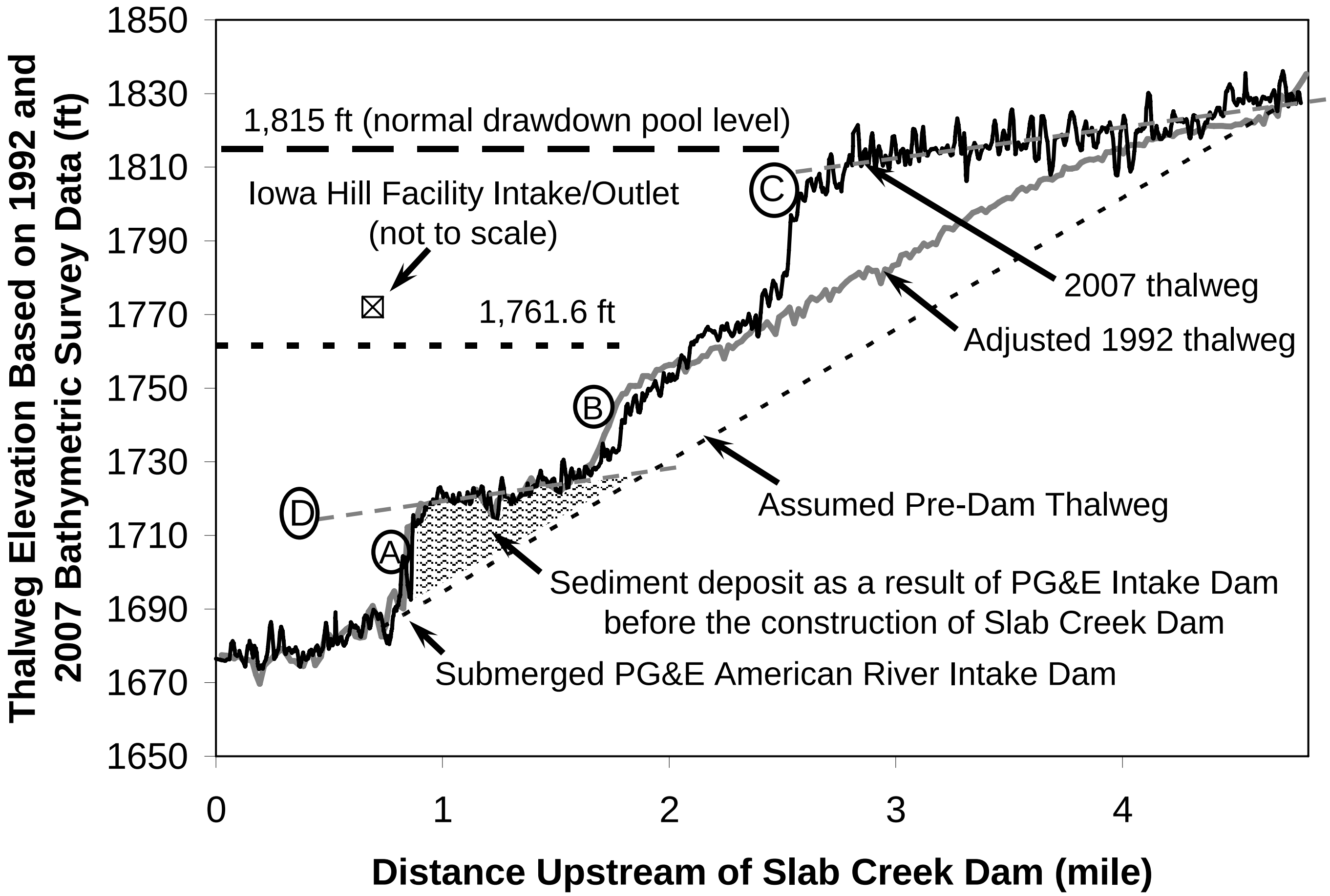


Figure 9: **Longitudinal profile of Slab Creek Reservoir. The 1992 profile was adjusted to the 2007 profile in order to make elevations at the PG&E American River Intake Dam area consistent between surveys. Label "A" indicates the PG&E American River Intake Dam, the dashed-line labeled "D" indicates the slope of the sediment deposit upstream of Intake Dam (S = 0.0016), which is identical to the slope of the sediment deposit in the 2007 profile at the upstream end of the reservoir indicated by the dashed-line labeled "C", and label "B" indicates a depositional front attributed to a drawdown event in October 1991, when the reservoir pool level was lowered to 1,761.6 ft.**

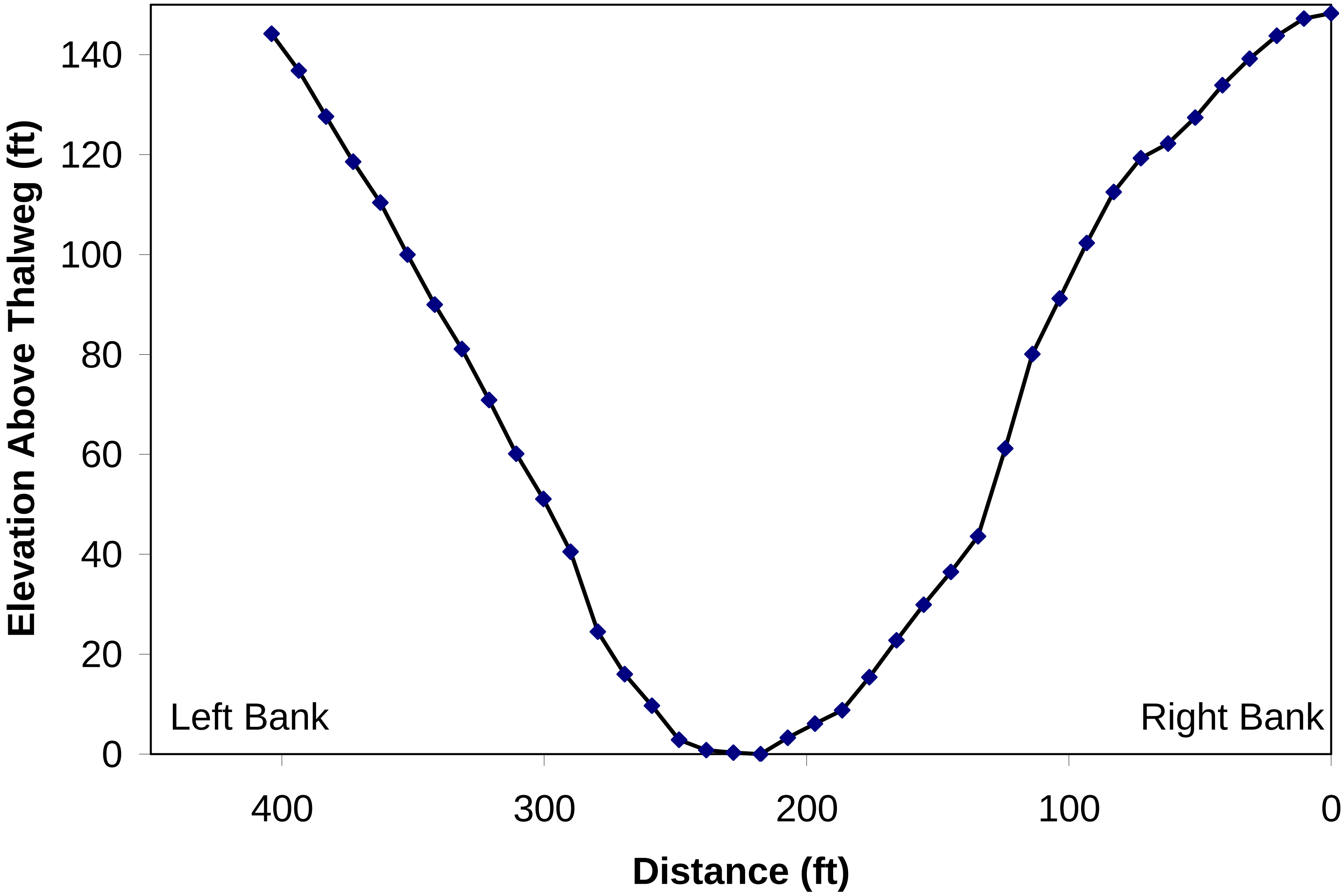


Figure 10: **Reservoir cross-section 0.5 miles upstream of Slab Creek Dam, based on 1992 bathymetry survey data.**

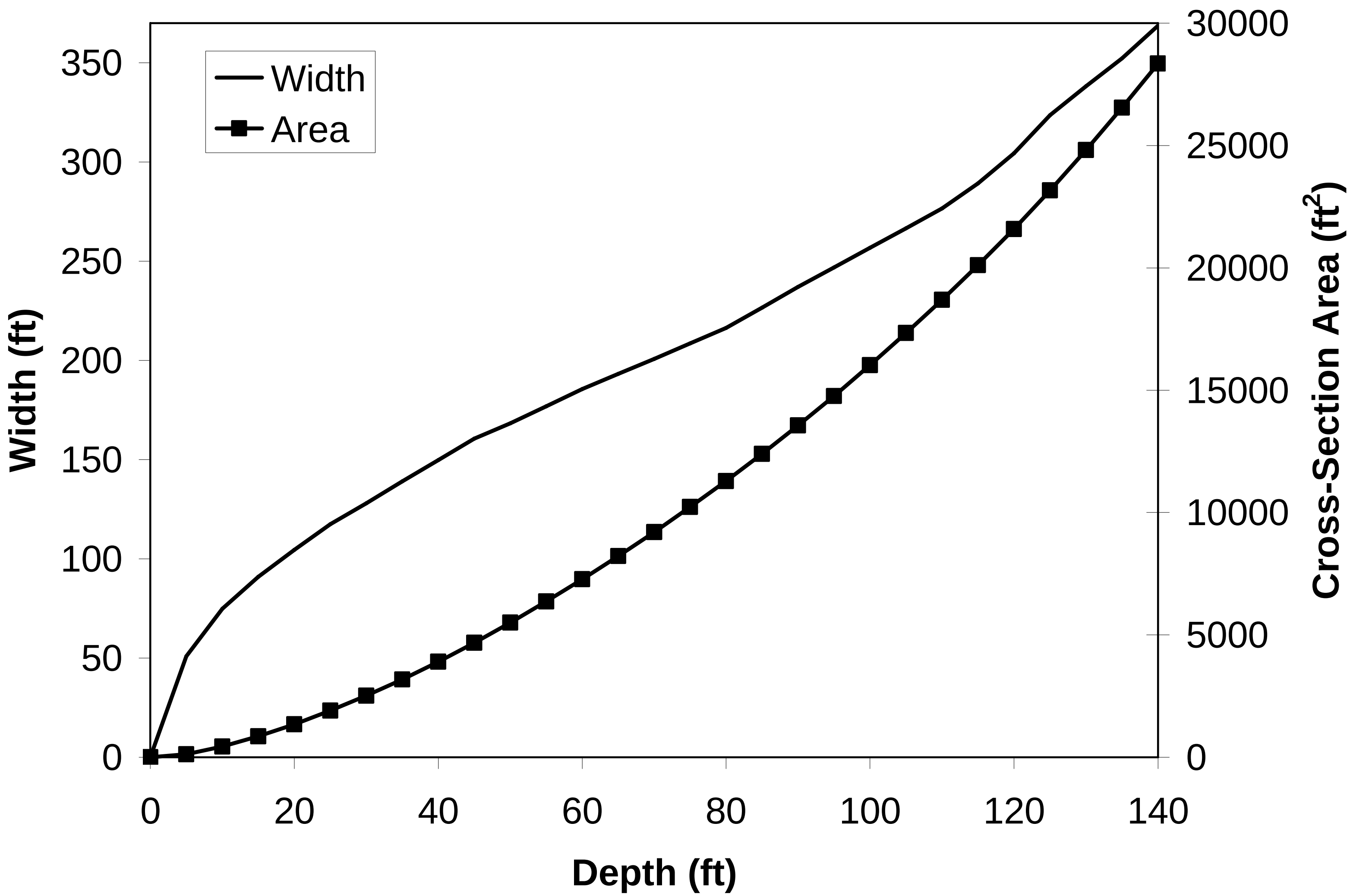
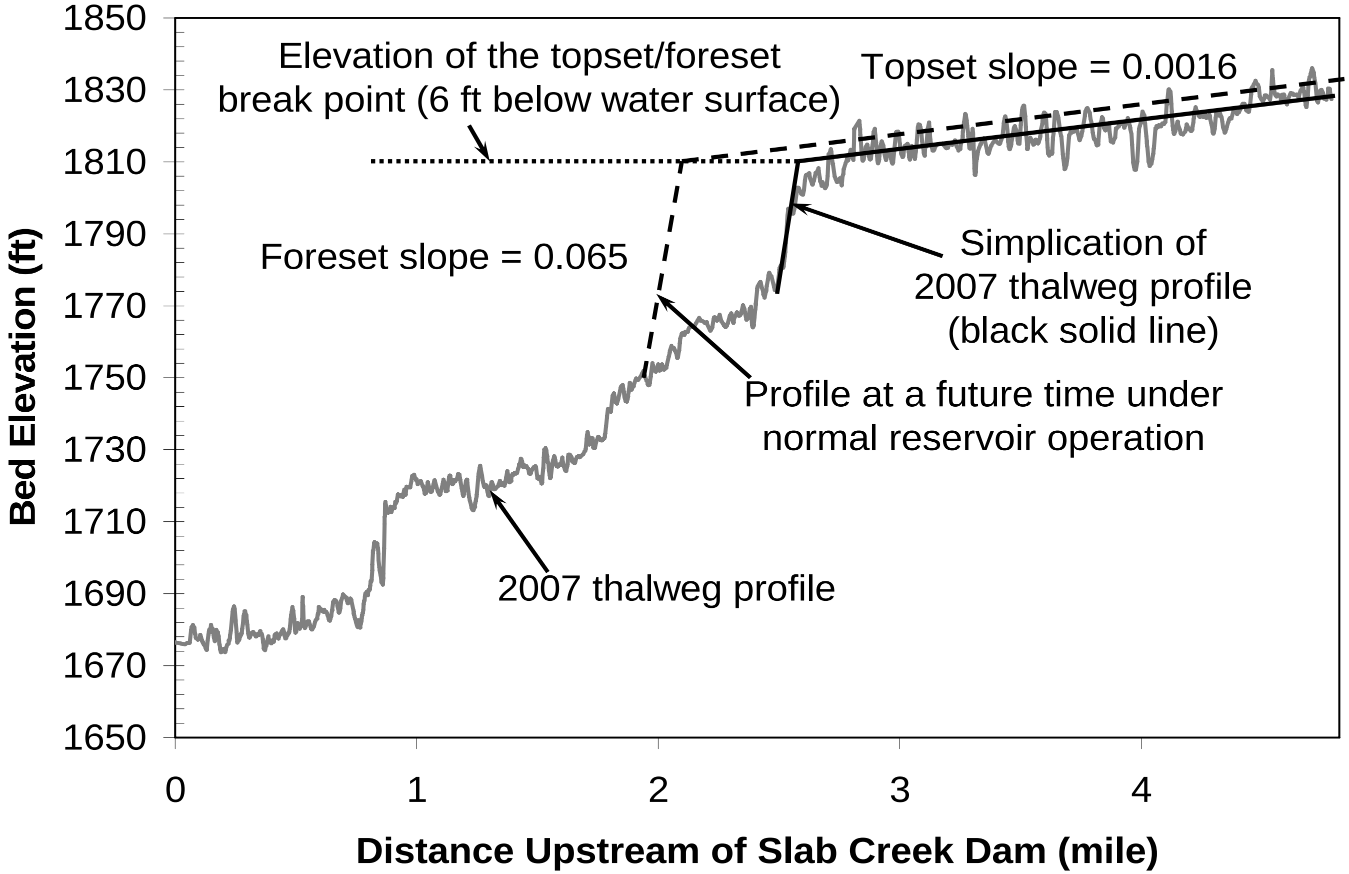


Figure 11: **Reservoir channel width and cross-section area for different depths, based on the typical cross-section shown in Figure 9.**



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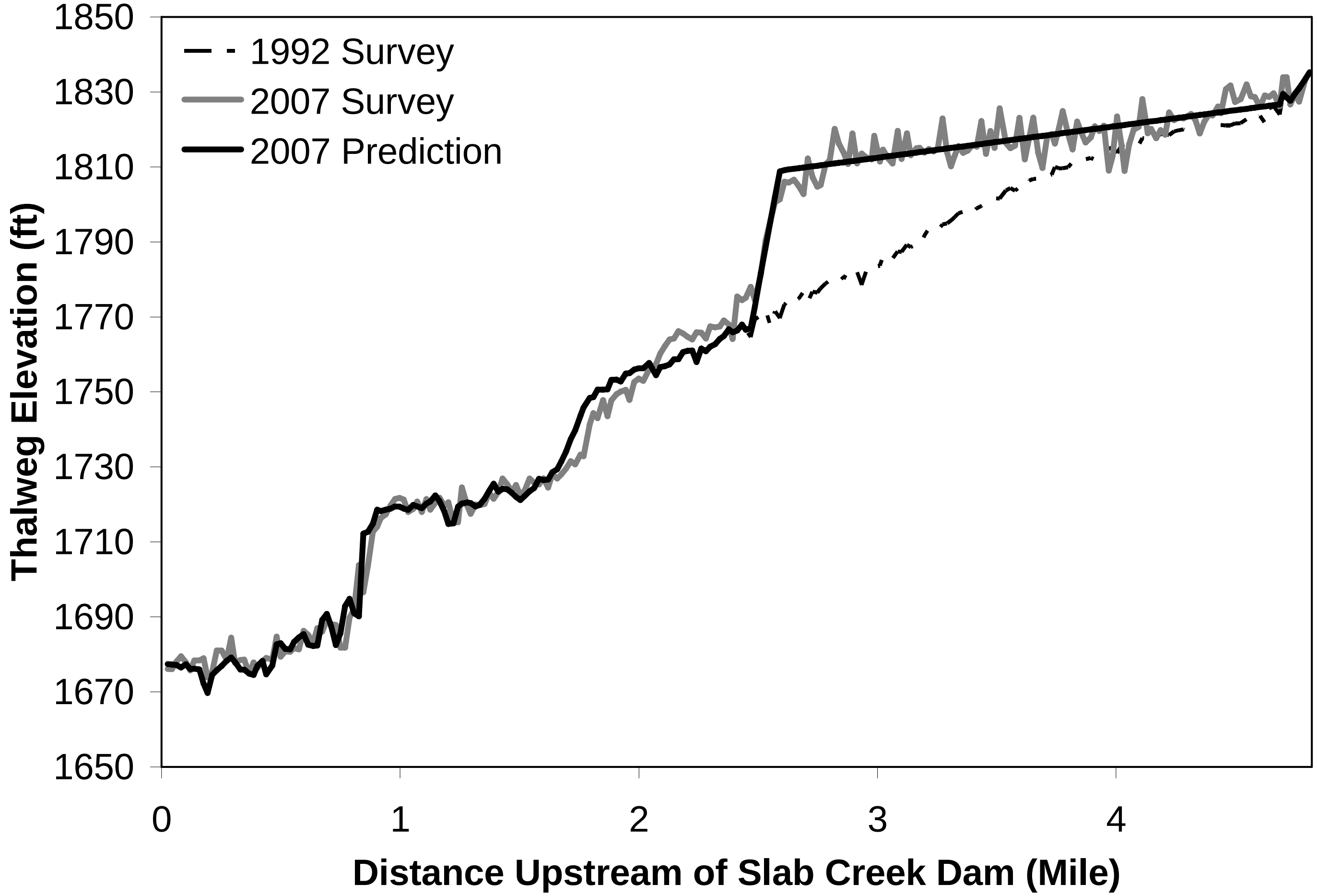

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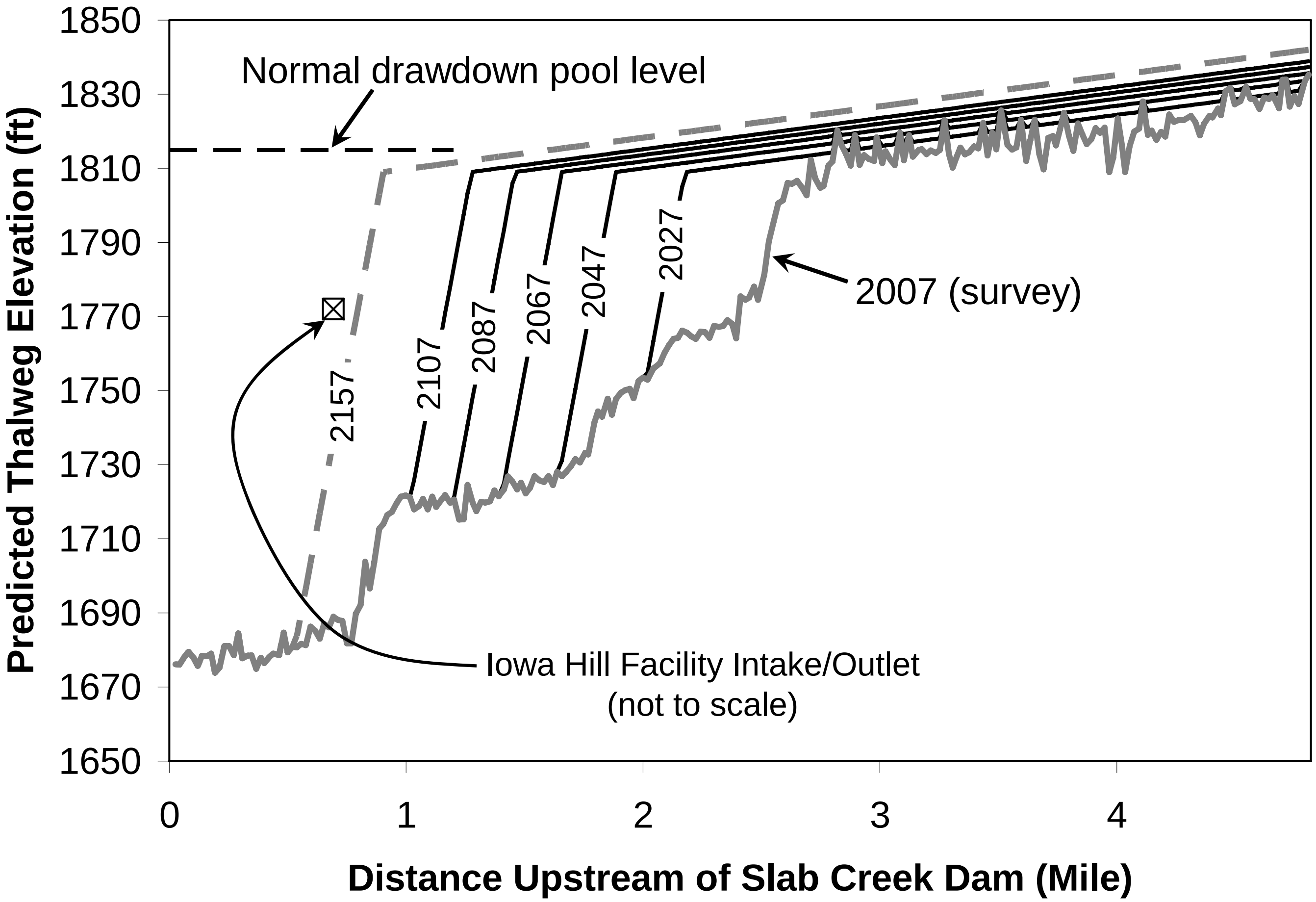

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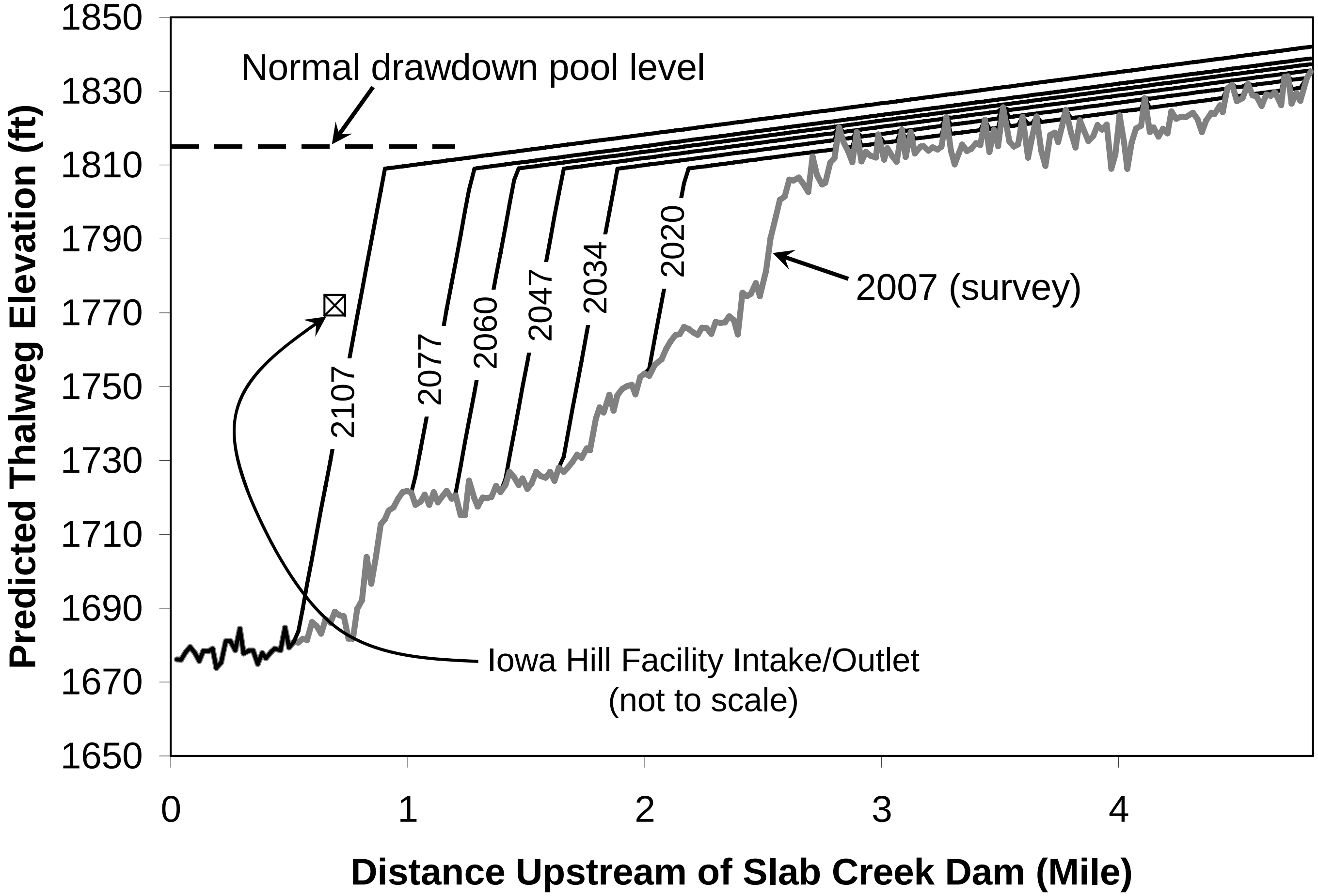

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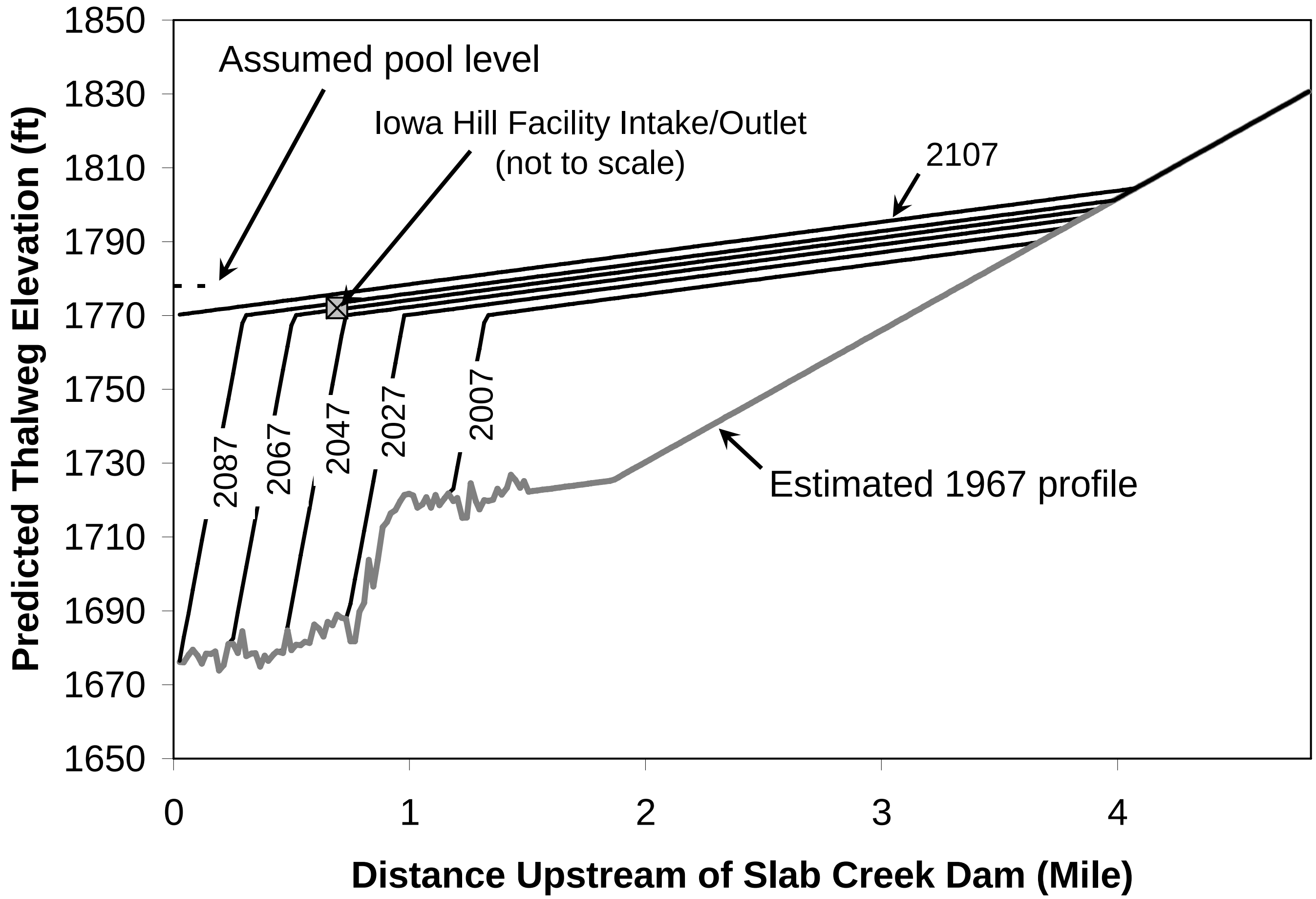

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Appendix B - Peer Reviewer Comments to Draft Report and Responses from Authors

We have received comments from three peer reviewers for this report: Dr. Michael Singer, Professor Andrew Wilcox, and Professor Leonard Sklar. Over all, the reviewers all agreed that the analyses and results of the report are technically sound. Dr. Singer stated that "*overall, this report competently addresses issues of sedimentation in the lower part of Slab Creek Reservoir based on simplistic assumptions of sediment delivery from the upland basin and chronic processes of progradation to the lower reservoir.*" Professor Wilcox stated that "*The report, the analyses it is based on, and the assumptions therein are sound.*" Professor Sklar stated that "*overall, the report is a highly credible, professional treatment of the questions. The analysis is clearly described, the assumptions and rationale are well supported, and the calculations appear to be correct and reliable.*"

More detailed comments and our responses are provided below. A complete record of reviewer comments are included in this document and denoted in italics, indented and with quotation marks while our responses follow the comments in normal text.

1. Dr. Michael Singer's Comments

> *"General Comments"*
>
> *"This report addresses the impacts of the proposed Iowa Hill pump-storage facility on sedimentation and turbidity in the Slab Creek Reservoir and in the downstream reach of the South Fork of the American River. The report addresses several questions on the impact of the proposed project operation on existing delta deposits in the Slab Creek Reservoir, on the sources and evolution of sedimentation in the reservoir, and on turbidity. Cui employs hydrologic data and bathymetric information from the reservoir bed to ascertain temporal patterns of drawdown and infilling, and to determine sedimentation rates for various time periods since the construction of Slab Creek Dam. He uses a numerical model developed upon bathymetric profiles to assess the downstream evolution of existing delta deposits and the timing of their impact (if any) on the proposed intake pump."*
>
> *"In the end, the report determines the new pumping plant will have a negligible impact on sedimentation and turbidity in the reservoir and downstream. It also outlines a minor risk that sedimentation will impact Iowa Hill pumping. However, most of the report is focused on the downstream migration of the existing reservoir deposit and its exposure to increased ramping associated with the new Iowa Hill pumping facility. Cui asserts that since the post-project reservoir operation is not predicted to impact the existing sediment deposit (based on measured hydrology, bathymetry, and sediment routing model) within the project lifetime, issues of turbidity are not relevant. The report provides prescriptions for reservoir operation and pumping that would prevent burial of the intake."*
>
> *"The report purports to address the following questions:"*

“1) How will altered reservoir operation affect the erosion of the existing delta deposit in the reservoir?”

“2) How long will it take for the delta deposit to migrate downstream with and without the project and how could the migration be slowed?”

“3) Will new reservoir operation increase turbidity in the reservoir and downstream?”

“4) Will more frequent ramping of reservoir affect erosion of surrounding hillslopes?”

“Of these, Questions 1 & 2 are most fully examined in this report. Questions 3 & 4 are investigated in a cursory way. Questions 1 & 2 are addressed primarily using a numerical model that is not well explained, perhaps because such explanation is beyond the scope of such a report. However, such a model description would increase the transparency of the analysis. The issues regarding turbidity are not well developed either. This may be the result of an obvious lack of data related to grain size in the reservoir deposits (see below). Such data would enable modeling of suspended sediment in the water column in terms of time-dependent concentrations and settling in the reservoir. It would also assist assessment of impacts to water quality downstream of the reservoir, which are also weakly discussed in the report. Indeed the report’s title invites such an analysis.”

We appreciate the careful review of the draft report and the insightful comments from Dr. Singer. Dr. Singer stated that the numerical model used in the analysis was not well explained. It is true that we did not provide equations that normally accompany a numerical model description. In this case, however, the model simply implements sediment mass conservation and our description should provide adequate information to allow others to reconstruct the model if needed. The relevant statement within the report reads: “The model allows sediment to deposit along the foreset and topset slopes described above with the break point elevation located at 6 ft below the normal drawdown pool level, while advancing in the downstream direction with a constant sediment accumulation rate.” Note the foreset and topset slopes mentioned in this statement were provided previously in the report. Regarding Dr. Singer’s statements starting with: “The issues regarding turbidity are not well developed either”, we believe Dr. Singer misunderstood the purpose of the modeling. The simple numerical model presented in the report was developed to assess the potential sediment deposition profile in the future, and utilize this profile as a first-order understanding as to whether it is possible for the delta front to bury the proposed Iowa Hill facility intake/outlet structure. The model does not contain any elements for assessing sediment transport dynamics other than the recognition that sediment depositional profiles are self-similar (i.e., preserving foreset and topset bed slopes and maintaining break point elevation) if water surface elevation is kept within the normal range of operation. As a result of the lack of sediment transport dynamics elements, the model cannot provide information with regard to suspended sediment concentration. Potential changes in sediment suspension and turbidity with the proposed operation of Iowa Hill facility is discussed outside of the model results.

> *"I have made many specific comments within an annotated version of the report and address some technical points in more detail below."*

Comments in the annotated draft report are addressed during the revision to the report.

> *"Technical Comments"*

> *"(Section 4.2) Cui makes an arbitrary adjustment to the longitudinal profile of the reservoir bed between the two available time periods based on a mismatch in the data at a location assumed to remain constant. This choice is reasonable based on the notion that a submerged dam functions as a fixed knick-point that cannot migrate or grow in elevation. However, it is also possible that further problems with one or both of the bathymetric datasets exist, which in turn would limit their utility in the exercise of computing accumulation. This profile adjustment is further complicated by the lack of GPS control on the long profiles themselves. As such, there is no guarantee that the two long profiles (from 1992 and 2007) may be directly compared. I find it hard to believe that the data to compare these surveys directly does not exist. Survey contractors generally retain full GPS information for all their surveys."*

There is no evidence that there are problems associated with the horizontal coordinates for the two set of survey maps. As a matter of fact, the longitudinal profiles of the two set of maps seem to match well as evidenced in Figure 9, in which no adjustment was made to horizontal coordinates. As stated in the report and agreed upon by Dr. Singer (and also Professor Wilcox), the problem seems to be in a mistake in the vertical benchmark of the 1992 survey. Potential errors in the 1992 survey may affect the estimated sediment accumulation rate for the periods of 1967 – 1992 and 1992 – 2007. The sediment accumulation rate for the period of 1967 – 2007, however, was estimated based on the 1967 and 2007 profiles, and thus, is not affected by potential errors in the 1992 survey data. Similarly, the simulation of the advancement of the depositional delta was based on the estimated sediment accumulation rate for the period of 1967 – 2007, and thus, was not affected by potential errors in the 1992 survey. We have added discussions with regard to uncertainties associated with possible errors due to the adjustment of the 1992 profile in Section 4.4.

> *"(Section 4.3) To develop accumulation estimates presented in Table 1, Cui uses a characteristic cross section that assumes uniform width and consistent shape over the entire reservoir. Although the assumption of uniform width may be valid to first order, the assumption is poorly defended with quantitative data. As Cui suggests, it is likely that most of the variance in down-valley topography is in the vertical, but in such mountain channels hard rock knick-points are also prominent. Knick-points in the pre-dam long profile could dramatically impact Cui's simplified estimate of sediment accumulation in the reservoir."*

We agree with Dr. Singer that using a single cross section for the analysis is a first-order approximation. The primary reason for this approximation is that we would have to acquire the pre-Slab Creek Dam cross sections currently buried with sediment deposits in order to have any improvement in modeling accuracy. No cross sections for the buried pre-dam channel are available. Although acquiring buried cross sections through an intense drilling program is possible, such a program is generally cost-prohibitive. With that, we are not providing further revisions to the model in the revised draft. In order to improve the confidence level of our results, we have provided a sensitivity analysis run in Section 4.4, in which we assumed a sediment accumulation rate that is 50% higher than the long-term estimate.

> *"The description of the Mill Creek landslide and its impact on Slab Creek reservoir is compromised by the fact that there is no specific data available. Such landslides are possible and indeed likely during extreme flooding that is becoming more frequent in this region of California. It is certainly possible that the Mill Creek slide contributed a slug of sediment to the reservoir, but in the absence of data or a plausibility calculation, the speculation is futile. In any event, this potential source of sediment to the reservoir in the future was not directly analyzed, despite a brief look at potential bank erosion around the reservoir margins. This may require additional slope stability analysis (e.g. via SHALSTAB, http://socrates.berkeley.edu/~geomorph/shalstab/) in the drainage area above the reservoir. I believe this is a worthwhile exercise if the 100-year life of Iowa Hill is to be fully assessed."*

We believe there is enough evidence the 1999 Mill Creek landslide contributed the extra sediment during the period of 1992 to 2007. Although there is no direct measurement of the amount of sediment delivered to the river, observations of the sediment deposit dimensions accumulated on Highway 50 provided good information for a plausible estimate. As stated in the report, the mud resulting from the landslide buried Highway 50 for a stretch of 800 ft with a depth of 75 ft based on the observation of Sydnor (1997). Applying the same dimension for sediment delivered to the river, a 150 wide river valley would have made up the extra sediment contributed during the 1992 to 2007 period. Note that direct measurements of sediment delivery to a river during a landslide event is not possible even if we know when and where the slide will occur, because sediment delivered to the river channel will rapidly wash downstream. We feel the estimates provided above for the 1999 Mill Creek landslide is a reasonably accurate estimate given the inherent uncertainties with estimating the volume of material delivered to a channel under all circumstances. No further revisions are provided in the report with regard to sediment contribution from the Mill Creek landslide.

> *"(Section 4.4 and 4.5) The model employed by Cui in this analysis places its emphasis on chronic sediment transport processes. It computes the movement of sediment from the delta deposit down toward the toe of the dam under the assumption of constant accumulation. Unfortunately the processes by which sediment reaches critical zones of the reservoir are more complicated and fundamentally dependent on the rate of sediment supply, which is generally nonlinear with rainfall or runoff and unsteady in time. Cui acknowledges the*

> *potentially large role of landslides as a sediment source, but minimizes its influence in his computations. Even without major landslides such as Mill Creek, sediment production from the upland area that may vary dramatically as a function of rainfall intensities and antecedent soil conditions. It is possible, therefore, for extremely high sediment loads to reach Slab Creek (and potentially Iowa Hill pumps) during episodic flooding associated with large frontal rainstorms (e.g. 'pineapple express' conditions) that are increasingly common in the basin."*

We agree with Dr. Singer that sediment supply to Slab Creek Reservoir is not constant. The purpose of our analyses through the modeling exercise, however, is to establish the potential bed profile at a future date. No attempt was made to understand the detailed sediment transport dynamics during specific storm events as it is not relevant to the question we were trying to answer (i.e., whether the advanced delta will bury the proposed Iowa Hill intake/outlet structure). In the modeling analysis, the sediment supply rate used for input has already included past landslide events and should be a reasonable long-term average value. As a result, the predicted deposition profile at the end of the project life should be a reasonable estimate that has already included the potential for landslides. In addition, we also provided a sensitivity test run in the revised draft by increasing the estimated sediment accumulation rate by 50%, which may provide some additional comfort to readers. As for the question whether extremely high sediment loads from a storm event will reach Slab Creek Reservoir, the answer is a definite yes. High suspended sediment load associated with a storm is a nature event and is not the concern of this report.

> *"The presented modeling focuses transport within the reservoir on foreset progradation of the existing delta deposit. However, the possibility of a turbidity current due to erosion of the delta toe has not been addressed. It is possible that such a scenario is unlikely due to relatively coarse grain sizes in the deposit, but the lack of grain size data induces uncertainty. In fact, fine sediment is the caliber usually associated with water quality, a subject which was apparently to be the focus of the report. In the end, the lack of information on sediment concentration prevented any significant analysis of water quality either in the reservoir or in the downstream reach."*

There will be no delta toe erosion if the reservoir is operated within the normal range of pool levels as discussed in the report and demonstrated in Figure 12. Toe erosion will occur if the reservoir is drawdown to a level beyond the normal range. Whether a turbidity current event will occur during such a drawdown event, however, is unknown as it will depend on the rate of drawdown, water discharge, and the grain size distribution of the sediment deposit. In addition, whether turbidity currents will occur during such a drawdown event is irrelevant to this report because high suspended sediment concentrations will occur under such drawdown events regardless of whether turbidity currents occur, as has been fully addressed in the report in Section 4.5. The relevant sentence is quoted here: "Due to the existence of fine-grained particles in the sediment deposit in Slab Creek Reservoir, a reservoir drawdown beyond the normal drawdown reservoir level will cause rapid remobilization and transport of the sediment deposit, and create high suspended sediment concentrations and turbidity levels regardless of whether the Development is being operated." As a result, no further revisions are provided with regard to the above comments.

> *"Overall, this report competently addresses issues of sedimentation in the lower part of Slab Creek Reservoir based on simplistic assumptions of sediment delivery from the upland basin and chronic processes of progradation to the lower reservoir. It crudely tackles issues related to turbidity in the reservoir under the assumption that sediment is not mobilized unless the existing delta deposit becomes sub-aerially exposed. It also presents a simplified view of the potential erosion of the reservoir's banks that suggests general stability. The life of the proposed pumping facility and general impacts to water quality could be more fully assessed with a combination of: 1) upland slope stability analysis; 2) episodic sediment delivery modeling under various extreme hydrologic scenarios; 3) grain size analysis of the reservoir sediments and their susceptibility to being suspended; and 4) modeling of the potential for turbidity currents in the delta deposit. But perhaps these are beyond the purview of the report."*

With regard to the comments numbered from 1) through 4):

1) We have added discussions with regard to potential changes in sediment production in the future.
2) See previous response.
3) Specific grain size information is not critical to our analysis as long as we know there is fine sediment in the deposit. This is because the model we used for the analysis is a simple mass conservation model that does not have any sediment transport dynamics components, which are often grain size dependent, as we responded to other comments earlier.
4) Similar to responses to comment 3) above, there are no sediment transport dynamics components in our model because the purpose of the report is not trying to understand the detailed dynamics of sediment transport. Thus, modeling of turbidity current is not necessary.

Again, we thank Dr. Singer for his careful review, insightful comments, and his confidence in our analysis.

2. Professor Andrew Wilcox's Comments

> *"Summary"*

> *"The report, the analyses it is based on, and the assumptions therein are sound. Existing data are assembled to evaluate the history of sedimentation and delta evolution in Slab Creek Reservoir, and a simple model of delta progradation is developed to predict the potential for sedimentation issues in the vicinity of the Iowa Hill Development's intake/outtake structure. The basic conclusion of the*

report is that the Development will not cause increased turbidity problems within the 100-year life of the project."

"The main deficiency of the draft report is the absence of any uncertainty analysis. The assumptions used in the analysis are for the most part reasonable, and some such assumptions are necessary in any analysis such as this one. A sensitivity analysis of several key assumptions should be added, however, and used to estimate the uncertainty associated with estimates of delta progradation. In particular, much of the analysis builds on assumptions about: 1) error in the 1992 bathymetric surveys (Section 4.2); and 2) the extent to which a single cross section can be considered representative for estimating reservoir sedimentation rates. These and other assumptions and the sensitivity of conclusions to various assumptions need additional justification and attention. Evaluation of uncertainties would strengthen this report and could be used to assist development of a monitoring and adaptive management program related to sedimentation of Slab Creek Reservoir and turbidity issues associated with the Iowa Hill Development."

We thank Professor Wilcox for his careful review. The comments with regard to the adjustment of 1992 bathymetric data and the use of a single cross sections are similar to Dr. Singer's, and thus, we will not repeat our responses here. We have added sensitivity analysis in the revised draft (see Section 4.4) in responses to Professor Wilcox's recommendations.

"Comments"

"Section 4.1"

"p. 6, paragraph 1, TSS: A figure showing a time series of TSS data, annotated with events such as reservoir fluctuations beyond the normal range and the 1997 landslide, would be helpful in terms of understanding current TSS conditions."

TSS data were collected only during the low flow season and had been low as discussed in the draft report, and no data were collected during winter storm events. We have revised the relevant sentences to be clearer.

"Section 4.2"

"More information on the submerged PG&E American River Intake Dam would be helpful, for example: 1) When was that structure built? 2) How high is it? 3) How far upstream of Slab Creek Dam is it? 4) How close is it to the Development's proposed intake/outtake structure? 5) Was its impoundment full of sediment by the time it was submerged, and if so, is it known how quickly it filled?"

We were unable to find any additional information with regard to the American River Intake Dam. Anecdotal account places the construction of the dam to the early 20th century (1900 –

1920). By the time of the construction of Slab Creek Dam in 1967, the Intake Dam would have operated for at least 40 years. Based on data presented in Table 1, there was approximately 230,000 yd^3 of sediment prior to 1967, assuming the Intake Dam was full of sediment. Using the rate of 30,000 yd3/yr estimated for the period of 1967 – 1992, it would have taken less than 8 years to completely fill the impoundment created by Intake Dam, and thus, an assumption that the Intake Dam was full of sediment at the time of Slab Creek Dam closure is reasonable. We did not add this discussion in our report because we do not have solid information with regard to when Intake Dam was constructed.

> *"The suggestion that discrepancies between the 1992 and 2007 bathymetries are a result of surveying errors, and the way this discrepancy is dealt with in the ensuing analysis (i.e., adjustment of the 1992 profile), is reasonable, especially in the downstream portion of the reservoir. The assumptions regarding this discrepancy underlie much of the subsequent analysis relating to reservoir sedimentation rates, delta progradation rates, and mechanisms of reservoir sedimentation. Because of the importance of the assumption of surveying error and of the 1992 profile adjustment, additional justification and sensitivity analysis are needed. How sensitive are the results to the 1992 profile adjustment? What if the surveying error applies to the whole profile, rather than only to the downstream portion of the reservoir (the report suggests that there is no discrepancy in the upstream end of the reservoir, where the delta deposit is)? If the 1992 error assumptions are wrong, then perhaps part of deltaic front area "B" may have formed after 1992, and there may be more sediment deposition downstream of the delta than suggested here. The report could highlight uncertainty better (and with an effective sensitivity analysis, illustrate the extent to which uncertainty, and in what parameters, may affect conclusions)."*

As a matter of fact, the 1992 profile adjustment does not affect the subsequent analyses because they are not dependent on the information from the 1992 profile (i.e., the simulated delta advancement was based on the accumulation rate estimated based on 1967 and 2007 profile). We have added remarks in the revised report to be clear. Question with regard to the detailed deposition profile downstream of the delta front is reasonable, and we have addressed that in the revised report in Section 4.4.

> *"Can any additional evidence (e.g., the 1999 survey, grain size data from the reservoir) be provided to support these assumptions? The 1999 survey is dismissed awfully quickly here. Are there any grain size data associated with the bathymetric surveys? If fine sediments are present on the bed in the downstream portion of the reservoir, this may indicate that deposition is not confined to the delta."*

As stated in the report, the 1999 survey data are only available in small-scale contour maps and do not provide any reliable information for our purposes.

> *"The statement that '…there has been minimal fine sediment deposition downstream of the deltaic front (p. 7)" is largely based on the surveying error assumption, and the adjusted bathymetry (Figure 9) is used to support the statement. I would suggest adding a clause such as ". . ., assuming our adjustment of the 1992 profile is accurate'."*

Revised as suggested.

> *"Section 4.3"*

> *"The report states that Slab Creek Reservoir "has a relatively consistent shape" to justify the use of a single cross section to estimate width-depth-area relationships, which are then used to estimate reservoir sedimentation rates. In Figure 6, however, the reservoir appears to narrow in an upstream direction. Further, the cross section used to determine a depth-area relationship is near the dam (0.5 miles upstream), whereas most deposition has occurred upstream, in the narrower portion of the reservoir. If one or more cross sections are available from the upstream portion of the reservoir, where sediment deposition is most active, incorporating those into the analysis may improve estimates of reservoir sedimentation rates and/or provide additional insight into uncertainties."*

The reservoir appear to narrow in the upstream direction because it becomes shallower in the upstream direction, which is consistent with our assumption (i.e., the deeper the reservoir the wider the assumed width, as shown in Figures 10 and 11). Using a single cross-section is necessary because buried pre-Slab Creek Dam cross-sections are not available (see responses to Dr. Singer's earlier comment for more detailed discussions).

> *"In Table 1, the order of the last 2 rows should be reversed, so that 1967-2007 is the last row of the table, as it is inclusive of 1992-2007."*

Revised as suggested.

> *"Section 4.4"*

> *"The analysis of advancement of the delta front does not appear to account for upstream propagation of the delta. The reduced energy gradient in the upstream end of Slab Creek Reservoir could cause upstream sediment deposition, especially of coarse sediment. Uncertainty in the 1992 and 2007 surveys may preclude conclusions about upstream sediment deposition, but field observations, coring, and aerial photograph analysis could provide insights. If some sediment deposition was occurring upstream, and/or increasing the topset slope of the delta, this could potentially reduce the rate of delta advance."*

Upstream progradation of the delta is accounted for, as demonstrated in Figure 14 and more clearly seen in Figure 15. The upstream progradation of the delta is associated with the slow and persistent aggradation of the topset of the delta deposit. Although the topset deposit should always have a concave profile (i.e., bed slope increases in the upstream direction, e.g., Cui et al. 1996, Cui et al. 2005), this is a short distance and the effect from the concavity is very minor, and a constant topset slope should provide adequate approximations, as demonstrated in Figures 12, 13, and 14.

> *"The numerical model predicting advance of the delta front assumes a constant sediment accumulation rate, which is reasonable as a first cut, but we know that sedimentation is episodic (e.g., in response to events like the 1997 landslide). Can model runs be completed to predict profiles resulting from time-varying sediment accumulation rates? The model also assumes that breakpoint elevations will remain 6' below normal drawdown pool levels. Further justification of this and sensitivity analysis of this and other model parameters would strengthen the analysis and provide insights into uncertainty levels."*

We agree with Professor Wilcox that sediment supply to the reservoir is episodic, and thus, the advancement of the delta will not follow exactly as demonstrated in Figures 14. The purpose of the analysis of the delta advancement, however, is to have a first-order estimate of whether the delta will be able to reach the Iowa Hill inlet/outlet structure during the life of the project. With that, we only need to predict where will be the most likely delta front location at the end of the project life (assumed to be 100 years), which renders the exact location of the delta front unnecessary to predict the final location after 100 years. Thus, we will not modify the model to run varying sediment supply conditions. The assumption of the location of the break point is not entirely arbitrary but rather relied on the 2007 survey profile. This assumption is validated with the comparison between the simulated and surveyed 2007 profile as shown in Figure 13.

> *"The modeling assumes a constant sedimentation rate for the next 150 years. Some discussion of trapping efficiency should be included. As reservoirs fill, trapping efficiency typically decreases (which would reduce sedimentation rates over time). Is the current trap efficiency known?"*

Revised as suggested (see the first paragraph in Section 4.4):

> *"Section 4.6"*

> *"'The amount of sediment that can be deposited within any 15-hour period is small.' This statement should be qualified with something like "… under normal hydrologic conditions." Events such as landslides can deposit substantial amounts in a short time—perhaps temporary reductions in reservoir fluctuations would be merited following such events."*

We have added some additional detailed discussion to be clear about the potential effect on suspended sediment from daily pool level fluctuation.

> *"In the final paragraph of this section, the analogy of a scour hole associated with the Development's outtake to scour holes below dams does not account for*

the difference in sediment supply between the two scenarios. Below dams, there is typically little or no sediment supply, whereas if an advancing delta reached the vicinity of the intake/outtake structure, it would potentially cause persistent sediment supply and associated turbidity issues."

Scour holes do not occur just downstream of dams. They occur in other places such as downstream of a weir that is not trapping sediment at all. This situation is not different from the case analyzed in the report because there will be sediment supply from the river upstream. Thus, no revisions were made with regard to this comment.

"Section 5"

"The analysis of slope stability is cursory. Although the general conclusion, that increased reservoir fluctuations may cause short-term slumping in unstable areas but no significant slope stability problems, may be valid, it is not well supported here. Have slope stability problems been documented at other reservoirs with frequent water surface fluctuations? How would increased reservoir fluctuations affect hillslope pore pressures (and thus failure potential)? Does the bathymetric data provide any insight on the amount of reservoir sedimentation resulting from bank slumping (rather than from upstream sediment supply) under current operating conditions?"

We have revised the section to address Professor Wilcox's comments. The discussion of slope stability at Slab Creek Reservoir was expanded in a number of ways. We performed a literature survey to determine if marginal slope stability is a frequent condition on reservoirs in similar geologic and topographic terrain. A reconnaissance of the reservoir was also performed, evaluating the existing geological structures, including existing rockfalls and debris flows. We added a discussion stability of the existing bank slopes with respect to pore pressure changes due to fluctuating water elevations. Finally, aerial photo and bathymetric map analyses were performed, looking for evidence of major, deep-seated areas of slope instability and/or mass wasting, but none were identified along Slab Creek Reservoir.

"Other comments"

"Sometimes word choice indicates too much certainty. For example, 'suggesting' would be more appropriate than 'indicating' in the last paragraph of page 8, after 2nd Snydor 1997 citation."

Revised as suggested at six different locations.

"The footers showing page numbers are inconsistent: e.g., Page 6 of 14 is followed by Page 7 of 16."

Corrected as suggested.

We thank Professor Wilcox for his careful review and insightful comments.

3. Professor Leonard Sklar's comments

> *"(1) Overall, the report is a highly credible, professional treatment of the questions. The analysis is clearly described, the assumptions and rationale are well supported, and the calculations appear to be correct and reliable. This is a first-rate piece of work. I would concur with the primary conclusions of the analysis: a) water level fluctuations associated with operation of the Iowa Hill pumped-storage facility will not cause erosion of the sediment delta and associated increases in turbidity so long as the water surface is maintained above the normal drawdown pool level of 1815 ft; b) increases in turbidity associated with increased reservoir bank erosion due to enhanced water-surface fluctuations will be short-lived because bank conditions will rapidly equilibrate to the new operational regime; and c) the intake structure cannot be submerged by the prograding sediment delta until a threshold deposit volume has been reached, after a time period that depends on the rate of sediment supply to the reservoir (40 years assuming 38,000 yds3/yr)."*

We thank Professor Sklar for his careful review and confidence of our analysis.

> *"(2) My primary concern is that over the 100-year life of the project, climate change is very likely to significantly alter the hydrologic and sediment supply conditions, possibly resulting in more frequent low water-surface elevation events and increased rates of sediment delivery to the reservoir. The best scientific studies to-date predict a dramatic decrease in snowfall and snowpack accumulation, with a shift to dominantly rainfall precipitation (e.g. Hahoe et al., 2005; Mote et al., 2004), an increase in inter-annual variability in precipitation, with more frequent and intense droughts (e.g. Cayan, 1996; Dettinger et al., 2004), and an increase in frequency of intense rainfall events, and associated landsliding hazards (e.g. Miller, et al., 2003). I would consider it prudent, at the very least, to consider the sensitivity of the report's conclusions to changes in the assumed sediment supply rate. For example, if average annual sediment supply in the coming decades is better represented by the more recent period including the 1997 Highway 50 landslide (i.e. 52,000 yds3/yr), then the date of earliest submergence of the proposed intake structure would be 2037, assuming no significant reworking of the delta deposit. Even greater rates of sediment delivery due to continued activation of deepseated landslides (e.g. Reid et al., 2003) upstream of the reservoir are within a reasonable range of possible values. In addition to considering uncertainty in sediment supply rates, the risk of a hydrologically-forced reservoir drawdown event could be estimated with simulations of climate change impacts on management scenarios for UARP. Although such simulations are probably beyond the scope of the present turbidity analysis, I hope and assume that SMUD is separately conducting such analyses of potential climate change impacts on UARP operations and may be able to*

combine these with the turbidity analysis without undue effort. Focusing narrowly on the potential impacts of the Iowa Hill Development, it is possible that continued operation of the pumped storage facility during low pool events would enhance the rate of erosion of the exposed delta, having the effect of reducing the tolerable period of low water surface elevation."

"(3) References cited:

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Mote, P.W., Hamlet, A.F., Clark, M.P., and Lettenmaier, D.P. 2005. Declining mountain snowpack in western North America. Bulletin of the American Meteorological Society, January 2005: 39-49.

Reid, M.E., Brien, D.L., LaHusen, R.G., Roering, J.J., de la Fuenta, J., and Ellen, S.D. 2003. Debris flow initiation from large, slow-moving landslides. In Debris-Flow Hazards Mitigation: Mechanics, Prediction and Assessment, Richenmann and Chen (eds), Millpress, Rotterdam, pp. 155-166."

We have added a sensitivity run in Section 4.4 that increased the sediment accumulation rate by 50% to address the uncertainties in future sediment supply.

We thank Professor Sklar for his careful review and insightful comments.

Appendix C - Recorded Nephelometric Turbidity Units (NTUs) for the Summer of 2007

- **South Fork American River at Camino Powerhouse**
- **South Fork American River Immediately Downstream of Slab Creek Reservoir**
- **White Rock Powerhouse Tailrace (water drawn from Slab Creek Reservoir near the bottom of the reservoir)**

Sacramento Municipal Utility District
2007 Turbidity Measurements in Nephelometric Turbidity Units (NTU)
South American at Camino PH

Raw data as reported by field sensor, see notes at bottom

Date	Daily summary			Hourly Data																							
	Min	Mean	Max	0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300
6/1/2007	#N/A	#N/A	#N/A																								
6/2/2007	#N/A	#N/A	#N/A																								
6/3/2007	#N/A	#N/A	#N/A																								
6/4/2007	#N/A	#N/A	#N/A																								
6/5/2007	#N/A	#N/A	#N/A																								
6/6/2007	#N/A	#N/A	#N/A																								
6/7/2007	#N/A	#N/A	#N/A																								
6/8/2007	#N/A	#N/A	#N/A																								
6/9/2007	#N/A	#N/A	#N/A																								
6/10/2007	#N/A	#N/A	#N/A																								
6/11/2007	#N/A	#N/A	#N/A																								
6/12/2007	#N/A	#N/A	#N/A																								
6/13/2007	#N/A	#N/A	#N/A																								
6/14/2007	#N/A	#N/A	#N/A																								
6/15/2007	#N/A	#N/A	#N/A																								
6/16/2007	#N/A	#N/A	#N/A																								
6/17/2007	#N/A	#N/A	#N/A																								
6/18/2007	#N/A	#N/A	#N/A																								
6/19/2007	#N/A	#N/A	#N/A																								
6/20/2007	#N/A	#N/A	#N/A																								
6/21/2007	#N/A	#N/A	#N/A														1.3	1.3	1.1	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.3	1.2	1.2
6/22/2007	.9	1.1	1.2	1.2	1.0	.9	1.0	1.0	1.0	1.0	1.0	1.0	1.2	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.0	1.0	1.0	1.2	1.2	1.0
6/23/2007	1.0	1.1	1.2	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.2	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.0	1.2	1.0	1.2	1.2	1.0
6/24/2007	.9	1.0	1.1	.9	.9	.9	.9	.9	.9	.9	.9	.9	1.1	1.1	1.1	1.0	1.0	1.1	1.1	1.0	1.1	1.1	1.1	1.1	1.1	1.1	1.0
6/25/2007	.9	1.0	1.1	1.0	.9	.9	.9	.9	.9	.9	.9	.9	1.1	1.0	1.0	1.0	1.0	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	.9
6/26/2007	.8	1.0	1.1	.9	.9	.9	.9	.9	.9	.9	.8	.8	1.1	.9	.9	.9	.9	1.1	.9	.9	.9	.9	.9	.9	.9	1.1	.9
6/27/2007	.8	.9	1.1	.9	.9	.9	.8	.8	.8	.8	.8	.8	1.1	1.1	1.1	.9	.9	1.1	1.1	1.1	.9	.9	.9	.9	.9	1.1	.8
6/28/2007	.8	.9	1.1	.8	.8	.8	.8	.8	.8	.8	.8	.8	1.1	.9	.9	.9	.9	.9	.9	.9	.9	.9	1.1	1.1	1.1	1.1	.9
6/29/2007	.8	.9	1.0	.8	.8	.8	.8	.8	.8	.8	.8	.8	1.0	.9	.9	.9	.9	.9	.9	.9	.9	.9	.9	.9	.9	.9	.8
6/30/2007	.8	.9	1.0	.8	.8	.8	.8	.8	.8	.8	.8	.8	1.0	.9	.9	.9	.9	.9	.9	.9	.9	.9	.9	.9	.9	.9	.9
7/1/2007	.8	.9	1.0	.8	.8	.8	.8	.8	.8	.8	.8	.8	1.0	.9	.9	.9	.9	.9	.9	.9	.9	.9	.9	.9	.9	.9	.8
7/2/2007	.8	.9	1.1	.8	.8	.8	.8	.8	.8	.8	.8	.8	1.1	.9	.9	.9	.9	.9	.9	.9	.9	.9	.9	.9	.9	1.1	.9
7/3/2007	.8	.9	1.1	.8	.8	.8	.8	.8	.8	.8	.8	.8	1.1	.9	.9	.9	.9	.9	.9	.9	.9	.9	.9	.9	.9	.9	.9
7/4/2007	.7	.8	1.2	.8	.8	.8	.8	.8	.8	.8	.8	.8	1.2	1.0	.9	.8	.8	.8	.8	.8	.7	.7	.7	.7	.7	.7	.7
7/5/2007	.6	.7	.8	.7	.7	.7	.7	.7	.7	.7	.7	.7	.6	.6	.6	.6	.6	.8	.8	.8	.8	.8	.8	.6	.6	.6	.6
7/6/2007	.5	.7	.8	.5	.5	.5	.5	.5	.5	.5	.5	.6	.6	.6	.6	.6	.7	.7	.8	.8	.8	.8	.8	.8	.8	.8	.8
7/7/2007	.8	.8	.8	.8	.8	.8	.8	.8	.8	.8	.8	.8	.8	.8	.8	.8	.8	.8	.8	.8	.8	.8	.8	.8	.8	.8	.8
7/8/2007	.7	.7	.8	.8	.8	.8	.8	.8	.8	.8	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7
7/9/2007	.7	.8	1.0	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	1.0	1.0	.9	.9	1.0	1.0	1.0	1.0	.9
7/10/2007	.7	.9	1.0	.9	.9	.9	.9	.9	.9	.9	.9	.8	.9	1.0	1.0	.9	.9	1.0	1.0	1.0	.9	.9	.9	.7	.9	.9	.9
7/11/2007	.7	1.7	3.4	.7	.7	.7	.7	.7	.7	.7	.7	.7	.9	.9	3.2	3.4	3.0	2.4	2.0	2.2	2.7	2.5	2.6	2.6	2.4	2.3	1.5
7/12/2007	.9	1.1	1.5	1.5	1.3	1.2	1.2	1.0	1.0	.9	.9	.9	.9	.9	1.0	1.0	.9	1.0	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.1
7/13/2007	.7	.9	1.1	1.1	1.0	1.0	.9	.9	.9	.7	.7	.7	.7	.7	.8	.8	.9	.9	.9	.9	1.0	1.1	1.0	1.0	1.0	.9	1.0
7/14/2007	.6	.8	.9	.9	.8	.8	.8	.8	.8	.8	.6	.6	.6	.6	.6	.8	.8	.8	.9	.9	.9	.9	.9	.9	.9	.9	.8

Sacramento Municipal Utility District
2007 Turbidity Measurements in Nephelometric Turbidity Units (NTU)
South American at Camino PH

Raw data as reported by field sensor, see notes at bottom

Date	Daily summary			Hourly Data																							
	Min	Mean	Max	0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300
7/15/2007	.6	.7	.8	.7	.7	.7	.7	.7	.7	.7	.7	.6	.6	.6	.6	.6	.6	.6	.8	.8	.8	.8	.8	.8	.8	.8	.8
7/16/2007	.6	.8	1.0	.8	.6	.6	.6	.6	.6	.6	.6	.6	.6	1.0	1.0	.9	.9	.9	.9	1.0	1.0	.9	.9	1.0	1.0	1.0	.8
7/17/2007	.8	.9	1.0	.8	.9	.8	.8	.8	.8	.8	.8	.8	1.0	1.0	.9	.9	.9	.9	.9	.9	.9	.9	.8	.8	.9	.9	.8
7/18/2007	.7	.8	.8	.8	.8	.8	.8	.8	.8	.8	.8	.7	.8	.8	.8	.8	.8	.8	.8	.8	.8	.8	.8	.8	.8	.8	.8
7/19/2007	.7	.8	1.0	.8	.8	.8	.8	.7	.7	.7	.7	.9	1.0	1.0	1.0	.9	.9	.9	.9	.9	.9	.9	.9	.9	.9	.9	.9
7/20/2007	.6	.7	.9	.9	.9	.9	.9	.9	.7	.7	.7	.7	.7	.9	.9	.7	.7	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6
7/21/2007	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6
7/22/2007	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6
7/23/2007	.6	.7	2.4	.6	.6	.6	.6	.6	.6	.6	.6	.7	.7	2.4	.7	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.7
7/24/2007	.6	.6	.7	.6	.7	.6	.6	.6	.6	.7	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6
7/25/2007	.6	.6	.8	.6	.8	.6	.6	.6	.6	.6	.6	.6	.6	.7	.7	.7	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.7
7/26/2007	.6	.6	.7	.6	.6	.6	.6	.6	.6	.7	.7	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6
7/27/2007	.6	.6	.7	.6	.6	.6	.6	.6	.6	.6	.7	.7	.7	.7	.7	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6
7/28/2007	.6	.6	.7	.6	.6	.6	.6	.7	.7	.7	.7	.7	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.7
7/29/2007	.6	.6	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.7
7/30/2007	.6	.6	.7	.6	.7	.7	.6	.7	.7	.7	.7	.6	.7	.7	.7	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6
7/31/2007	.6	.6	.7	.6	.6	.7	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6
8/1/2007	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6
8/2/2007	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6
8/3/2007	.5	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.5	.6	.6	.6
8/4/2007	.6	.6	.7	.6	.6	.6	.6	.6	.6	.7	.7	.7	.7	.7	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6
8/5/2007	.5	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.5	.5	.5	.5	.5	.6	.6
8/6/2007	.5	.6	.6	.6	.6	.6	.5	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6
8/7/2007	.6	.6	.9	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.9	.6	.6	.7	.7	.8	.7	.7	.7	.6	.6	.6	.6
8/8/2007	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6
8/9/2007	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6
8/10/2007	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6
8/11/2007	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6
8/12/2007	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6
8/13/2007	.5	.6	1.2	.6	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.6	.6	1.2	.6	.6	.6	.6
8/14/2007	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6
8/15/2007	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6
8/16/2007	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6
8/17/2007	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6
8/18/2007	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6
8/19/2007	.5	.6	.6	.6	.5	.6	.5	.5	.5	.6	.6	.6	.6	.5	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6
8/20/2007	.5	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.5	.5	.5	.5	.5	.5	.5	.5	.6	.6	.6	.6	.6
8/21/2007	.5	.5	.6	.6	.6	.6	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.6	.6	.6	.6	.6
8/22/2007	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6
8/23/2007	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6
8/24/2007	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6
8/25/2007	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6
8/26/2007	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6
8/27/2007	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6

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Date	Daily summary			Hourly Data																							
	Min	Mean	Max	0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300
8/28/2007	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6
8/29/2007	.5	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.5
8/30/2007	.5	.6	.6	.6	.6	.5	.5	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6
8/31/2007	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6
9/1/2007	.6	.6	.7	.6	.6	.6	.7	.7	.6	.7	.7	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6
9/2/2007	.6	.6	.7	.6	.6	.6	.6	.6	.6	.6	.7	.7	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6
9/3/2007	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6
9/4/2007	.5	.6	.6	.5	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.5	.5	.5	.5	.5	.5	.5
9/5/2007	.5	.6	.6	.5	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6
9/6/2007	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6
9/7/2007	.5	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.5	.5	.6	.6	.6	.6	.6	.5	.5	.5	.5	.6	.6	.6	.6
9/8/2007	.5	.5	.6	.5	.5	.5	.6	.5	.5	.5	.6	.5	.5	.5	.6	.6	.6	.6	.5	.6	.6	.5	.5	.5	.6	.5	.6
9/9/2007	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6
9/10/2007	.5	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.5	.5	.5	.5	.6	.6	.6
9/11/2007	.5	.6	.6	.5	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6
9/12/2007	.5	.6	.6	.6	.5	.5	.5	.5	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6
9/13/2007	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6
9/14/2007	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6
9/15/2007	.5	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.5	.5	.6	.6	.6	.6
9/16/2007	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6
9/17/2007	.5	.5	.6	.6	.6	.6	.6	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5
9/18/2007	.5	1.3	12.7	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.6	.6	2.0	12.7	1.8	1.2	1.1	1.0	1.0	.9	.9	.9
9/19/2007	.9	1.2	1.9	.9	1.1	1.0	1.4	1.0	1.0	1.0	1.0	.9	1.9	1.7	1.4	1.4	1.3	1.3	1.1	1.1	1.1	1.1	1.1	1.3	1.1	1.1	1.0
9/20/2007	1.0	1.0	1.3	1.0	1.1	1.0	1.0	1.0	1.0	1.1	1.3	1.1	1.1	1.0	1.0	1.0	1.0	1.0	1.0	1.1	1.0	1.0	1.0	1.0	1.0	1.0	1.0
9/21/2007	.9	1.0	1.2	1.0	1.2	1.0	1.0	.9	1.0	1.0	1.0	.9	.9	.9	.9	.9	.9	.9	.9	.9	.9	.9	.9	.9	.9	.9	.9
9/22/2007	.8	.9	.9	.9	.9	.9	.9	.9	.9	.9	.9	.9	.9	.9	.9	.9	.9	.9	.9	.8	.8	.8	.8	.8	.8	.8	.8
9/23/2007	.8	.8	.9	.9	.9	.9	.9	.9	.9	.9	.9	.9	.9	.9	.9	.9	.9	.9	.9	.8	.8	.8	.8	.8	.8	.8	.8
9/24/2007	.8	.8	.8	.8	.8	.8	.8	.8	.8	.8	.8	.8	.8	.8	.8	.8	.8	.8	.8	.8	.8	.8	.8	.8	.8	.8	.8
9/25/2007	.7	.8	.8	.8	.8	.8	.8	.8	.8	.8	.8	.7	.8	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.8	.8	.8
9/26/2007	.7	.8	.8	.8	.8	.8	.8	.8	.8	.8	.8	.7	.7	.8	.8	.7	.7	.7	.7	.7	.8	.7	.8	.8	.8	.8	.8
9/27/2007	.7	.8	.8	.8	.8	.8	.8	.8	.8	.8	.8	.8	.8	.8	.8	.8	.8	.8	.8	.8	.8	.8	.8	.8	.7	.7	.7
9/28/2007	.7	.7	.8	.7	.7	.7	.7	.7	.8	.8	.8	.8	.8	.8	.8	.8	.8	.8	.8	.7	.7	.7	.7	.7	.7	.7	.7
9/29/2007	.8	.8	1.0	.8	.8	.8	.8	.8	1.0	1.0	1.0	.9	.9	.8	.8	.8	.8	.8	.8	.8	.8	.8	.8	.8	.8	.8	.8
9/30/2007	.7	.7	.8	.8	.8	.8	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7
10/1/2007	.5	.7	1.6	.7	.7	.7	.7	.7	.7	.7	.7	.7	1.6	1.0	.8	.8	.7	.6	.6	.6	.6	.6	.6	.6	.6	.5	.5
10/2/2007	.5	.6	.7	.5	.5	.5	.5	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.7	.7	.7	.7	.7	.7	.7	.7	.7
10/3/2007	.5	.6	.6	.6	.6	.6	.6	.6	.6	.5	.5	.6	.5	.5	.5	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6
10/4/2007	.5	.5	.6	.6	.6	.6	.6	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.6	.6	.6	.6
10/5/2007	.6	.6	.7	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.7	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6
10/6/2007	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6
10/7/2007	.5	.5	.6	.6	.6	.6	.6	.5	.5	.5	.5	.5	.5	.5	.5	.6	.6	.6	.6	.6	.6	.6	.6	.5	.5	.5	.5
10/8/2007	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5
10/9/2007	.4	.5	.6	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.4	.6	.4	.6	.4	.6
10/10/2007	.6	.7	1.6	.6	.6	.6	.6	.6	.6	.7	1.6	.9	.7	.7	.7	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6

Sacramento Municipal Utility District
2007 Turbidity Measurements in Nephelometric Turbidity Units (NTU)
South American at Camino PH

Raw data as reported by field sensor, see notes at bottom

Date	Daily summary			Hourly Data																							
	Min	Mean	Max	0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300
10/11/2007	.6	.7	.8	.6	.6	.6	.6	.7	.7	.7	.7	.8	.8	.8	.8	.8	.8	.7	.7	.7	.7	.6	.6	.6	.6	.7	.6
10/12/2007	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6
10/13/2007	.5	.5	.6	.6	.6	.6	.6	.6	.6	.6	.6	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5
10/14/2007	.5	.5	.6	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.6	.6	.6	.6	.6	.6	.6	.6	.5	.5	.5	.5	.5	.5
10/15/2007	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5
10/16/2007	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5
10/17/2007	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5
10/18/2007	.5	.5	.6	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.6	.6	.6	.5	.6	.5	.6	.5	.5	.5	.5	.5
10/19/2007	.5	.5	.7	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.6	.7
10/20/2007	.6	1.2	2.6	.6	.6	.6	.6	.6	.6	.7	.7	.9	.9	1.0	1.1	1.3	1.3	1.3	1.3	1.5	1.6	1.5	1.5	1.3	1.5	2.1	2.6
10/21/2007	1.6	2.7	5.0	3.3	4.9	5.0	4.8	4.5	4.0	3.4	3.1	3.0	2.8	2.5	2.4	2.2	1.9	1.8	1.8	1.9	1.8	1.7	1.8	1.7	1.6	1.6	1.6
10/22/2007	.8	1.0	1.4	1.4	1.3	1.3	1.3	1.3	1.2	1.3	1.2	1.2	1.0	1.0	1.0	1.0	.9	.9	.9	.8	.8	.8	.8	.8	.8	.8	.8
10/23/2007	.6	.7	.8	.8	.8	.8	.8	.8	.8	.8	.8	.7	.7	.7	.7	.7	.7	.7	.6	.6	.6	.6	.6	.6	.6	.6	.6
10/24/2007	#N/A	#N/A	#N/A	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.8													

Notes: *Start-up of Camino monitor was delayed approximately a month due to repairs needed to the intake line. In operation on 6-21-07.*

Maximum was 12.7 (ntu) on 9-18-07 at 1500 hour.

Sacramento Municipal Utility District
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South American at Slab Creek PH

Raw data as reported by field sensor, see notes at bottom

Date	Daily summary			Hourly Data																							
	Min	Mean	Max	0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300
5/1/2007																											
5/2/2007																											
5/3/2007																											
5/4/2007																											
5/5/2007																											
5/6/2007																											
5/7/2007																											
5/8/2007																											
5/9/2007																											
5/10/2007																											
5/11/2007																											
5/12/2007																											
5/13/2007																											
5/14/2007																											
5/15/2007																											
5/16/2007																											
5/17/2007																											
5/18/2007																											
5/19/2007																											
5/20/2007																											
5/21/2007																											
5/22/2007																											
5/23/2007																											
5/24/2007																		.8	1.1	1.2	1.8	1.4	1.4	1.4	1.5	1.2	1.1
5/25/2007	.9	1.1	1.4	1.1	1.1	1.1	1.2	1.1	1.1	1.1	1.1	1.2	.9	1.0	1.0	1.1	.9	1.1	1.1	1.1	.9	1.2	1.2	1.4	1.4	1.4	1.2
5/26/2007	.9	1.1	1.2	1.2	1.2	1.2	1.1	1.2	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	.9	1.1	1.1	1.1	1.1	1.2	1.2
5/27/2007	1.1	1.1	1.2	1.2	1.2	1.2	1.1	1.2	1.1	1.2	1.2	1.1	1.1	1.1	1.2	1.1	1.1	1.1	1.2	1.1	1.1	1.1	1.1	1.1	1.1	1.2	1.1
5/28/2007	.9	1.1	1.2	1.1	1.2	1.1	.9	1.1	1.1	1.0	1.1	1.1	1.1	1.1	1.0	1.0	1.0	1.1	1.1	1.1	1.1	1.1	1.2	1.1	1.1	1.1	1.2
5/29/2007	.9	1.1	1.2	1.2	1.1	1.0	1.1	.9	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.2	1.1	1.1	1.1	.9	1.1	1.1	1.1	1.1	1.1	1.1	1.1
5/30/2007	1.0	1.1	1.4	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.2	1.1	1.4	1.1	1.1	1.0	1.1	1.2	1.1	1.2	1.4	1.1	1.1	1.2	1.1	1.1
5/31/2007	.9	1.1	1.4	1.2	1.1	1.2	1.2	1.1	1.2	1.2	1.2	1.1	1.1	1.1	1.2	1.1	1.2	1.4	1.0	1.0	1.2	1.1	1.1	.9	1.2	1.1	1.1
6/1/2007	.9	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	.9	.9	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
6/2/2007	.9	1.1	1.2	.9	1.1	1.1	1.2	1.1	1.1	1.1	1.1	1.0	1.1	1.0	1.1	1.1	1.2	1.1	1.1	1.1	1.1	1.1	1.1	1.2	1.2	1.1	1.1
6/3/2007	.9	1.1	1.4	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.0	1.1	.9	1.0	1.0	1.1	1.4	1.2	1.1	1.1	1.1	1.1	1.1
6/4/2007	.9	1.1	1.2	1.1	1.1	1.1	1.1	1.1	.9	1.1	1.1	.9	.9	1.0	1.0	1.0	1.1	1.1	1.2	1.0	1.1	1.2	1.1	1.2	1.2	1.0	1.0
6/5/2007	.8	.8	1.0	1.0	.8	.8	.9	.9	.8	1.0	.8	.8	.8	.8	.8	.8	.8	.8	1.0	.8	.8	.8	.8	.8	.8	.8	.8
6/6/2007	.7	.8	.8	.8	.8	.8	.8	.8	.8	.8	.8	.8	.8	.8	.8	.8	.8	.8	.8	.7	.7	.8	.8	.8	.8	.8	.8
6/7/2007	.8	.9	1.1	.8	.8	.8	.8	.8	.8	.8	1.0	1.0	1.0	1.0	1.0	1.1	1.0	1.0	.8	.8	.8	1.0	1.0	1.0	.8	.8	1.0
6/8/2007	.7	.8	1.0	.8	.8	.8	.8	.8	.8	.8	.8	.8	.8	.8	.7	.7	.7	.7	.7	.7	.7	.7	.9	.9	.9	1.0	.8
6/9/2007	.7	.7	1.0	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.8	1.0	1.0	1.0	.8
6/10/2007	.7	.7	.9	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.8	.9	.9	.9	.9	.9
6/11/2007	.7	.9	1.4	.9	.8	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	1.2	1.1	1.1	1.1	1.1	1.4	1.4	1.4	1.2	1.2
6/12/2007	.8	.9	1.2	1.2	1.1	.8	.8	.8	.8	.8	.8	.8	.8	.8	.8	.8	.8	.8	.8	.8	1.2	1.0	1.0	1.0	1.0	1.0	1.0
6/13/2007	.7	.8	.9	.8	.8	.8	.8	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.8	.9	.9	.9	.9	.9	.9

Sacramento Municipal Utility District
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Date	Daily summary			Hourly Data																							
	Min	Mean	Max	0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300
6/14/2007	.8	.9	1.1	.9	.9	1.0	1.0	1.1	1.0	.8	.8	.8	.8	.8	.8	.8	.8	.8	.9	1.0	.9	.9	.9	.9	1.1	1.1	1.1
6/15/2007	.8	.9	1.2	1.1	1.1	1.1	1.2	1.2	1.1	1.0	.8	.8	.8	.8	.8	.8	.8	.8	.8	.8	.8	.8	.8	.8	.8	.8	.8
6/16/2007	.7	.7	.8	.7	.7	.7	.8	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7
6/17/2007	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5
6/18/2007	.4	.6	.7	.5	.5	.6	.6	.6	.6	.6	.6	.5	.5	.5	.5	.5	.5	.4	.7	.7	.7	.7	.7	.7	.7	.7	.7
6/19/2007	.5	.6	.7	.7	.7	.7	.7	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5
6/20/2007	.5	1.4	3.6	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	2.9	2.1	2.9	2.3	2.8	2.1	2.8	2.9	2.9	3.6
6/21/2007	1.6	2.2	3.5	3.5	2.8	3.3	3.3	2.3	2.1	2.1	1.8	1.9	1.8	2.1	1.9	2.3	2.6	2.1	2.5	2.2	1.6	1.8	1.8	2.2	2.1	1.8	2.1
6/22/2007	1.4	1.6	2.1	2.1	1.8	1.9	1.8	1.7	1.5	1.4	1.4	1.7	1.5	1.4	1.5	1.5	1.8	1.7	1.8	1.5	1.6	1.8	1.8	1.5	1.6	1.5	1.5
6/23/2007	1.4	1.6	1.9	1.6	1.7	1.7	1.7	1.5	1.5	1.5	1.4	1.5	1.5	1.5	1.7	1.8	1.5	1.5	1.9	1.8	1.6	1.5	1.4	1.5	1.5	1.4	1.5
6/24/2007	1.4	1.5	1.7	1.5	1.5	1.5	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.5	1.5	1.7	1.5	1.5	1.4	1.5	1.4	1.4	1.4	1.5	1.5	1.5
6/25/2007	1.2	1.4	1.9	1.4	1.2	1.2	1.2	1.2	1.2	1.4	1.4	1.4	1.2	1.5	1.5	1.5	1.5	1.4	1.4	1.9	1.5	1.5	1.4	1.2	1.4	1.4	1.4
6/26/2007	1.0	1.2	1.4	1.2	1.2	1.1	1.0	1.0	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.0	1.1	1.4	1.4	1.4	1.3	1.4	1.4	1.4	1.4
6/27/2007	1.0	1.1	1.5	1.2	1.2	1.4	1.1	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.2	1.1	1.1	1.2	1.4	1.5	1.4	1.5	1.4
6/28/2007	1.0	1.2	1.4	1.4	1.4	1.4	1.0	1.0	1.0	1.0	1.0	1.0	1.1	1.0	1.0	1.1	1.0	1.0	1.0	1.4	1.2	1.2	1.4	1.4	1.4	1.4	1.4
6/29/2007	1.0	1.1	1.4	1.2	1.2	1.2	1.0	1.0	1.0	1.0	1.1	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.2	1.2	1.2	1.4	1.4	1.2	1.2
6/30/2007	.8	1.0	1.4	1.2	1.1	1.0	1.0	1.0	1.0	.8	1.0	1.0	1.0	1.0	1.0	1.0	1.0	.8	.8	1.0	1.2	1.4	1.2	1.2	1.2	1.1	1.1
7/1/2007	.8	1.1	1.2	1.2	1.2	1.1	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	.8	.8	1.0	1.0	.8	1.0	1.2	1.2	1.2	1.2	1.2	1.2	1.2
7/2/2007	.6	1.3	1.8	1.2	1.2	1.2	1.2	1.1	1.1	1.1	1.0	1.0	1.0	1.0	1.0	1.1	.6	1.5	1.5	1.5	1.5	1.5	1.6	1.8	1.6	1.7	1.8
7/3/2007	1.2	1.7	2.6	1.7	1.8	1.8	1.7	1.4	1.4	1.5	1.4	1.5	1.4	1.4	1.2	1.4	1.8	2.6	2.3	2.1	1.9	1.8	1.6	1.6	1.6	1.5	1.5
7/4/2007	1.1	1.4	1.6	1.5	1.5	1.2	1.4	1.4	1.4	1.2	1.1	1.1	1.1	1.1	1.4	1.2	1.5	1.5	1.4	1.5	1.5	1.4	1.4	1.2	1.6	1.4	1.4
7/5/2007	1.0	1.2	1.4	1.2	1.2	1.1	1.4	1.1	1.2	1.1	1.1	1.1	1.2	1.2	1.2	1.1	1.0	1.1	1.2	1.4	1.4	1.4	1.2	1.4	1.4	1.2	1.1
7/6/2007	1.1	1.2	2.1	1.2	1.2	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	2.1	1.1	1.1	1.1	1.1	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
7/7/2007	1.0	1.1	1.4	1.1	1.1	1.1	1.0	1.1	1.0	1.1	1.1	1.1	1.0	1.1	1.1	1.1	1.1	1.4	1.1	1.0	1.1	1.0	1.0	1.0	1.0	1.1	1.0
7/8/2007	1.0	1.1	1.2	1.0	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.2	1.2	1.2	1.2	1.1	1.1	1.0	1.0	1.0	1.0
7/9/2007	.9	1.2	1.8	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	.9	.9	1.8	1.5	1.4	1.6	1.6	1.5	1.4	1.2	1.4	1.4	1.2
7/10/2007	1.1	1.2	1.4	1.2	1.4	1.2	1.2	1.1	1.1	1.1	1.1	1.2	1.1	1.2	1.2	1.1	1.4	1.2	1.2	1.1	1.1	1.4	1.4	1.2	1.2	1.4	1.4
7/11/2007	1.2	1.5	1.8	1.4	1.2	1.4	1.5	1.5	1.6	1.5	1.5	1.5	1.5	1.5	1.6	1.5	1.6	1.5	1.5	1.6	1.8	1.6	1.5	1.4	1.4	1.5	1.2
7/12/2007	1.2	1.5	1.8	1.4	1.2	1.4	1.5	1.4	1.5	1.5	1.5	1.4	1.5	1.4	1.5	1.5	1.6	1.6	1.5	1.5	1.8	1.6	1.6	1.6	1.6	1.6	1.6
7/13/2007	1.2	1.5	1.6	1.6	1.6	1.6	1.5	1.5	1.4	1.4	1.5	1.2	1.5	1.4	1.6	1.4	1.4	1.2	1.4	1.6	1.6	1.6	1.5	1.6	1.6	1.4	1.4
7/14/2007	1.2	1.4	1.6	1.4	1.4	1.4	1.4	1.4	1.2	1.2	1.4	1.2	1.2	1.4	1.4	1.6	1.4	1.4	1.4	1.6	1.5	1.6	1.6	1.6	1.5	1.4	1.5
7/15/2007	1.2	1.4	1.5	1.4	1.5	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.2	1.4	1.5	1.4	1.2	1.2	1.5	1.5	1.3	1.3	1.3	1.5	1.5	1.4
7/16/2007	.5	1.2	1.6	1.4	1.5	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.2	1.4	1.4	1.2	1.2	1.4	1.6	1.5	1.6	.5	.5	.5	.5	.5	.7
7/17/2007	.3	.9	1.2	.5	.7	.7	.7	.7	.7	.3	1.1	1.2	1.2	1.1	1.1	1.1	1.1	1.1	1.1	.9	1.1	1.1	1.1	1.1	1.0	.4	.5
7/18/2007	.5	1.4	1.8	.5	.5	1.2	1.2	1.2	.7	1.1	1.2	1.2	1.2	1.1	1.7	1.6	1.6	1.6	1.6	1.6	1.6	1.8	1.6	1.5	1.5	1.6	1.5
7/19/2007	1.2	1.4	1.6	1.5	1.4	1.4	1.4	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.6	1.5	1.6	1.6	1.6	1.6	1.6	1.5	1.4	1.6	1.5
7/20/2007	1.1	1.4	1.6	1.4	1.4	1.2	1.2	1.4	1.2	1.1	1.2	1.4	1.2	1.4	1.4	1.4	1.2	1.1	1.5	1.6	1.6	1.6	1.6	1.6	1.5	1.6	1.4
7/21/2007	.9	1.4	1.8	1.4	1.4	1.2	1.4	1.4	1.2	1.4	1.4	1.2	1.4	1.2	1.5	1.2	.9	1.1	.9	1.2	1.5	1.5	1.5	1.5	1.6	1.6	1.8
7/22/2007	1.2	1.5	2.0	1.5	1.4	1.5	1.4	1.4	1.5	1.4	1.5	1.4	1.4	1.5	1.2	1.4	1.4	1.4	1.6	1.6	1.5	1.6	1.8	1.6	1.8	1.8	2.0
7/23/2007	1.2	1.6	2.0	1.9	1.9	1.6	1.6	1.8	1.6	1.6	1.8	1.6	1.8	1.6	1.5	1.5	1.5	1.2	1.2	1.5	2.0	1.6	1.5	1.6	1.6	1.5	1.6
7/24/2007	1.1	1.3	1.6	1.6	1.4	1.5	1.4	1.4	1.4	1.4	1.4	1.2	1.4	1.4	1.4	1.4	1.2	1.2	1.2	1.2	1.1	1.1	1.4	1.4	1.4	1.4	1.4
7/25/2007	.8	1.2	1.8	1.4	1.4	1.2	1.2	1.2	1.2	1.2	1.1	1.2	1.1	1.2	1.2	1.2	1.2	1.2	1.1	1.0	.8	1.1	1.1	1.4	1.8	1.5	1.5
7/26/2007	.9	1.4	1.6	1.5	1.4	1.4	1.2	1.5	1.4	1.4	1.6	1.5	1.4	1.6	1.5	1.5	1.2	1.1	1.1	.9	1.4	1.1	1.5	1.6	1.6	1.6	1.5
7/27/2007	.7	1.4	2.5	.7	.8	.8	.8	.8	.8	.8	.8	.8	.8	.8	.8	1.0	1.0	1.1	1.6	2.2	2.3	2.3	2.3	2.3	2.5	2.3	2.5

Sacramento Municipal Utility District
2007 Turbidity Measurements in Nephelometric Turbidity Units (NTU)
South American at Slab Creek PH

Raw data as reported by field sensor, see notes at bottom

Date	Daily summary			Hourly Data																							
	Min	Mean	Max	0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300
7/28/2007	2.3	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.3	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
7/29/2007	2.3	2.4	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.3	2.5	2.3	2.5	2.5	2.5	2.5	2.5	2.3	2.3	2.3	2.3
7/30/2007	1.5	2.2	2.5	2.3	2.3	2.3	2.3	2.5	2.3	2.3	2.3	2.3	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	1.6	1.6	1.5	1.6	1.5	1.5
7/31/2007	.4	1.0	1.5	.7	.8	.8	.8	.8	.8	.8	.8	.8	.8	.7	.7	.8	1.4	.4	1.1	1.1	1.4	1.5	1.5	1.4	1.5	1.5	1.4
8/1/2007	.9	1.3	1.5	1.2	1.2	1.2	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.5	1.4	1.5	1.5	1.4	1.1	1.1	.9	1.4	1.4	1.4	1.4	1.2	1.2
8/2/2007	.8	1.2	1.6	1.1	1.2	1.1	1.4	1.1	1.1	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.1	1.4	1.1	.9	.8	1.1	1.1	1.6	1.5	1.6	1.5
8/3/2007	1.1	1.4	1.6	1.5	1.5	1.5	1.4	1.4	1.4	1.4	1.5	1.4	1.4	1.6	1.5	1.4	1.5	1.4	1.1	1.2	1.1	1.4	1.1	1.2	1.5	1.5	1.4
8/4/2007	1.1	1.3	1.4	1.4	1.4	1.2	1.4	1.3	1.4	1.4	1.2	1.2	1.4	1.4	1.4	1.4	1.2	1.2	1.1	1.1	1.1	1.2	1.1	1.1	1.2	1.4	1.4
8/5/2007	1.1	1.3	1.6	1.2	1.4	1.2	1.2	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.6	1.4	1.2	1.1	1.2	1.2	1.2	1.2	1.4	1.2	1.2	1.4	1.1
8/6/2007	1.1	1.3	1.7	1.1	1.2	1.1	1.1	1.1	1.1	1.1	1.4	1.4	1.4	1.5	1.7	1.7	1.4	1.3	1.2	1.1	1.2	1.1	1.1	1.2	1.4	1.4	1.2
8/7/2007	1.0	1.4	1.8	1.2	1.0	1.4	1.4	1.5	1.5	1.5	1.7	1.8	1.7	1.4	1.2	1.2	1.2	1.4	1.4	1.5	1.2	1.4	1.2	1.4	1.8	1.5	1.7
8/8/2007	1.0	1.3	1.5	1.5	1.5	1.5	1.4	1.4	1.2	1.4	1.4	1.2	1.4	1.4	1.4	1.2	1.2	1.2	1.1	1.1	1.0	1.2	1.2	1.1	1.1	1.2	1.2
8/9/2007	1.1	1.4	1.8	1.2	1.4	1.4	1.2	1.4	1.4	1.5	1.5	1.4	1.5	1.5	1.5	1.5	1.8	1.5	1.4	1.2	1.2	1.4	1.4	1.2	1.4	1.1	1.2
8/10/2007	1.1	1.4	1.8	1.2	1.1	1.4	1.4	1.4	1.4	1.7	1.4	1.4	1.8	1.8	1.5	1.7	1.4	1.5	1.2	1.1	1.2	1.1	1.4	1.4	1.2	1.2	1.4
8/11/2007	1.0	1.3	1.8	1.2	1.1	1.1	1.2	1.2	1.4	1.4	1.2	1.4	1.8	1.4	1.5	1.5	1.5	1.4	1.4	1.1	1.2	1.1	1.0	1.2	1.4	1.4	1.1
8/12/2007	1.0	1.2	1.5	1.1	1.0	1.1	1.1	1.1	1.2	1.2	1.4	1.4	1.5	1.5	1.5	1.5	1.4	1.4	1.1	1.2	1.0	1.1	1.1	1.2	1.1	1.1	1.2
8/13/2007	1.0	1.3	1.5	1.2	1.5	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.2	1.5	1.2	1.4	1.4	1.4	1.2	1.1	1.1	1.0	1.1	1.2	1.4	1.5	1.2
8/14/2007	.9	1.2	1.5	1.2	1.4	1.2	1.4	1.4	1.2	1.2	1.2	1.5	1.4	1.4	1.4	1.2	1.1	1.2	1.2	1.1	1.1	.9	.9	1.1	1.2	1.4	1.2
8/15/2007	1.0	1.1	1.4	1.2	1.2	1.2	1.1	1.2	1.2	1.1	1.2	1.1	1.1	1.2	1.1	1.1	1.0	1.0	1.1	1.1	1.1	1.1	1.2	1.2	1.1	1.1	1.4
8/16/2007	1.0	1.3	1.5	1.5	1.4	1.4	1.5	1.4	1.4	1.4	1.4	1.5	1.4	1.4	1.5	1.5	1.4	1.1	1.1	1.0	1.1	1.1	1.2	1.4	1.2	1.4	1.2
8/17/2007	.8	1.1	1.5	1.2	1.1	1.1	1.0	1.2	1.1	1.1	1.1	1.1	1.1	1.2	1.1	1.1	1.1	1.1	1.1	1.2	1.2	1.0	.8	1.1	1.4	1.2	1.5
8/18/2007	1.2	1.5	1.8	1.2	1.4	1.4	1.4	1.2	1.4	1.2	1.5	1.5	1.4	1.5	1.5	1.4	1.5	1.5	1.4	1.2	1.6	1.6	1.5	1.8	1.8	1.5	1.7
8/19/2007	1.0	1.3	1.7	1.4	1.2	1.2	1.2	1.7	1.4	1.4	1.4	1.4	1.4	1.4	1.5	1.2	1.2	1.5	1.7	1.1	1.1	1.0	1.1	1.1	1.1	1.5	1.4
8/20/2007	1.1	1.5	3.2	1.4	1.5	1.2	1.4	1.2	1.4	1.4	3.2	1.5	2.1	1.7	1.5	1.5	1.5	1.5	1.5	1.5	1.1	1.4	1.4	1.2	1.5	1.5	1.4
8/21/2007	.8	1.3	1.7	1.5	1.2	1.2	1.2	1.2	1.5	1.2	1.2	1.4	1.4	1.7	1.5	1.7	1.2	1.1	1.1	1.1	1.1	1.1	.8	.8	1.1	1.5	1.4
8/22/2007	.9	1.3	1.5	1.2	1.2	1.2	1.5	1.2	1.2	1.2	1.2	1.4	1.4	1.4	1.4	1.5	1.5	1.2	1.1	.9	1.4	1.4	1.5	1.4	1.1	1.2	1.1
8/23/2007	1.0	1.1	1.4	1.1	1.0	1.1	1.0	1.1	1.1	1.1	1.4	1.1	1.0	1.0	1.1	1.1	1.4	1.1	1.1	1.0	1.0	1.1	1.2	1.2	1.2	1.2	1.2
8/24/2007	1.0	1.2	1.5	1.1	1.0	1.5	1.0	1.2	1.1	1.1	1.1	1.2	1.2	1.1	1.2	1.4	1.1	1.0	1.1	1.1	1.1	1.1	1.1	1.4	1.4	1.5	1.2
8/25/2007	.8	1.1	1.4	1.1	1.1	1.0	1.1	1.2	1.1	1.0	1.1	1.1	1.1	1.1	1.1	1.0	1.1	1.2	1.1	1.4	1.1	1.1	.8	1.1	1.1	1.2	1.1
8/26/2007	1.0	1.1	1.4	1.1	1.0	1.0	1.1	1.0	1.1	1.1	1.0	1.1	1.1	1.0	1.2	1.0	1.1	1.0	1.0	1.0	1.2	1.0	1.2	1.1	1.2	1.4	1.1
8/27/2007	.9	1.2	1.6	1.1	1.0	1.0	1.1	1.1	1.1	1.1	1.1	1.4	1.2	1.0	1.2	1.2	1.2	1.4	1.4	.9	1.1	.9	1.0	1.2	1.6	1.6	1.2
8/28/2007	1.0	1.2	1.5	1.5	1.4	1.4	1.2	1.2	1.2	1.2	1.4	1.2	1.4	1.2	1.5	1.2	1.1	1.1	1.1	1.2	1.1	1.1	1.2	1.1	1.4	1.1	1.0
8/29/2007	.8	1.2	1.6	1.0	1.1	1.2	1.1	1.2	1.2	1.2	1.4	1.4	1.2	1.2	1.5	1.6	1.5	1.4	1.2	.9	.9	1.1	1.1	1.2	1.0	1.0	.8
8/30/2007	.8	1.2	1.5	1.1	1.1	1.2	1.2	1.1	1.1	1.1	1.3	1.3	1.3	1.3	1.1	1.1	1.0	1.2	1.0	.8	1.0	1.1	1.2	1.2	1.1	1.2	1.5
8/31/2007	1.0	1.2	1.5	1.1	1.1	1.1	1.3	1.1	1.3	1.3	1.1	1.4	1.4	1.3	1.3	1.1	1.4	1.2	1.2	1.0	1.1	1.0	1.2	1.2	1.5	1.4	1.1
9/1/2007	1.2	1.3	1.4	1.3	1.3	1.3	1.3	1.4	1.3	1.4	1.3	1.3	1.3	1.4	1.4	1.3	1.4	1.2	1.4	1.2	1.2	1.2	1.2	1.4	1.2	1.2	1.3
9/2/2007	1.0	1.3	1.4	1.4	1.4	1.3	1.1	1.4	1.3	1.1	1.1	1.3	1.3	1.3	1.3	1.3	1.3	1.4	1.2	1.2	1.4	1.2	1.2	1.4	1.4	1.0	1.1
9/3/2007	1.1	1.3	1.7	1.1	1.3	1.1	1.1	1.1	1.3	1.1	1.3	1.3	1.3	1.4	1.7	1.7	1.7	1.5	1.4	1.4	1.4	1.2	1.2	1.2	1.4	1.3	1.3
9/4/2007	1.0	1.2	1.5	1.4	1.3	1.1	1.1	1.0	1.0	1.1	1.0	1.1	1.3	1.4	1.3	1.1	1.4	1.1	1.3	1.3	1.4	1.1	1.2	1.1	1.5	1.1	1.5
9/5/2007	1.1	1.4	1.7	1.1	1.4	1.4	1.4	1.4	1.4	1.5	1.4	1.7	1.7	1.5	1.5	1.7	1.7	1.5	1.5	1.5	1.4	1.4	1.3	1.3	1.1	1.1	1.3
9/6/2007	1.0	1.2	1.5	1.3	1.5	1.3	1.3	1.1	1.3	1.1	1.1	1.5	1.4	1.4	1.3	1.3	1.1	1.3	1.0	1.3	1.3	1.1	1.0	1.1	1.3	1.3	1.3
9/7/2007	1.1	1.3	1.5	1.3	1.1	1.3	1.3	1.1	1.3	1.3	1.4	1.1	1.3	1.3	1.3	1.4	1.4	1.1	1.3	1.5	1.3	1.3	1.3	1.5	1.4	1.4	1.1
9/8/2007	1.2	1.5	1.8	1.3	1.3	1.3	1.4	1.4	1.4	1.5	1.7	1.5	1.7	1.7	1.5	1.8	1.8	1.8	1.5	1.5	1.5	1.4	1.2	1.3	1.4	1.5	1.3
9/9/2007	1.1	1.3	1.5	1.4	1.3	1.3	1.3	1.1	1.3	1.1	1.3	1.4	1.4	1.5	1.4	1.5	1.3	1.3	1.4	1.3	1.3	1.2	1.2	1.1	1.1	1.1	1.3

Sacramento Municipal Utility District
2007 Turbidity Measurements in Nephelometric Turbidity Units (NTU)
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Date	Daily summary			Hourly Data																							
	Min	Mean	Max	0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300
9/10/2007	1.0	1.3	1.5	1.0	1.0	1.1	1.1	1.3	1.1	1.1	1.5	1.1	1.3	1.4	1.4	1.4	1.4	1.3	1.4	1.4	1.4	1.5	1.5	1.5	1.4	1.4	1.4
9/11/2007	.8	1.3	1.5	1.5	1.4	1.4	1.3	1.4	1.3	1.3	1.3	1.4	1.3	1.4	1.4	1.5	1.4	1.5	1.3	1.0	.8	1.4	1.1	1.4	1.2	1.4	1.1
9/12/2007	.8	1.2	1.3	1.3	1.1	1.3	1.0	1.3	1.1	1.3	1.1	1.1	1.3	1.3	1.3	1.1	1.1	1.0	.8	1.1	1.3	1.2	1.3	1.1	1.1	1.3	1.3
9/13/2007	1.1	1.4	1.7	1.4	1.3	1.1	1.3	1.1	1.3	1.3	1.4	1.4	1.5	1.4	1.5	1.7	1.7	1.7	1.4	1.4	1.3	1.3	1.5	1.4	1.5	1.4	1.3
9/14/2007	1.1	1.3	1.8	1.3	1.3	1.4	1.5	1.3	1.1	1.4	1.4	1.3	1.3	1.8	1.4	1.5	1.3	1.4	1.3	1.4	1.3	1.1	1.3	1.3	1.4	1.4	1.4
9/15/2007	1.1	1.4	1.5	1.4	1.5	1.4	1.5	1.5	1.4	1.5	1.4	1.4	1.5	1.4	1.5	1.4	1.5	1.5	1.4	1.4	1.4	1.4	1.4	1.3	1.1	1.1	1.1
9/16/2007	1.0	1.2	1.5	1.0	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.3	1.3	1.4	1.4	1.5	1.4	1.3	1.3	1.1	1.1	1.1	1.3	1.5	1.3	1.3	1.3
9/17/2007	1.0	1.2	1.5	1.3	1.1	1.3	1.3	1.4	1.4	1.3	1.3	1.1	1.3	1.3	1.4	1.3	1.5	1.3	1.3	1.0	1.1	1.1	1.3	1.0	1.3	1.3	1.1
9/18/2007	1.2	1.5	1.5	1.3	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.4	1.4	1.4	1.2	1.2	1.4	1.4
9/19/2007	1.2	1.4	1.8	1.2	1.2	1.4	1.2	1.2	1.2	1.2	1.2	1.5	1.3	1.3	1.4	1.5	1.8	1.5	1.5	1.4	1.7	1.5	1.4	1.4	1.2	1.2	1.4
9/20/2007	1.1	1.2	1.5	1.1	1.5	1.1	1.1	1.3	1.1	1.1	1.1	1.1	1.4	1.2	1.3	1.3	1.3	1.2	1.2	1.2	1.4	1.4	1.4	1.4	1.2	1.2	1.1
9/21/2007	1.1	1.3	1.5	1.4	1.2	1.2	1.2	1.3	1.1	1.1	1.3	1.3	1.2	1.2	1.1	1.1	1.1	1.4	1.4	1.4	1.5	1.5	1.4	1.5	1.4	1.5	1.4
9/22/2007	1.1	1.3	1.5	1.3	1.3	1.1	1.1	1.1	1.3	1.3	1.4	1.3	1.4	1.3	1.4	1.3	1.3	1.4	1.5	1.4	1.5	1.4	1.4	1.5	1.5	1.4	1.3
9/23/2007	1.1	1.5	1.7	1.3	1.3	1.1	1.5	1.3	1.4	1.4	1.4	1.5	1.7	1.5	1.7	1.5	1.5	1.5	1.7	1.5	1.5	1.5	1.5	1.4	1.5	1.5	1.5
9/24/2007	1.2	1.4	1.7	1.5	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.7	1.7	1.7	1.7	1.7	1.7	1.5	1.4	1.2	1.2	1.4	1.4	1.4	1.2	1.2
9/25/2007	1.1	1.5	1.9	1.2	1.3	1.3	1.3	1.3	1.3	1.4	1.5	1.7	1.7	1.7	1.8	1.8	1.7	1.9	1.7	1.9	1.7	1.7	1.7	1.5	1.4	1.2	1.1
9/26/2007	1.1	1.3	1.7	1.2	1.2	1.1	1.1	1.1	1.2	1.3	1.3	1.3	1.2	1.3	1.4	1.5	1.4	1.4	1.4	1.4	1.5	1.4	1.4	1.7	1.4	1.7	1.5
9/27/2007	1.0	1.3	1.6	1.5	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.3	1.3	1.2	1.2	1.4	1.2	1.2	1.4	1.2	1.2	1.4	1.6	1.2	1.1	1.0	1.1
9/28/2007	1.0	1.2	1.4	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.3	1.3	1.3	1.3	1.3	1.4	1.4	1.3	1.3	1.4	1.2	1.3	1.0	1.1	1.3	1.1
9/29/2007	1.0	1.4	1.9	1.0	1.1	1.3	1.1	1.1	1.1	1.1	1.5	1.4	1.5	1.7	1.7	1.5	1.9	1.7	1.8	1.7	1.5	1.5	1.5	1.4	1.4	1.5	1.3
9/30/2007	1.1	1.5	1.8	1.3	1.3	1.4	1.4	1.3	1.4	1.4	1.4	1.5	1.5	1.4	1.5	1.5	1.4	1.1	1.7	1.8	1.7	1.5	1.5	1.7	1.5	1.5	1.4
10/1/2007	.8	1.3	1.5	1.3	1.3	1.4	1.1	1.1	1.1	1.3	1.4	1.3	1.4	1.5	1.1	1.4	.8	1.4	1.3	1.2	1.2	1.4	1.4	1.5	1.4	1.2	1.4
10/2/2007	1.1	1.5	1.8	1.4	1.3	1.1	1.3	1.3	1.8	1.5	1.5	1.5	1.7	1.7	1.7	1.5	1.7	1.5	1.5	1.4	1.4	1.4	1.5	1.4	1.5	1.2	1.2
10/3/2007	1.1	1.5	1.9	1.1	1.1	1.1	1.4	1.5	1.5	1.5	1.5	1.7	1.7	1.7	1.9	1.8	1.5	1.7	1.5	1.5	1.5	1.4	1.4	1.2	1.4	1.4	1.5
10/4/2007	1.1	1.2	1.4	1.1	1.1	1.1	1.3	1.3	1.1	1.1	1.1	1.1	1.1	1.4	1.3	1.4	1.4	1.3	1.4	1.1	1.4	1.3	1.3	1.3	1.3	1.1	1.1
10/5/2007	1.0	1.3	1.7	1.3	1.3	1.3	1.4	1.1	1.1	1.0	1.3	1.4	1.3	1.7	1.5	1.5	1.5	1.5	1.5	1.4	1.4	1.4	1.3	1.4	1.3	1.3	1.3
10/6/2007	1.2	1.4	1.8	1.4	1.2	1.3	1.3	1.3	1.2	1.4	1.2	1.2	1.5	1.8	1.5	1.4	1.7	1.5	1.8	1.7	1.5	1.4	1.4	1.5	1.5	1.4	1.4
10/7/2007	1.1	1.5	1.9	1.3	1.4	1.7	1.9	1.4	1.7	1.5	1.5	1.5	1.5	1.8	1.8	1.7	1.5	1.5	1.7	1.8	1.8	1.4	1.2	1.4	1.4	1.1	1.3
10/8/2007	1.1	1.4	1.8	1.1	1.3	1.4	1.3	1.4	1.3	1.3	1.3	1.4	1.5	1.4	1.8	1.5	1.4	1.5	1.5	1.4	1.4	1.2	1.2	1.5	1.4	1.3	1.3
10/9/2007	1.1	1.2	1.5	1.3	1.1	1.1	1.1	1.1	1.1	1.1	1.3	1.4	1.1	1.5	1.4	1.4	1.4	1.3	1.3	1.2	1.2	1.1	1.1	1.3	1.3	1.1	1.1
10/10/2007	1.0	1.1	1.4	1.1	1.3	1.3	1.3	1.1	1.1	1.0	1.0	1.4	1.3	1.1	1.1	1.0	1.0	1.0	1.0	1.1	1.3	1.0	1.3	1.1	1.3	1.1	1.0
10/11/2007	.8	1.1	1.5	.8	1.1	1.0	1.0	1.0	1.0	1.0	1.0	1.5	1.1	1.1	1.4	1.4	1.0	1.0	1.0	1.0	.8	1.1	1.1	1.3	1.3	1.3	1.3
10/12/2007	1.1	1.5	2.6	1.3	1.3	1.3	1.3	1.3	1.1	1.1	1.3	1.4	1.4	1.5	1.4	1.5	2.6	1.7	1.7	1.4	1.5	1.4	1.5	1.7	1.4	1.4	1.5
10/13/2007	1.0	1.2	1.4	1.4	1.4	1.4	1.1	1.1	1.4	1.3	1.2	1.4	1.3	1.4	1.1	1.1	1.0	1.1	1.1	1.0	1.3	1.1	1.1	1.1	1.1	1.0	1.0
10/14/2007	1.0	1.2	1.5	1.1	1.1	1.1	1.1	1.0	1.1	1.0	1.1	1.4	1.4	1.4	1.4	1.5	1.1	1.1	1.1	1.1	1.2	1.1	1.1	1.1	1.1	1.1	1.3
10/15/2007	.8	1.2	1.9	1.1	1.0	1.3	1.1	1.1	.8	1.0	1.1	1.3	1.3	1.3	1.9	1.1	1.0	.8	1.1	1.1	1.1	1.1	1.3	1.4	1.1	1.3	1.1
10/16/2007	1.1	1.3	1.5	1.3	1.4	1.4	1.4	1.3	1.3	1.1	1.1	1.1	1.3	1.3	1.5	1.4	1.4	1.5	1.4	1.4	1.3	1.3	1.3	1.3	1.1	1.4	1.1
10/17/2007	1.0	1.3	1.5	1.1	1.5	1.3	1.4	1.4	1.4	1.5	1.4	1.2	1.4	1.4	1.4	1.4	1.3	1.3	1.3	1.1	1.3	1.3	1.3	1.3	1.3	1.3	1.0
10/18/2007	1.0	1.3	1.9	1.3	1.1	1.0	1.0	1.0	1.0	1.0	1.0	1.3	1.2	1.2	1.2	1.3	1.1	1.9	1.5	1.5	1.5	1.7	1.7	1.5	1.4	1.4	1.4
10/19/2007	1.2	1.4	1.7	1.4	1.3	1.4	1.3	1.3	1.3	1.4	1.4	1.4	1.4	1.5	1.5	1.7	1.5	1.4	1.4	1.2	1.2	1.2	1.2	1.2	1.2	1.4	1.4
10/20/2007	1.3	1.3	1.4	1.3	1.4	1.3	1.3	1.3	1.4	1.3	1.3	1.4	1.4	1.4	1.3	1.4	1.4	1.4	1.4	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3
10/21/2007	1.0	1.2	1.5	1.1	1.1	1.1	1.1	1.1	1.4	1.5	1.2	1.2	1.1	1.1	1.4	1.1	1.1	1.1	1.0	1.4	1.3	1.3	1.3	1.3	1.3	1.1	1.5
10/22/2007	1.2	1.4	1.5	1.5	1.4	1.4	1.4	1.5	1.4	1.5	1.4	1.4	1.4	1.4	1.5	1.4	1.3	1.3	1.2	1.5	1.5	1.4	1.4	1.4	1.4	1.4	1.5
10/23/2007	1.3	1.4	1.5	1.4	1.5	1.4	1.4	1.4	1.4	1.4	1.5	1.4	1.4	1.4	1.4	1.4	1.3	1.5	1.4	1.4	1.4	1.4	1.4	1.3	1.4	1.3	1.3

Sacramento Municipal Utility District
2007 Turbidity Measurements in Nephelometric Turbidity Units (NTU)
South American at Slab Creek PH

Raw data as reported by field sensor, see notes at bottom

Date	Daily summary			Hourly Data																							
	Min	Mean	Max	0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300
10/24/2007	1.1	1.3	1.5	1.3	1.1	1.1	1.1	1.3	1.3	1.3	1.4	1.3	1.5	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4
10/25/2007	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4
10/26/2007	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4
10/27/2007	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4
10/28/2007	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4
10/29/2007	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4
10/30/2007	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4
10/31/2007	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4
11/1/2007	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4
11/2/2007	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4
11/3/2007	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4
11/4/2007	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4
11/5/2007	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4
11/6/2007	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4
11/7/2007	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4
11/8/2007	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4
11/9/2007	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4
11/10/2007	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4
11/11/2007	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4
11/12/2007	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4
11/13/2007	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4
11/14/2007	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4
11/15/2007	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4
11/16/2007	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4
11/17/2007	#N/A	#N/A	#N/A	1.4	1.4																						

Notes: *Maximum was 3.6 (ntu) on 6-20-07 at 2300 hour.*

Sacramento Municipal Utility District
2007 Turbidity Measurements in Nephelometric Turbidity Units (NTU)
White Rock Powerhouse Tailrace

Raw data as reported by field sensor, see notes at bottom

Date	Daily summary			Hourly Data																							
	Min	Mean	Max	0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300
5/1/2007	#N/A	#N/A	#N/A																								
5/2/2007	#N/A	#N/A	#N/A																								
5/3/2007	#N/A	#N/A	#N/A																								
5/4/2007	#N/A	#N/A	#N/A																								
5/5/2007	#N/A	#N/A	#N/A																								
5/6/2007	#N/A	#N/A	#N/A																								
5/7/2007	#N/A	#N/A	#N/A																								
5/8/2007	#N/A	#N/A	#N/A																								
5/9/2007	#N/A	#N/A	#N/A																								
5/10/2007	#N/A	#N/A	#N/A																								
5/11/2007	#N/A	#N/A	#N/A																								
5/12/2007	#N/A	#N/A	#N/A																								
5/13/2007	#N/A	#N/A	#N/A																								
5/14/2007	#N/A	#N/A	#N/A																								
5/15/2007	#N/A	#N/A	#N/A																								
5/16/2007	#N/A	#N/A	#N/A																								
5/17/2007	#N/A	#N/A	#N/A											1.0	1.0	.8	.7	.7	.8	.8	.8	.8	.8	.8	.8	.8	.8
5/18/2007	.6	.8	.9	.7	.7	.7	.6	.7	.6	.6	.7	.7	.7	.7	.9	.9	.9	.9	.9	.9	.7	.9	.9	.7	.9	.8	.7
5/19/2007	.6	.7	.8	.7	.7	.6	.7	.6	.6	.6	.6	.8	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.6
5/20/2007	.6	.6	.7	.7	.6	.6	.6	.6	.6	.6	.7	.7	.6	.6	.6	.7	.6	.7	.7	.7	.7	.7	.7	.7	.7	.7	.6
5/21/2007	.5	.6	.7	.6	.6	.6	.6	.5	.5	.6	.6	.7	.7	.7	.6	.7	.6	.6	.6	.6	.6	.6	.7	.6	.7	.7	.6
5/22/2007	.4	.5	.7	.6	.6	.6	.4	.4	.4	.6	.6	.6	.6	.6	.6	.4	.6	.6	.6	.5	.6	.6	.6	.6	.6	.7	.7
5/23/2007	.6	.6	.8	.7	.7	.7	.6	.6	.6	.6	.6	.6	.6	.6	.7	.6	.6	.6	.6	.6	.6	.8	.6	.7	.7	.7	.7
5/24/2007	.6	.8	1.1	.7	.6	.6	.6	.6	.6	.6	.6	.6	.6	.7	1.0	.9	.9	.9	1.0	1.0	1.0	1.0	1.0	1.0	1.1	1.0	1.1
5/25/2007	.9	1.0	1.1	1.1	1.1	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	.9	.9	1.0	1.0	1.0	.9	.9	1.0	.9
5/26/2007	.8	.9	1.4	1.0	.9	.9	.9	.9	.9	.9	.9	.9	1.1	1.0	1.4	1.1	1.0	1.0	1.0	1.0	1.0	1.0	1.0	.9	.8	.8	.8
5/27/2007	.7	.9	1.2	.8	.8	.8	.8	.8	.8	.7	.8	.8	.7	.8	.8	.8	.8	.8	1.2	1.1	.9	.9	1.0	.9	1.0	.9	.9
5/28/2007	.7	.8	1.0	.9	.9	.9	.7	.7	.8	.8	.7	.7	.8	.9	1.0	1.0	.9	.9	.9	.9	.9	.9	.9	.9	.9	.9	.9
5/29/2007	.7	.9	1.0	.9	.9	.9	.7	.7	.7	.8	.8	.9	.9	.9	.9	.9	.9	.9	1.0	1.0	.9	.9	.9	.9	.9	.9	.9
5/30/2007	.7	.8	.9	.9	.9	.9	.8	.8	.8	.7	.7	.8	.8	.7	.9	.8	.7	.9	.7	.7	.8	.8	.8	.8	.8	.8	.7
5/31/2007	.6	.7	.9	.7	.6	.7	.6	.6	.6	.7	.7	.7	.8	.9	.8	.8	.8	.9	.8	.8	.7	.8	.7	.7	.7	.7	.7
6/1/2007	.7	.8	1.0	.7	.7	.7	.7	.9	.7	.7	.9	.9	.9	.9	.9	.9	.9	1.0	.9	.7	.7	.7	.8	.8	.8	.8	.8
6/2/2007	.7	.8	1.0	.7	.7	.7	.7	.9	.7	.9	.9	.7	1.0	1.0	1.0	.9	.9	.9	.9	.9	.9	.9	.7	.7	.7	.7	.7
6/3/2007	.6	.8	1.0	.7	.7	.7	.7	.7	.7	.7	.7	.6	.7	.6	.7	.7	1.0	1.0	.9	.7	.7	.9	.9	.7	.9	.9	.9
6/4/2007	.7	.8	1.0	.9	.9	.7	.7	.7	.7	.7	.7	.7	.7	.7	.9	1.0	1.0	1.0	.8	.9	.9	.9	.9	.9	.9	.9	1.0
6/5/2007	.9	1.0	1.2	1.2	1.1	1.0	1.0	1.0	.9	1.0	1.0	1.0	.9	.9	.9	.9	.9	1.0	1.2	1.1	.9	.9	.9	.9	1.0	1.0	1.0
6/6/2007	.7	.8	.9	.9	.9	.9	.7	.7	.7	.7	.8	.7	.7	.7	.9	.8	.7	.8	.8	.8	.8	.8	.9	.9	.9	.9	.9
6/7/2007	.7	.9	1.2	.7	.7	.7	.7	.7	.7	.7	.7	.9	.7	.8	.9	1.2	1.1	1.1	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
6/8/2007	.8	1.0	1.5	.9	.9	.9	.9	.9	.9	.9	1.0	1.1	1.5	1.3	1.1	1.1	1.1	1.1	1.1	1.0	1.0	1.0	1.0	.8	.9	.8	.8
6/9/2007	.7	.9	1.3	.8	.8	.8	.8	.8	.8	.7	.8	.8	.8	.8	.7	.7	.8	.8	1.1	1.2	1.3	1.0	1.0	1.0	1.1	1.1	1.0
6/10/2007	.9	.9	1.2	1.0	.9	.9	.9	.9	.9	.9	.9	.9	1.0	1.0	1.0	1.2	1.0	1.0	1.0	1.2	1.0	1.0	.9	.9	.9	.9	.9
6/11/2007	.7	.9	1.4	.9	.9	.9	.9	.9	.9	.7	.7	.9	.9	1.0	.9	1.2	1.0	1.0	1.4	1.2	1.0	1.0	.9	1.0	1.0	.9	.8
6/12/2007	.8	1.0	1.4	.8	.8	.8	.8	.9	.9	.9	.9	.9	.9	.9	.9	.9	.9	1.0	1.4	1.4	1.4	1.2	1.2	.9	1.0	.9	.9
6/13/2007	.8	.9	1.4	.9	.9	.9	.9	.9	.9	.9	.9	.9	.8	.8	.8	.8	.8	1.1	1.4	1.2	.8	.8	.8	.8	.8	.8	.8

Sacramento Municipal Utility District
2007 Turbidity Measurements in Nephelometric Turbidity Units (NTU)
White Rock Powerhouse Tailrace

Raw data as reported by field sensor, see notes at bottom

Date	Daily summary			Hourly Data																							
	Min	Mean	Max	0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300
6/14/2007	.7	.9	1.1	.8	.8	.8	.8	.7	.7	.7	.9	.9	.9	.9	.9	.9	.9	1.0	1.1	1.0	1.0	1.0	1.0	.9	.9	.9	.7
6/15/2007	.7	.9	1.5	.9	.7	.7	.7	.7	.7	.9	.9	1.0	1.0	1.0	1.5	1.4	.9	1.0	1.0	1.0	.9	1.0	.9	.9	.9	.7	.7
6/16/2007	.7	.9	1.4	.8	.8	.7	.7	.7	.8	.7	.7	.7	.8	.8	1.1	1.4	1.1	1.0	1.0	1.0	.9	.9	.9	.7	.9	.9	.9
6/17/2007	.8	.9	1.2	.9	.9	.9	.9	.9	.9	.8	.8	.8	1.0	1.2	1.1	1.0	.9	.9	1.0	1.0	.9	.9	.9	.9	.9	.9	.9
6/18/2007	.7	.8	1.1	.9	.9	.8	.7	.7	.8	.8	.7	.7	.8	.7	.7	.7	.7	.7	.9	1.0	1.1	.9	.9	.9	.9	.9	1.0
6/19/2007	.8	1.0	1.6	.9	.9	1.0	1.0	.8	.8	.8	.8	.8	.9	.8	1.1	1.2	1.2	1.6	1.2	1.2	1.0	1.0	1.0	.9	.9	1.0	1.0
6/20/2007	.8	1.0	1.7	1.0	1.0	1.0	.9	.9	.9	.9	.9	.9	.9	.9	.9	.9	.9	.8	.9	.9	1.0	1.0	1.3	1.6	1.7	1.6	1.5
6/21/2007	.8	1.2	1.7	1.7	1.7	1.6	1.6	1.5	1.5	1.4	1.4	1.3	1.1	1.1	1.3	1.1	1.4	1.3	1.0	1.0	1.1	1.1	1.0	1.0	.9	.9	.8
6/22/2007	.8	.9	1.3	.8	.8	.8	.8	.8	.8	.8	.8	.8	.8	.8	.8	.8	.8	1.2	1.3	1.0	.9	.9	.9	.9	.9	.9	.9
6/23/2007	.8	1.0	1.5	.9	.9	.9	.9	.9	.9	.9	.8	.8	.8	.8	.8	.8	.8	1.0	1.1	1.5	1.4	1.1	1.1	1.0	1.0	1.0	1.0
6/24/2007	.8	1.0	1.6	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	.9	.9	.9	.9	.9	.8	.9	1.1	1.6	1.2	1.1	1.2	1.0	1.0	1.0	.8
6/25/2007	.8	.9	1.3	.9	.8	.8	.8	.8	.8	.8	.8	.8	.8	.8	.8	.8	.9	.9	.9	1.2	1.3	1.3	1.1	1.0	1.0	1.0	1.0
6/26/2007	.8	.9	1.3	1.0	.9	.9	.9	.9	.9	.9	.9	.9	.9	.8	.8	.8	.8	.8	.9	.9	1.1	1.3	1.2	1.2	1.2	1.0	1.0
6/27/2007	.8	1.0	1.7	1.0	1.0	1.0	.9	.9	.9	.9	.9	.9	.9	.9	.9	.8	.8	.9	1.1	1.7	1.2	1.2	1.0	1.0	1.0	1.0	1.0
6/28/2007	.8	1.0	1.5	1.0	1.0	.9	.9	.9	.9	.9	.9	.9	.9	.8	.8	.8	1.0	1.0	1.5	1.1	1.0	1.0	1.0	1.0	1.0	1.0	1.1
6/29/2007	.8	.9	1.3	1.1	1.0	1.0	1.0	.9	.9	.9	.9	.9	.8	.8	.8	.9	.9	1.1	1.3	1.1	1.1	1.0	.9	.8	.9	.8	.8
6/30/2007	.7	.9	1.1	.8	.8	.8	.8	.7	.7	.7	.7	.7	.7	.7	.8	1.0	1.0	1.1	1.0	1.0	1.0	1.0	1.0	.9	1.0	1.0	1.0
7/1/2007	.7	.9	1.1	.9	.9	.9	.9	.9	.9	.9	.9	.8	.8	.8	.8	.8	.9	1.1	1.0	.9	.9	.9	.9	.9	.9	.7	.7
7/2/2007	.7	.9	1.3	.7	.7	.7	.7	.7	.7	.7	.7	.9	.7	.7	.7	.7	.7	.7	1.3	1.2	1.3	1.0	.9	1.0	1.0	1.1	1.0
7/3/2007	.8	1.1	1.5	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	.8	1.0	1.0	1.0	1.0	1.1	1.3	1.5	1.5	1.4	1.4	1.3	1.4	1.3	1.1	1.1
7/4/2007	1.0	1.1	1.5	1.3	1.1	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.1	1.3	1.5	1.3	1.2	1.2	1.2	1.2	1.0	1.0	1.1	1.1
7/5/2007	.8	1.0	1.3	1.0	1.0	.8	.8	.8	.8	.8	.8	.8	.8	.8	1.1	1.1	1.0	1.0	1.0	1.0	1.1	1.3	1.2	1.0	1.3	1.3	1.2
7/6/2007	.9	.9	1.1	1.0	.9	.9	.9	.9	.9	.9	.9	.9	.9	.9	1.0	1.0	.9	.9	1.1	1.0	1.1	1.1	1.0	.9	.9	1.0	1.0
7/7/2007	.7	.8	1.0	.9	.9	.9	.9	.9	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.9	1.0	1.0	1.0	.9	.9	.9	.9	.9
7/8/2007	.7	.8	1.2	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.9	1.0	1.2	1.1	1.0	1.0	1.0	1.0	.9	.8	.8
7/9/2007	.7	.9	1.4	.8	.8	.7	.7	.7	.7	.7	.7	.7	.8	.8	.7	.7	.8	1.1	1.4	1.3	1.3	1.3	1.1	1.1	1.0	1.0	1.0
7/10/2007	.7	.9	1.1	1.0	1.0	1.0	.9	.9	.9	.9	.9	.7	.8	.8	.8	.8	.8	1.1	1.0	1.0	.9	.9	.9	.9	1.0	1.0	1.0
7/11/2007	.8	1.0	1.5	1.0	1.0	1.0	1.0	1.0	1.0	.9	1.0	.9	.8	.8	.9	.9	1.0	1.5	1.4	1.3	1.3	1.1	1.3	1.1	1.1	1.0	.9
7/12/2007	.9	1.0	1.5	.9	.9	.9	.9	.9	.9	.9	.9	.9	.9	.9	.9	1.0	1.3	1.5	1.3	1.2	1.2	1.3	1.2	1.1	1.1	1.1	1.0
7/13/2007	.8	1.1	1.6	1.0	.9	1.0	.9	.9	.8	.8	.8	.9	1.0	1.0	.9	1.1	1.6	1.3	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.1	1.0
7/14/2007	.9	1.0	1.3	1.0	1.0	1.0	.9	.9	.9	.9	1.0	1.0	1.0	1.0	1.1	1.0	1.0	1.0	1.1	1.1	1.1	1.3	1.2	1.1	1.1	1.1	1.0
7/15/2007	.8	1.0	1.3	1.0	1.0	1.0	1.0	.9	.9	.8	.8	.8	.8	.9	1.1	.9	1.3	1.0	1.1	1.1	1.3	1.1	1.3	1.1	1.0	1.0	1.0
7/16/2007	.8	1.0	1.3	1.0	.9	.9	.9	.9	.9	.9	.9	.9	.9	.8	.9	1.0	1.0	1.3	.9	1.0	1.3	1.3	1.3	1.0	1.1	1.0	1.0
7/17/2007	.7	.9	1.3	.9	.9	.9	.9	.9	.9	.8	.7	.7	.7	.7	.7	.8	.9	1.0	1.1	1.0	1.0	1.0	1.0	1.1	1.1	1.3	1.0
7/18/2007	.9	1.0	1.1	1.0	.9	.9	.9	.9	.9	1.0	1.0	1.1	.9	1.0	1.0	1.1	1.1	1.1	1.1	1.1	1.0	1.0	1.0	.9	.9	1.0	.9
7/19/2007	.7	.9	1.5	.7	.8	.8	.7	.7	.7	.7	.7	.7	.7	.8	.9	1.1	1.5	1.2	1.1	1.1	1.1	1.1	1.1	1.1	1.0	1.0	.9
7/20/2007	.7	1.0	1.3	.9	.9	.9	.9	.9	.9	.9	.9	.9	.9	.7	1.0	1.0	1.3	.9	1.0	1.0	1.1	1.1	1.1	1.1	1.1	1.1	1.0
7/21/2007	.9	1.0	1.1	1.0	.9	.9	.9	.9	.9	.9	.9	.9	.9	1.1	1.0	1.0	1.1	1.0	1.0	1.0	1.1	1.1	1.0	1.0	1.0	1.0	1.0
7/22/2007	.8	1.0	1.5	.9	.9	.9	.9	.8	.8	.8	.8	.8	.9	1.1	1.5	1.0	1.0	1.0	1.3	1.1	1.0	1.0	1.0	.9	.9	.9	.9
7/23/2007	.7	.9	1.8	.9	.7	.8	.7	.7	.8	.8	.7	.7	.7	.7	.7	.8	1.1	1.8	1.0	1.0	1.1	1.2	1.1	1.0	1.0	1.0	1.0
7/24/2007	.7	.9	1.2	.9	.9	.9	.9	.9	.9	.9	.9	.8	.8	.8	.8	.7	.7	.7	.8	1.2	1.2	.9	.9	.9	1.1	1.1	1.1
7/25/2007	.7	.9	1.1	1.0	1.0	.9	.9	.9	.9	.9	.9	.7	.9	.8	.7	.8	.8	.8	1.1	1.0	.9	.9	.9	.9	.9	1.0	.9
7/26/2007	.8	.9	1.1	.9	.9	.9	.9	.8	.8	.8	.8	.8	.8	.8	.9	1.1	1.0	1.0	1.0	.9	.9	.9	.9	1.0	1.0	.9	.9
7/27/2007	.7	.9	1.2	.9	.9	.9	.9	.9	.7	.7	.7	.7	.7	.7	.7	.8	.9	1.2	.9	1.0	1.1	1.0	1.0	1.0	1.0	.9	.9

Sacramento Municipal Utility District
2007 Turbidity Measurements in Nephelometric Turbidity Units (NTU)
White Rock Powerhouse Tailrace

Raw data as reported by field sensor, see notes at bottom

Date	Daily summary Min	Mean	Max	Hourly Data 0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300
7/28/2007	.7	.9	1.2	.9	.9	.9	.9	.9	.9	.9	.9	.9	.7	.7	.7	.8	.8	.8	1.2	1.1	1.0	1.0	1.0	1.0	.9	.9	.9
7/29/2007	.7	.8	1.2	.8	.8	.8	.8	.8	.7	.7	.7	.7	.7	.7	.7	.7	.8	.8	.8	1.2	1.0	1.1	1.0	1.0	1.0	1.0	.9
7/30/2007	.7	.8	1.1	.9	.7	.9	.7	.7	.7	.7	.7	.7	.7	.7	.8	.8	.8	.8	1.1	.9	.9	.9	.9	1.0	.9	.9	.9
7/31/2007	.7	.8	1.0	.9	.8	.8	.8	.8	.8	.8	.8	.8	.7	.9	.9	.9	.9	1.0	1.0	1.0	.9	.9	.9	.9	.9	1.0	1.0
8/1/2007	.7	.8	1.2	1.0	.9	.9	.9	.9	.9	.9	.7	.7	.7	.9	.7	.7	.9	1.2	1.0	.9	.8	.8	.7	.7	.7	.8	.7
8/2/2007	.6	.7	.9	.7	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.7	.6	.6	.7	.9	.9	.7	.9	.7	.7	.7	.7	.7
8/3/2007	.6	.8	1.2	.7	.6	.6	.6	.6	.6	.7	.7	.7	.7	.8	.8	.8	1.2	.9	1.1	.9	.8	.8	.8	.8	.7	.8	.8
8/4/2007	.7	.8	1.1	.8	.8	.8	.8	.7	.7	.7	.7	.7	.7	.7	.8	.8	1.1	.8	.8	.8	.8	.8	.8	.8	.9	.7	.9
8/5/2007	.7	.8	1.1	.7	.7	.7	.7	.7	.7	.7	.7	.7	.8	.8	.8	1.1	.9	.9	.9	.9	.9	.9	.7	.7	.9	.9	.9
8/6/2007	.6	.8	1.1	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.6	.9	.7	.7	1.0	1.1	1.1	1.0	.9	.9	.9	.7	.9	.9
8/7/2007	.7	.8	1.1	.7	.7	.7	.7	.7	.7	.7	.7	.7	1.1	1.0	1.1	.9	.9	.9	.9	.8	.8	.8	.8	.7	.7	.7	.7
8/8/2007	.7	.8	1.2	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.8	1.2	1.0	.9	.9	1.0	.8	.8	.7	.7	.7
8/9/2007	.7	.8	1.1	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.8	1.1	1.0	1.0	.9	.9	.9	.9	.9	.8	.7
8/10/2007	.6	.8	1.1	.7	.7	.7	.7	.7	1.1	.6	.6	.6	.6	.8	.9	1.0	1.1	1.0	1.0	.9	1.0	1.0	.9	.7	.9	.9	.9
8/11/2007	.7	.8	1.3	.8	.8	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.9	.7	.9	1.3	1.1	1.0	1.0	.9	.9	.9	.9	.9
8/12/2007	.7	.8	1.0	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	1.0	1.0	1.0	1.0	1.0	.9	.9	.7	.7	.7	.7	.9	.7
8/13/2007	.7	.8	1.0	.9	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.8	1.0	1.0	.8	.8	.9	.9	.8	.8	.9	1.0	1.0
8/14/2007	.7	.8	1.0	.9	.9	.9	.9	.7	.7	.7	.7	.7	.7	.9	.9	.8	.8	.8	1.0	1.0	1.0	1.0	.9	.9	.9	.9	.9
8/15/2007	.7	.8	.9	.7	.7	.8	.7	.7	.7	.7	.7	.8	.8	.8	.9	.8	.8	.8	.8	.8	.8	.8	.7	.7	.8	.8	.8
8/16/2007	.6	.7	1.1	.7	.7	.7	.7	.7	.7	.7	.6	.6	.6	.6	.8	.8	1.1	.8	.9	.8	.9	.7	.8	.8	.8	.8	.8
8/17/2007	.6	.7	1.1	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.9	1.1	.9	.9	.9	.9	.7	.9	.7	.7
8/18/2007	.7	.8	1.1	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	1.1	.9	.9	.9	.9	.9	1.1	1.0	1.1
8/19/2007	.7	.9	1.1	1.1	1.0	1.0	.9	.9	.9	.9	.7	.7	.9	.9	1.1	1.0	.9	.8	.9	1.0	.9	1.0	.9	.8	.7	.7	.7
8/20/2007	.6	.8	1.0	.7	.7	.7	.7	.7	.7	.7	.7	.6	.7	.6	.7	.8	.8	.8	.9	1.0	1.0	1.0	.9	.9	1.0	1.0	.9
8/21/2007	.7	.8	1.0	.9	.9	.9	.9	.7	.7	.7	.7	.9	.7	.7	.7	.9	1.0	1.0	1.0	1.0	.9	.9	.9	.9	.7	.9	.7
8/22/2007	.7	.8	1.4	.9	.9	.8	.8	.7	.7	.7	.7	.7	.7	.7	.7	.8	.8	1.4	.8	.8	.9	.8	.9	.9	.9	.9	.9
8/23/2007	.7	.8	1.0	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	1.0	.9	.9	.9	.9	.7	.7	.8	.8	.7
8/24/2007	.7	.8	1.1	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.8	.8	1.1	.9	.9	1.0	1.0	.9	.7	.7	.7	.7
8/25/2007	.7	.8	.9	.9	.9	.9	.9	.7	.9	.9	.7	.7	.8	.7	.8	.7	.7	.8	.8	.8	.8	.8	.8	.8	.8	.7	.7
8/26/2007	.6	.7	.8	.7	.7	.7	.7	.7	.7	.7	.6	.6	.6	.8	.7	.7	.7	.7	.7	.7	.8	.7	.7	.7	.7	.7	.7
8/27/2007	.6	.7	1.0	.7	.7	.7	.7	.7	.6	.6	.6	.6	.7	.6	.6	.6	.6	.6	.7	1.0	.9	.8	.7	.7	.7	.7	.9
8/28/2007	.7	.8	1.0	1.0	.9	.9	.9	.9	.9	.8	.8	.8	.8	.8	.8	.8	.9	.9	.9	.9	.7	.7	.7	.7	.7	.7	.7
8/29/2007	.6	.7	.9	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.7	.7	.9	.9	.7	.7	.7	.7	.7	.7	.7	.7
8/30/2007	.6	.7	.9	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.7	.9	.7	.7	.7	.7	.7	.7	.6	.6	.6	.6
8/31/2007	.6	.7	.9	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.7	.7	.9	.9	.9	.9	.7	.8	.8	.7	.8	.6	.6	.6
9/1/2007	.6	.7	1.1	.6	.8	.6	.6	.6	.6	.6	.6	.6	.6	.6	.7	.7	1.1	.7	.7	.7	.7	.7	.7	.7	.7	.7	.6
9/2/2007	.7	.8	.9	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.8	.8	.8	.8	.9	.9	.9	.8	.7
9/3/2007	.6	.7	.9	.7	.7	.7	.7	.7	.7	.7	.6	.7	.6	.6	.7	.8	.8	.9	.8	.8	.8	.7	.7	.7	.7	.7	.6
9/4/2007	.6	.7	.7	.6	.6	.6	.6	.6	.6	.6	.6	.6	.7	.7	.7	.7	.7	.7	.6	.6	.6	.7	.7	.7	.7	.7	.7
9/5/2007	.6	.7	1.1	.9	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.6	.6	.6	.6	.7	.7	.7	.7	1.1	.9	.9	.7	.7
9/6/2007	.6	.7	.9	.7	.7	.7	.6	.7	.6	.6	.6	.6	.7	.6	.7	.7	.7	.7	.8	.8	.9	.7	.7	.6	.6	.7	.6
9/7/2007	.6	.7	1.0	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.7	.7	.8	.6	.6	.6	.8	.7	.9	.9	.9	.9	.9	1.0
9/8/2007	.7	.9	1.4	.9	.9	.9	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.9	1.4	1.3	.9	1.1	1.0	1.0	.9	.9	.9
9/9/2007	.6	.7	1.2	.7	.7	.7	.7	.7	.7	.7	.7	.6	.6	.7	.7	.7	.7	.7	.8	1.2	.8	.7	.7	.7	.7	.7	.7

Sacramento Municipal Utility District
2007 Turbidity Measurements in Nephelometric Turbidity Units (NTU)
White Rock Powerhouse Tailrace

Raw data as reported by field sensor, see notes at bottom

Date	Daily summary			Hourly Data																							
	Min	Mean	Max	0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300
9/10/2007	.6	.7	.9	.7	.6	.7	.7	.7	.7	.7	.7	.7	.7	.6	.6	.7	.7	.8	.9	.8	.8	.8	.8	.8	.7	.8	.7
9/11/2007	.6	.7	.9	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.8	.9	.9	.8	.7	.8	.7	.7	.7	.6	.6	.6
9/12/2007	.6	.6	.9	.7	.6	.6	.6	.6	.6	.6	.6	.6	.6	.7	.6	.7	.9	.8	.7	.7	.7	.6	.6	.6	.6	.6	.6
9/13/2007	.6	.7	1.1	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.7	.7	.7	1.1	.9	.8	.8	.8	.7	.8	.8	.7	.7
9/14/2007	.7	.8	1.0	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.9	1.0	.9	.9	.9	.9	.7	.7	.7	.7	.7	.7	.7
9/15/2007	.6	.7	1.1	.7	.7	.7	.7	.7	.6	.6	.6	.6	.6	.6	.6	.6	.7	.7	.7	.7	.7	.8	1.1	1.1	1.0	.9	.9
9/16/2007	.7	.8	1.1	.9	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.8	.8	1.1	.9	.8	.9	.9	.8	.8	.8	.8	.8	.8
9/17/2007	.7	.8	1.1	.8	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.8	.7	.7	.7	1.1	.9	.9	1.0	.7	.7	.7	.7	.7
9/18/2007	.6	.8	1.4	.7	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.7	.7	.9	1.2	1.4	1.0	.9	.8	.8	.8	.8	.8	.8
9/19/2007	.7	.8	1.2	.8	.8	.7	.7	.7	.7	.7	.7	.7	.7	.7	.8	.8	.8	.7	.7	.7	.7	.8	.8	1.1	1.2	1.2	1.1
9/20/2007	.7	.8	.9	.9	.9	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.9	.7	.7	.7	.9	.9	.8	.8	.7	.7
9/21/2007	.7	.8	1.1	.7	.7	.7	.7	.7	.7	.7	.7	.8	.8	.7	.7	.7	.7	.8	.7	.8	.8	.8	.8	.8	.8	1.1	1.1
9/22/2007	.7	.8	1.3	.9	.8	.8	.8	.7	.7	.7	.7	.7	.8	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.9	1.3	1.0	.9
9/23/2007	.7	.8	1.0	1.0	.7	.9	.9	.7	.7	.7	.7	.7	.7	.8	.8	.8	.7	.8	1.0	1.0	1.0	1.0	1.0	1.0	.9	.9	.9
9/24/2007	.7	.9	1.2	.7	.7	.7	.7	.7	.7	.7	.7	.7	.8	.9	.9	1.1	1.2	1.2	1.0	.9	.9	.9	.8	.8	.9	.9	.7
9/25/2007	.6	.8	1.3	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.6	.8	.9	.8	.8	.8	1.3	1.0	1.0	1.1	1.0	1.0
9/26/2007	.7	.8	.9	.9	.9	.9	.7	.7	.7	.7	.9	.7	.7	.7	.8	.8	.8	.9	.8	.7	.7	.7	.7	.8	.8	.8	.8
9/27/2007	.7	.9	1.4	.9	.9	.9	.8	.8	.7	.8	.8	.8	.9	.9	.7	.7	.7	1.2	1.1	1.0	.8	1.2	1.4	.9	.9	.7	.9
9/28/2007	.7	.7	.8	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.8	.7	.7	.7	.8	.7	.7	.7	.7	.8	.8	.8	.8
9/29/2007	.7	.8	1.1	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.8	.9	.9	.9	1.0	1.0	1.1	1.1	.8
9/30/2007	.7	.8	1.3	.8	.8	.8	.8	.8	.8	.7	.8	.7	.7	.7	.7	.7	.8	.8	.8	.8	.8	.9	1.0	1.3	1.3	.8	.8
10/1/2007	.7	.8	1.1	.7	.7	.7	.7	.7	.7	.7	.7	.7	.8	1.0	.8	1.1	1.1	.8	.8	.7	.8	.8	.8	.9	.9	.9	.8
10/2/2007	.6	.8	1.0	.8	.8	.8	.8	.7	.7	.7	.7	.7	.7	.6	.7	.7	.6	.7	.8	.7	.7	.8	.8	1.0	1.0	.9	.9
10/3/2007	.7	.8	1.1	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.9	1.0	1.0	1.1	1.1	1.0	1.0	1.1	1.0
10/4/2007	.7	.8	1.0	.9	.9	.9	.9	.7	.7	.9	.7	.7	.7	.7	.7	.8	.7	.7	.9	1.0	.9	.9	.9	.7	.7	.7	.7
10/5/2007	.6	.8	1.0	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.6	.6	.6	.7	.9	.9	.9	1.0	.9	.9	.9
10/6/2007	.7	.8	1.1	.8	.7	.7	.7	.7	.7	.7	.7	.7	.8	.8	.8	.9	.8	.9	.9	.9	1.1	.9	1.0	1.0	.8	.9	.9
10/7/2007	.7	.9	1.2	.9	.8	.8	.7	.7	.7	.7	.7	.8	.9	.8	.8	.8	.8	.9	.9	.8	1.1	1.1	1.2	1.2	.8	.8	.7
10/8/2007	.7	.8	1.2	.7	.7	.7	.7	.7	.7	.7	.7	.7	.8	.9	1.1	1.1	1.2	1.1	1.0	.9	.9	.9	.9	.8	.8	.9	.8
10/9/2007	.6	.7	.9	.7	.8	.7	.7	.7	.7	.7	.7	.7	.6	.7	.7	.7	.8	.8	.9	.8	.8	.8	.8	.8	.8	.8	.7
10/10/2007	.6	.7	.9	.7	.8	.7	.7	.7	.7	.6	.6	.6	.6	.7	.8	.9	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7
10/11/2007	.6	.7	.7	.7	.6	.6	.6	.6	.6	.6	.6	.6	.6	.7	.7	.6	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7
10/12/2007	.6	.7	.9	.7	.7	.7	.7	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.7	.7	.7	.8	.8	.8	.8	.9	.9	.9
10/13/2007	.7	.7	.9	.8	.8	.7	.7	.7	.7	.7	.7	.7	.7	.7	.8	.9	.8	.7	.7	.7	.7	.7	.8	.7	.7	.7	.7
10/14/2007	.6	.7	.9	.7	.7	.7	.7	.7	.6	.6	.6	.6	.6	.7	.7	.7	.8	.7	.6	.6	.6	.7	.8	.9	.8	.7	.7
10/15/2007	.6	.6	.8	.6	.6	.6	.6	.6	.6	.6	.7	.7	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.7	.8	.7	.7	.6
10/16/2007	.6	.6	.7	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.7
10/17/2007	.6	.6	.8	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.8	.7	.7
10/18/2007	.6	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.6	.6	.6	.6	.6	.7	.7
10/19/2007	.6	.8	1.2	.6	.6	.6	.6	.6	.6	.6	.7	1.1	1.2	1.2	.9	1.1	1.1	.9	.9	.9	.9	.8	.8	.8	.8	.8	.8
10/20/2007	.7	.8	.9	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.8	.8	.9	.8	.8	.8	.9	.9	.8
10/21/2007	.7	.8	1.0	.8	.8	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.8	.8	.7	.7	.7	.7	.9	.9	1.0	.9	.8
10/22/2007	.7	.9	1.3	.8	.8	.8	.8	.8	.7	.7	.8	.8	.8	.8	.8	.9	.9	.9	.9	.9	.9	.8	.9	1.0	1.3	1.2	.9
10/23/2007	.8	.9	1.2	.9	.9	.9	.8	.8	.8	.8	.9	.8	.8	.9	.9	1.1	1.2	1.1	1.1	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0

Sacramento Municipal Utility District
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White Rock Powerhouse Tailrace

Raw data as reported by field sensor, see notes at bottom

Date	Daily summary			Hourly Data																							
	Min	Mean	Max	0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300
10/24/2007	#N/A	#N/A	#N/A	.8	.8	.8	.8	.8	.8	.8	.8	.8	.7	.8	.8	.9	1.1										

Notes: *Maximum was 1.8 (ntu) on 7-23-07 at 1400 hour.*