FINAL
HINES GROWERS
BIOASSESSMENT REPORT
FIELD SURVEY FROM JUNE 2013
FALLBROOK, CALIFORNIA

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ACRONYMS AND ABBREVIATIONS

°C	degrees Celsius
%	percent
µg/L	micrograms per liter
µm	micrometer
AFDM	ash free dry mass
AMEC	AMEC Environment & Infrastructure, Inc.
ASTM	American Society for Testing and Materials
BMI	benthic macroinvertebrate
cm	centimeter(s)
cm^2	square centimeters
CPOM	coarse particulate organic matter
DO	dissolved oxygen
EPT	Ephemeroptera, Plecoptera, and Trichoptera
FFG	functional feeding groups
facility	Hines Growers, Inc. facility
ft/sec	feet per second
g	gram(s)
HBI	Hilsenhoff Biotic Index
I-15	Interstate-15
IBI	Index of Biological Integrity
L	liter(s)
m	meter(s)
mg/L	milligrams per liter
mg	milligram(s)
mL	milliliter(s)
mm	millimeter(s)
MRI	Margalef's Richness Index
NH_3	Ammonia
NO_2	Nitrite
NO_3	Nitrate
pH	Hydrogen Ion Activity
PHAB	physical habitat
ppt	parts per thousand

ACRONYMS AND ABBREVIATIONS (Cont.)

PVC	Polyvinyl chloride
QA	quality assurance
QAPP	Quality Assurance Prevention Plan
RC	Rainbow Creek
RL	reporting limit
RWB	reach-wide benthos
SoCal IBI	Southern California Index of Biotic Integrity
SWAMP	Surface Water Ambient Monitoring Program
SWI	Shannon-Weaver Index
TDS	total dissolved solids
TKN	Total Kjeldahl Nitrogen
TN	total nitrogen
TSS	Total Suspended Solids
TV	tolerance value
umhos	Micro-ohm
WQO	Water Quality Objectives

1.0 INTRODUCTION

Stream bioassessments provide a quantifiable assessment of the resident aquatic organisms in wadeable freshwater streams. Since these organisms live in a given water body for extended periods, they provide an integrative direct assessment of the cumulative impact of water quality over time that other measurements (e.g., water chemistry and toxicity) cannot provide (Karr & Chu 1999). Analysis of the benthic macroinvertebrate (BMI) community leads to the calculation of an Index of Biological Integrity (IBI), which responds predictably to the presence of stresses such as water quality impairment, habitat alteration, and watershed development (Ode et. al. 2005). Analyses of the stream periphyton (algae) community also provide an estimate of water quality, particularly those related to nutrient impairment. Extensive physical habitat (PHAB) characterizations of in-stream and surrounding riparian zones are completed concurrent to BMI and periphyton collections; and are used to describe habitat quality and availability, known to be important drivers in biological community health. This information along with general water quality parameters can assist in explaining changes to the biological community in streams over time (Karr & Chu 1999).

AMEC Environment & Infrastructure, Inc. (AMEC), on behalf of Hines Growers, Inc., conducted bioassessment monitoring in Rainbow Creek (RC). Bioassessment monitoring was required pursuant to the requirements of Conditional Waiver No. 4 for Discharges from Agricultural and Nursery Operations. This report summarizes methods and results from the field survey undertaken in June 2013.

Procedures for collecting biological samples and PHAB data adhered to the Surface Water Ambient Monitoring Program (SWAMP) bioassessment protocols for benthic macroinvertebrates (SWAMP 2007) and algae (SWAMP 2010).

1.1 Project Location and Background

The RC watershed in northern San Diego County, flows west from the valley floor of Rainbow, California, then under Interstate-15 (I-15) highway, and finally through the northern portion of Fallbrook, California before converging with the Santa Margarita River. While the watershed supports vital ecological functions and has some limited areas of high quality habitat, RC is listed as an impaired waterbody (303(d)) by the Regional Water Quality Control Board for iron, sulfates, total dissolved solids (TDS), and nutrients. Upstream of the project site, potential impacts to water quality include rural development, agriculture (e.g., avocado groves), and septic systems. The naturally high ground water levels in the Rainbow valley floor are known to be problematic for septic systems in the area, especially during the rainy season, and can be a potential source of pollutants to RC.

The proposed project is on private property within the Hines Growers, Inc. facility (facility) in Rainbow, California (Figure 1 in Appendix A). The 261-acre facility footprint consists of several non-contiguous areas approximately 6 miles northeast of downtown Fallbrook, California. Hines Growers, Inc. grows containerized ornamental plants on the site for subsequent sale and distribution. The facility borders RC for approximately 1.1 miles, just prior to its passing beneath I-15 highway. During the “dry season”, the stretch of RC that passes through the facility consists of intermittent flow, with large dry sections separated by small segments of low flow.

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2.0 METHODS

2.1 Monitoring Stations and Field Effort Schedule

Bioassessment monitoring was performed at the facility location on June 27, 2013. The station ID and location of the monitoring station are presented in Table 2-1 and shown in Figure 1 (Appendix A).

Table 2-1.
Sampling Site ID and Location

Station ID	Station Name Location[1] and Elevation
HG-062713	Hines Growers, Inc. 33.41683° N –117.15128° W 319 meters

Notes:
1. Latitude and Longitude, North American Datum 1983.

2.2 Delineation of Sampling Reaches and Sampling Approach

The sampling team delineated a 150-meter (m) stream "reach" from which biological samples were collected and PHAB observations were made. The sampling reach was divided into 11 main transects (A, B, C…K) spaced at 15-m intervals. Transects were established perpendicular to the direction of stream flow (labeled A through K from downstream to upstream), and marked with flags along the stream bank. Inter-transects were established between the 11 main transects (AB, BC, CD…JK), equidistant from the adjacent down and upstream transects and also flagged along the stream bank. The biological sampling team for BMI and algae started the sampling at the downstream end of the sampling reach and progressed upstream in order to avoid influencing portions of the creek not yet sampled. BMI samples were collected first, approximately 1 m downstream of each main transect. Algae samples were then collected, approximately 0.5 m downstream of each main transect. Collecting biological samples just downstream of the main transect avoided disturbing sediments along the transects being subsequently assessed by the PHAB team. The biological sampling team would then exit the stream before proceeding to the next upstream transect. The team collecting PHAB measurements then followed the biological sampling team to each main and inter-transect.

Water quality parameters were sampled at the beginning of each field effort just downstream of Transect A prior to sampling to ensure measurements were not affected by collection activities. Representative photos of the stream reach as they existed in June 2013 are shown in Appendix E.

2.3 Water Quality Data Collection

Water quality was measured in conjunction with the bioassessment as outlined in Table 2-2. Measurements included water temperature, Hydrogen Ion Activity (pH), dissolved oxygen (DO), specific conductivity, and salinity. All parameters were measured in the field using calibrated instruments.

For grab samples, pre-cleaned sample bottles were obtained from the analytical laboratory for collection of water quality samples. The following sample handling protocols were utilized when collecting samples to minimize the possibility of contamination:

- When the analytical methods did not require a chemical preservative, the sample bottle was used directly to collect the sample.
- If the analytical method required preservation, a pre-cleaned bottle was used as a secondary container to collect the sample which was then transferred to the laboratory-provided analytical container.

Manual grab samples were collected by inserting the pre-cleaned bottle upside-down into the channel and then inverting at the approximate midway point in the water column (when depth permitted) with the container opening facing upstream.

Sample containers were labeled with a unique sample ID, date, time, project, analyses, and collector's initials. The samples were then packed on ice and transported to AMEC. Samples were held on ice at 4 degrees Celsius (°C) until transferred to a laboratory provided courier.

2.4 Location of Biological Sample Collections

Sample collection for both BMI and periphyton samples within each transect followed the protocol guidance for the Standard Reach-Wide Benthos (RWB) approach. Sampling began on the left side of Transect A (looking upstream), then proceeded to the middle for Transect B, and to the right side of the channel for Transect C. Sampling at Transect D then rotated back to the left side, and sampling continued in this "zig-zag" pattern for the remainder of the 11 main transects. The standard RWB technique employed rotated collection locations at 25 percent (%), 50% and 75% of stream width at each transect.

Detailed information regarding the procedures used to collect BMI samples can be found in the SWAMP bioassessment protocol (SWAMP 2007 and 2010). The following is a summary of collection methods used in the field during sampling activities.

Table 2-2.
Water Quality Measurements

Analyte	Method Number	Units
Field Measurements		
pH	Field Meter	pH units
DO	Field Meter	mg/L
Specific Conductance	Field Meter	umhos/cm
Salinity	Field Meter	ppt
Temperature	Field Meter	°C
Laboratory Analyses		
Sulfate	ASTM D516-02	mg/L
Ash-free dry mass	SM10300 C(M)	mg/L
Chlorophyll *a*	SM10200 H	µg/L
TDS	SM2540 C	mg/L
TSS	SM2540 D	mg/L
Nitrate + Nitrite as N	SM4500-NO3	mg/L
Chloride	SM4500-CL C	mg/L
TKN	SM4500 N Org B	mg/L
Ammonia as N	SM4500-NH3 B/C	mg/L
Total Phosphorus as P	SM4500 P B/E	mg/L
Particulate Nitrogen	SM4500 NO3-E (M) Calc	mg/L
Particulate Phosphorus	SM4500 P B/E (M) Calc	mg/L
Dissolved Organic Carbon	SM5310 B	mg/L
Specific Conductance	SM2510 B	umhos/cm
DO	SM4500-O G	mg/L
pH	SM4500 H+ B	pH Units

Notes:
°C - degrees Celsius
µg/L - microgram per liter
ASTM - American Society for Testing and Materials
cm - centimeter(s)
DO - Dissolved Oxygen
mg/L - milligram per liter
pH - Hydrogen Ion Activity
ppt - parts per thousand
TDS - Total Dissolved Solids
TKN - Total Kjeldahl Nitrogen
TSS - Total Suspended Solids
umhos - micro-ohms

2.4.1 Benthic Macroinvertebrate Collections

BMI samples were collected at each of the 11 main transects (A through K) by two field staff working in tandem. A 1 square-foot patch of streambed was sampled at each main transect, rotating locations along each transect as described above. All sediments, organic matter, and other substrates within the delineated patch, were agitated to a depth of 10 centimeters (cm) for at least 30 seconds so that all associated organisms were dislodged from the benthos. The natural current of the stream carried the dislodged organisms into a 0.5 millimeter (mm) mesh

D-frame net positioned immediately downstream of the sampling patch. If the sampling points were in a low-flow environment, the sampling team would manually push water through the sampling net to capture dislodged organisms as described in the SWAMP (2007) field manual. Samples from all 11 transects were composited into the D-frame net as the sampling team moved upstream. Once all 11 transects were sampled, the entire contents of the D-frame net was transferred into 1 liter (L) plastic sample jars and preserved in an approximately 70% ethanol solution diluted with stream water. All BMI samples were shipped to EcoAnalysts, Inc. in Moscow, Idaho for taxonomic identification and calculation of BMI metrics. These calculations lead to a final integrative multi-metric score, the Southern California IBI (SoCal IBI), developed specifically for use in coastal Southern California streams (Ode et. al. 2005).

2.4.2 Algae Collections

Algae samples were collected to assess the community structure and biomass within stream environment. Detailed information regarding the procedures used to collect periphyton samples may be found in the SWAMP algal bioassessment protocol (SWAMP 2010). The following is a summary of field collection methods.

One member of the field team collected all periphyton samples from each station immediately after BMI sample collection. A single periphyton sample was taken from each of the 11 main transects, with the collection location along each transect matching that of the BMI samples. Samples were collected slightly upstream of the BMI sampling location to ensure the substrate had not been disturbed. All 11 samples were composited into a single opaque collection container as the team moved upstream. Different sampler types were used dependent upon the substrate present at the collection location as described further below.

2.4.2.1 Polyvinyl Chloride Delimiter

A polyvinyl chloride (PVC) delimiter was used to collect algae from depositional substrates (i.e., sand, silt, and gravel). This type of sampler acted as a coring device, measuring 4 cm in diameter, and was pressed into the sediment 1 cm deep, thereby sampling an area of 12.6 square cm (cm^2). Being careful not to disturb the sediment surface, a spatula was worked under the PVC delimiter and the sample was extracted from the streambed and deposited into the collection container. Extra substrate material outside the PVC delimiter was cut away using a razor blade prior to placement in the collection container to ensure a consistent size core was collected across all transects.

2.4.2.2 Rubber Delimiter

A rubber delimiter was used to collect algae from erosional substrates that could be removed from the water (i.e., cobbles or small boulder). The rubber delimiter was constructed from a strip of thick flexible rubber material. A hole was cut out to create a 12.6 cm^2 sampling area. To sample algae, the delimiter was wrapped around the substrate and the algae within the designated area scrubbed with a clean toothbrush. The substrate, delimiter, and toothbrush were then rinsed with stream water into the sampling tray.

2.4.2.3 Syringe Scrubber

A syringe scrubber consisted of a white scrubbing pad affixed to the plunger of a plastic syringe and was used to remove algae from large boulders and bedrock that could not be physically removed from the stream. The plunger was depressed all the way to the end of the syringe, and the syringe was submerged in the stream and pressed firmly against the substrate. While applying pressure to the plunger, the scrubber was rotated to capture the algae from the substrate surface. The plunger was then retracted slightly and a plastic spatula was slid between the substrate and plunger. The syringe was subsequently removed from the water, and any water present within the syringe was drained into the collection container. The scrubbing pad was detached from the plunger and rinsed over the tray with a bottle containing stream water. Excess water was removed from the pad by wringing it into the tray.

2.4.2.4 Algae Sample Processing

Once all 11 transects were sampled, the composite periphyton sample consisted of a mixture of stream sediments, water and leaf litter. Any leaves or other non-algae organic matter captured were gently rubbed to loosen surficial periphyton material, which was then rinsed into the plastic tray with a light washing of stream water. The organic matter was discarded from the sample. Any filamentous algae captured in the composite sample was cut into fine pieces (approximately 1 mm) with scissors and added back to the composite. The composite sample was then vigorously agitated to remove and suspend periphyton material from small particulate surfaces (i.e., silt and sands). The suspension was then allowed to rest for a few seconds to allow larger particulates to sink and then the water was poured off into a clean graduated cylinder. A small amount of stream water was added to the plastic tray and the process was repeated to remove periphyton not collected in the initial rinse. This was repeated until the sample poured off was relatively clear. This resulted in a composite sample volume of 525 milliliters (mL), which was transferred to a 1 L plastic sample jar for further processing.

After processing, the soft bodied algae sample was collected by pouring 45 mL of the composite into a 50-mL centrifuge tube and immediately placed on ice. Upon arrival back to the laboratory, 5 mL of 25% gluteraldehyde was added to the soft bodied algal sample for preservation. To collect the diatom sample, a 40-mL portion of the processed composite was homogenated and poured into a 50-mL centrifuge tube and preserved with 10 mL of 10% formalin. For full details of the algal sample processing, please see the SWAMP algal bioassessment protocol (SWAMP 2010).

To prepare both the ash free dry mass (AFDM) and chlorophyll a samples, the composite water sample was thoroughly shaken to homogenize the liquid. A 25-mL sub-sample was then quickly poured into a small graduated cylinder. This aliquot was filtered through a 0.7 micrometer (µm) glass fiber filter in the field using a Hach® filter tower driven by a Fisher® vacuum hand-pump. Using forceps, the filter paper was removed from the filter tower, folded in half and placed in a snap lock plastic Petri® dish. The Petri dish was wrapped in foil and placed in a WhirlPak® bag. The procedure was then repeated to collect an additional filter in the same manner. The two samples were stored on wet ice until the team returned to the laboratory at the end of the day.

Once back in the laboratory, the two samples were frozen at –4°C, until they were delivered to Calscience Environmental Laboratories.

2.5 Physical Habitat Measurements

Measurements of PHAB characteristics were performed once biological sampling had been completed and are used to document local conditions which may affect the stream environment. At each main transect, three measurements of stream size were collected, including wetted width, bankfull width, and bankfull height (each to the nearest cm). Wetted width is defined as the width of streambed that is inundated with water at the time of sampling, while bankfull width is defined as the distance between the apparent limits of the stream banks under normal 1 to 2-year storm-flow conditions. The sampling team considered several variables when determining bankfull margins, such as bank slope and morphology, perennial vegetation patterns, transition of soil types, and undercutting of banks. Bankfull height is measured from the water level to the height of the bank at bankfull dimensions. This dimension provides an estimate of stream capacity at the time of sampling, relative to peak flow capacity during 1 to 2-year storm flow conditions.

Once these stream size measurements were collected, water depth and particle size were recorded at five points along each transect and inter-transect at the left bank (point 1), at distances of 25%, 50%, and 75% of stream width (points 2–4), and at the right bank (point 5). A stadia rod was placed at each of these positions, and depth was recorded to the nearest cm. The streambed particle directly at the base of the rod was randomly selected and classified according to particle size categories on the field datasheets. Any particles larger than sand (>2 mm) that could be removed from the stream were measured across the intermediate axis to the nearest mm. In addition to particle size classification, the presence of Coarse Particulate Organic Matter (CPOM), percent cobble embeddedness, microalgae, macroalgae, and macrophytes were recorded at each of the five points. A measure of overhead canopy cover was taken from the center of each main transect with a handheld densiometer while facing upstream, downstream, and towards the left and right banks. Riparian vegetation on each bank, human influence, and instream habitat complexity were all recorded using a categorical scoring system.

At inter-transects, the channel wetted width, depth, particle size characteristics, and presence of organic material were recorded, as well as the flow habitats present in the sampling reach according to a categorical classification system.

Following PHAB observations at each transect, a series of reach-wide characteristics were recorded. These included stream sinuosity, stream discharge, and gradient. Sinuosity is a measure of stream path deviation from the shortest straight-line path length between Transects A and K, and is expressed as the ratio of channel length to straight line reach length. This was measured by taking compass bearings from the center of each main transect to the next downstream main transect across the entire sampling reach. Stream velocity was estimated using a handheld flow meter when flows were sufficiently strong, or alternatively, through the buoyant object method when stream flows were slower. Stream gradient was determined across the sampling reach with a hand level and stadia rod using standard surveying practices.

The final habitat characterization task included scoring each station for three parameters: epifaunal cover, sediment deposition, and channel alteration. Stations were scored from 0 to 20 for each of these parameters, 0 indicating poor conditions and 20 indicating optimal conditions.

2.6 Benthic Macroinvertebrate Data Analyses

BMIs were identified according to Southwest Association of Freshwater Invertebrate Taxonomists Level 2 requirements. This data was then analyzed to produce an IBI score according to the procedures outlined in Ode et. al. (2005), which measures biological stream health by evaluating the composition of the BMI community. The SoCal IBI distills seven key measures of organism abundance and diversity into a single composite score that varies predictably in response to anthropogenic stresses. The SoCal IBI responds to various forms of environmental stress, including water quality impairment or PHAB degradation. The individual metric scores from each of the seven component measures are summed and converted to a 0 to 100 point scale. These scores correspond with one of five classes that convey biological integrity. These include very poor (0 to 19), poor (20 to 39), fair (40 to 59), good (60 to 79), and very good (80 to 100).

The seven key metrics incorporated into the SoCal IBI include the number of Coleopteran taxa; number of Ephemeroptera, Plecoptera, and Trichoptera (EPT) taxa; number of predator taxa; percent collector individuals; percent intolerant individuals; percent non-insect taxa; and percent tolerant taxa. These metrics respond to a range of stresses by either increasing or decreasing. In this way, an analysis of the component species groups in a stream can provide an assessment of whether or not a stream is experiencing stress from anthropogenic or natural processes in the watershed. A summary of how each of these metrics is scored for calculation of the SoCal IBI, and how they are expected to vary in response to water quality or habitat impairment is shown in Tables 2-3 and 2-4 respectively. Each metric is discussed in more depth below.

Table 2-3.
Southern California Index of Biotic Integrity Scoring Ranges

Score	Number of Coleoptera Taxa	Number of EPT Taxa	Number of Predator Taxa	Percent Intolerant Individuals	Percent Collector Individuals	Percent Non-Insect Taxa	Percent Tolerant Taxa
10	>5	>17	>12	>24	0–59	0–8	0–4
9		16–17	12	23–24	60–63	9–12	5–8
8	5	15	11	21–22	64–67	13–17	9–12
7	4	13–14	10	19–20	68–71	18–21	13–16
6		11–12	9	16–18	72–75	22–25	17–19
5	3	9–10	8	13–15	76–80	26–29	20–22
4	2	7–8	7	10–12	81–84	30–34	23–25
3		5–6	6	7–9	85–88	35–38	26–29
2	1	4	5	4–6	89–92	39–42	30–33
1		2–3	4	1–3	93–96	43–46	34–37
0	0	0–1	0–3	0	>96	>46	>37

Notes:
* Data from Ode et. al. 2005
\> - greater than
EPT - Ephemeroptera, Plecoptera, and Trichoptera taxa

Table 2-4.
Metrics Incorporated into the Southern California Index of Biological Integrity

Metric	Description
Number of Coleopteran[a] Taxa	Generally exhibit a negative relationship with degraded water quality or habitat impairment (i.e., component species will be less prevalent in impaired streams).
Number of EPT[b] Taxa	
Number of Predator Taxa	
Percent of Intolerant[c] Taxa Individuals	
Percent of Collector[d] Taxa Individuals	Generally exhibit a positive relationship with degraded water quality or habitat impairment (i.e., component species will be more prevalent in impaired streams).
Percent of Non-insect[e] Taxa	
Percent of Tolerant[f] Taxa	

Notes:
a. Beetle taxa.
b. Ephemeroptera, Plecoptera, and Trichoptera Taxa (Mayflies, Stoneflies, and Caddisflies).
c. Taxa intolerant of degraded water quality or other habitat impairment, with low tolerance values of 0–2.
d. Taxa that feed by collecting fine particulate organic matter.
e. Taxa not in the Class Insecta.
f. Taxa tolerant of degraded water quality or other habitat impairment, with high tolerance values of 8–10.

2.6.1 Southern California Index of Biological Integrity Metrics

2.6.1.1 Number of Coleoptera Taxa

The number of Coleopteran taxa is the measure of the abundance of aquatic beetle taxa present in a stream sample. In the Southern California coastal area, Coleopteran diversity correlate negatively with stresses such as channel alteration, excessive fine sediment loads, and watershed development (Ode et. al. 2005 and Brown 1973) so higher numbers of beetle taxa are typically associated with higher habitat quality and more pristine conditions.

2.6.1.2 Number of Ephemeroptera, Plecoptera, and Trichoptera Taxa

The number of EPT taxa refers to the number of Ephemeroptera (mayfly), Plecoptera (stonefly), and Trichoptera (caddisfly) taxa present in the system. The number of EPT taxa is a widely used indicator of stream quality as these insect families are generally sensitive to various forms of anthropogenic stressors and water quality degradation (Ode et. al. 2005). High numbers of EPT typically indicates a relatively healthy biological community.

2.6.1.3 Number of Predator Taxa

The number of predator taxa is a measure of the number of macroinvertebrate taxa that feed upon other macroinvertebrates. Studies in other ecoregions of California have found the response of this metric to have variable responses to impairment (Harrington 1999). However, this metric exhibits a moderate to strong response to impairment within the Southern California area. In the development of the SoCal IBI, the number of predator taxa in freshwater streams was found to correlate negatively with urban and agricultural development in surrounding watersheds, and the total nitrogen (TN) and TDS concentration in stream waters (Ode et. al. 2005). Thus, higher numbers of predator taxa are consistent with improved water quality and habitat conditions in Southern Californian streams.

2.6.1.4 Percent Intolerant Individuals

A tolerance value (TV) has been determined for the majority of stream macroinvertebrate genera or species through prior research on the organism's life history and sensitivity to stressors (Hilsenhoff 1987). These TVs range from 0 to 10, with 0 being assigned to species that are highly sensitive to pollutants and 10 being assigned to species that are able to withstand highly polluted streams. Species with a low TV of between 0 and 2 are referred to as intolerant species, as they are highly sensitive to pollution and will be the first to disappear from the community as impairment increases. A station with many intolerant species is considered to be less disturbed than one with few intolerant species. It should be kept in mind that a species could be sensitive to one type of pollutant, while tolerant of another. Therefore, while TVs can provide valuable information on stream quality, this information should be interpreted in light of all other biological and physical data available.

2.6.1.5 Percent Collector Individuals

Collector-gathering or collector-filtering species feed on fine particulate organic matter, periphyton, and various microorganisms. While naturally high levels of organic detritus may be a characteristic of some streams, one would generally expect the amount of fine material entering streams to increase with urbanization in a watershed due to increased impervious area and erosion. Thus, an increase in the number of individuals using the collector feeding strategy may be indicative of watershed urbanization impacting a stream. In Southern California, percent collector individuals has been shown to correlate positively with increasing urbanization and road density, as well as TDS in streams (Ode et. al. 2005).

2.6.1.6 Percent Non-insect Taxa

This metric measures the number of taxa collected that are not of the Class Insecta. Generally, non-insect taxa are relatively tolerant of pollution. A high percentage of non-insect taxa is typically a characteristic of an impacted stream. In Southern California percent non-insect taxa correlates positively with increasing agricultural and urban development in a watershed, and increasing concentrations of fine particulates and TN in streams (Ode et. al. 2005). Higher number of non-insects indicates poorer habitat and/or water quality.

2.6.1.7 Percent Tolerant Taxa

Tolerant taxa are those that have a TV range of 8 to 10 and are relatively insensitive to pollution. Although they can be found in relatively pristine habitats, they will dominate highly impacted streams. Similar to non-insect taxa, percent tolerant taxa increase in Southern California streams with increasing urbanization in surrounding watersheds, and TN in streams (Ode et. al. 2005).

3.0 RESULTS

3.1 Water Quality

The results from the *in-situ* field measurements at the Hines Growers, Inc. bioassessment location are presented in Table 3-1. Results for the corresponding water quality grab samples are provided in Table 3-2.

Table 3-1.
***In-situ* Field Measurements**

Analyte	Method	Units	Site HG-062713
pH	Field Meter	pH units	7.51
DO	Field Meter	mg/L	8.18
Specific Conductance	Field Meter	umhos/cm	2106
Temperature	Field Meter	°C	22.1

Notes:
°C - degrees Celsius
cm - centimeter(s)
DO - Dissolved Oxygen
mg/L - milligram per liter
pH - Hydrogen Ion Activity
umhos - micro-ohms

Table 3-2.
Water Quality Results Summary

Analyte	Method Number	Units	RL	Site HG-062713 Result	WQO[1]
Sulfate	ASTM D516-02	mg/L	50	530	250
Ash-free dry mass	SM10300 C(M)	mg/L	10	3290	N/A
Chlorophyll *a*	SM10200 H	µg/L	300	9300	N/A
TDS	SM2540 C	mg/L	10	1680	750
TSS	SM2540 D	mg/L	1.0	1.2	N/A
Nitrate + Nitrite as N	SM4500-NO3	mg/L	10	41	10
TKN	SM4500 N Org B	mg/L	0.5	ND	N/A
Total Nitrogen[2]	SM4500-NO3 + SM4500 N Org B	mg/L	10	41	1
Chloride	SM4500-CL C	mg/L	2.0	230	250
Total Ammonia as N	SM4500-NH3 B/C	mg/L	0.1	0.11	N/A
Un-ionized Ammonia	Calculated[3]	mg/L	N/A	0.0013	0.025
Total Phosphorus as P	SM4500 P B/E	mg/L	0.1	0.24	0.1
Particulate Nitrogen	SM4500 NO3-E (M) Calc	mg/L	0.5	5.0	N/A
Particulate Phosphorus	SM4500 P B/E (M) Calc	mg/L	0.2	0.89	N/A
Dissolved Organic Carbon	SM5310 B	mg/L	0.5	2.9	N/A
Specific Conductance	SM2510 B	umhos/cm	10	2000	N/A
DO	SM4500-O G	mg/L	0.01	7.43	<5.0
pH	SM4500 H+ B	pH Units	0.01	7.42	6.5–8.5

Notes:
1. San Diego Basin Plan (SDRWQCB 1994 and updates)
2. Sum of TKN and Nitrite/Nitrate
3. Thursby et al (1969)

µg/L - microgram per liter
ASTM - American Society for Testing and Materials
cm - centimeter(s)
DO - Dissolved Oxygen
mg/L - milligrams per liter
ND - Not detected
N/A - Not applicable
pH - Hydrogen Ion Activity
RL - reporting limit
SM - Standard Method
TDS - Total Dissolved Solids
TKN - Total Kjeldahl Nitrogen
TSS - Total Suspended Solids
umhos - micro-ohms
WQO - Water Quality Objectives

3.2 Summary of Benthic Macroinvertebrate Community Composition

A list of BMI species present in the sample collected during the June 2013 monitoring event is presented in Table 3-3, with the three most abundant taxa depicted in Figures 2 through 4 (Appendix A). Total abundance (adjusted for percent subsampled) of organisms was 12,468 individuals. The seed shrimp Ostracoda was the overwhelming dominant taxa observed comprising 83.4% of the community. This was followed by annelids of the Class Oligochaeta and gastropods of the genus *Physa* sp. making up 5.4% and 5.2% of the community, respectively. These top three taxa dominated the site, comprising 94.0% of the entire community. Ostracods can be found in many different substrate types where they eat bacteria, mold, algae, and detritus. Ostracods can be found across a full spectrum of water or habitat conditions; however, dominance by this group is generally an indicator of degraded conditions. Oligochaetes are segmented aquatic worms, generally found in silty substrate and detritus of streams and rivers. Similar to Ostracods, Oligochaetes can be found in both good quality and highly impacted streams. However a stream population dominated by members of this Family is generally an indicator of poor conditions. An overabundance of Oligochaeta can also be an indicator of sedimentation. *Physa* is a group of freshwater snails that are generally considered scrapers, in that they scour the substrate scraping off algae, diatoms, and detrital material. All three taxa (Ostracods, Oligochaetes, and *Physa* sp.) are generally considered tolerant taxa (TV between 8 and 10), meaning they are relatively insensitive to anthropogenic stressors and are typically found in higher abundances at disturbed sites.

Table 3-3.
Raw Abundance of Individual Taxa Observed

Taxonomic Group	Taxon	Site HG-062713
Odonata	Coenagrionidae	1
Diptera-Chironomidae	*Apedilum* sp.	1
	Endotribelos sp.	1
	Labrundinia sp.	3
	Micropsectra sp.	1
	Pentaneura sp.	4
Diptera	*Caloparyphus*/*Euparyphus* sp.	1
	Dasyhelea sp.	3
	Dixella sp.	1
	Tipulidae	1
Annelida-Oligochaeta	Oligochaeta	33
Mollusc-Gastropoda	*Physa* sp.	32
Crustacea-Ostracoda	Ostracoda	511
Other	Turbellaria	20
	TOTAL	**613**

Notes:
Data is a summary of the taxa identified in the subsample aliquot, not the entire sample.

3.2.1 Southern California Index of Biological Integrity Score

A summary of the SoCal IBI metric values, metric scores, and overall categorical ranking is presented in Table 3-4. The overall IBI score is a sum of the individual seven metric scores multiplied by 1.43 to convert to a 100 point scale.

The Hines Growers, Inc. station received an IBI score of 5.7, placing it in the "Very Poor" biological category, indicating a lack of BMI community characteristics typical of reference conditions in Southern California. Six of the seven metrics scored either 0 or 1, with only percent of tolerant taxa receiving a higher score of 3.

Table 3-4.
Summary of Southern California Index of Biological Integrity Metrics and Overall Score

Metric	Site HG-062713	
	Value	Score
Number of Coleoptera Taxa	0	0
Number of EPT Taxa	0	0
Number of Predator Taxa	0	0
Percent of Collector Individuals	94.3	1
Percent of Intolerant Individuals	0.21	0
Percent of Non-Insect Taxa	50.0	0
Percent of Tolerant Taxa	28.6	3
SoCal IBI Score (sum of scores x 1.43)	**5.7**	
SoCal IBI Rank	**Very Poor**	

Notes:
EPT - Ephemeroptera, Plecoptera, Trichoptera
SoCal IBI - Southern California Index of Biotic Integrity

3.2.2 Selected Benthic Macroinvertebrate Metrics

A summary of selected BMI metrics outside of those used to calculate the SoCal IBI are presented in Table 3-5.

3.2.2.1 Diversity Measures

Diversity metrics provide information about the number of taxa observed and the evenness of the distribution of individuals among those taxa (Washington 1984). Pristine ecosystems are typically expected to have a high diversity of invertebrate species with a relatively even distribution of organisms between those species. In contrast, degraded systems may consist of high numbers of individuals with few tolerant taxa. A summary of the diversity metrics is presented in Table 3-5. Two methods were used to measure invertebrate diversity, including the Shannon-Weaver Index (SWI) and Margalef's Richness Index (MRI). The MRI is a measure of the number of taxa observed at a given site, while the SWI evaluates the number of taxa and the evenness of distribution among them. Typically these index scores are used to compare differences in diversity between several sites along a condition gradient or a potentially impacted site versus reference location. While somewhat less informative when evaluated without context, the SWI can range from 0 to 4.6, with a score approaching 2.0 typically indicating a diverse community. Typical MRI scores at diverse high quality sites are above 5.0. Diversity index scores calculated for the HG-062713 monitoring site indicate a BMI community with low diversity and dominance by few species. The diversity scores reflect a low number of taxa observed (14) and an unbalanced distribution of individuals among them (i.e., dominance by Ostracoda).

Table 3-5.
Summary of Select Biological Metrics

Biological Metric	Site HG-062713
Number of Organisms Sorted	613
Number of Organisms in entire sample[1]	12468
Taxa Richness	14
First Dominant Taxa	Ostracoda
Percent of Top Dominant Taxa	83.4
Percent of 3 Top Dominant Taxa	94.0
Percent of Intolerant Individuals	0.16
Percent of Sensitive EPT Taxa	0.0
Dominant FFG	Collector-Gatherer
Shannon-Weaver Diversity Index (log10)	0.32
Margalef's Richness Index	1.38
Mean HBI	7.83

Notes:
1. Estimate based on number subsampled and percent of sample sorted.
EPT - Ephemeroptera, Plecoptera, Trichoptera
FFG - functional feeding groups
HBI - Hilsenhoff Biotic Index

3.2.2.2 Sensitivity Metrics

The tolerance of many BMI taxa to habitat impairment and water quality has been determined through prior studies (Hilsenhoff 1987). The Hilsenhoff Biotic Index (HBI) ranks BMI taxa on a scale of 0 to 10 regarding their sensitivity to impairment, with a TV of 0 being given to taxa that are highly sensitive to habitat or water quality impairment and a TV of 10 to those that are very insensitive. While organisms with a high TV can be found in streams with good water and habitat quality, they tend to be a lesser proportion of the community. Conversely, taxa with low TVs (i.e., sensitive organisms) will very rarely be found at sites with poor water or habitat quality. Although originally developed to assess low DO caused by organic loading (Hilsenhoff 1977, 1982, and 1987), the HBI may also be sensitive to the effects of impoundment, thermal pollution, and some types of chemical pollution (Hilsenhoff 1988, Hooper 1993). The average of HBI scores for individual taxa within observed at the site was 7.83, indicating mostly tolerant, insensitive organisms. One intolerant individual of the Dipteran genus *Dixella* sp. (TV of 2) was observed at the site, accounting for the 0.16% intolerant individuals metric.

EPT taxa comprise a group of sensitive organisms, which are found worldwide and provide a good estimate of the water and habitat quality in a stream. While some of the taxa from this group are moderately insensitive to impairment, the majority are good indicators of community health. The number of EPT taxa is one of the seven sub-metrics used to calculate the SoCal IBI score. No EPT taxa were found at the HG-062713 site.

3.2.2.3 Functional Feeding Groups

BMI may be grouped according to mode of feeding, referred to as Functional Feeding Groups (FFG). A healthy assemblage will typically contain a variety of FFG, while dominance of the community by few FFG suggests the stream may not support a diversity of ecological niches and may be general indicator of poor community health. The type and relative abundance of groups present can provide valuable insight with regard to ecological integrity, especially when considered with other assessment data.

A summary of the various FFG distributions obtained is presented in Table 3-6. The distribution of FFGs at HG-062713 was rather disproportionate. The collector-gatherer FFG contained the vast majority of taxa present with over 89% of the organisms, 17 times higher than the next highest group. In addition, five of the six remaining FFGs had less than 5% of the community. The collector-gatherer FFG is a subset of a larger collector group, comprised of collector-gatherers and collector-filterers. The collector-gatherers typically acquire fine particulate organic matter from the bottom by ingesting fine sediments, while the collector-filterers use mucous nets or fans to filter out fine particulate organic matter suspended in the passing water column. Both of these collectors are typically found in higher numbers in streams containing a high proportion of fines and sands and/or algal growth.

Table 3-6.
Community Composition of Functional Feeding Groups

Metric (%)	Site HG-062713
Collector-Filterers	0.0
Collector-Gatherers	89.6
Predators	4.6
Scrapers	5.2
Shredders	0.2
Piercer-Herbivores	0.0
Unclassified	0.5

3.3 Summary of Algal Biomass Data

Chlorophyll *a* is an important component of algae, and combined with AFDM, provides an indicator of the amount of algae at the sampling location. Due to the relative uniformity of substrate types encountered at the Hines Growers, Inc. sampling location (i.e., sands, fines, and small gravel), only the PVC delimiter algal collection device was used for collections.

Analytical results of chlorophyll *a* and AFDM samples are presented in Table 3-7. Chlorophyll *a* and AFDM concentrations were 35.2 micrograms per square centimeter (µg/cm^2) and 12.5 milligrams per square centimeter (mg/cm^2), respectively.

Table 3-7.
Chlorophyll *a* and Ash-Free Dry Mass Results

Parameter	Site HG-062713
Total Surface Area Sampled (cm^2)	138.6
Sample Composite Volume (mL)	525
Chlorophyll *a* (µg/cm^2)[a]	35.2
Ash-Free Dry Mass (mg/cm^2)[a]	12.5

Notes:
[a] Converted from milligrams per liter to represent concentration of benthic algae per surface area collected.
µg/cm^2 - microgram per square centimeter
cm - centimeter
mL - milliliter
mg/cm^2 - milligram per square centimeter

3.4 Summary of Algal Taxonomic Data

A summary of algal community metrics is presented in Table 3-8. Algae are good indicators of water-quality conditions; notably nutrient and organic enrichment; and also are indicators of major ion, DO, and stream microhabitat conditions. The autecology, or physiological optima and tolerance, of algal species for various water-quality contaminants and conditions is relatively well understood for certain groups of freshwater algae, notably diatoms. These algal characteristics can be used to help understand the condition of a river or stream. An algal IBI is currently in development by the State Water Resources Control Board and the Southern California Coastal Water Research Project and may become a very useful tool in ambient surface water monitoring. Algae respond more quickly and to different ecological stressors than BMI (particularly nutrients and sediment), and there is a general consensus that these two monitoring tools are complementary and should provide a more comprehensive understanding of anthropogenic impacts to the stream biota. The following is a summary of various algal biological metrics which describe the algal community observed at the Hines Growers, Inc. stream monitoring location.

Table 3-8.
Summary of Selected Algal Biological Metrics

Biological Metric	Site HG-062713
Diatom Taxa Richness	25
First Dominant Diatom Taxa	*Staurosira construens* var *venter*
Percent of First Dominant Diatom Taxa	33.5
Percent of Top 3 Dominant Diatom Taxa	60.7
Shannon-Weaver Diversity Index (log10) Diatoms	0.96
Margalef's Richness Index Diatoms	3.75
Soft Algae Taxa Richness	10
First Dominant Soft Microalgae Taxa	*Heteroleibleinia pusilla*
Percent of First Dominant Soft Microalgae Taxa	44.3
Percent of Top 3 Dominant Soft Microalgae Taxa	91.5
Shannon-Weaver Diversity Index (log10) Soft Microalgae	0.61
Margalef's Richness Index Soft Microalgae	1.5
Percent of Motile Diatom Taxa	36.0
Percent of Taxa High Phosphorus Indicators	40.0
Percent of Taxa High Nitrogen Indicators	49.6
Percent of Eutrophic Taxa	57.1
Percent of α-Mesosaprobous & Polysaprobous Diatoms[a]	52.0

Notes:
a. algal taxa that are typically found in higher densities in streams with degraded water or habitat quality.

3.4.1 Diversity and Dominance

Diatom taxa richness was relatively high with 25 species observed in the sample. The diatom *Staurosira construens* var *venter* was the dominant taxa, comprising 33.5% of the diatom community. This was followed by diatoms *Planothidium frequentissimum* and *Nitzschia inconspicua* making up 15.2% and 12.0% of the community, respectively. These top three taxa comprised the majority of diatom taxa present, at 60.7% of the community. The SWI and MRI diversity indices indicate a diatom community with moderate diversity, yet an unbalanced distribution of individuals among them.

Soft bodied microalgae taxa richness was low with 10 species observed in the sample. *Heteroleibleinia pusilla* was the dominant taxa, comprising 44.3% of the soft bodied microalgal community. This was followed by *Characium* and *Heteroleibleinia kossinskajae* making up 27.8% and 19.5% of the community, respectively. These top three microalgae taxa comprised the vast majority of taxa present, at 91.5% of the community. The SWI and MRI indicate a soft microalgal community with low diversity and dominance by few species.

3.4.2 Diatom Autecology Indicators

It should be noted that while these autecology indicators are general indicators of water and habitat quality, algal species can be found across a spectrum of conditions. For example, an algal species considered pollution tolerant (e.g., polysaprobous and α-mesosaprobous) are frequently found in higher abundances in streams with poor water and habitat quality; however, these taxa can also be found in streams of higher quality. Conversely, taxa considered less tolerant (e.g., oligosaprobous and β-mesosaprobous taxa) will very rarely be found at sites with poor water or habitat quality.

The dominant diatom taxon was *Staurosira construens* var *venter*. This species can be indicative of eutrophic conditions, and is generally tolerant to increases in organically bound nitrogen enrichment. It is somewhat sensitive to pollution and is classified as a β-mesosaprobic diatom, meaning it can be observed in slightly degraded conditions, but will generally not be found in highly impacted sites. The second most dominant diatom taxon, *Planothidium frequentissimum*, can be indicative of high TN conditions. It is considered an α-meso/polysaprobous diatom, able to tolerate moderate to high levels pollution. The third most dominant diatom taxon, *Nitzschia inconspicua*, is a eutrophic diatom indicative of high TN and phosphorus conditions. It is considered a α-mesosaprobous diatom, able to tolerate moderate to high levels pollution.

Motile diatoms accounted for 36% of the diatom community, indicating a moderate level of siltation at this site. The presence of motile diatoms typically increases with increasing siltation. High phosphorus and nitrogen indicator taxa accounted for 40% and 50% of the diatoms present, respectively. Diatom taxa frequently observed in eutrophic conditions comprised 57% of the diatom community at the Hines Grower, Inc. stream monitoring location. Polysaprobous and α-mesosaprobous diatoms (those indicative of highly degraded conditions) accounted for 52% of the diatoms observed.

3.5 Physical Habitat Characteristics

Field data sheets containing PHAB observations are provided in Appendix B. Summaries of the dominant habitat characteristics at the sampling station during the June 2013 bioassessment are provided below in Tables 3-9 through 3-11. Densiometer readings were converted to percent vegetative cover according to the procedures outlined in Strickler (1959).

The average wetted and bankfull width across all transects was 2.0 and 4.7m, respectively, with a mean reach-wide depth of 8.7cm. Substrate within the creek was composed primarily of sand (65%), and almost equal contributions of fines (18%) and gravel (17%). A small amount of CPOM was present in the creek, present at 26% of the point count locations. Instream habitat complexity was composed of a mixture of patch types, including filamentous macroalgae (74% of point count locations), macrophytes (36% of the point count locations), sparse small woody debris, and some overhanging vegetation. The creek banks were a mix of vulnerable and stable areas, some shored with broken concrete pieces or solid concrete bags, and other areas with only grasses. Human influences at various distances from the creek consisted of rip-rap on both banks for almost the entire reach, cleared lot, pipes, trash, nursery operations, and a bridge abutment at Transect D.

Mean canopy cover over the entire reach monitored, as measured with a densiometer, was low, at 36%. The mean coverage estimate of the upper canopy riparian vegetation (trees and saplings >5 m high) was low (0–10%) across the reach assessed. Mean lower canopy riparian vegetation (0.5 m to 5 m high) also had low (0–10%) coverage on both banks. Mean groundcover (<0.5 m high) at transects contained low coverage (0–10%) of woody shrubs, low coverage (0–10%) of herbs/grasses, and very heavy coverage (>75%) barren soil/duff.

Flow habitats across the reach assessed were dominated by glides (shallow / slow flow), covering 97% of the assessed area. The sinuosity ratio was 1.01, indicating a straight stream path. Flow velocity at the Hines Growers, Inc. sampling location was low at 0.125 feet per second (ft/sec). The creek slope was measured at 0.21%, indicating a very low-gradient stream, which is defined as one with a slope less than 0.5%.

In addition to PHAB measurements collected at each transect and inter-transect, a reach-wide characterization (including epifaunal substrate/cover, sediment deposition, and channel alteration) was performed at each station. Epifaunal substrate is defined as the type and variety of habitat within the stream channel. Sediment deposition assesses the amount of fines and sands that have accumulated within the channel and channel alteration characterizes the extent to which the channel has been modified by human activity. The epifaunal substrate and sediment deposition at the Hines Growers, Inc. station were both rated as poor (scored 2 and 1, respectively) due to the high presence of sand and fine benthic substrate, and sparse instream habitat. Channel alteration was also rated in the poor category (scored 5) due to the presence of extensive shoring structures present on both banks and straitening of the channel.

Table 3-9.
Summary of Selected Physical Habitat Characteristics

Parameter	Site HG-062713
Dominant Substrate	Sand
Mean Bankfull Width (m)	4.7
Mean Wetted Width (m)	2.0
Mean Water Depth (cm)[1]	8.7
Macroalgae Presence (%)[1]	74.3
Macrophyte Presence(%)[1]	36.2
Densiometer Canopy Cover (%)[2]	35.7
CPOM Presence (%)[1]	25.7
Upper Canopy Riparian Cover (%)[3]	0–10
Lower Canopy Riparian Cover (%)[3]	0–10
Riparian Ground Cover – Shrubs / Saplings (%)[3]	0–10
Riparian Ground Cover – Herbs / Grasses (%)[3]	0–10
Riparian Ground Cover – Barren (%)[3]	>75
Flow Velocity (ft/sec)	0.125
Sinuosity Ratio	1.01
Gradient (%)	0.21

Notes:
1. Derived from discrete 105 point count measurements.
2. Mean of 11 main transects.
3. Mean across entire reach.

% - percent
cm - centimeter(s)
CPOM - Course Particulate Organic Matter
ft/sec - feet per second
m - meter(s)

Table 3-10.
Summary of Substrate Types Observed

Substrate Type (%)	Site HG-062713
Fines	18.1
Sand	64.8
Gravel	17.1
Cobble	0
Boulder	0
Bedrock	0
Other	0

Note: percent of 105 point counts

Table 3-11.
Summary of Flow Habitat Types Observed

Flow Habitat (% of reach)	Site HG-062713
Cascade	0
Rapid	0
Riffle	0
Run	0
Glide	97.0
Pool	1.0
Dry	2.0

Note: Mean across entire reach

4.0 QUALITY ASSURANCE/QUALITY CONTROL

All of the data presented have been thoroughly reviewed in accordance with our internal quality assurance (QA) program and are deemed acceptable for reporting. Any deviations from the protocol are discussed below, or are otherwise considered minor with no effect upon the assessment.

4.1 Water Chemistry

All samples collected were submitted to the analytical laboratories within 12 hours of collection and met holding time requirements for analysis. Analytical data were thoroughly reviewed and deemed acceptable for reporting purposes with qualifications as noted in the QA section of the individual lab report.

One deviation from the Quality Assurance Prevention Plan (QAPP) was made during analysis of water samples. The QAPP specified the anions nitrate and nitrite be analyzed individually, which would be performed using method EPA 300.0. However, these two constituents were analyzed together using EPA SM 4500-NO3 E, which does not distinguish between them, but produces a sum total. By the time this error was discovered, the sample was out of holding time and could not be reproduced.

In two cases, analytical reporting limits (RL) were above the target RL specified in the QAPP (sulfate and nitrate+nitrite). Laboratory RLs for each analyte were generated depending on performance based criteria per National Environmental Laboratory Accreditation Certification guidelines. In all cases, the RLs were equal to or below water quality objectives (WQO) for these analytes; and measured values exceeded RLs for these measurements; therefore exceeded RLs had no bearing on data interpretation.

4.2 Benthic Macroinvertebrate Sampling

SWAMP sampling protocols were followed throughout the bioassessment. The data is released without qualification.

4.3 Benthic Macroinvertebrate Identification

EcoAnalysts, Inc. performed taxonomic identification and SoCal IBI calculations. QA measures included re-sorting a minimum of 20% of each BMI sample to determine sorting efficacy (which exceeded 90%). Accurate calculation of the SoCal IBI using SWAMP methods under the Standard Taxonomic Effort Level 2 requires a minimum sample size of 600 invertebrates.

4.4 Physical Habitat Characterization

PHAB data were collected in accordance with SWAMP methods and is acceptable without further qualification.

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5.0 DISCUSSION

5.1 Water Quality

Several analytes were found in exceedance of San Diego Basin Plan (SDRWQCB 1994) WQO. These include sulfate, TDS, TN, nitrate+nitrite, and total phosphorus.

While the nitrate+nitrite result of 41 milligrams per liter (mg/L) using EPA SM 4500-NO3 E does exceed the WQO of 10 mg/L for the combined analysis of these two compounds, the individual WQO for nitrite of 1.0 mg/L, may or may not have been exceeded, depending on the ratio of nitrate to nitrite in the sample. The individual WQO for nitrate of 45 mg/L was not exceeded based on the total nitrate+nitrite result of 41 mg/L.

The WQO for ammonia is based on the un-ionized fraction (NH_3). Total ammonia measured in the sample was 0.11 mg/L. Using the pH, temperature, and salinity of the sample water at the time of collection, the un-ionized fraction was calculated to be 0.0013 mg/L, below the un-ionized ammonia WQO of 0.025 mg/L.

5.2 Biological Metrics

5.2.1 Macroinvertebrates

The overall SoCal IBI categorical ranking at the Hines Growers, Inc. bioassessment station during the June 2013 sampling event resulted in a classification of “Very Poor”. The FFGs present were dominated by the collector groups, specifically the collector-gatherers and the biological community diversity measurements indicated low diversity, with dominance by one taxa.

Abundance measures provide an estimate of the total number of taxa groups and individuals in a stream. A high abundance does not necessarily provide an indication of good water quality. In many cases, as water or habitat quality begins to decline, the number of organisms in a stream will increase. However, this is often observed with a corresponding decrease in total taxa groups, and these groups are dominated by increasingly pollutant-tolerant species. The total abundance of macroinvertebrates at this site (adjusted for percent subsampled) was high at 12,468 individuals, while taxa richness was low at 14. High quality reference sites tend to have low to moderate abundance levels and a relatively high numbers of taxa groups.

There is a close link between the diversity measures observed at a site and the magnitude of dominance observed by the top three most abundant species. This relationship is generally an inverse one. Typically as water or habitat quality decline, measures of species diversity also decrease, with a corresponding increase in dominance of a few more tolerant taxa. The bioassessment station at Hines Growers, Inc. exhibited an elevated dominance of Ostracods making up 83% of the community and the top three species comprising 94% of the individuals present. The SWI and MRI diversity measures at the station both indicated low diversity.

The distribution of FFGs at the Hines Growers, Inc. station was rather disproportionate. The collector-gatherer FFG contained the majority (89.6%) of individuals present. This unbalanced community suggests some level of stress on the macroinvertebrate community.

Sensitivity metrics calculated for this dataset (e.g., HBI) rank species present based on their tolerance to water or habitat impairment. The average of HBI scores for individual taxa within observed at the site was 7.83, indicating predominantly tolerant organisms. As a basis for comparison, higher quality reference sites would be expected to have HBI scores under 5.0. Adobe Creek, a reference station within the Santa Margarita River Watershed, had an average HBI score of 4.82 when sampled during Spring 2013.

5.2.2 Algae

The Hines Growers, Inc. station had relatively high benthic chlorophyll-*a* concentration of 35.2 μg/cm^2. This concentration of chlorophyll-*a* suggests an increased presence of green algae. This is further supported by the substrate point counts which identified benthic macroalgae at 74% of the locations. Station photos (see Appendix E) show much of the stream surface area with filamentous algae coverage.

The diversity of diatom taxa present was moderate with top three taxa comprising 60% of the community. However, the soft bodied algal taxa community was dominated by the top three taxa at 92%. The three dominant diatom taxa present *Staurosira construens* var *venter*, *Planothidium frequentissimum*, and *Nitzschia inconspicua* all have some characteristics of algae found in eutrophic, moderately degraded streams. Approximately 40% to 60% of the diatom taxa present were indicative of high nitrogen, high phosphorus, eutrophic, or degraded conditions.

5.3 Physical Habitat

Sands and fines accounted for a very high percentage of the particles observed. A number of studies have shown the impact that less than adequate PHAB can have on the stream benthic biological communities, particularly that of excess fines and sand substrate (Munn et. al. 2009, Wilson et. al. 2007, Hall et. al. 2009, Harrison et. al. 2007, and Mazor et. al. 2010). Healthy, diverse benthic macroinvertebrate communities require varied habitat types with an abundance of interstitial spaces. Sands and fines act to fill those spaces, thereby smothering the habitat, leaving a uniform sandy substrate that few species in Southern California are adapted to (Mazor et. al. 2010). Generally, in the absence of water quality degradation, a greater diversity of habitat types and niches will result in a more diverse benthic community (Munn et. al. 2009 and Wilson et. al. 2007). Very little habitat complexity was observed at this location.

In addition, RC along this reach is considered a very low gradient stream (<0.5% slope). Gradient can result in a marked difference in flow regime and availability of microhabitats, relative to higher gradient streams. For bioassessment programs, an important distinction between high and low-gradient streams is the scarcity of riffles and other microhabitats that are typically the richest macroinvertebrate habitats (Mazor et al. 2010). In addition, reduced flow, low gradient streams are generally characterized by settling conditions in which sediment particulates accumulate. This was observed in the current dataset with Hines Growers, Inc.

stream segment being comprised primarily of slow flowing glides. This habitat type does not provide an ideal setting for macroinvertebrates.

5.4 Integrative Assessment

Despite several water quality constituents exceeding San Diego Basin Plan WQO, water quality may not necessarily be the primary driver of the benthic community observed at the Hines Growers, Inc. sampling location on RC. Regardless of water quality, one would not expect a healthy, diverse benthic macroinvertebrate population at this location based on the PHAB conditions alone. The large fraction of sands and fines, along with lack of riparian habitat, lack of instream habitat complexity, very low gradient, and low flow all limit the ability of a stream to sustain a healthy macroinvertebrate community.

As suggested by the sparse riparian vegetative metrics, the stream canopy cover at this site was low at only 35.7% of the stream reach having overhead canopy. This in combination with shallow depth and slow flow enhances conditions that can favor algal growth by increasing temperature and allowing more sunlight to reach the creek surface.

5.5 Comparison to Other Historical Bioassessment Sampling in Rainbow Creek

As part of the County of San Diego's copermittee bioassessment monitoring program, the RC Watershed was sampled in 2008 and 2011. Two stations were sampled downstream of the facility. A summary of the sampling locations and IBI scores for these events is presented in Table 5-1. These bioassessment IBI scores indicate that the BMI community in RC has consistently ranked as "Poor" or "Very Poor". Based on known inherent variability in most biological systems (ex. RC-WGR results below), the single biological integrity score obtained for the Hines Growers, Inc. reach does not categorically differ from scores observed in other monitored portions of the RC watershed.

Table 5-1.
Summary of Historical Bioassessment Sampling in Rainbow Creek

Sample ID	Sample Date	Location Relative to Site HD-062713	IBI Score Range	Biological Condition
RC-I15	May 2011	Downstream ~ 1100m	9	Very Poor
RC-WGR	May 2008	Downstream ~ 5500m	24	Poor
RC-WGR	May 2011	Downstream ~ 5500m	11	Very Poor

Notes:
~ - approximately
IBI - index of biological integrity
m - meter(s)

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6.0 RECOMMENDATIONS

Without context it is difficult to say whether the facility is having an impact on the stream biological community. While it is clear that this stream does not contain the benthic macroinvertebrate or algal communities that one would expect in a pristine reference stream, many factors are at play (e.g., PHAB constraints and water quality). Some prior bioassessments performed in other portions of RC do show a degraded macroinvertebrate community; however, these are downstream of the current monitored station, and therefore not able to differentiate the contributions of the facility. For greater context, a recommendation for future monitoring would be to conduct bioassessment collections upstream of the facility in a portion of RC with habitat similar to that found in the current monitored location.

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7.0 REFERENCES

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APPENDIX A

FIGURES

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Legend

Monitoring Location

Roads

Map Notes

June 2013 Bioassessment

Project Number: 1315102400
Date: October 2013

Hines Growers Inc.
June 2013 Water Quality and Bioassessment
Monitoring Location

FIGURE

1

amec

Graphics/Biology/HinesGrowers/MonitoringLocation_v1.ai

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Figure 2. Freshwater Ostracod

Figure 3. Oligochaete

Figure 4. Physa sp.

APPENDIX B

FIELD DATASHEETS

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Reach Documentation

Standard Reach Length (wetted width ≤ 10 m) = 150 m Distance between transects = 15 m
Alternate Reach Length (wetted width >10 m) = 250 m Distance between transects = 25 m

Project Name: Hines Growers	Date: 06 / 27 / 2013 Sample Collection Time: 0845
Stream Name: Rainbow Creek	Site Name/ Description: Hines Growers
Site Code: HG-062713	Crew Members: JR, TA, KT, GM
Latitude (actual – decimal degrees): °N 33.41683	datum: NAD83
Longitude (actual – decimal degrees): °W -117.N728	other: GPS Device: Garmin 76

Ambient Water Quality Measurements

* Turbidity, silica, oxygen saturation, and air temp are optional; calibration date required on page 24

Water Temp (Deg C)	pH	Alkalinity (mg/L)	Turbidity (ntu)*	Oxygen Sat. (%)*
22.1	7.51	—	—	—
Dissolved O^2 (mg/L)	**Specific Conduct (uS/cm)**	**Salinity (ppt)**	**Silica (mg/L)***	**Air Temp (Deg C)***
8.18	2106	1.1	—	—

Actual Reach Length (m) (see reach length guidelines at top of form): NO

Explanation:

Discharge Measurements

1st measurement = left bank (looking downstream)

check if discharge measurements not possible (explain in field notes section) ☐

Velocity Area Method (preferred)

cal. date: Transect Width (m): 0.50

	Distance from Left Bank (cm)	Depth (cm)	Velocity (ft/sec)		Distance from Left Bank (cm)	Depth (cm)	Velocity (ft/sec)
1	0	3.0	0	11			
2	10	3.5	0	12			
3	20	5.0	0.38	13			
4	30	5.5	0.33	14			
5	40	4.5	0.04	15			
6	50	1.0	0	16			
7				17			
8				18			
9				19			
10				20			

Buoyant Object Method (use ONLY if velocity area method not possible)

	Float 1	Float 2	Float 3
Distance (m)			
Float Time (sec)			

Float Reach Cross Section

width (m) depth(cm)	Upper Section	Middle Section	Lower Section
Width			
Depth 1			
Depth 2			
Depth 3			
Depth 4			
Depth 5			

Notable Field Conditions (check one box per topic)

Evidence of recent rainfall (enough to increase surface runoff)	NO	X	minimal		>10% flow increase	
Evidence of fires in reach or immediately upstream (<500 m)	NO	X	< 1 year		< 5 years	
Dominant landuse/ landcover in area surrounding reach	Agriculture	X	Forest		Rangeland	
	Urban/ Industrial		Suburb/Town		Other	

Additional Cobble Embeddedness Measures

(carry over from transect forms if needed to attain target count of 25; measure in %)

1	2	3	4	5	6	7	8	9	10	11	12	13
14	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**	

SWAMP Stream Habitat Characterization Form — FULL VERSION — Revision Date: March 19th, 2013

Site Code: HG-062713 | Date: 06/27/2013

SLOPE and BEARING FORM (transect based - for Full PHAB only)

AUTOLEVEL ☐ CLINOMETER ☐ HANDLEVEL ☒ OTHER ☐

Starting Transect	MAIN SEGMENT (record percent of inter-transect distance in each segment if supplemental segments are used): Stadia rod measurements	Slope (%) or Elevation Difference cm ☒ % ☐	Segment Length (m)	Bearing (0°-359°)	Percent of Total Length (%)	SUPPLEMENTAL SEGMENT (record percent of inter-transect distance in each segment if supplemental segments are used): Stadia rod measurements	Slope or Elevation Difference cm ☐ % ☐	Segment Length (m)	Bearing (0°-359°)	Percent of Total Length (%)
K	117									
J	117 ~~115~~ TR	0	15	0	100					
I	119	2	↑	0	↑					
H	119	0		8						
G	122	3		8						
F	125	3		356						
E	130	5		0						
D	137	7		22						
C	147	10		22						
B	149	2		22						
A	149	0	15	8	100					
additional calculation area										

ADDITIONAL HABITAT CHARACTERIZATION

High Gradient ☐ Low Gradient ☒

Parameter	Optimal	Suboptimal	Marginal	Poor
Epifaunal Substrate/ Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover (50% for low-gradient streams); mix of submerged logs, undercut banks, cobble or other stable habitat	40-70% mix of stable habitat (30-50% for low-gradient streams); well-suited for full colonization potential	20-40% mix of stable habitat (10-30% in low-gradient streams); substrate frequently disturbed or removed	Less than 20% stable habitat (10% in low-gradient streams); lack of habitat is obvious; substrate unstable or lacking
Score:	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition (<20% in low-gradient streams)	Some new increase in bar formation, mostly from gravel, sand, or fine sediment; 5-30% of the bottom affected (20-50% in low-gradient streams)	Moderate deposition of new gravel, sand, or fine sediment on bars; 30-50% of the bottom affected (50-80% in low-gradient streams)	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently (>80% in low-gradient streams)
Score:	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern	Some channelization present, (e.g., bridge abutments); evidence of past channelization (> 20yrs) may be present but recent channelization not present	Channelization may be extensive; embankments or shoring structures present on both banks; 40 to 80% of stream reach disrupted	Banks shored with gabian or cement; Over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely
Score:	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

Site Code: H6-062713	Site Name: Hines Growers	Date: 06/27/2013
Wetted Width (m): 1,3	Bankfull Width (m): 5,0	Bankfull Height (m): 0,23

Transect A

Transect Substrates

Position	Dist from LB (m)	Depth (cm)	mm/ size class	% Cobble Embed.	CPOM	Microalgae Thickness Code	Macroalgae Attached	Macroalgae Unattached	Macrophytes
Left Bank	0	2	GF 6mm	—	P A D	2	P A D	P A D	P A D
Left Center	0.33	4	GF 4m	—	P A D	2	P A D	P A D	P A D
Center	0.65	2	SA	—	P A D	2	P A D	P A D	P A D
Right Center	0.98	3	GF 10mm	—	P A D	2	P A D	P A D	P A D
Right Bank	1.3	1	SA	—	P A D	2	P A D	P A D	P A D

Note: Substrate sizes can be recorded either as direct measures of the median axis of each particle or one of the size class categories listed on the supplemental page (direct measurements preferred)

Microalgae Thickness Codes
0 = No microalgae present. Feels rough, not slimy;
1 = Present but not visible. Feels slimy;
2 = Present and visible but <1mm; Rubbing fingers on surface produces a brownish tint on them, scraping leaves visible trail.
3 = 1-5mm;
4 = 5-20mm;
5 = >20mm;
UD = Cannot determine if microalgae present, substrate too small or covered with silt (formerly Z code).
D = Dry, not assessed

Riparian Vegetation

(facing downstream, 5 m u/s, 5 m d/s, 10 m from wetted width)

0 = Absent (0%) 1 = Sparse (<10%) 2 = Moderate (10-40%) 3 = Heavy (40-75%) 4 = Very Heavy (>75%)

Vegetation Class	Left Bank	Right Bank
Upper Canopy (>5 m high)		
Trees and saplings >5 m high	0 1 2 3 4	0 1 2 3 4
Lower Canopy (0.5 m-5 m high)		
All vegetation 0.5 m to 5 m	0 1 2 3 4	0 1 2 3 4
Ground Cover (<0.5 m high)		
Woody shrubs & saplings <0.5 m	0 1 2 3 4	0 1 2 3 4
Herbs/ grasses	0 1 2 3 4	0 1 2 3 4
Barren, bare soil/ duff	0 1 2 3 4	0 1 2 3 4

Instream Habitat Complexity

(5 m u/s, 5 m d/s)

0 = Absent (0%) 1 = Sparse (<10%) 2 = Moderate (10-40%) 3 = Heavy (40-75%) 4 = Very Heavy (>75%)

Filamentous Algae	0 1 2 3 4
Aquatic Macrophytes/ Emergent Vegetation	0 1 2 3 4
Boulders	0 1 2 3 4
Woody Debris >0.3 m	0 1 2 3 4
Woody Debris <0.3 m	0 1 2 3 4
Undercut Banks	0 1 2 3 4
Overhang. Vegetation	0 1 2 3 4
Live Tree Roots	0 1 2 3 4
Artificial Structures	0 1 2 3 4

Densiometer Readings (0-17)

count covered dots

Center Left	14
Center Upstream	17
Center Right	17
Center Downstream	13
Optional	
Left Bank	—
Right Bank	—

Human Influence

(circle only the closest to wetted channel; assess 5 m u/s, 5 m d/s)

0 = Not Present;
B = On Bank;
C = Between Bank & 10m from Channel;
P = >10m+<50m from Channel;
Channel (record Yes or No; if Y for an analyte, do not assess banks)

	Left Bank	Channel	Right Bank
Walls/ Rip-rap/ Dams	P C B 0	Y N	0 B C P
Buildings	P C B 0	Y N	0 B C P
Pavement/ Cleared Lot	P C B 0		0 B C P
Road/ Railroad	P C B 0	Y N	0 B C P
Pipes (Inlet/ Outlet)	P C B 0	Y N	0 B C P
Landfill/ Trash	P C B 0	Y N	0 B C P
Park/ Lawn	P C B 0		0 B C P
Row Crop	P C B 0		0 B C P
Pasture/ Range	P C B 0		0 B C P
Logging Operations	P C B 0		0 B C P
Mining Activity	P C B 0	Y N	0 B C P
Vegetation Management	P C B 0		0 B C P
Bridges/ Abutments	P C B 0	Y N	0 B C P
Orchards/ Vineyards	P C B 0		0 B C P

Bank Stability

([illegible])

Left Bank	eroded	vulnerable	stable
Right Bank	eroded	vulnerable	stable

TAKE PHOTOGRAPHS
(check box if taken & record photo code)

- [ ] Downstream (**optional**)
- [x] Upstream (**required**)

Inter-Transect: AB

Wetted Width (m): 0.8

Inter-Transect Substrates

Position	Dist from LB (m)	Depth (cm)	mm/ size class	% Cobble Embed.	CPOM	Microalgae Thickness Code	Macroalgae Attached	Macroalgae Unattached	Macrophytes
Left Bank	0	27	SA	—	P A D	2	P A D	P A D	P A D
Left Center	0.2	17	SA	—	P A D	2	P A D	P A D	P A D
Center	0.4	15	SA	—	P A D	1	P A D	P A D	P A D
Right Center	0.6	0.5	SA	—	P A D	1	P A D	P A D	P A D
Right Bank	0.8	0.5	SA	—	P A D	2	P A D	P A D	P A D

Note: Substrate sizes can be recorded either as direct measures of the median axis of each particle or one of the size class categories listed on the supplemental page (direct measurements preferred).

Microalgae Thickness Codes
0 = No microalgae present, Feels rough, not slimy;
1 = Present but not visible, Feels slimy;
2 = Present and visible but <1mm; Rubbing fingers on surface produces a brownish tint on them, scraping leaves visible trail;
3 = 1-5mm;
4 = 5-20mm;
5 = >20mm;
UD = Cannot determine if microalgae present, substrate too small or covered with silt (formerly Z code).
D = Dry, not assessed

FLOW HABITATS (% Between transects, Total=100%)	
Channel Type	%
Cascade/ Falls	
Rapid	
Riffle	
Run	
Glide	100
Pool	
Dry	

Site Code: H6-062713	Site Name: Hines Growers	Date: 06/27/2013
Wetted Width (m): 1.8	Bankfull Width (m): 3.9	Bankfull Height (m): 0.20
		Transect B

Transect Substrates

Position	Dist from LB (m)	Depth (cm)	mm/ size class	% Cobble Embed.	CPOM	Microalgae Thickness Code	Macroalgae Attached	Macroalgae Unattached	Macrophytes
Left Bank	0.0	0.5	SA	—	P A D	2	P A D	P A D	P A D
Left Center	0.45	12	SA	—	P A D	2	P A D	P A D	P A D
Center	0.9	13	SA	—	P A D	2	P A D	P A D	P A D
Right Center	1.35	18	SA	—	P A D	2	P A D	P A D	P A D
Right Bank	1.8	3	FN	~~NA~~	P A D	UD	P A D	P A D	P A D

Note: Substrate sizes can be recorded either as direct measures of the median axis of each particle or one of the size class categories listed on the supplemental page (direct measurements preferred)

Microalgae Thickness Codes
0 = No microalgae present, Feels rough, not slimy;
1 = Present but not visible, Feels slimy;
2 = Present and visible but <1mm; Rubbing fingers on surface produces a brownish tint on them, scraping leaves visible trail.
3 = 1-5mm;
4 = 5-20mm;
5 = >20mm;
UD = Cannot determine if microalgae present, substrate too small or covered with silt (formerly Z code).
D = Dry, not assessed

Riparian Vegetation

(facing downstream, 5 m u/s, 5 m d/s, 10 m from wetted width)

0 = Absent (0%) 1 = Sparse (<10%) 2 = Moderate (10-40%) 3 = Heavy (40-75%) 4 = Very Heavy (>75%)

Vegetation Class	Left Bank	Right Bank
Upper Canopy (>5 m high)		
Trees and saplings >5 m high	0 1 2 3 4	0 1 2 3 4
Lower Canopy (0.5 m-5 m high)		
All vegetation 0.5 m to 5 m	0 1 2 3 4	0 1 2 3 4
Ground Cover (<0.5 m high)		
Woody shrubs & saplings <0.5 m	0 1 2 3 4	0 1 2 3 4
Herbs/ grasses	0 1 2 3 4	0 1 2 3 4
Barren, bare soil/ duff	0 1 2 3 4	0 1 2 3 4

Instream Habitat Complexity

(5 m u/s, 5 m d/s)

0 = Absent (0%) 1 = Sparse (<10%) 2 = Moderate (10-40%) 3 = Heavy (40-75%) 4 = Very Heavy (>75%)

Filamentous Algae	0 1 2 3 4
Aquatic Macrophytes/ Emergent Vegetation	0 1 2 3 4
Boulders	0 1 2 3 4
Woody Debris >0.3 m	0 1 2 3 4
Woody Debris <0.3 m	0 1 2 3 4
Undercut Banks	0 1 2 3 4
Overhang. Vegetation	0 1 2 3 4
Live Tree Roots	0 1 2 3 4
Artificial Structures	0 1 2 3 4

Densiometer Readings (0-17)

count covered dots

Center Left	0
Center Upstream	11
Center Right	15
Center Downstream	11
Optional	
Left Bank	—
Right Bank	—

Human Influence

(circle only the closest to wetted channel; assess 5 m u/s, 5 m d/s)

0 = Not Present; B = On Bank; C = Between Bank & 10m from Channel; P = >10m+<50m from Channel; Channel (record Yes or No. If Y for an analyte, do not assess banks)

	Left Bank	Channel	Right Bank
Walls/ Rip-rap/ Dams	P C B 0	Y N	0 B C P
Buildings	P C B 0	Y N	0 B C P
Pavement/ Cleared Lot	P C B 0		0 B C P
Road/ Railroad	P C B 0	Y N	0 B C P
Pipes (Inlet/ Outlet)	P C B 0	Y N	0 B C P
Landfill/ Trash	P C B 0	Y N	0 B C P
Park/ Lawn	P C B 0		0 B C P
Row Crop	P C B 0		0 B C P
Pasture/ Range	P C B 0		0 B C P
Logging Operations	P C B 0		0 B C P
Mining Activity	P C B 0	Y N	0 B C P
Vegetation Management	P C B 0		0 B C P
Bridges/ Abutments	P C B 0	Y N	0 B C P
Orchards/ Vineyards	P C B 0		0 B C P

Bank Stability

(bank zone 5m upstream and 5m downstream of transect between bankfull - wetted width)

Left Bank	eroded	vulnerable	stable
Right Bank	eroded	vulnerable	stable

Inter-Transect: BC

Wetted Width (m): 2,6

Inter-Transect Substrates

Position	Dist from LB (m)	Depth (cm)	mm/ size class	% Cobble Embed.	CPOM	Microalgae Thickness Code	Macroalgae Attached	Macroalgae Unattached	Macrophytes
Left Bank	0	10	GC 18m	—	P A D	2	P A D	P A D	P A D
Left Center	0,65	13	GC 25 mm	—	P A D	2	P A D	P A D	P A D
Center	1,35	13	SA	—	P A D	2	P A D	P A D	P A D
Right Center	1,95	6	SA	—	P A D	2	P A D	P A D	P A D
Right Bank	2,6	0,5	FN	—	P A D	UD	P A D	P A D	P A D
	Note: Substrate sizes can be recorded either as direct measures of the median axis of each particle or one of the size class categories listed on the supplemental page (direct measurements preferred)								

Microalgae Thickness Codes
- **0** = No microalgae present, Feels rough, not slimy;
- **1** = Present but not visible, Feels slimy;
- **2** = Present and visible but <1mm; Rubbing fingers on surface produces a brownish tint on them, scraping leaves visible trail
- **3** = 1-5mm;
- **4** = 5-20mm;
- **5** = >20mm;
- **UD** = Cannot determine if microalgae present, substrate too small or covered with silt (formerly Z code).
- **D** = Dry, not assessed

FLOW HABITATS
[illegible]

Channel Type	%
Cascade/ Falls	
Rapid	
Riffle	
Run	
Glide	100
Pool	
Dry	

Site Code: 46-062713	Site Name: Hines Growers	Date: 06 / 27 / 2013
Wetted Width (m): 1,6	Bankfull Width (m): 5,5	Bankfull Height (m): 0.27

Transect C

Transect Substrates

Position	Dist from LB (m)	Depth (cm)	mm/ size class	% Cobble Embed.	CPOM	Microalgae Thickness Code	Macroalgae Attached	Macroalgae Unattached	Macrophytes
Left Bank	0	28	SA	—	P **A** D	2	**P** A D	P **A** D	P **A** D
Left Center	0.4	34	SA	—	P **A** D	2	**P** A D	P **A** D	P **A** D
Center	0.8	36	SA	—	P **A** D	2	P **A** D	P **A** D	**P** A D
Right Center	1.2	37	FN	—	P **A** D	UD	**P** A D	P **A** D	P **A** D
Right Bank	1.6	2	G* 10 mm	—	P **A** D	1	**P** A D	P **A** D	P **A** D

Note: Substrate sizes can be recorded either as direct measures of the median axis of each particle or one of the size class categories listed on the supplemental page (direct measurements preferred)

Microalgae Thickness Codes
0 = No microalgae present. Feels rough, not slimy;
1 = Present but not visible. Feels slimy;
2 = Present and visible but <1mm; Rubbing fingers on surface produces a brownish tint on them, scraping leaves visible trail.
3 = 1-5mm;
4 = 5-20mm;
5 = >20mm;
UD = Cannot determine if microalgae present, substrate too small or covered with silt (formerly Z code).
D = Dry, not assessed

RIPARIAN VEGETATION
(facing downstream, 5 m u/s, 5 m d/s, 10 m from wetted width)

0 = Absent (0%) 1 = Sparse (<10%) 2 = Moderate (10-40%) 3 = Heavy (40-75%) 4 = Very Heavy (>75%)

Vegetation Class	Left Bank	Right Bank
Upper Canopy (>5 m high)		
Trees and saplings >5 m high	**0** 1 2 3 4	0 1 **2** 3 4
Lower Canopy (0.5 m-5 m high)		
All vegetation 0.5 m to 5 m	**0** 1 2 3 4	0 1 **2** 3 4
Ground Cover (<0.5 m high)		
Woody shrubs & saplings <0.5 m	**0** 1 2 3 4	0 **1** 2 3 4
Herbs/ grasses	0 **1** 2 3 4	0 **1** 2 3 4
Barren, bare soil/ duff	0 1 2 3 **4**	0 1 2 3 **4**

INSTREAM HABITAT COMPLEXITY
(5 m u/s, 5 m d/s)

0 = Absent (0%) 1 = Sparse (<10%) 2 = Moderate (10-40%) 3 = Heavy (40-75%) 4 = Very Heavy (>75%)

Filamentous Algae	0 1 2 3 **4**
Aquatic Macrophytes/ Emergent Vegetation	0 **1** 2 3 4
Boulders	**0** 1 2 3 4
Woody Debris >0.3 m	**0** 1 2 3 4
Woody Debris <0.3 m	0 **1** 2 3 4
Undercut Banks	0 **1** 2 3 4
Overhang. Vegetation	**0** 1 2 3 4
Live Tree Roots	**0** 1 2 3 4
Artificial Structures	0 **1** 2 3 4

DENSIOMETER READINGS (0-17)
count covered dots

Center Left	0
Center Upstream	0
Center Right	10
Center Downstream	6
Optional	
Left Bank	
Right Bank	

HUMAN INFLUENCE
(circle only the closest to wetted channel; assess 5 m u/s, 5 m d/s)

0 = Not Present; B = On Bank; C = Between Bank & 10m from Channel; P = >10m+<50m from Channel; Channel (record Yes or No; if Y for an analyte, do not assess banks)

	Left Bank	Channel	Right Bank
Walls/ Rip-rap/ Dams	P C **B** 0	Y **N**	0 B **C** P
Buildings	P C B **0**	Y **N**	0 B C **P**
Pavement/ Cleared Lot	P C B **0**		**0** B C P
Road/ Railroad	P C B **0**	Y **N**	**0** B C P
Pipes (Inlet/ Outlet)	P C **B** 0	Y **N**	**0** B C P
Landfill/ Trash	**P** C B 0	Y **N**	0 B **C** P
Park/ Lawn	**P** C B 0		**0** B C P
Row Crop	**P** C B 0		**0** B C P
Pasture/ Range	**P** C B 0		**0** B C P
Logging Operations	**P** C B 0		**0** B C P
Mining Activity	**P** C B 0	Y **N**	**0** B C P
Vegetation Management	**P** C B 0		**0** B C P
Bridges/ Abutments	**P** C B 0	Y **N**	**0** B C P
Orchards/ Vineyards	**P** C B 0		**0** B C P

BANK STABILITY

Left Bank	eroded	vulnerable	**stable**
Right Bank	eroded	**vulnerable**	stable

Inter-Transect: CD

Wetted Width (m): 4.5

Inter-Transect Substrates

Position	Dist from LB (m)	Depth (cm)	mm/ size class	% Cobble Embed.	CPOM	Microalgae Thickness Code	Macroalgae Attached	Macroalgae Unattached	Macrophytes
Left Bank	0	21	FN	—	A	UD	P	A	A
Left Center	1.12	42	SA	—	A	2	P	A	A
Center	2.25	15	SA	—	A	1	P	A	A
Right Center	3.37	19	FN	—	P	UD	P	A	A
Right Bank	4.5	3	SA	—	P	2	P	A	P

Note: Substrate sizes can be recorded either as direct measures of the median axis of each particle or one of the size class categories listed on the supplemental page (direct measurements preferred)

Microalgae Thickness Codes
0 = No microalgae present. Feels rough, not slimy;
1 = Present but not visible, Feels slimy;
2 = Present and visible but <1mm; Rubbing fingers on surface produces a brownish tint on them, scraping leaves visible trail.
3 = 1-5mm;
4 = 5-20mm;
5 = >20mm;
UD = Cannot determine if microalgae present, substrate too small or covered with silt (formerly Z code).
D = Dry, not assessed

FLOW HABITATS
(% between transects, total=100%)

Channel Type	%
Cascade/ Falls	
Rapid	
Riffle	
Run	
Glide	80
Pool	10
Dry	10

Site Code: H6-062713	Site Name: Hines Growers		Date: 06/27/2013
Wetted Width (m): 3.0	Bankfull Width (m): 5.2	Bankfull Height (m): 0.25	**Transect D**

Transect Substrates

Position	Dist from LB (m)	Depth (cm)	mm/ size class	% Cobble Embed.	CPOM	Microalgae Thickness Code	Macroalgae Attached	Macroalgae Unattached	Macrophytes
Left Bank	0	0	SA	—	P A D	2	P A D	P A D	P A D
Left Center	0.75	2	SA	—	P A D	2	P A D	P A D	P A D
Center	1.5	1	SA	—	P A D	1	P A D	P A D	P A D
Right Center	2.25	10	SA	—	P A D	2	P A D	P A D	P A D
Right Bank	3	1	SA	—	P A D	2	P A D	P A D	P A D

Note: Substrate sizes can be recorded either as direct measures of the median axis of each particle or one of the size class categories listed on the supplemental page (direct measurements preferred)

Microalgae Thickness Codes
0 = No microalgae present, Feels rough, not slimy;
1 = Present but not visible, Feels slimy;
2 = Present and visible but <1mm; Rubbing fingers on surface produces a brownish tint on them, scraping leaves visible trail.
3 = 1-5mm;
4 = 5-20mm;
5 = >20mm;
UD = Cannot determine if microalgae present, substrate too small or covered with silt (formerly Z code).
D = Dry, not assessed

Riparian Vegetation
(facing downstream, 5 m u/s, 5 m d/s, 10 m from wetted width)

0 = Absent (0%) 1 = Sparse (<10%) 2 = Moderate (10-40%) 3 = Heavy (40-75%) 4 = Very Heavy (>75%)

Vegetation Class	Left Bank	Right Bank
Upper Canopy (>5 m high)		
Trees and saplings >5 m high	0 1 2 3 4	0 1 2 3 4
Lower Canopy (0.5 m-5 m high)		
All vegetation 0.5 m to 5 m	0 1 2 3 4	0 1 2 3 4
Ground Cover (<0.5 m high)		
Woody shrubs & saplings <0.5 m	0 1 2 3 4	0 1 2 3 4
Herbs/ grasses	0 1 2 3 4	0 1 2 3 4
Barren, bare soil/ duff	0 1 2 3 4	0 1 2 3 4

Instream Habitat Complexity
(5 m u/s, 5 m d/s)

0 = Absent (0%) 1 = Sparse (<10%) 2 = Moderate (10-40%) 3 = Heavy (40-75%) 4 = Very Heavy (>75%)

Category	Score
Filamentous Algae	0 1 2 3 4
Aquatic Macrophytes/ Emergent Vegetation	0 1 2 3 4
Boulders	0 1 2 3 4
Woody Debris >0.3 m	0 1 2 3 4
Woody Debris <0.3 m	0 1 2 3 4
Undercut Banks	0 1 2 3 4
Overhang. Vegetation	0 1 2 3 4
Live Tree Roots	0 1 2 3 4
Artificial Structures	0 1 2 3 4

Densiometer Readings (0-17)
count covered dots

Position	Reading
Center Left	17
Center Upstream	17
Center Right	17
Center Downstream	17
Optional	
Left Bank	
Right Bank	

Densiometer covered by Bridge

Human Influence
(circle only the closest to wetted channel; assess 5 m u/s, 5 m d/s)

0 = Not Present; B = On Bank; C = Between Bank & 10m from Channel; P = >10m+<50m from Channel; Channel (record Yes or No, If Y for an analyte, do not assess banks)

	Left Bank	Channel	Right Bank
Walls/ Rip-rap/ Dams	P C B 0	Y N	0 B C P
Buildings	P C B 0	Y N	0 B C P
Pavement/ Cleared Lot	P C B 0		0 B C P
Road/ Railroad	P C B 0	Y N	0 B C P
Pipes (Inlet/ Outlet)	P C B 0	Y N	0 B C P
Landfill/ Trash	P C B 0	Y N	0 B C P
Park/ Lawn	P C B 0		0 B C P
Row Crop	P C B 0		0 B C P
Pasture/ Range	P C B 0		0 B C P
Logging Operations	P C B 0		0 B C P
Mining Activity	P C B 0	Y N	0 B C P
Vegetation Management	P C B 0		0 B C P
Bridges/ Abutments	P C B 0	Y N	0 B C P
Orchards/ Vineyards	P C B 0		0 B C P

Bank Stability
(score zone 5m upstream and 5m downstream of transect between bankfull - wetted width)

Left Bank	eroded	vulnerable	stable
Right Bank	eroded	vulnerable	stable

Inter-Transect: DE

Wetted Width (m): 1,3

Inter-Transect Substrates

Position	Dist from LB (m)	Depth (cm)	mm/ size class	% Cobble Embed.	CPOM	Microalgae Thickness Code	Macroalgae Attached	Macroalgae Unattached	Macrophytes
Left Bank	0	13	GC 26 mm	—	P A D	2	P A D	P A D	P A D
Left Center	0,33	12	SA	—	P A D	2	P A D	P A D	P A D
Center	0.65	10	SA	—	P A D	2	P A D	P A D	P A D
Right Center	0,98	3	SA	—	P A D	2	P A D	P A D	P A D
Right Bank	1,3	0,5	FN		P A D	UD	P A D	P A D	P A D
	Note: Substrate sizes can be recorded either as direct measures of the median axis of each particle or one of the size class categories listed on the supplemental page (direct measurements preferred)								

Microalgae Thickness Codes

0 = No microalgae present, Feels rough, not slimy;
1 = Present but not visible, Feels slimy;
2 = Present and visible but <1mm; Rubbing fingers on surface produces a brownish tint on them, scraping leaves visible trail.
3 = 1-5mm;
4 = 5-20mm;
5 = >20mm;
UD = Cannot determine if microalgae present, substrate too small or covered with silt (formerly Z code).
D = Dry, not assessed

FLOW HABITATS	
Channel Type	%
Cascade/ Falls	
Rapid	
Riffle	
Run	
Glide	100
Pool	
Dry	

Site Code: HG-062713	Site Name: Hiner Growers	Date: 06/27/2013
Wetted Width (m): 1,8	Bankfull Width (m): 5,5 / Bankfull Height (m): 0,20	**Transect E**

Transect Substrates

Position	Dist from LB (m)	Depth (cm)	mm/ size class	% Cobble Embed.	CPOM	Microalgae Thickness Code	Macroalgae Attached	Macroalgae Unattached	Macrophytes
Left Bank	0	2	FN	—	P A D	UD	P A D	P A D	P A D
Left Center	0,45	7	SA	—	P A D	2	P A D	P A D	P A D
Center	0.9	6	SA	—	P A D	2	P A D	P A D	P A D
Right Center	1,35	0,5	SA	—	P A D	2	P A D	P A D	P A D
Right Bank	1,8	1	SA	—	P A D	2	P A D	P A D	P A D

Note: Substrate sizes can be recorded either as direct measures of the median axis of each particle or one of the size class categories listed on the supplemental page (direct measurements preferred)

Microalgae Thickness Codes
0 = No microalgae present, Feels rough, not slimy;
1 = Present but not visible, Feels slimy;
2 = Present and visible but <1mm; Rubbing fingers on surface produces a brownish tint on them, scraping leaves visible trail.
3 = 1-5mm;
4 = 5-20mm;
5 = >20mm;
UD = Cannot determine if microalgae present, substrate too small or covered with silt (formerly Z code).
D = Dry, not assessed

Riparian Vegetation
(facing downstream, 5 m u/s, 5 m d/s, 10 m from wetted width)

0 = Absent (0%) 1 = Sparse (<10%) 2 = Moderate (10-40%) 3 = Heavy (40-75%) 4 = Very Heavy (>75%)

Vegetation Class	Left Bank	Right Bank
Upper Canopy (>5 m high)		
Trees and saplings >5 m high	0 1 2 3 4	0 1 2 3 4
Lower Canopy (0.5 m-5 m high)		
All vegetation 0.5 m to 5 m	0 1 2 3 4	0 1 2 3 4
Ground Cover (<0.5 m high)		
Woody shrubs & saplings <0.5 m	0 1 2 3 4	0 1 2 3 4
Herbs/ grasses	0 1 2 3 4	0 1 2 3 4
Barren, bare soil/ duff	0 1 2 3 4	0 1 2 3 4

Instream Habitat Complexity
(5 m u/s, 5 m d/s)

0 = Absent (0%) 1 = Sparse (<10%) 2 = Moderate (10-40%) 3 = Heavy (40-75%) 4 = Very Heavy (>75%)

Filamentous Algae	0 1 2 3 4
Aquatic Macrophytes/ Emergent Vegetation	0 1 2 3 4
Boulders	0 1 2 3 4
Woody Debris >0.3 m	0 1 2 3 4
Woody Debris <0.3 m	0 1 2 3 4
Undercut Banks	0 1 2 3 4
Overhang. Vegetation	0 1 2 3 4
Live Tree Roots	0 1 2 3 4
Artificial Structures	0 1 2 3 4

Densiometer Readings (0-17)
count covered dots

Center Left	0
Center Upstream	0
Center Right	0
Center Downstream	0
Optional	
Left Bank	
Right Bank	

Human Influence
(circle only the closest to wetted channel; assess 5 m u/s, 5 m d/s)

0 = Not Present; B = On Bank; C = Between Bank & 10m from Channel; P = >10m+<50m from Channel; Channel (record Yes or No; if Y for an analyte, do not assess banks)

	Left Bank	Channel	Right Bank
Walls/ Rip-rap/ Dams	P C B 0	Y N	0 B C P
Buildings	P C B 0	Y N	0 B C P
Pavement/ Cleared Lot	P C B 0		0 B C P
Road/ Railroad	P C B 0	Y N	0 B C P
Pipes (Inlet/ Outlet)	P C B 0	Y N	0 B C P
Landfill/ Trash	P C B 0	Y N	0 B C P
Park/ Lawn	P C B 0		0 B C P
Row Crop	P C B 0		0 B C P
Pasture/ Range	P C B 0		0 B C P
Logging Operations	P C B 0		0 B C P
Mining Activity	P C B 0	Y N	0 B C P
Vegetation Management	P C B 0		0 B C P
Bridges/ Abutments	P C B 0	Y N	0 B C P
Orchards/ Vineyards	P C B 0		0 B C P

Bank Stability
(zone from 5m u/s to 5m d/s of transect, between bankfull - wetted width)

Left Bank	eroded	vulnerable	stable
Right Bank	eroded	vulnerable	stable

Inter-Transect: EF

Wetted Width (m): 1,9

Inter-Transect Substrates

Position	Dist from LB (m)	Depth (cm)	mm/ size class	% Cobble Embed.	CPOM	Microalgae Thickness Code	Macroalgae Attached	Macroalgae Unattached	Macrophytes
Left Bank	0	1	FN	—	P A D	UD	P A D	P A D	P A D
Left Center	0.47	13	SA	—	P A D	2	P A D	P A D	P A D
Center	0,95	12	SA	—	P A D	1	P A D	P A D	P A D
Right Center	1,47	11	SA	—	P A D	2	P A D	P A D	P A D
Right Bank	1,9	1	FN	—	P A D	UD	P A D	P A D	P A D

Note: Substrate sizes can be recorded either as direct measures of the median axis of each particle or one of the size class categories listed on the supplemental page (direct measurements preferred)

Microalgae Thickness Codes
0 = No microalgae present, Feels rough, not slimy;
1 = Present but not visible, Feels slimy;
2 = Present and visible but <1mm; Rubbing fingers on surface produces a brownish tint on them, scraping leaves visible trail;
3 = 1-5mm;
4 = 5-20mm;
5 = >20mm;
UD = Cannot determine if microalgae present, substrate too small or covered with silt (formerly Z code).
D = Dry, not assessed

FLOW HABITATS
(% between transects, total 100%)

Channel Type	%
Cascade/ Falls	
Rapid	
Riffle	
Run	
Glide	100
Pool	
Dry	

Site Code: HG-062713	Site Name: Hines Growers	Date: 06/27/2013
Wetted Width (m): 1.0	Bankfull Width (m): 4.8	Bankfull Height (m): 0.20

Transect F

Transect Substrates

Position	Dist from LB (m)	Depth (cm)	mm/ size class	% Cobble Embed.	CPOM	Microalgae Thickness Code	Macroalgae Attached	Macroalgae Unattached	Macrophytes
Left Bank	0	1	SA	—	P A D	2	P A D	P A D	P A D
Left Center	0.25	5	SA	—	P A D	2	P A D	P A D	P A D
Center	0.5	10	GF 10mm	—	P A D	1	P A D	P A D	P A D
Right Center	0.75	5	SA	—	P A D	2	P A D	P A D	P A D
Right Bank	1.0	1	GF 7mm	—	P A D	2	P A D	P A D	P A D

Note: Substrate sizes can be recorded either as direct measures of the median axis of each particle or one of the size class categories listed on the supplemental page (direct measurements preferred)

Microalgae Thickness Codes
0 = No microalgae present, Feels rough, not slimy;
1 = Present but not visible, Feels slimy;
2 = Present and visible but <1mm; Rubbing fingers on surface produces a brownish tint on them, scraping leaves visible trail.
3 = 1-5mm;
4 = 5-20mm;
5 = >20mm;
UD = Cannot determine if microalgae present, substrate too small or covered with silt (formerly Z code).
D = Dry, not assessed

Riparian Vegetation

(facing downstream, 5 m u/s, 5 m d/s, 10 m from wetted width)

0 = Absent (0%)
1 = Sparse (<10%)
2 = Moderate (10-40%)
3 = Heavy (40-75%)
4 = Very Heavy (>75%)

Vegetation Class	Left Bank	Right Bank
Upper Canopy (>5 m high)		
Trees and saplings >5 m high	0 1 2 3 4	0 1 2 3 4
Lower Canopy (0.5 m-5 m high)		
All vegetation 0.5 m to 5 m	0 1 2 3 4	0 1 2 3 4
Ground Cover (<0.5 m high)		
Woody shrubs & saplings <0.5 m	0 1 2 3 4	0 1 2 3 4
Herbs/ grasses	0 1 2 3 4	0 1 2 3 4
Barren, bare soil/ duff	0 1 2 3 4	0 1 2 3 4

Instream Habitat Complexity

(5 m u/s, 5 m d/s)

0 = Absent (0%)
1 = Sparse (<10%)
2 = Moderate (10-40%)
3 = Heavy (40-75%)
4 = Very Heavy (>75%)

Habitat	Score
Filamentous Algae	0 1 2 3 4
Aquatic Macrophytes/ Emergent Vegetation	0 1 2 3 4
Boulders	0 1 2 3 4
Woody Debris >0.3 m	0 1 2 3 4
Woody Debris <0.3 m	0 1 2 3 4
Undercut Banks	0 1 2 3 4
Overhang. Vegetation	0 1 2 3 4
Live Tree Roots	0 1 2 3 4
Artificial Structures	0 1 2 3 4

Densiometer Readings (0-17)

count covered dots

Position	Reading
Center Left	1
Center Upstream	2
Center Right	4
Center Downstream	3
Optional	
Left Bank	
Right Bank	

Human Influence

(circle only the closest to wetted channel; assess 5 m u/s, 5 m d/s)

0 = Not Present;
B = On Bank;
C = Between Bank & 10m from Channel;
P = >10m+<50m from Channel;
Channel (record Yes or No. If Y for an analyte, do not assess banks)

	Left Bank	Channel	Right Bank
Walls/ Rip-rap/ Dams	P C B 0	Y N	0 B C P
Buildings	P C B 0	Y N	0 B C P
Pavement/ Cleared Lot	P C B 0		0 B C P
Road/ Railroad	P C B 0	Y N	0 B C P
Pipes (Inlet/ Outlet)	P C B 0	Y N	0 B C P
Landfill/ Trash	P C B 0	Y N	0 B C P
Park/ Lawn	P C B 0		0 B C P
Row Crop	P C B 0		0 B C P
Pasture/ Range	P C B 0		0 B C P
Logging Operations	P C B 0		0 B C P
Mining Activity	P C B 0	Y N	0 B C P
Vegetation Management	P C B 0		0 B C P
Bridges/ Abutments	P C B 0	Y N	0 B C P
Orchards/ Vineyards	P C B 0		0 B C P

Bank Stability

[illegible]

Left Bank	eroded	vulnerable	stable
Right Bank	eroded	vulnerable	stable

TAKE PHOTOGRAPHS

(check box if taken & record photo code)

Downstream (**required**)	☒
Upstream (**required**)	☒

Inter-Transect: FG

Wetted Width (m): 2,2

Inter-Transect Substrates

Position	Dist from LB (m)	Depth (cm)	mm/ size class	% Cobble Embed.	CPOM	Microalgae Thickness Code	Macroalgae Attached	Macroalgae Unattached	Macrophytes
Left Bank	0	2	FN	—	P A D	UD	P A D	P A D	P A D
Left Center	0.55	2	SA	—	P A D	2	P A D	P A D	P A D
Center	1,1	4	GF 10 mm	—	P A D	2	P A D	P A D	P A D
Right Center	1,65	3	SA	—	P A D	2	P A D	P A D	P A D
Right Bank	2,2	1	FN	—	P A D	UD	P A D	P A D	P A D

Note: Substrate sizes can be recorded either as direct measures of the median axis of each particle or one of the size class categories listed on the supplemental page (direct measurements preferred)

Microalgae Thickness Codes
0 = No microalgae present, Feels rough, not slimy;
1 = Present but not visible, Feels slimy;
2 = Present and visible but <1mm; Rubbing fingers on surface produces a brownish tint on them, scraping leaves visible trail.
3 = 1-5mm;
4 = 5-20mm;
5 = >20mm;
UD = Cannot determine if microalgae present, substrate too small or covered with silt (formerly Z code)
D = Dry, not assessed

FLOW HABITATS (% between Transects, Total=100%)	
Channel Type	%
Cascade/ Falls	
Rapid	
Riffle	
Run	
Glide	90
Pool	
Dry	10

SWAMP Stream Habitat Characterization Form FULL VERSION Revision Date: March 19th, 2013

Site Code: HG-062713	Site Name: Hines Groves	Date: 06/27/2013
Wetted Width (m): 1.1	Bankfull Width (m): 4.4 / Bankfull Height (m): 0.20	**Transect G**

Transect Substrates

Position	Dist from LB (m)	Depth (cm)	mm/ size class	% Cobble Embed.	CPOM (P A D)	Microalgae Thickness Code	Macroalgae Attached (P A D)	Macroalgae Unattached (P A D)	Macrophytes (P A D)
Left Bank	0	1	SA	—	A	1	A	A	A
Left Center	0.27	8	GC 17mm	—	A	2	P	A	P
Center	0.55	12	SA	—	A	2	P	A	P
Right Center	0.82	10	SA	—	A	1	P	A	P
Right Bank	1.1	1	SA	—	A	1	A	A	A

Note: Substrate sizes can be recorded either as direct measures of the median axis of each particle or one of the size class categories listed on the supplemental page (direct measurements preferred)

Microalgae Thickness Codes
0 = No microalgae present. Feels rough, not slimy;
1 = Present but not visible. Feels slimy;
2 = Present and visible but <1mm. Rubbing fingers on surface produces a brownish tint on them, scraping leaves visible trail.
3 = 1-5mm;
4 = 5-20mm;
5 = >20mm;
UD = Cannot determine if microalgae present, substrate too small or covered with silt (formerly Z code).
D = Dry, not assessed

Riparian Vegetation
(facing downstream, 5 m u/s, 5 m d/s, 10 m from wetted width)

0 = Absent (0%) 1 = Sparse (<10%) 2 = Moderate (10-40%) 3 = Heavy (40-75%) 4 = Very Heavy (>75%)

Vegetation Class	Left Bank (0 1 2 3 4)	Right Bank (0 1 2 3 4)
Upper Canopy (>5 m high)		
Trees and saplings >5 m high	0	2
Lower Canopy (0.5 m-5 m high)		
All vegetation 0.5 m to 5 m	0	2
Ground Cover (<0.5 m high)		
Woody shrubs & saplings <0.5 m	0	1
Herbs/ grasses	1	1
Barren, bare soil/ duff	4	4

Instream Habitat Complexity
(5 m u/s, 5 m d/s)

0 = Absent (0%) 1 = Sparse (<10%) 2 = Moderate (10-40%) 3 = Heavy (40-75%) 4 = Very Heavy (>75%)

Category	Score (0 1 2 3 4)
Filamentous Algae	3
Aquatic Macrophytes/ Emergent Vegetation	2
Boulders	0
Woody Debris >0.3 m	0
Woody Debris <0.3 m	1
Undercut Banks	0
Overhang. Vegetation	1
Live Tree Roots	0
Artificial Structures	1

Densiometer Readings (0-17)
count covered dots

Position	Reading
Center Left	3
Center Upstream	4
Center Right	6
Center Downstream	10
Optional	
Left Bank	
Right Bank	

Human Influence
(circle only the closest to wetted channel; assess 5 m u/s, 5 m d/s)

0 = Not Present; B = On Bank; C = Between Bank & 10m from Channel; P = >10m+<50m from Channel; Channel (record Yes or No; if Y for an analyte, do not assess banks)

Category	Left Bank (P C B 0)	Channel (Y N)	Right Bank (0 B C P)
Walls/ Rip-rap/ Dams	C	N	B
Buildings	0	N	0
Pavement/ Cleared Lot	0		0
Road/ Railroad	0	N	0
Pipes (Inlet/ Outlet)		Y	
Landfill/ Trash	B	N	0
Park/ Lawn	0		0
Row Crop	0		0
Pasture/ Range	0		0
Logging Operations	0		0
Mining Activity	0	N	0
Vegetation Management	0		0
Bridges/ Abutments	0	N	0
Orchards/ Vineyards	P		P

Bank Stability
(score zone from upstream and downstream of transect between the bankfull width)

	eroded	vulnerable	stable
Left Bank		vulnerable	
Right Bank			stable

Inter-Transect: GH

Wetted Width (m): 2.0

Inter-Transect Substrates

Position	Dist from LB (m)	Depth (cm)	mm/ size class	% Cobble Embed.	CPOM	Microalgae Thickness Code	Macroalgae Attached	Macroalgae Unattached	Macrophytes
Left Bank	0	2	SA	—	P A D	2	P A D	P A D	P A D
Left Center	0,5	4	FN	—	P A D	UD	P A D	P A D	P A D
Center	1.0	4	SA	—	P A D	2	P A D	P A D	P A D
Right Center	1.5	6	SA	—	P A D	2	P A D	P A D	P A D
Right Bank	20	1	FN	—	P A D	UD	P A D	P A D	P A D

Note: Substrate sizes can be recorded either as direct measures of the median axis of each particle or one of the size class categories listed on the supplemental page (direct measurements preferred)

Microalgae Thickness Codes
0 = No microalgae present, Feels rough, not slimy;
1 = Present but not visible, Feels slimy;
2 = Present and visible but <1mm; Rubbing fingers on surface produces a brownish tint on them, scraping leaves visible trail.
3 = 1-5mm;
4 = 5-20mm;
5 = >20mm;
UD = Cannot determine if microalgae present, substrate too small or covered with silt (formerly Z code).
D = Dry, not assessed

Flow Habitats
(% between transects, total 100%)

Channel Type	%
Cascade/ Falls	
Rapid	
Riffle	
Run	
Glide	100
Pool	
Dry	

Site Code: H6-06271B	Site Name: Hines Growers	Date: 06/27/2013
Wetted Width (m): 4.0	Bankfull Width (m): 4.2 / Bankfull Height (m): 0.2	**Transect H**

Transect Substrates

Position	Dist from LB (m)	Depth (cm)	mm/ size class	% Cobble Embed.	CPOM	Microalgae Thickness Code	Macroalgae Attached	Macroalgae Unattached	Macrophytes
Left Bank	0	6	FN	—	A	UD	A	A	P
Left Center	1	1	SA	—	A	2	P	A	P
Center	2	0	SA	—	D	D	D	D	D
Right Center	3	3	SA	—	P	1	A	A	P
Right Bank	4	12	SA	—	P	2	A	A	A

Note: Substrate sizes can be recorded either as direct measures of the median axis of each particle or one of the size class categories listed on the supplemental page (direct measurements preferred).

Microalgae Thickness Codes
0 = No microalgae present. Feels rough, not slimy;
1 = Present but not visible. Feels slimy;
2 = Present and visible but <1mm. Rubbing fingers on surface produces a brownish tint on them, scraping leaves visible trail.
3 = 1-5mm;
4 = 5-20mm;
5 = >20mm;
UD = Cannot determine if microalgae present, substrate too small or covered with silt (formerly Z code).
D = Dry, not assessed

Riparian Vegetation
(facing downstream, 5 m u/s, 5 m d/s, 10 m from wetted width)

0 = Absent (0%); 1 = Sparse (<10%); 2 = Moderate (10-40%); 3 = Heavy (40-75%); 4 = Very Heavy (>75%)

Vegetation Class	Left Bank	Right Bank
Upper Canopy (>5 m high)		
Trees and saplings >5 m high	0	1
Lower Canopy (0.5 m-5 m high)		
All vegetation 0.5 m to 5 m	0	2
Ground Cover (<0.5 m high)		
Woody shrubs & saplings <0.5 m	0	2
Herbs/ grasses	1	1
Barren, bare soil/ duff	4	3

Instream Habitat Complexity
(5 m u/s, 5 m d/s)

0 = Absent (0%); 1 = Sparse (<10%); 2 = Moderate (10-40%); 3 = Heavy (40-75%); 4 = Very Heavy (>75%)

Habitat	Score
Filamentous Algae	2
Aquatic Macrophytes/ Emergent Vegetation	3
Boulders	0
Woody Debris >0.3 m	0
Woody Debris <0.3 m	0
Undercut Banks	0
Overhang. Vegetation	2
Live Tree Roots	0
Artificial Structures	1

Densiometer Readings (0-17)
count covered dots

Position	Reading
Center Left	1
Center Upstream	16
Center Right	17
Center Downstream	15
Optional	
Left Bank	
Right Bank	

Human Influence
(circle only the closest to wetted channel; assess 5 m u/s, 5 m d/s)

0 = Not Present; B = On Bank; C = Between Bank & 10m from Channel; P = >10m+<50m from Channel; Channel (record Yes or No; if Y for an analyte, do not assess banks)

Influence	Left Bank	Channel	Right Bank
Walls/ Rip-rap/ Dams	B	N	B
Buildings	0	N	0
Pavement/ Cleared Lot	0		0
Road/ Railroad	0	N	0
Pipes (Inlet/ Outlet)	0	Y	0
Landfill/ Trash	0	N	0
Park/ Lawn	0		0
Row Crop	0		0
Pasture/ Range	0		0
Logging Operations	0		0
Mining Activity	0	N	0
Vegetation Management	0		0
Bridges/ Abutments	0	N	0
Orchards/ Vineyards	P		P

Bank Stability
(score zone 5m upstream and 5m downstream of transect between bankfull-wetted width)

Bank	eroded	vulnerable	stable
Left Bank			stable
Right Bank			stable

Inter-Transect: HI

Wetted Width (m): 2,6

Inter-Transect Substrates

Position	Dist from LB (m)	Depth (cm)	mm/ size class	% Cobble Embed.	CPOM	Microalgae Thickness Code	Macroalgae Attached	Macroalgae Unattached	Macrophytes
Left Bank	0	15	GF 10Am	—	P A D	2	P A D	P A D	P A D
Left Center	0,65	12	SA	—	P A D	2	P A D	P A D	P A D
Center	1,3	9	SA	—	P A D	2	P A D	P A D	P A D
Right Center	1,95	3	SA	—	P A D	2	P A D	P A D	P A D
Right Bank	2,6	2	FN	—	P A D	UD	P A D	P A D	P A D

Note: Substrate sizes can be recorded either as direct measures of the median axis of each particle or one of the size class categories listed on the supplemental page (direct measurements preferred)

Microalgae Thickness Codes
0 = No microalgae present; Feels rough, not slimy;
1 = Present but not visible, Feels slimy;
2 = Present and visible but <1mm; Rubbing fingers on surface produces a brownish tint on them, scraping leaves visible trail.
3 = 1-5mm;
4 = 5-20mm;
5 = >20mm;
UD = Cannot determine if microalgae present, substrate too small or covered with silt (formerly Z code).
D = Dry, not assessed

FLOW HABITATS (% between transects, Total=100%)	
Channel Type	%
Cascade/Falls	
Rapid	
Riffle	
Run	
Glide	100
Pool	
Dry	

Site Code: HG-062713	Site Name: Hines Growers	Date: 06/27/2013
Wetted Width (m): 2.8	Bankfull Width (m): 4.3	Bankfull Height (m): 0.25
		Transect I

Transect Substrates

Position	Dist from LB (m)	Depth (cm)	mm/ size class	% Cobble Embed.	CPOM	Microalgae Thickness Code	Macroalgae Attached	Macroalgae Unattached	Macrophytes
Left Bank	0	7	SA	–	P A D	2	P A D	P A D	P A D
Left Center	0.7	17	SA	–	P A D	1	P A D	P A D	P A D
Center	1.4	12	SA	–	P A D	2	P A D	P A D	P A D
Right Center	2.1	13	SA	–	P A D	2	P A D	P A D	P A D
Right Bank	2.8	0.5	FN	—	P A D	UD	P A D	P A D	P A D

Note: Substrate sizes can be recorded either as direct measures of the median axis of each particle or one of the size class categories listed on the supplemental page (direct measurements preferred).

Microalgae Thickness Codes
0 = No microalgae present, Feels rough, not slimy;
1 = Present but not visible, Feels slimy;
2 = Present and visible but <1mm; Rubbing fingers on surface produces a brownish tint on them, scraping leaves visible trail;
3 = 1-5mm;
4 = 5-20mm;
5 = >20mm;
UD = Cannot determine if microalgae present, substrate too small or covered with silt (formerly Z code).
D = Dry, not assessed

Riparian Vegetation
(facing downstream, 5 m u/s, 5 m d/s, 10 m from wetted width)

0 = Absent (0%); 1 = Sparse (<10%); 2 = Moderate (10-40%); 3 = Heavy (40-75%); 4 = Very Heavy (>75%)

Vegetation Class	Left Bank	Right Bank
Upper Canopy (>5 m high)		
Trees and saplings >5 m high	0 1 2 3 4	0 1 2 3 4
Lower Canopy (0.5 m-5 m high)		
All vegetation 0.5 m to 5 m	0 1 2 3 4	0 1 2 3 4
Ground Cover (<0.5 m high)		
Woody shrubs & saplings <0.5 m	0 1 2 3 4	0 1 2 3 4
Herbs/ grasses	0 1 2 3 4	0 1 2 3 4
Barren, bare soil/ duff	0 1 2 3 4	0 1 2 3 4

Instream Habitat Complexity
(5 m u/s, 5 m d/s)

0 = Absent (0%); 1 = Sparse (<10%); 2 = Moderate (10-40%); 3 = Heavy (40-75%); 4 = Very Heavy (>75%)

Filamentous Algae	0 1 2 3 4
Aquatic Macrophytes/ Emergent Vegetation	0 1 2 3 4
Boulders	0 1 2 3 4
Woody Debris >0.3 m	0 1 2 3 4
Woody Debris <0.3 m	0 1 2 3 4
Undercut Banks	0 1 2 3 4
Overhang. Vegetation	0 1 2 3 4
Live Tree Roots	0 1 2 3 4
Artificial Structures	0 1 2 3 4

Densiometer Readings (0-17)
count covered dots

Center Left	0
Center Upstream	0
Center Right	0
Center Downstream	0
Optional	
Left Bank	
Right Bank	

Human Influence
(circle only the closest to wetted channel; assess 5 m u/s, 5 m d/s)

0 = Not Present; B = On Bank; C = Between Bank & 10m from Channel; P = >10m+<50m from Channel; Channel (record Yes or No; if Y for an analyte, do not assess banks)

	Left Bank	Channel	Right Bank
Walls/ Rip-rap/ Dams	P C B 0	Y N	0 B C P
Buildings	P C B 0	Y N	0 B C P
Pavement/ Cleared Lot	P C B 0		0 B C P
Road/ Railroad	P C B 0	Y N	0 B C P
Pipes (Inlet/ Outlet)	P C B 0	Y N	0 B C P
Landfill/ Trash	P C B 0	Y N	0 B C P
Park/ Lawn	P C B 0		0 B C P
Row Crop	P C B 0		0 B C P
Pasture/ Range	P C B 0		0 B C P
Logging Operations	P C B 0		0 B C P
Mining Activity	P C B 0	Y N	0 B C P
Vegetation Management	P C B 0		0 B C P
Bridges/ Abutments	P C B 0	Y N	0 B C P
Orchards/ Vineyards	P C B 0		0 B C P

Bank Stability
(from 5 m upstream and 5m downstream of transect between bankfull - wetted width)

Left Bank	eroded	vulnerable	stable
Right Bank	eroded	vulnerable	stable

Inter-Transect: IJ

Wetted Width (m): 1,8

Inter-Transect Substrates

Position	Dist from LB (m)	Depth (cm)	mm/ size class	% Cobble Embed.	CPOM	Microalgae Thickness Code	Macroalgae Attached	Macroalgae Unattached	Macrophytes
Left Bank	0	6	SA	—	P	1	P	A	A
Left Center	0.45	20	SA	—	A	1	P	A	A
Center	0,9	20	SA	—	A	2	P	A	A
Right Center	1,35	18	G,C 20mm	—	A	2	P	A	A
Right Bank	1,8	1	G,C 35mm	—	P	0	A	A	P

Note: Substrate sizes can be recorded either as direct measures of the median axis of each particle or one of the size class categories listed on the supplemental page (direct measurements preferred)

Microalgae Thickness Codes
- **0** = No microalgae present. Feels rough, not slimy;
- **1** = Present but not visible, Feels slimy;
- **2** = Present and visible but <1mm; Rubbing fingers on surface produces a brownish tint on them, scraping leaves visible trail.
- **3** = 1-5mm;
- **4** = 5-20mm;
- **5** = >20mm;
- **UD** = Cannot determine if microalgae present, substrate too small or covered with silt (formerly Z code).
- **D** = Dry, not assessed

FLOW HABITATS
(% between transects, total=100%)

Channel Type	%
Cascade/ Falls	
Rapid	
Riffle	
Run	
Glide	100
Pool	
Dry	

SWAMP Stream Habitat Characterization Form *FULL VERSION* *Revision Date: March 19th, 2013*

Site Code: HG-062713	Site Name: Hines Growers	Date: 06/27/2013
Wetted Width (m): 2.3	Bankfull Width (m): 4.0 / Bankfull Height (m): 0.2	**Transect J**

Transect Substrates

Position	Dist from LB (m)	Depth (cm)	mm/ size class	% Cobble Embed.	CPOM	Microalgae Thickness Code	Macroalgae Attached	Macroalgae Unattached	Macrophytes
Left Bank	0	1	FN	—	P A D	UD	P A D	P A D	P A D
Left Center	0.57	19	SA	—	P A D	2	P A D	P A D	P A D
Center	1.15	10	SA	—	P A D	2	P A D	P A D	P A D
Right Center	1.73	7	SA	—	P A D	1	P A D	P A D	P A D
Right Bank	2.3	3	GC 30 mm	—	P A D	2	P A D	P A D	P A D

Note: Substrate sizes can be recorded either as direct measures of the median axis of each particle or one of the size class categories listed on the supplemental page (direct measurements preferred)

Microalgae Thickness Codes
- 0 = No microalgae present, Feels rough, not slimy;
- 1 = Present but not visible, Feels slimy;
- 2 = Present and visible but <1mm; Rubbing fingers on surface produces a brownish tint on them, scraping leaves visible trail;
- 3 = 1-5mm;
- 4 = 5-20mm;
- 5 = >20mm;
- UD = Cannot determine if microalgae present, substrate too small or covered with silt (formerly Z code).
- D = Dry, not assessed

Riparian Vegetation

(facing downstream, 5 m u/s, 5 m d/s, 10 m from wetted width)

0 = Absent (0%) 1 = Sparse (<10%) 2 = Moderate (10-40%) 3 = Heavy (40-75%) 4 = Very Heavy (>75%)

Vegetation Class	Left Bank	Right Bank
Upper Canopy (>5 m high)		
Trees and saplings >5 m high	0 1 2 3 4	0 1 2 3 4
Lower Canopy (0.5 m-5 m high)		
All vegetation 0.5 m to 5 m	0 1 2 3 4	0 1 2 3 4
Ground Cover (<0.5 m high)		
Woody shrubs & saplings <0.5 m	0 1 2 3 4	0 1 2 3 4
Herbs/ grasses	0 1 2 3 4	0 1 2 3 4
Barren, bare soil/ duff	0 1 2 3 4	0 1 2 3 4

Instream Habitat Complexity

(5 m u/s, 5 m d/s)

0 = Absent (0%) 1 = Sparse (<10%) 2 = Moderate (10-40%) 3 = Heavy (40-75%) 4 = Very Heavy (>75%)

Filamentous Algae	0 1 2 3 4
Aquatic Macrophytes/ Emergent Vegetation	0 1 2 3 4
Boulders	0 1 2 3 4
Woody Debris >0.3 m	0 1 2 3 4
Woody Debris <0.3 m	0 1 2 3 4
Undercut Banks	0 1 2 3 4
Overhang. Vegetation	0 1 2 3 4
Live Tree Roots	0 1 2 3 4
Artificial Structures	0 1 2 3 4

Densiometer Readings (0-17)

count covered dots

Center Left	0
Center Upstream	0
Center Right	0
Center Downstream	0
Optional	
Left Bank	
Right Bank	

Human Influence

(circle only the closest to wetted channel; assess 5 m u/s, 5 m d/s)

0 = Not Present; B = On Bank; C = Between Bank & 10m from Channel; P = >10m+<50m from Channel; Channel (record Yes or No, if Y for an analyte, do not assess banks)

	Left Bank	Channel	Right Bank
Walls/ Rip-rap/ Dams	P C B 0	Y N	0 B C P
Buildings	P C B 0	Y N	0 B C P
Pavement/ Cleared Lot	P C B 0		0 B C P
Road/ Railroad	P C B 0	Y N	0 B C P
Pipes (Inlet/ Outlet)	P C B 0	Y N	0 B C P
Landfill/ Trash	P C B 0	Y N	0 B C P
Park/ Lawn	P C B 0		0 B C P
Row Crop	P C B 0		0 B C P
Pasture/ Range	P C B 0		0 B C P
Logging Operations	P C B 0		0 B C P
Mining Activity	P C B 0	Y N	0 B C P
Vegetation Management	P C B 0		0 B C P
Bridges/ Abutments	P C B 0	Y N	0 B C P
Orchards/ Vineyards	P C B 0		0 B C P

Bank Stability

([illegible] between bankfull - wetted width)

Left Bank	eroded	vulnerable	stable
Right Bank	eroded	vulnerable	stable

Inter-Transect: JK

Wetted Width (m): 1,0

Inter-Transect Substrates

Position	Dist from LB (m)	Depth (cm)	mm/ size class	% Cobble Embed.	CPOM	Microalgae Thickness Code	Macroalgae Attached	Macroalgae Unattached	Macrophytes
Left Bank	0	1	FN	—	P A D	UD	P A D	P A D	P A D
Left Center	0,25	10	GC 35mm	—	P A D	2	P A D	P A D	P A D
Center	0.5	17	GC 40mm	—	P A D	2	P A D	P A D	P A D
Right Center	0.75	19	SA	—	P A D	2	P A D	P A D	P A D
Right Bank	1	1	FN	—	P A D	UD	P A D	P A D	P A D

Note: Substrate sizes can be recorded either as direct measures of the median axis of each particle or one of the size class categories listed on the supplemental page (direct measurements preferred)

Microalgae Thickness Codes
0 = No microalgae present. Feels rough, not slimy;
1 = Present but not visible. Feels slimy;
2 = Present and visible but <1mm; Rubbing fingers on surface produces a brownish tint on them, scraping leaves visible trail.
3 = 1-5mm;
4 = 5-20mm;
5 = >20mm;
UD = Cannot determine if microalgae present, substrate too small or covered with silt (formerly Z code).
D = Dry, not assessed

FLOW HABITATS
(% between transects, total 100%)

Channel Type	%
Cascade/ Falls	
Rapid	
Riffle	
Run	
Glide	100
Pool	
Dry	

Site Code: HG-0627B	Site Name: Hines Growers	Date: 06/27/2013
Wetted Width (m): 1.4	Bankfull Width (m): 4.8	Bankfull Height (m): 0.25
		Transect K

Transect Substrates

Position	Dist from LB (m)	Depth (cm)	mm/ size class	% Cobble Embed.	CPOM	Microalgae Thickness Code	Macroalgae Attached	Macroalgae Unattached	Macrophytes
Left Bank	0	4	SA	—	P A D	2	P A D	P A D	P A D
Left Center	0.35	18	GC 40mm	—	P A D	2	P A D	P A D	P A D
Center	0.7	12	SA	—	P A D	1	P A D	P A D	P A D
Right Center	1.05	9	SA	—	P A D	1	P A D	P A D	P A D
Right Bank	1.4	1	SA	—	P A D	2	P A D	P A D	P A D

Note: Substrate sizes can be recorded either as direct measures of the median axis of each particle or one of the size class categories listed on the supplemental page (direct measurements preferred).

Microalgae Thickness Codes
0 = No microalgae present, Feels rough, not slimy;
1 = Present but not visible, Feels slimy;
2 = Present and visible but <1mm; Rubbing fingers on surface produces a brownish tint on them, scraping leaves visible trail.
3 = 1-5mm;
4 = 5-20mm;
5 = >20mm;
U = Cannot determine if microalgae present, substrate too small or covered with silt (formerly Z code).
D = Dry, not assessed

Riparian Vegetation
(facing downstream, 5 m u/s, 5 m d/s, 10 m from wetted width)

0 = Absent (0%) 1 = Sparse (<10%) 2 = Moderate (10-40%) 3 = Heavy (40-75%) 4 = Very Heavy (>75%)

Vegetation Class	Left Bank	Right Bank
Upper Canopy (>5 m high)		
Trees and saplings >5 m high	0 1 2 3 4	0 1 2 3 4
Lower Canopy (0.5 m-5 m high)		
All vegetation 0.5 m to 5 m	0 1 2 3 4	0 1 2 3 4
Ground Cover (<0.5 m high)		
Woody shrubs & saplings <0.5 m	0 1 2 3 4	0 1 2 3 4
Herbs/ grasses	0 1 2 3 4	0 1 2 3 4
Barren, bare soil/ duff	0 1 2 3 4	0 1 2 3 4

Instream Habitat Complexity
(5 m u/s, 5 m d/s)

0 = Absent (0%) 1 = Sparse (<10%) 2 = Moderate (10-40%) 3 = Heavy (40-75%) 4 = Very Heavy (>75%)

Filamentous Algae	0 1 2 3 4
Aquatic Macrophytes/ Emergent Vegetation	0 1 2 3 4
Boulders	0 1 2 3 4
Woody Debris >0.3 m	0 1 2 3 4
Woody Debris <0.3 m	0 1 2 3 4
Undercut Banks	0 1 2 3 4
Overhang. Vegetation	0 1 2 3 4
Live Tree Roots	0 1 2 3 4
Artificial Structures	0 1 2 3 4

Densiometer Readings (0-17)
count covered dots

Center Left	0
Center Upstream	3
Center Right	6
Center Downstream	0
Optional	
Left Bank	
Right Bank	

Human Influence
(circle only the closest to wetted channel; assess 5 m u/s, 5 m d/s)

0 = Not Present;
B = On Bank;
C = Between Bank & 10m from Channel;
P = >10m+<50m from Channel;
Channel (record Yes or No; if Y for an analyte, do not assess banks)

	Left Bank	Channel	Right Bank
Walls/ Rip-rap/ Dams	P C B 0	Y N	0 B C P
Buildings	P C B 0	Y N	0 B C P
Pavement/ Cleared Lot	P C B 0		0 B C P
Road/ Railroad	P C B 0	Y N	0 B C P
Pipes (Inlet/ Outlet)	P C B 0	Y N	0 B C P
Landfill/ Trash	P C B 0	Y N	0 B C P
Park/ Lawn	P C B 0		0 B C P
Row Crop	P C B 0		0 B C P
Pasture/ Range	P C B 0		0 B C P
Logging Operations	P C B 0		0 B C P
Mining Activity	P C B 0	Y N	0 B C P
Vegetation Management	P C B 0		0 B C P
Bridges/ Abutments	P C B 0	Y N	0 B C P
Orchards/ Vineyards	P C B 0		0 B C P

Bank Stability
(look at 5 m upstream and 5 m downstream of transect between bankfull - wetted width)

Left Bank	eroded	vulnerable	stable
Right Bank	eroded	vulnerable	stable

TAKE PHOTOGRAPHS
(check box if taken & record photo code)

Downstream (**required**)	☒
Upstream (**optional**)	☐

Site Code: 116-062713 Date: 06/27/2013

BENTHIC INVERTEBRATE SAMPLES

Collection Method (indicate standard or margin-center-margin)			Replicate	# Jars
RWB (standard)	RWB (MCM)	TRC	1	4
~~RWB (standard)~~	RWB (MCM)	TRC	2	
RWB (standard)	RWB (MCM)	TRC		
RWB (standard)	RWB (MCM)	TRC		

Analyte	Equipment & Calibration Date
pH	Cal date: / /
Wat temp	Cal date: / /
dissolved oxygen	Cal date: / /
oxygen sat	Cal date: / /
specific cond	Cal date: / /
Salinity	Cal date: / /
Alkalinity	Cal date: / /
Turbidity	Cal date: / /
Silica	Cal date: / /
Air temp	Cal date: / /
Velocity	Cal date: / /

Field Notes/ Comments:

Was macroalgae (e.g., filamentous algae) collected in the composite algae sample? Yes / No

If YES, how many of the 11 transect samples contained macroalgae? 9

If YES, what was the original size of the macroalgae cylinder roll before sectioning into ¼ and ¾ pieces? 60 mm length x 25 mm diameter

no additional cobble noted in reach

ALGAE SAMPLES

138.6

Collection Method (circle one or write new method if applicable)	SWAMP EMAP	SWAMP EMAP	SWAMP EMAP	SWAMP EMAP
Collection Device (sum # of transects per device)	Rep. 1	Rep. 2	Rep.	Rep.
Rubber Delimiter (area=12.6cm^2)				
PVC Delimiter (area=12.6cm^2)	11			
Syringe Scrubber (area=5.3cm^2)				
Other area=				
Number of transects sampled (0-11)	11			
Composite Volume (mL)	525			
Assemblage ID volume **(diatoms)** (50 mL tube)	40			
Assemblage ID volume **(soft algae)** (50 mL tube)	45			
Check if Qualitative Algae sample was collected with soft algae/diatom sample (required even if macroalgae not visible)	☒	☐	☐	☐
Check if a water chem. **integrated** sample was collected (chl, AFDM)	☒	☐	☐	☐
Chlorophyll a volume use GF/F filter (25 mL **(preferred volume)**)	25			
Ash Free Dry Mass (AFDM) volume use GF/F filter (25 mL **(preferred vol)**)	25			

Water and Sediment Chemistry Samples

Check if a WATER chemistry **grab** sample was collected (nutrients, SSC, etc.)	☒
Check if a DUPLICATE WATER chemistry **grab** sample was collected	☒
Check if a SEDIMENT chemistry sample was collected	☐
Check if a DUPLICATE SED chemistry sample was collected	☐
Sed Coll Device:	SCOOP CORE GRAB
Material:	Stainless Steel Polyethylene Polycarbonate Other
Sediment Collection Depth (cm):	2 or 5

Create Lab Collection records for each checked box for integrated and grab water chemistry samples

ADDITIONAL PHOTOGRAPHS

Description	Photo Code	Description	Photo Code

Flow Habitat Type	Description
Cascades	Short, high gradient drop in stream bed elevation often accompanied by boulders and considerable turbulence
Falls	High gradient drop in elevation of the stream bed associated with an abrupt change in the bedrock
Rapids	Sections of stream with swiftly flowing water and considerable surface turbulence. Rapids tend to have larger substrate sizes than riffles
Riffles	Shallow sections where the water flows over coarse stream bed particles that create mild to moderate surface turbulence; (< 0.5 m deep, > 0.3 m/s).
Runs	Long, relatively straight, low-gradient sections without flow obstructions. The stream bed is typically even and the water flows faster than it does in a pool; (> 0.5 m deep, > 0.3 m/s). A **step-run** is a series of runs separated by short riffles or flow obstructions that cause discontinuous breaks in slope
Glides	A section of stream with little or no turbulence, but faster velocity than pools; (< 0.5 m deep, < 0.3 m/s)
Pools	A reach of stream that is characterized by deep, low-velocity water and a smooth surface; (> 0.5 m deep, < 0.3 m/s)

Size Class Code	Size Class Range	Size Class Description	Common Size Reference
RS	> 4 m	bedrock, smooth	larger than a car
RR	> 4 m	bedrock, rough	larger than a car
XB	1 - 4 m	boulder, large	meter stick to car
SB	25 cm - 1.0 m	boulder, small	basketball to meter stick
CB	64 - 250 mm	cobble	tennis ball to basketball
GC	16 - 64 mm	gravel, coarse	marble to tennis ball
GF	2 – 16 mm	gravel, fine	ladybug to marble
SA	0.06 – 2 mm	sand	gritty to ladybug
FN	< 0.06 mm	fines	not gritty
HP	< 0.06 mm	hardpan (consolidated fines)	
WD	NA	wood	
RC	NA	concrete/ asphalt	
OT	NA	other	

Bank Stability Although this measure of the degree of erosive potential is subjective, it can provide clues to the erosive potential of the banks within the reach. Assign the category whose description best fits the conditions in the area between the wetted channel and bankfull channel (see figure below)	
Eroded	Banks show obvious signs of erosion from the current or previous water year; banks are usually bare or nearly bare
Vulnerable	Banks have some vegetative protection (usually annual growth), but not enough to prevent erosion during flooding
Stable	Bank vegetation has well-developed roots that protect banks from erosion; alternately, bedrock or artificial structures (e.g., concrete/ rip-rap) prevent bank erosion

CPOM/ Cobble Embeddedness

CPOM: Record presence (P) or absence (A) of coarse particulate organic matter (>1.0 mm particles) within 1 cm of each substrate particle; if point is dry, record Dry (D)

Cobble Embeddedness: Visually estimate % embedded by fine particles (record to nearest 5%)

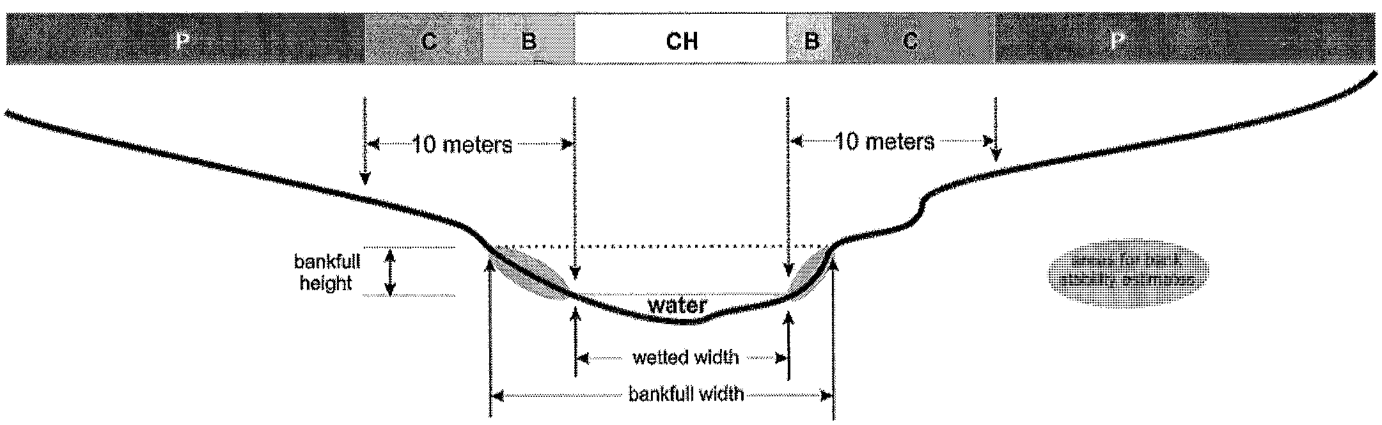


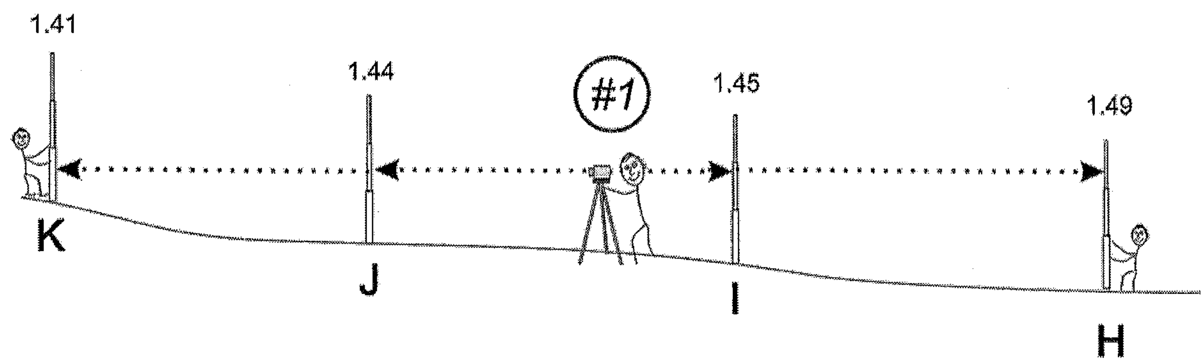
Figure 1. Cross-sectional diagram of stream transect indicating regions for assessing human influence measures:

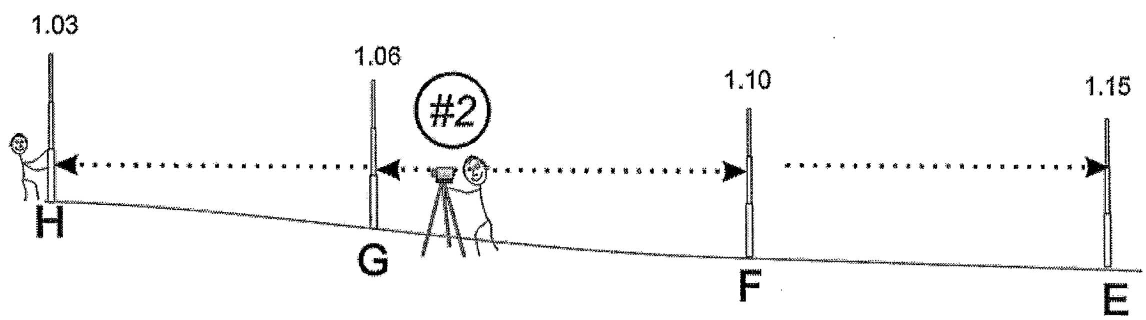
- The measurement zone extends 5 meters upstream and 5 meters downstream of each transect
- Record one category for each bank and for the wetted channel (3 values possible)
- In reaches with wide banks, region "C" may be entirely overlapped by region "B"; in these cases, circle "B"
- Region "P" extends from 10 meters to the distance that can be seen from the channel, but not greater than 50 m

SLOPE and BEARING FORM **EXAMPLE**

AUTOLEVEL	X
CLINOMETER	
HANDLEVEL	

Starting Transect	MAIN SEGMENT (record percent of inter-transect distance in each segment if supplemental segments are used)						SUPPLEMENTAL SEGMENT (record percent of inter-transect distance in each segment if supplemental segments are used)					
	Stadia rod measurements		Slope (%) or Elevation Difference cm ■ % ☐	Segment Length (m)	Bearing (0°-359°)	Percent of Total Length (%)	Stadia rod measurements		Slope or Elevation Difference cm ☐ % ☐	Segment Length (m)	Bearing (0°-359°)	Percent of Total Length (%)
K	1.41											
J	1.44		3	15	140	100						
I	1.45		1	15	145	100						
H	1.49	1.03	4	15	150	100						
G		1.06	3	15	143	100						
F		1.10	4	15	187	100						
E		1.15	5	15	195	100						





1. Level the autolevel at Position #1
2. Place base of stadia rod at water level every time
3. Sight to stadia rod at Transect K, then Transect J
4. Rotate scope and sight to Transects I and H.
5. Move level to Position #2 and re-level
6. Re-sight to stadia rod at Transect H, then Transect G
7. Rotate scope and sight to Transects F and E

Note: Sites will vary in the number of separate level positions needed to survey the reach.

APPENDIX C

BENTHIC INVERTEBRATE AND ALGAE TAXONOMY LAB REPORT

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AMEC Hines Nursery SWAMP Benthos 2013
Sort Report

ECO ANALYSTS, INC.

EcoA Sample ID	Sample Station ID	Collection Time	Collection Date	Sorter	Sort Date	% Subsampled	Primary Matrix	Estimated Pre-Rinse Volume (L)	Estimated Post-Rinse Volume (L)	QC Sorter	QC Date	Estimated %Recovery1	Estimated %Recovery2	Estimated %Recovery3
6568.1-1	HG-062713-BMI	8:45	06/27/2013	Nora Williams	09/10/2013	4.92	Inorganic	2.05	0.45	Jennifer Bobier	09/11/2013	100.00	N/A	N/A

AMEC Hines Nursery SWAMP Benthos 2013
Data are not adjusted for subsampling

EcoAnalysts, Inc.

	Sample Station ID	**HG-062713-BMI**
	Collection Time	**8:45**
	Collection Date	**06-27-2013**
	Percent Subsampled	**4.92**
	EcoAnalysts Sample ID	**6568.1-1**
Odonata	Coenagrionidae	1
Diptera-Chironomidae	Apedilum sp.	1
	Endotribelos sp.	1
	Labrundinia sp.	3
	Micropsectra sp.	1
	Pentaneura sp.	4
Diptera	Caloparyphus/Euparyphus sp.	1
	Dasyhelea sp.	3
	Dixella sp.	1
	Tipulidae	1
Annelida-Oligochaeta	Oligochaeta	33
Mollusca-Gastropoda	Physa sp.	32
Crustacea-Ostracoda	Ostracoda	511
Turbellaria	Turbellaria	20
	TOTAL	**613**

AMEC Hines Nursery SWAMP Benthos 2013
Data are adjusted for subsampling
****Calculations use EcoAnalysts Inc. standard attributes****

Sample Station ID	HG-062713-BMI
Collection Time	8:45
Collection Date	06-27-2013
Percent Subsampled	4.92
EcoAnalysts Sample ID	6568.1-1
Abundance Measures	
Corrected Abundance	12468.42
EPT Abundance	0.00
Dominance Measures	
Dominant Taxon	Ostracoda
Dominant Abundance	10393.74
2nd Dominant Taxa	Oligochaeta
2nd Dominant Abundance	671.22
3rd Dominant Taxa	Physa sp.
3rd Dominant Abundance	650.88
% Dominant Taxon	83.36
% 2 Dominant Taxa	88.74
% 3 Dominant Taxa	93.96
Richness Measures	
Species Richness	14.00
EPT Richness	0.00
Ephemeroptera Richness	0.00
Plecoptera Richness	0.00
Trichoptera Richness	0.00
Chironomidae Richness	5.00
Oligochaeta Richness	1.00
Non-Chiro. Non-Olig. Richness	8.00
Rhyacophila Richness	0.00
Community Composition	
% Ephemeroptera	0.00
% Plecoptera	0.00
% Trichoptera	0.00
% EPT	0.00
% Coleoptera	0.00
% Diptera	2.61
% Oligochaeta	5.38
% Baetidae	0.00
% Brachycentridae	0.00
% Chironomidae	1.63
% Ephemerellidae	0.00
% Hydropsychidae	0.00
% Odonata	0.16
% Perlidae	0.00
% Pteronarcyidae	0.00
% Simuliidae	0.00
Functional Group Composition	
% Filterers	0.00
% Gatherers	89.56
% Predators	4.57
% Scrapers	5.22
% Shredders	0.16
% Piercer-Herbivores	0.00
% Unclassified	0.49
Filterer Richness	0.00
Gatherer Richness	5.00
Predator Richness	4.00
Scraper Richness	1.00
Shredder Richness	1.00
Piercer-Herbivore Richness	0.00
Unclassified	3.00
Diversity/Evenness Measures	
Shannon-Weaver H' (log 10)	0.32
Shannon-Weaver H' (log 2)	1.06
Shannon-Weaver H' (log e)	0.73
Margalef's Richness	1.38
Pielou's J'	0.28
Simpson's Heterogeneity	0.30
Biotic Indices	
% Indiv. w/ HBI Value	99.02
Hilsenhoff Biotic Index	7.83
% Indiv. w/ MTI Value	4.40
Metals Tolerance Index	3.56
% Indiv. w/ FSBI Value	0.00
Fine Sediment Biotic Index	N/A
FSBI - average	N/A
FSBI - weighted average	N/A
% Indiv. w/ TPM Value	0.65
Temp. Pref. Metric - average	0.14
TPM - weighted average	2.00
Karr BIBI Metrics	
Long-Lived Taxa Richness	0.00
Clinger Richness	2.00
% Clingers	5.38
Intolerant Taxa Richness	1.00
% Tolerant Individuals	4.67
% Tolerant Taxa	28.57
Coleoptera Richness	0.00
Montana DEQ Metrics	
MT Biotic Index	7.83
C-Gatherers + C-Filterers	89.56
% Scraper + % Shredder	5.38
% Univoltine	0.65
% Multivoltine	87.11
% Semivoltine	0.00
Community Tolerance Quotient	N/A
% Hydropsychinae	0.00
Lake Metrics	
% Orthocladiinae	0.00
Orthocladiinae Richness	0.00
% Chironomini	0.33
Chironomini Richness	2.00
% Tanytarsini	0.16
% Chironomus	0.00
% Tanytarsus	0.00
% Dicrotendipes	0.00
% Dicrotendipes + Chironomus	0.00
% Corbicula	0.00
% Manayunkia speciosa	0.00
% Intolerant	0.16
% Intolerant Indiv. (S.CA)	0.16
% Individuals w/ CAHBI value	90.21
% Intolerant Indiv. (CAHBI)	0.00
% Sensitive EPT (CAHBI)	0.00
% Non-Insect Individuals (S.CA)	97.23
% Non-Insect Taxa	28.57
% Crustacea + Mollusca	88.58
Average Abundance (per Taxon)	890.60
NYDEC PMA Metrics	
% Crustacea	83.36
% Mollusca	5.22
% Non-Chironomidae	1.14

AMEC Hines Nursery SWAMP Benthos 2013
Southern California B-IBI (calculated using Region 6 Chaparral and Oak Woodlands)
***Metrics used are those calculated using the CAMLnet attributes**

EcoAnalysts, Inc.

Sample Station ID	**HG-062713-BMI**	
Collection Time	**8:45**	
Collection Date	**06-27-2013**	
Percent Subsampled	**4.92**	
EcoAnalysts Sample ID	**6568.1-1**	
	Value	Score
Coleoptera Taxa	0	0
EPT Taxa	0	0
Predator Taxa	0	0
% Collector Individuals	94.32	1
% Intolerant Individuals	0.21	0
% Non-Insect Taxa	50.00	0
% Tolerant Taxa	28.57	3
SoCal B-IBI	**5.71**	

Score	Rating
0 - 19	Very Poor
20 - 39	Poor
40 - 59	Fair
60 - 79	Good
80 - 100	Very Good

AMEC Hines Nursery SWAMP Algae 2013

EcoAnalysts, Inc.

Sample Station ID	**HG-062713**
Collection Time	**8:45**
Collection Date	**06-27-2013**
EcoAnalysts Sample ID	**6568.1-1**

Algal Type	Sample Type	Area Sampled	Taxa	Count	Volume	Unit
Soft Algae	Qualitatative	138.6 cm2	Cladophora glomerata	[redacted]	[redacted]	count
Soft Algae	Qualitatative	138.6 cm2	Microspora amoena	[redacted]	[redacted]	count
Soft Algae	Qualitatative	138.6 cm2	Oedogonium sp 2	[redacted]	[redacted]	count
Soft Algae	Macroalgae	138.6 cm2	Plant Matter	[redacted]	360750361	um3/cm2
Soft Algae	Macroalgae	138.6 cm2	Cladophora glomerata	[redacted]	1.804E+10	um3/cm2
Soft Algae	Macroalgae	138.6 cm2	Microspora amoena	[redacted]	1.407E+10	um3/cm2
Soft Algae	Macroalgae	138.6 cm2	Oedogonium sp 2	[redacted]	3.608E+09	um3/cm2
Soft Algae	Epiphyte	138.6 cm2	Characium sp1_EcoA	70	[redacted]	count
Soft Algae	Epiphyte	138.6 cm2	Heteroleibleinia kossinskajae	30	[redacted]	count
Soft Algae	Microalgae	138.6 cm2	Microspora amoena	6	17884468	um3/cm2
Soft Algae	Microalgae	138.6 cm2	Scenedesmus communis	4	179419.83	um3/cm2
Soft Algae	Microalgae	138.6 cm2	Cladophora glomerata	6	878842695	um3/cm2
Soft Algae	Microalgae	138.6 cm2	Characium sp1_EcoA	111	8951454.2	um3/cm2
Soft Algae	Microalgae	138.6 cm2	Scenedesmus intermedius	5	179864.48	um3/cm2
Soft Algae	Microalgae	138.6 cm2	Oedogonium sp 2	7	318836349	um3/cm2
Soft Algae	Microalgae	138.6 cm2	Merismopedia punctata	1	19636.364	um3/cm2
Soft Algae	Microalgae	138.6 cm2	Leptolyngbya foveolarum	5	12449.745	um3/cm2
Soft Algae	Microalgae	138.6 cm2	Heteroleibleinia kossinskajae	78	50487.273	um3/cm2
Soft Algae	Microalgae	138.6 cm2	Heteroleibleinia pusilla	177	13552.836	um3/cm2
Diatoms	Integrated	138.6 cm2	Cyclotella meneghiniana	39		count
Diatoms	Integrated	138.6 cm2	Planothidium frequentissimum	91		count
Diatoms	Integrated	138.6 cm2	Staurosira construens var venter	201		count
Diatoms	Integrated	138.6 cm2	Halamphora veneta	10		count
Diatoms	Integrated	138.6 cm2	Nitzschia inconspicua	72		count
Diatoms	Integrated	138.6 cm2	Nitzschia frustulum	61		count
Diatoms	Integrated	138.6 cm2	Undetermined PennateB5_EcoA	4		count
Diatoms	Integrated	138.6 cm2	Navicula veneta	12		count
Diatoms	Integrated	138.6 cm2	Nitzschia amphibia	26		count
Diatoms	Integrated	138.6 cm2	Planothidium lanceolatum	5		count
Diatoms	Integrated	138.6 cm2	Synedra ulna	2		count
Diatoms	Integrated	138.6 cm2	Achnanthidium exiguum	2		count
Diatoms	Integrated	138.6 cm2	Navicula tenelloides	2		count
Diatoms	Integrated	138.6 cm2	Nitzschia supralitorea	12		count
Diatoms	Integrated	138.6 cm2	Gomphonema spB5_EcoA	4		count
Diatoms	Integrated	138.6 cm2	Eolimna subminuscula	10		count
Diatoms	Integrated	138.6 cm2	Nitzschia desertorum	2		count
Diatoms	Integrated	138.6 cm2	Nitzschia valdestriata	2		count
Diatoms	Integrated	138.6 cm2	Amphora pediculus	1		count
Diatoms	Integrated	138.6 cm2	Nitzschia capitellata	2		count
Diatoms	Integrated	138.6 cm2	Rhoicosphenia abbreviata	2		count
Diatoms	Integrated	138.6 cm2	Mayamaea permitis	2		count
Diatoms	Integrated	138.6 cm2	Gomphonema parvulum	4		count
Diatoms	Integrated	138.6 cm2	Eolimna minima	2		count
Diatoms	Integrated	138.6 cm2	Nitzschia rosenstockii	30		count

APPENDIX D

WATER CHEMISTRY LAB REPORT

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Calscience Environmental Laboratories, Inc.

Supplemental Report 1

The original report has been revised/corrected.

CALSCIENCE

WORK ORDER NUMBER: 13-06-1879

The difference is service

AIR | SOIL | WATER | MARINE CHEMISTRY

Analytical Report For

Client: AMEC Environment & Infrastructure

Client Project Name: Hines Growers Bioassessment Sampling 2013

Attention: John Rudolph
9210 Sky Park Court, Suite 200
San Diego, CA 92123-4302

Approved for release on 07/26/2013 by:
Danielle Gonsman
Project Manager

ResultLink ▸

Email your PM ▸

Calscience Environmental Laboratories, Inc.

Contents

Client Project Name: Hines Growers Bioassessment Sampling 2013
Work Order Number: 13-06-1879

Calscience Environmental Laboratories, Inc.

Work Order Narrative

Work Order: 13-06-1879 Page 1 of 1

Condition Upon Receipt:

Samples were received under Chain of Custody (COC) on 06/27/13. They were assigned to Work Order 13-06-1879.

Unless otherwise noted on the Sample Receiving forms all samples were received in good condition and within the recommended EPA temperature criteria for the methods noted on the COC. The COC and Sample Receiving Documents are integral elements of the analytical report and are presented at the back of the report.

Holding Times:

All samples were analyzed within prescribed holding times (HT) and/or in accordance with the Calscience Sample Acceptance Policy unless otherwise noted in the analytical report and/or comprehensive case narrative, if required.

Any parameter identified in 40CFR Part 136.3 Table II that is designated as "analyze immediately" with a holding time of <= 15 minutes (40CFR-136.3 Table II, footnote 4), is considered a "field" test and the reported results will be qualified as being received outside of the stated holding time unless received at the laboratory within 15 minutes of the collection time.

Quality Control:

All quality control parameters (QC) were within established control limits except where noted in the QC summary forms or described further within this report.

Additional Comments:

Solid - Unless otherwise indicated, solid sample data is reported on a wet weight basis, not corrected for % moisture. All QC results are always reported on a wet weight basis.

Subcontractor Information:

Unless otherwise noted below (or on the subcontract form), no samples were subcontracted.

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Calscience Environmental Laboratories, Inc.

Sample Summary

Client:	AMEC Environment & Infrastructure 9210 Sky Park Court, Suite 200 San Diego, CA 92123-4302	Work Order:	13-06-1879
		Project Name:	Hines Growers Bioassessment Sampling 2013
		PO Number:	
		Date Received:	06/27/13
Attn:	John Rudolph		

Sample Identification	Lab Number	Collection Date and Time	Number of Containers	Matrix
HG-062713-01	13-06-1879-1	06/27/13 08:45	13	Aqueous
HG-062713-02	13-06-1879-2	06/27/13 08:45	13	Aqueous

Return to Contents

Calscience Environmental Laboratories, Inc.

Analytical Report

AMEC Environment & Infrastructure		Date Received:	06/27/13
9210 Sky Park Court, Suite 200		Work Order:	13-06-1879
San Diego, CA 92123-4302		Preparation:	N/A
		Method:	ASTM D516-02
		Units:	mg/L
Project: Hines Growers Bioassessment Sampling 2013			Page 1 of 1

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
HG-062713-01	**13-06-1879-1-D**	**06/27/13 08:45**	**Aqueous**	**UV 8**	**N/A**	**06/28/13 15:30**	**D0628SO4L1**

Parameter	Result	RL	DF	Qualifiers
Sulfate	530	50	25	

Parameter	Result	RL	DF	Qualifiers
Sulfate	570	50	25	

Parameter	Result	RL	DF	Qualifiers
Sulfate	ND	2.0	1	

Return to Contents

RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

Calscience Environmental Laboratories, Inc.

Analytical Report

AMEC Environment & Infrastructure	Date Received: 06/27/13
9210 Sky Park Court, Suite 200	Work Order: 13-06-1879
San Diego, CA 92123-4302	Preparation: N/A
	Method: SM 10300C (M)
	Units: mg/L
Project: Hines Growers Bioassessment Sampling 2013	Page 1 of 1

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
HG-062713-01	**13-06-1879-1-M**	**06/27/13 08:45**	**Aqueous**	**N/A**	**07/25/13**	**07/25/13 17:00**	**D0725VSSB1**

Parameter	Result	RL	DF	Qualifiers
Ash Free Dry Weight	3290	10.0	1	

Parameter	Result	RL	DF	Qualifiers
Ash Free Dry Weight	4010	10.0	1	

Parameter	Result	RL	DF	Qualifiers
Ash Free Dry Weight	ND	1.0	1	

Return to Contents

RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

Calscience Environmental Laboratories, Inc.

Analytical Report

AMEC Environment & Infrastructure		Date Received:	06/27/13
9210 Sky Park Court, Suite 200		Work Order:	13-06-1879
San Diego, CA 92123-4302		Preparation:	N/A
		Method:	SM 2510 B
		Units:	umhos/cm

Project: Hines Growers Bioassessment Sampling 2013

Page 1 of 1

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
HG-062713-01	**13-06-1879-1-D**	**06/27/13 08:45**	**Aqueous**	**SC 5**	**N/A**	**06/28/13 17:58**	**D0628SCD1**

Parameter	Result	RL	DF	Qualifiers
Specific Conductance	2000	10	1	

Parameter	Result	RL	DF	Qualifiers
Specific Conductance	2100	10	1	

Return to Contents

RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

Calscience Environmental Laboratories, Inc.

Analytical Report

AMEC Environment & Infrastructure	Date Received: 06/27/13
9210 Sky Park Court, Suite 200	Work Order: 13-06-1879
San Diego, CA 92123-4302	Preparation: N/A
	Method: SM 2540 C
	Units: mg/L

Project: Hines Growers Bioassessment Sampling 2013

Page 1 of 1

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
HG-062713-01	**13-06-1879-1-G**	**06/27/13 08:45**	**Aqueous**	**SC 5**	**07/01/13**	**07/01/13 16:50**	**D0701TDSL2**

Parameter	Result	RL	DF	Qualifiers
Solids, Total Dissolved	1680	10.0	1	

Parameter	Result	RL	DF	Qualifiers
Solids, Total Dissolved	1640	10.0	1	

Parameter	Result	RL	DF	Qualifiers
Solids, Total Dissolved	ND	1.0	1	

Return to Contents

RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

Calscience Environmental Laboratories, Inc.

Analytical Report

AMEC Environment & Infrastructure		Date Received:	06/27/13
9210 Sky Park Court, Suite 200		Work Order:	13-06-1879
San Diego, CA 92123-4302		Preparation:	N/A
		Method:	SM 2540 D
		Units:	mg/L
Project: Hines Growers Bioassessment Sampling 2013			Page 1 of 1

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
HG-062713-01	**13-06-1879-1-F**	**06/27/13 08:45**	**Aqueous**	**N/A**	**07/01/13**	**07/01/13 15:30**	**D0701TSSL1**

Parameter	Result	RL	DF	Qualifiers
Solids, Total Suspended	1.2	1.0	1	

Parameter	Result	RL	DF	Qualifiers
Solids, Total Suspended	1.0	1.0	1	

Parameter	Result	RL	DF	Qualifiers
Solids, Total Suspended	ND	1.0	1	

Return to Contents

RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

Calscience Environmental Laboratories, Inc.

Analytical Report

AMEC Environment & Infrastructure
9210 Sky Park Court, Suite 200
San Diego, CA 92123-4302

Date Received:	06/27/13
Work Order:	13-06-1879
Preparation:	N/A
Method:	SM 4500 H+ B
Units:	pH units

Project: Hines Growers Bioassessment Sampling 2013

Page 1 of 1

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
HG-062713-01	**13-06-1879-1-D**	**06/27/13 08:45**	**Aqueous**	**PH 1**	**N/A**	**06/27/13 18:49**	**D0627PHD1**

Parameter	Result	RL	DF	Qualifiers
pH	7.42	0.01	1	

Parameter	Result	RL	DF	Qualifiers
pH	7.37	0.01	1	

Return to Contents

RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

Calscience Environmental Laboratories, Inc.

Analytical Report

AMEC Environment & Infrastructure		Date Received:	06/27/13
9210 Sky Park Court, Suite 200		Work Order:	13-06-1879
San Diego, CA 92123-4302		Preparation:	N/A
		Method:	SM 4500 N Org B
		Units:	mg/L
Project: Hines Growers Bioassessment Sampling 2013			Page 1 of 1

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
HG-062713-01	**13-06-1879-1-H**	**06/27/13 08:45**	**Aqueous**	**BUR05**	**07/03/13**	**07/03/13 18:07**	**D0703TKNB1**

Parameter	Result	RL	DF	Qualifiers
Total Kjeldahl Nitrogen	ND	0.50	1	

Parameter	Result	RL	DF	Qualifiers
Total Kjeldahl Nitrogen	ND	0.50	1	

Parameter	Result	RL	DF	Qualifiers
Total Kjeldahl Nitrogen	ND	0.50	1	

Return to Contents

RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

Calscience Environmental Laboratories, Inc.

Analytical Report

AMEC Environment & Infrastructure	Date Received: 06/27/13
9210 Sky Park Court, Suite 200	Work Order: 13-06-1879
San Diego, CA 92123-4302	Preparation: N/A
	Method: SM 4500 P B/E
	Units: mg/L

Project: Hines Growers Bioassessment Sampling 2013

Page 1 of 1

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
HG-062713-01	**13-06-1879-1-B**	**06/27/13 08:45**	**Aqueous**	**UV 7**	**06/28/13**	**06/28/13 19:11**	**D0628TPL1**

Parameter	Result	RL	DF	Qualifiers
Phosphorus, Total	0.24	0.10	1	

Parameter	Result	RL	DF	Qualifiers
Phosphorus, Total	0.25	0.10	1	

Parameter	Result	RL	DF	Qualifiers
Phosphorus, Total	ND	0.10	1	

Return to Contents

RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

Calscience Environmental Laboratories, Inc.

Analytical Report

AMEC Environment & Infrastructure	Date Received: 06/27/13
9210 Sky Park Court, Suite 200	Work Order: 13-06-1879
San Diego, CA 92123-4302	Preparation: N/A
	Method: SM 4500-Cl C
	Units: mg/L
Project: Hines Growers Bioassessment Sampling 2013	Page 1 of 1

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
HG-062713-01	**13-06-1879-1-D**	**06/27/13 08:45**	**Aqueous**	**BUR02**	**N/A**	**06/28/13 17:05**	**D0628CLCB1**

Parameter	Result	RL	DF	Qualifiers
Chloride	230	2.0	1	

Parameter	Result	RL	DF	Qualifiers
Chloride	230	2.0	1	

Parameter	Result	RL	DF	Qualifiers
Chloride	ND	2.0	1	

Return to Contents

RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

Calscience Environmental Laboratories, Inc.

Analytical Report

AMEC Environment & Infrastructure	Date Received: 06/27/13
9210 Sky Park Court, Suite 200	Work Order: 13-06-1879
San Diego, CA 92123-4302	Preparation: N/A
	Method: SM 4500-NH3 B/C
	Units: mg/L
Project: Hines Growers Bioassessment Sampling 2013	Page 1 of 1

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
HG-062713-01	**13-06-1879-1-H**	**06/27/13 08:45**	**Aqueous**	**BUR05**	**07/01/13**	**07/01/13 17:00**	**D0701NH3L2**

Parameter	Result	RL	DF	Qualifiers
Ammonia (as N)	0.11	0.10	1	

Parameter	Result	RL	DF	Qualifiers
Ammonia (as N)	0.11	0.10	1	

Parameter	Result	RL	DF	Qualifiers
Ammonia (as N)	ND	0.10	1	

Return to Contents

RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

Calscience Environmental Laboratories, Inc.

Analytical Report

AMEC Environment & Infrastructure		Date Received:	06/27/13
9210 Sky Park Court, Suite 200		Work Order:	13-06-1879
San Diego, CA 92123-4302		Preparation:	N/A
		Method:	SM 4500-NO3 E
		Units:	mg/L
Project: Hines Growers Bioassessment Sampling 2013			Page 1 of 1

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
HG-062713-01	**13-06-1879-1-A**	**06/27/13 08:45**	**Aqueous**	**UV 7**	**06/28/13**	**06/28/13 13:15**	**D0628NO3L1**

Parameter	Result	RL	DF	Qualifiers
Nitrate-Nitrite (as N)	41	10	100	

Parameter	Result	RL	DF	Qualifiers
Nitrate-Nitrite (as N)	37	10	100	

Parameter	Result	RL	DF	Qualifiers
Nitrate-Nitrite (as N)	ND	0.10	1	

Return to Contents

RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

Calscience Environmental Laboratories, Inc.

Analytical Report

AMEC Environment & Infrastructure	Date Received: 06/27/13
9210 Sky Park Court, Suite 200	Work Order: 13-06-1879
San Diego, CA 92123-4302	Preparation: N/A
	Method: SM 4500-O G
	Units: mg/L

Project: Hines Growers Bioassessment Sampling 2013 Page 1 of 1

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
HG-062713-01	**13-06-1879-1-E**	**06/27/13 08:45**	**Aqueous**	**BOD 1**	**06/27/13**	**06/27/13 19:12**	**D0627DOD1**

Parameter	Result	RL	DF	Qualifiers
Dissolved Oxygen	7.43	0.0100	1	

Parameter	Result	RL	DF	Qualifiers
Dissolved Oxygen	7.53	0.0100	1	

Return to Contents

RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

Calscience Environmental Laboratories, Inc.

Analytical Report

AMEC Environment & Infrastructure	Date Received: 06/27/13
9210 Sky Park Court, Suite 200	Work Order: 13-06-1879
San Diego, CA 92123-4302	Preparation: N/A
	Method: SM 5310 B
	Units: mg/L

Project: Hines Growers Bioassessment Sampling 2013

Page 1 of 1

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
HG-062713-01	**13-06-1879-1-C**	**06/27/13 08:45**	**Aqueous**	**TOC 8**	**06/27/13**	**07/01/13 16:01**	**D0701DOCL1**

Parameter	Result	RL	DF	Qualifiers
Carbon, Dissolved Organic	2.9	0.50	1	

Parameter	Result	RL	DF	Qualifiers
Carbon, Dissolved Organic	1.3	0.50	1	

Parameter	Result	RL	DF	Qualifiers
Carbon, Dissolved Organic	ND	0.50	1	

Return to Contents

RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

Calscience Environmental Laboratories, Inc.

Analytical Report

LABORATORY ID: 13-06-1879

Method: SM 4500 P B/E (M) (Calculation)
Matrix: Water/Aqueous

CLIENT: Amec
PROJECT: Hines Growers Bioassessment Sampling 2013

Results

Sample ID	Particulate Phosphorus (mg/L)	RL (mg/L)	DF	Volume Filtered (L)
HG-062713-01	0.89	0.20	2	4.5
HG-062713-02	0.29	0.10	1	4.5
Method Blank	ND	0.10	1	

Laboratory Notes

Key: Rec=Recovery, ND=Not Detected at the reporting level

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Calscience Environmental Laboratories, Inc.

Analytical Report

LABORATORY ID: 13-06-1879

Method: SM 4500 NO3-E (M) (Calculation)
Matrix: Water/Aqueous

CLIENT: Amec
PROJECT: Hines Growers Bioassessment Sampling 2013

Results

Sample ID	Particulate Nitrogen (mg/L)	RL (mg/L)	DF	Volume Filtered (L)
HG-062713-01	5.0	0.50	5	2.0
HG-062713-02	5.0	0.50	5	2.0
Method Blank	ND	0.10	1	

Laboratory Notes

Key: Rec=Recovery, ND=Not Detected at the reporting level

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Calscience Environmental Laboratories, Inc.

Quality Control - Spike/Spike Duplicate

AMEC Environment & Infrastructure
9210 Sky Park Court, Suite 200
San Diego, CA 92123-4302

Date Received: 06/27/13
Work Order: 13-06-1879
Preparation: N/A
Method: ASTM D516-02

Project: Hines Growers Bioassessment Sampling 2013

Quality Control Sample ID	Matrix	Instrument	Date Prepared	Date Analyzed	MS/MSD Batch Number
HG-062713-01	**Aqueous**	**UV 8**	**N/A**	**06/28/13 15:30**	**D0628SO4S1**

Parameter	Sample Conc.	Spike Added	MS Conc.	MS %Rec.	MSD Conc.	MSD %Rec.	%Rec. CL	RPD	RPD CL	Qualifiers
Sulfate	525.5	375.0	882.5	95	897.5	99	70-130	2	0-25	

Return to Contents

RPD: Relative Percent Difference. CL: Control Limits

Calscience Environmental Laboratories, Inc.

Quality Control - Spike/Spike Duplicate

AMEC Environment & Infrastructure		Date Received:	06/27/13
9210 Sky Park Court, Suite 200		Work Order:	13-06-1879
San Diego, CA 92123-4302		Preparation:	N/A
		Method:	SM 4500 P B/E
Project: Hines Growers Bioassessment Sampling 2013			Page 2 of 5

Quality Control Sample ID	Matrix	Instrument	Date Prepared	Date Analyzed	MS/MSD Batch Number
13-06-1877-1	**Aqueous**	**UV 7**	**06/28/13**	**06/28/13 19:11**	**D0628TPS1**

Parameter	Sample Conc.	Spike Added	MS Conc.	MS %Rec.	MSD Conc.	MSD %Rec.	%Rec. CL	RPD	RPD CL	Qualifiers
Phosphorus, Total	0.1687	0.4000	0.5280	90	0.5250	89	70-130	1	0-25	

RPD: Relative Percent Difference.   CL: Control Limits

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Calscience Environmental Laboratories, Inc.

Quality Control - Spike/Spike Duplicate

AMEC Environment & Infrastructure
9210 Sky Park Court, Suite 200
San Diego, CA 92123-4302

Date Received: 06/27/13
Work Order: 13-06-1879
Preparation: N/A
Method: SM 4500-NH3 B/C

Project: Hines Growers Bioassessment Sampling 2013

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Quality Control Sample ID	Matrix	Instrument	Date Prepared	Date Analyzed	MS/MSD Batch Number
13-06-1568-8	**Aqueous**	**BUR05**	**07/01/13**	**07/01/13 17:00**	**D0701NH3S2**

Parameter	Sample Conc.	Spike Added	MS Conc.	MS %Rec.	MSD Conc.	MSD %Rec.	%Rec. CL	RPD	RPD CL	Qualifiers
Ammonia (as N)	25.82	5.000	30.24	4X	30.13	4X	70-130	4X	0-25	Q

Return to Contents

RPD: Relative Percent Difference. CL: Control Limits

Calscience Environmental Laboratories, Inc.

Quality Control - Spike/Spike Duplicate

AMEC Environment & Infrastructure
9210 Sky Park Court, Suite 200
San Diego, CA 92123-4302

Date Received: 06/27/13
Work Order: 13-06-1879
Preparation: N/A
Method: SM 4500-NO3 E

Project: Hines Growers Bioassessment Sampling 2013

Page 4 of 5

Quality Control Sample ID	Matrix	Instrument	Date Prepared	Date Analyzed	MS/MSD Batch Number
13-06-1877-1	**Aqueous**	**UV 7**	**06/28/13**	**06/28/13 13:15**	**D0628NO3S1**

Parameter	Sample Conc.	Spike Added	MS Conc.	MS %Rec.	MSD Conc.	MSD %Rec.	%Rec. CL	RPD	RPD CL	Qualifiers
Nitrate-Nitrite (as N)	4.038	5.000	8.700	93	8.760	94	70-130	1	0-25	

Return to Contents

RPD: Relative Percent Difference. CL: Control Limits

Calscience Environmental Laboratories, Inc.

Quality Control - Spike/Spike Duplicate

AMEC Environment & Infrastructure		Date Received:	06/27/13
9210 Sky Park Court, Suite 200		Work Order:	13-06-1879
San Diego, CA 92123-4302		Preparation:	N/A
		Method:	SM 5310 B
Project: Hines Growers Bioassessment Sampling 2013			Page 5 of 5

Quality Control Sample ID	Matrix	Instrument	Date Prepared	Date Analyzed	MS/MSD Batch Number
HG-062713-01	**Aqueous**	**TOC 8**	**06/27/13**	**07/01/13 16:01**	**D0701DOCS1**

Parameter	Sample Conc.	Spike Added	MS Conc.	MS %Rec.	MSD Conc.	MSD %Rec.	%Rec. CL	RPD	RPD CL	Qualifiers
Carbon, Dissolved Organic	2.940	10.00	12.00	91	11.80	89	70-130	2	0-25	

Return to Contents

RPD: Relative Percent Difference. CL: Control Limits

Calscience Environmental Laboratories, Inc.

Quality Control - Sample Duplicate

AMEC Environment & Infrastructure
9210 Sky Park Court, Suite 200
San Diego, CA 92123-4302

Date Received: 06/27/13
Work Order: 13-06-1879
Preparation: N/A
Method: SM 2510 B

Project: Hines Growers Bioassessment Sampling 2013

Quality Control Sample ID	Matrix	Instrument	Date Prepared	Date Analyzed	Duplicate Batch Number
HG-062713-02	**Aqueous**	**SC 5**	**N/A**	**06/28/13 17:58**	**D0628SCD1**

Parameter	Sample Conc.	DUP Conc.	RPD	RPD CL	Qualifiers
Specific Conductance	2060	2060	0	0-25	

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RPD: Relative Percent Difference.   CL: Control Limits

Calscience Environmental Laboratories, Inc.

Quality Control - Sample Duplicate

AMEC Environment & Infrastructure	Date Received: 06/27/13
9210 Sky Park Court, Suite 200	Work Order: 13-06-1879
San Diego, CA 92123-4302	Preparation: N/A
	Method: SM 2540 C
Project: Hines Growers Bioassessment Sampling 2013	Page 2 of 7

Quality Control Sample ID	Matrix	Instrument	Date Prepared	Date Analyzed	Duplicate Batch Number
13-06-1693-1	**Aqueous**	**SC 5**	**07/01/13 00:00**	**07/01/13 16:50**	**D0701TDSD2**

Parameter	Sample Conc.	DUP Conc.	RPD	RPD CL	Qualifiers
Solids, Total Dissolved	1200	1170	3	0-20	

Return to Contents

RPD: Relative Percent Difference. CL: Control Limits

Calscience Environmental Laboratories, Inc.

Quality Control - Sample Duplicate

AMEC Environment & Infrastructure	Date Received: 06/27/13
9210 Sky Park Court, Suite 200	Work Order: 13-06-1879
San Diego, CA 92123-4302	Preparation: N/A
	Method: SM 2540 D
Project: Hines Growers Bioassessment Sampling 2013	Page 3 of 7

Quality Control Sample ID	Matrix	Instrument	Date Prepared	Date Analyzed	Duplicate Batch Number
13-06-1769-4	**Aqueous**	**N/A**	**07/01/13 00:00**	**07/01/13 15:30**	**D0701TSSD1**

Parameter	Sample Conc.	DUP Conc.	RPD	RPD CL	Qualifiers
Solids, Total Suspended	5997	6140	2	0-20	

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RPD: Relative Percent Difference. CL: Control Limits

Calscience Environmental Laboratories, Inc.

Quality Control - Sample Duplicate

AMEC Environment & Infrastructure		Date Received:	06/27/13
9210 Sky Park Court, Suite 200		Work Order:	13-06-1879
San Diego, CA 92123-4302		Preparation:	N/A
		Method:	SM 4500 H+ B
Project: Hines Growers Bioassessment Sampling 2013			Page 4 of 7

Quality Control Sample ID	Matrix	Instrument	Date Prepared	Date Analyzed	Duplicate Batch Number
13-06-1787-1	**Aqueous**	**PH 1**	**N/A**	**06/27/13 18:49**	**D0627PHD1**

Parameter	Sample Conc.	DUP Conc.	RPD	RPD CL	Qualifiers
pH	7.450	7.450	0	0-25	

Return to Contents

RPD: Relative Percent Difference. CL: Control Limits

Calscience Environmental Laboratories, Inc.

Quality Control - Sample Duplicate

AMEC Environment & Infrastructure	Date Received: 06/27/13
9210 Sky Park Court, Suite 200	Work Order: 13-06-1879
San Diego, CA 92123-4302	Preparation: N/A
	Method: SM 4500 N Org B
Project: Hines Growers Bioassessment Sampling 2013	Page 5 of 7

Quality Control Sample ID	Matrix	Instrument	Date Prepared	Date Analyzed	Duplicate Batch Number
13-06-1877-1	**Aqueous**	**BUR05**	**07/03/13 00:00**	**07/03/13 18:07**	**D0703TKND1**

Parameter	Sample Conc.	DUP Conc.	RPD	RPD CL	Qualifiers
Total Kjeldahl Nitrogen	ND	ND	N/A	0-25	

Return to Contents

RPD: Relative Percent Difference. CL: Control Limits

Calscience Environmental Laboratories, Inc.

Quality Control - Sample Duplicate

AMEC Environment & Infrastructure
9210 Sky Park Court, Suite 200
San Diego, CA 92123-4302

Date Received:	06/27/13
Work Order:	13-06-1879
Preparation:	N/A
Method:	SM 4500-Cl C

Project: Hines Growers Bioassessment Sampling 2013

Quality Control Sample ID	Matrix	Instrument	Date Prepared	Date Analyzed	Duplicate Batch Number
13-06-1808-1	**Aqueous**	**BUR02**	**N/A**	**06/28/13 17:05**	**D0628CLCD1**

Parameter	Sample Conc.	DUP Conc.	RPD	RPD CL	Qualifiers
Chloride	128.6	128.6	0	0-25	

Return to Contents

RPD: Relative Percent Difference.   CL: Control Limits

Calscience Environmental Laboratories, Inc.

Quality Control - Sample Duplicate

AMEC Environment & Infrastructure
9210 Sky Park Court, Suite 200
San Diego, CA 92123-4302

Date Received: 06/27/13
Work Order: 13-06-1879
Preparation: N/A
Method: SM 4500-O G

Project: Hines Growers Bioassessment Sampling 2013

Quality Control Sample ID	Matrix	Instrument	Date Prepared	Date Analyzed	Duplicate Batch Number
HG-062713-01	**Aqueous**	**BOD 1**	**06/27/13 00:00**	**06/27/13 19:12**	**D0627DOD1**

Parameter	Sample Conc.	DUP Conc.	RPD	RPD CL	Qualifiers
Dissolved Oxygen	7.430	7.350	1	0-25	

Return to Contents

RPD: Relative Percent Difference. CL: Control Limits

Calscience Environmental Laboratories, Inc.

Quality Control - LCS/LCSD

AMEC Environment & Infrastructure		Date Received:	06/27/13
9210 Sky Park Court, Suite 200		Work Order:	13-06-1879
San Diego, CA 92123-4302		Preparation:	N/A
		Method:	ASTM D516-02
Project: Hines Growers Bioassessment Sampling 2013			Page 1 of 7

Quality Control Sample ID	Matrix	Instrument	Date Prepared	Date Analyzed	LCS/LCSD Batch Number
099-05-091-1889	**Aqueous**	**UV 8**	**N/A**	**06/28/13 15:30**	**D0628SO4L1**

Parameter	Spike Added	LCS Conc.	LCS %Rec.	LCSD Conc.	LCSD %Rec.	%Rec. CL	RPD	RPD CL	Qualifiers
Sulfate	20.00	19.20	96	19.30	96	80-120	1	0-20	

Return to Contents

RPD: Relative Percent Difference.   CL: Control Limits

Calscience Environmental Laboratories, Inc.

Quality Control - LCS/LCSD

AMEC Environment & Infrastructure		Date Received:	06/27/13
9210 Sky Park Court, Suite 200		Work Order:	13-06-1879
San Diego, CA 92123-4302		Preparation:	N/A
		Method:	SM 2540 C
Project: Hines Growers Bioassessment Sampling 2013			Page 2 of 7

Quality Control Sample ID	Matrix	Instrument	Date Prepared	Date Analyzed	LCS/LCSD Batch Number
099-12-180-3733	**Aqueous**	**SC 5**	**07/01/13**	**07/01/13 16:50**	**D0701TDSL2**

Parameter	Spike Added	LCS Conc.	LCS %Rec.	LCSD Conc.	LCSD %Rec.	%Rec. CL	RPD	RPD CL	Qualifiers
Solids, Total Dissolved	100.0	105.0	105	100.0	100	80-120	5	0-20	

Return to Contents

RPD: Relative Percent Difference.   CL: Control Limits

Calscience Environmental Laboratories, Inc.

Quality Control - LCS/LCSD

AMEC Environment & Infrastructure		Date Received:	06/27/13
9210 Sky Park Court, Suite 200		Work Order:	13-06-1879
San Diego, CA 92123-4302		Preparation:	N/A
		Method:	SM 2540 D
Project: Hines Growers Bioassessment Sampling 2013			Page 3 of 7

Quality Control Sample ID	Matrix	Instrument	Date Prepared	Date Analyzed	LCS/LCSD Batch Number
099-09-010-6338	**Aqueous**	**N/A**	**07/01/13**	**07/01/13 15:30**	**D0701TSSL1**

Parameter	Spike Added	LCS Conc.	LCS %Rec.	LCSD Conc.	LCSD %Rec.	%Rec. CL	RPD	RPD CL	Qualifiers
Solids, Total Suspended	100.0	92.00	92	90.00	90	80-120	2	0-20	

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RPD: Relative Percent Difference.   CL: Control Limits

Calscience Environmental Laboratories, Inc.

Quality Control - LCS/LCSD

AMEC Environment & Infrastructure
9210 Sky Park Court, Suite 200
San Diego, CA 92123-4302

Date Received: 06/27/13
Work Order: 13-06-1879
Preparation: N/A
Method: SM 4500 P B/E

Project: Hines Growers Bioassessment Sampling 2013

Page 4 of 7

Quality Control Sample ID	Matrix	Instrument	Date Prepared	Date Analyzed	LCS/LCSD Batch Number
099-05-098-2457	**Aqueous**	**UV 7**	**06/28/13**	**06/28/13 19:11**	**D0628TPL1**

Parameter	Spike Added	LCS Conc.	LCS %Rec.	LCSD Conc.	LCSD %Rec.	%Rec. CL	RPD	RPD CL	Qualifiers
Phosphorus, Total	0.4000	0.3920	98	0.4090	102	80-120	4	0-20	

Return to Contents

RPD: Relative Percent Difference. CL: Control Limits

Calscience Environmental Laboratories, Inc.

Quality Control - LCS/LCSD

AMEC Environment & Infrastructure		Date Received:	06/27/13
9210 Sky Park Court, Suite 200		Work Order:	13-06-1879
San Diego, CA 92123-4302		Preparation:	N/A
		Method:	SM 4500-NH3 B/C
Project: Hines Growers Bioassessment Sampling 2013			Page 5 of 7

Quality Control Sample ID	Matrix	Instrument	Date Prepared	Date Analyzed	LCS/LCSD Batch Number
099-12-814-1666	**Aqueous**	**BUR05**	**07/01/13**	**07/01/13 17:00**	**D0701NH3L2**

Parameter	Spike Added	LCS Conc.	LCS %Rec.	LCSD Conc.	LCSD %Rec.	%Rec. CL	RPD	RPD CL	Qualifiers
Ammonia (as N)	5.000	4.704	94	4.760	95	80-120	1	0-20	

Return to Contents

RPD: Relative Percent Difference. CL: Control Limits

Calscience Environmental Laboratories, Inc.

Quality Control - LCS/LCSD

AMEC Environment & Infrastructure	Date Received: 06/27/13
9210 Sky Park Court, Suite 200	Work Order: 13-06-1879
San Diego, CA 92123-4302	Preparation: N/A
	Method: SM 4500-NO3 E
Project: Hines Growers Bioassessment Sampling 2013	Page 6 of 7

Quality Control Sample ID	Matrix	Instrument	Date Prepared	Date Analyzed	LCS/LCSD Batch Number
099-14-282-202	**Aqueous**	**UV 7**	**06/28/13**	**06/28/13 13:15**	**D0628NO3L1**

Parameter	Spike Added	LCS Conc.	LCS %Rec.	LCSD Conc.	LCSD %Rec.	%Rec. CL	RPD	RPD CL	Qualifiers
Nitrate-Nitrite (as N)	0.5000	0.5010	100	0.4930	99	80-120	2	0-20	

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RPD: Relative Percent Difference. CL: Control Limits

Calscience Environmental Laboratories, Inc.

Quality Control - LCS/LCSD

AMEC Environment & Infrastructure
9210 Sky Park Court, Suite 200
San Diego, CA 92123-4302

Date Received: 06/27/13
Work Order: 13-06-1879
Preparation: N/A
Method: SM 5310 B

Project: Hines Growers Bioassessment Sampling 2013

Page 7 of 7

Quality Control Sample ID	Matrix	Instrument	Date Prepared	Date Analyzed	LCS/LCSD Batch Number
099-05-115-1268	**Aqueous**	**TOC 8**	**06/27/13**	**07/01/13 16:01**	**D0701DOCL1**

Parameter	Spike Added	LCS Conc.	LCS %Rec.	LCSD Conc.	LCSD %Rec.	%Rec. CL	RPD	RPD CL	Qualifiers
Carbon, Dissolved Organic	10.00	10.20	102	10.10	101	80-120	1	0-20	

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RPD: Relative Percent Difference. CL: Control Limits

Calscience Environmental Laboratories, Inc.

Glossary of Terms and Qualifiers

Work Order: 13-06-1879 Page 1 of 1

Qualifiers	Definition
*	See applicable analysis comment.
<	Less than the indicated value.
>	Greater than the indicated value.
1	Surrogate compound recovery was out of control due to a required sample dilution. Therefore, the sample data was reported without further clarification.
2	Surrogate compound recovery was out of control due to matrix interference. The associated method blank surrogate spike compound was in control and, therefore, the sample data was reported without further clarification.
3	Recovery of the Matrix Spike (MS) or Matrix Spike Duplicate (MSD) compound was out of control due to suspected matrix interference. The associated LCS recovery was in control.
4	The MS/MSD RPD was out of control due to suspected matrix interference.
5	The PDS/PDSD or PES/PESD associated with this batch of samples was out of control due to suspected matrix interference.
6	Surrogate recovery below the acceptance limit.
7	Surrogate recovery above the acceptance limit.
B	Analyte was present in the associated method blank.
BU	Sample analyzed after holding time expired.
BV	Sample received after holding time expired.
E	Concentration exceeds the calibration range.
ET	Sample was extracted past end of recommended max. holding time.
HD	The chromatographic pattern was inconsistent with the profile of the reference fuel standard.
HDH	The sample chromatographic pattern for TPH matches the chromatographic pattern of the specified standard but heavier hydrocarbons were also present (or detected).
HDL	The sample chromatographic pattern for TPH matches the chromatographic pattern of the specified standard but lighter hydrocarbons were also present (or detected).
J	Analyte was detected at a concentration below the reporting limit and above the laboratory method detection limit. Reported value is estimated.
ME	LCS Recovery Percentage is within Marginal Exceedance (ME) Control Limit range (+/- 4 SD from the mean).
ND	Parameter not detected at the indicated reporting limit.
Q	Spike recovery and RPD control limits do not apply resulting from the parameter concentration in the sample exceeding the spike concentration by a factor of four or greater.
SG	The sample extract was subjected to Silica Gel treatment prior to analysis.
X	% Recovery and/or RPD out-of-range.
Z	Analyte presence was not confirmed by second column or GC/MS analysis.
	Solid - Unless otherwise indicated, solid sample data is reported on a wet weight basis, not corrected for % moisture. All QC results are reported on a wet weight basis.
	Any parameter identified in 40CFR Part 136.3 Table II that is designated as "analyze immediately" with a holding time of <= 15 minutes (40CFR-136.3 Table II, footnote 4), is considered a "field" test and the reported results will be qualified as being received outside of the stated holding time unless received at the laboratory within 15 minutes of the collection time.
	A calculated total result (Example: Total Pesticides) is the summation of each component concentration and/or, if "J" flags are reported, estimated concentration. Component concentrations showing not detected (ND) are summed into the calculated total result as zero concentrations.

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13-06-1879

amec

Chain of Custody

Control Number:

Date: 6/27/13 Page: 1 of 1

Project Manager: John Rudolph	phone: 858-514-6465	Bill To: John Rudolph	Report To: John Rudolph
Project Name: Hines Growers Bioassessment Sampling 2013		Company: AMEC	Company: AMEC
		Address: john.d.rudolph@amec.com	Address: john.d.rudolph@amec.com (electronic copies only)
Sampler's Name: John Rudolph		Lab Use	
QC Level:	TAT:	Preservatives	

Sample Station ID	Client ID	Date Collected	Time Collected	# Containers	Soil/Sediment	Seawater	Freshwater	Algae	Benthic Macroinverts	Ash-free Dry Mass	Chlorophyll-a	Total Dissolved Solids	Total Suspended Solids	Total Kjeldahl Nitrogen	Nitrogen, Ammonia	Nitrogen, Nitrite +Nitrate	Total Phosphorus	Dissolved Oxygen	Dissolved Organic Carbon	Particulate Nitrogen	Particulate Phosphorus	ph, Conductivity, Chloride, Sulfate			
1 HG-062713-01		6/27/2013	0845	13			x			x	x	x	x	x	x	x	x	x	x	x	x	x			
2 HG-062713-02		6/27/2013	0845	13			x			x	x	x	x	x	x	x	x	x	x	x	x	x			

	Date	Time
Samplers Signature:	1205	6/27/13
Relinquished By:	1350 ~~1330~~	6/27/13
Received By:	06/27/13	1350
Relinquished By:	06/27/13	1755
Received By (LAB):	6/27/13	1755

For Lab Use

Lab No.:

Does COC match samples: Y or N
Broken container: Y or N
Received within holding time: Y or N
COC seal intact: Y or N
Any other problems: Y or N
If problems, Amec contacted: Y or N
Date contacted: ___/___/___
Temperature (°C): ______

Comments

Chlorophyll-a & AFDM samples submitted on 0.7 GFF
- Composite volume [redacted] for AFDM + Chl-a samples = 525 ml
- Volume filtered 25 ml for AFDM + Chl-a

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Calscience Environmental Laboratories, Inc.

WORK ORDER #: **13-06-1879**

SAMPLE RECEIPT FORM

Cooler 2 of 2

CLIENT: AMEC

DATE: 06 / 27 / 13

TEMPERATURE: Thermometer ID: SC1 (Criteria: 0.0 °C – 6.0 °C, not frozen except sediment/tissue)

Temperature 1.8 °C - 0.2 °C (CF) = 1.6 °C ☑ Blank ☐ Sample

☐ Sample(s) outside temperature criteria (PM/APM contacted by: ________).

☐ Sample(s) outside temperature criteria but received on ice/chilled on same day of sampling.

☐ **Received at ambient temperature, placed on ice for transport by Courier.**

Ambient Temperature: ☐ Air ☐ Filter Initial: [illegible]

CUSTODY SEALS INTACT:

☐ Cooler ☐ ____________ ☐ No (Not Intact) ☑ Not Present ☐ N/A Initial: [illegible]

☐ Sample ☐ ____________ ☐ No (Not Intact) ☑ Not Present Initial: JH

SAMPLE CONDITION:	Yes	No	N/A
Chain-Of-Custody (COC) document(s) received with samples	☑	☐	☐
COC document(s) received complete	☑	☐	☐
☐ Collection date/time, matrix, and/or # of containers logged in based on sample labels.			
☐ No analysis requested. ☐ Not relinquished. ☐ No date/time relinquished.			
Sampler's name indicated on COC	☑	☐	☐
Sample container label(s) consistent with COC	☑	☐	☐
Sample container(s) intact and good condition	☑	☐	☐
Proper containers and sufficient volume for analyses requested	☑	☐	☐
Analyses received within holding time	☑	☐	☐
pH / Res. Chlorine / Diss. Sulfide / Diss. Oxygen received within 24 hours	☑	☐	☐
Proper preservation noted on COC or sample container	☑	☐	☐
☐ Unpreserved vials received for Volatiles analysis			
Volatile analysis container(s) free of headspace	☐	☐	☑
Tedlar bag(s) free of condensation	☐	☐	☑

CONTAINER TYPE:

Solid: ☐4ozCGJ ☐8ozCGJ ☐16ozCGJ ☐Sleeve (_____) ☐EnCores® ☐TerraCores® ☐________

Water: ☐VOA ☐VOAh ☐VOAna₂ ☐125AGB ☐125AGBh ☐125AGBp ☐1AGB ☐1AGBna₂ ☑1AGBs (2) ☑500AGB ☐500AGJ ☐500AGJs ☑250AGB ☐250CGB ☑250CGBs (2) ☑1PB (2) ☐1PBna ☑500PB ☐250PB ☐250PBn ☐125PB ☐125PBznna ☐100PJ ☐100PJna₂ ☑1Gallon cube ☐________ ☐________

Air: ☐Tedlar® ☐Canister **Other:** ☑(2) Disk **Trip Blank Lot#:**________ **Labeled/Checked by:** JH

Container: C: Clear A: Amber P: Plastic G: Glass J: Jar B: Bottle Z: Ziploc/Resealable Bag E: Envelope **Reviewed by:** [illegible]

Preservative: h: HCL n: HNO_3 na₂: $Na_2S_2O_3$ na: NaOH p: H_3PO_4 s: H_2SO_4 u: Ultra-pure znna: $ZnAc_2$+NaOH f: Filtered **Scanned by:** [illegible]

Calscience Environmental Laboratories, Inc.

WORK ORDER #: 13-06-1879

SAMPLE RECEIPT FORM

Cooler 1 **of** 2

CLIENT: AMEC **DATE:** 06 /27/ 13

TEMPERATURE: Thermometer ID: SC1 (Criteria: 0.0 °C – 6.0 °C, not frozen except sediment/tissue)

Temperature 1.9 °C - 0.2 °C (CF) = 1.7 °C ☑ **Blank** ☐ **Sample**

☐ Sample(s) outside temperature criteria (PM/APM contacted by: ________).

☐ Sample(s) outside temperature criteria but received on ice/chilled on same day of sampling.

☐ **Received at ambient temperature, placed on ice for transport by Courier.**

Ambient Temperature: ☐ Air ☐ Filter Initial: VO

CUSTODY SEALS INTACT:

☐ Cooler ☐________ ☐ No (Not Intact) ☑ Not Present ☐ N/A Initial: VO

☐ Sample ☐________ ☐ No (Not Intact) ☑ Not Present Initial: HH

SAMPLE CONDITION:	Yes	No	N/A
Chain-Of-Custody (COC) document(s) received with samples	☑	☐	☐
COC document(s) received complete	☑	☐	☐
☐ Collection date/time, matrix, and/or # of containers logged in based on sample labels.			
☐ No analysis requested. ☐ Not relinquished. ☐ No date/time relinquished.			
Sampler's name indicated on COC	☑	☐	☐
Sample container label(s) consistent with COC	☑	☐	☐
Sample container(s) intact and good condition	☑	☐	☐
Proper containers and sufficient volume for analyses requested	☑	☐	☐
Analyses received within holding time	☑	☐	☐
pH / Res. Chlorine / Diss. Sulfide / Diss. Oxygen received within 24 hours	☑	☐	☐
Proper preservation noted on COC or sample container	☑	☐	☐
☐ Unpreserved vials received for Volatiles analysis			
Volatile analysis container(s) free of headspace	☐	☐	☑
Tedlar bag(s) free of condensation	☐	☐	☑

CONTAINER TYPE:

Solid: ☐4ozCGJ ☐8ozCGJ ☐16ozCGJ ☐Sleeve (_____) ☐EnCores® ☐TerraCores® ☐________

Water: ☐VOA ☐VOAh ☐VOAna$_2$ ☐125AGB ☐125AGBh ☐125AGBp ☐1AGB ☐1AGBna$_2$ ☑1AGBs (2) ☑500AGB ☐500AGJ ☐500AGJs ☑250AGB ☐250CGB ☑250CGBs (2) ☑1PB (2) ☐1PBna ☑500PB ☐250PB ☐250PBn ☐125PB ☐125PBznna ☐100PJ ☐100PJna$_2$ ☑ 1Gallon cube ☐________ ☐________

Air: ☐Tedlar® ☐Canister **Other:** ☑ Disk (2) **Trip Blank Lot#:**________ **Labeled/Checked by:** HH

Container: C: Clear **A:** Amber **P:** Plastic **G:** Glass **J:** Jar **B:** Bottle **Z:** Ziploc/Resealable Bag **E:** Envelope **Reviewed by:** NC

Preservative: h: HCL **n:** HNO_3 **na$_2$:**$Na_2S_2O_3$ **na:** NaOH **p:** H_3PO_4 **s:** H_2SO_4 **u:** Ultra-pure **znna:** $ZnAc_2$+NaOH **f:** Filtered **Scanned by:** NC

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Calscience Environmental Laboratories, Inc.

Laboratory Report

Report ID: 129053

Sierra Environmental Monitoring, Inc.

Calscience Environmental Laboratories, Inc.		**Date:**	7/11/2013
Attn: Danielle Gonsman		**Client:**	CSE-841
7440 Lincoln Way		**Taken by:**	Client
Garden Grove, California 92841-1427		**PO #:**	13-06-1879

Dear Danielle Gonsman,

It is the policy of Sierra Environmental Monitoring, Inc to strictly adhere to a comprehensive Quality Assurance Plan that insures the data presented in this report are both accurate and precise. Sierra Environmental Monitoring, Inc. maintains accreditation in the State of Nevada (NV-15 and NV-921) and the State of California (ELAP 2526).

The data presented in this report were obtained from the analysis of samples received under a chain of custody. Unless otherwise noted below, samples were received in good condition, properly preserved and within the hold time for the requested analyses. Any anomalies associated with the analysis of the samples have been flagged with appropriate explanation in the Analysis Report section of this Laboratory Report.

General Comments:

- Sampler did not sign COC

Individual Sample Comments:

- There are no specific comments that are associated with these samples.

Approved By: **Date:**

Sierra Environmental Monitoring, Inc. 7/11/2013

This report is applicable only to the sample received by the laboratory. The liability of the laboratory is limited to the amount paid for this report. This report is for the exclusive use of the client to whom it is addressed and upon the condition that the client assumes all liability for the further distribution of the report or its contents.

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sem@semanalytical.com

John C. Seher
Special Consultant
Quality Assurance Manager

Calscience Environmental Laboratories, Inc.

Laboratory Report

Report ID: 129053

Sierra Environmental Monitoring, Inc.

Calscience Environmental Laboratories, Inc.		Date:	7/11/2013
Attn: Danielle Gonsman		Client:	CSE-841
7440 Lincoln Way		Taken by:	Client
Garden Grove, California 92841-1427		PO #:	13-06-1879

Analysis Report

Laboratory Sample ID	Customer Sample ID	Date Sampled	Time Sampled	Date Received
S201307-0168	HG-062713-01	6/27/2013	8:45 AM	7/3/2013

Parameter	Method	Result	Units	Reporting Limit	Analyst	Date Analyzed	Data Flag
Chlorophyll a	SM 10200 H	9300	ug/L	300	Keller	7/10/2013	

Laboratory Sample ID	Customer Sample ID	Date Sampled	Time Sampled	Date Received
S201307-0169	HG-062713-02	6/27/2013	8:45 AM	7/3/2013

Parameter	Method	Result	Units	Reporting Limit	Analyst	Date Analyzed	Data Flag
Chlorophyll a	SM 10200 H	7600	ug/L	300	Keller	7/10/2013	

Data Flag Legend:

John Kobza, Ph.D
Laboratory Director

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John C. Seher
Special Consultant
Quality Assurance Manager

7440 Lincoln Way, Garden Grove, CA 92841-1427 • TEL: (714) 895-5494 • FAX: (714) 894-7501

Calscience Environmental Laboratories, Inc.

Laboratory Report
Report ID: 129053

Sierra Environmental Monitoring, Inc.

Calscience Environmental Laboratories, Inc.
Attn: Danielle Gonsman
7440 Lincoln Way
Garden Grove, California 92841-1427

Date: 7/11/2013
Client: CSE-841
Taken by: Client
PO #: 13-06-1879

Quality Control Report

Parameter	*LCS, % Recovery*	*MS, % Recovery*	*MSD, % Recovery*	*RPD, %*	*Method Blank*	
Chlorophyll a	99.0			6.06	<2	ug/L

Legend: *LCS- Laboratory Control Standard* *MS- Matrix Spike* *MSD- Matrix Spike Duplicate*
RPD- Relative Percent Difference

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Calscience Environmental Laboratories, Inc.

7440 LINCOLN WAY
GARDEN GROVE, CA 92841-1427
TEL: (714) 895-5494 . FAX: (714) 894-7501

TO: Sierra Lab, Reno, NV

129053

CHAIN OF CUSTODY RECORD

DATE: 06/28/13
PAGE: 1 OF 1

LABORATORY CLIENT: Calscience Environmental Laboratories, Inc.	CLIENT PROJECT NAME / NUMBER: 13-06-1879
ADDRESS: 7440 Lincoln Way	P.O. NO.: 13-06-1879
CITY: Garden Grove, CA 92841-1427	PROJECT CONTACT: Danielle Gonsman
TEL: (714) 895-5494	TEMP BLANK:
E-MAIL: dgonsman@calscience.com	SAMPLER(S): (PRINT)
	LAB USE ONLY

TURNAROUND TIME
___ SAME DAY ___ 24 HR ___ 48HR ___ 72 HR ___ 5 DAYS _X_ STANDARD

SPECIAL REQUIREMENTS (ADDITIONAL COSTS MAY APPLY)
☐ RWQCB REPORTING ☐ ARCHIVE SAMPLES UNTIL ___/___/___

SPECIAL INSTRUCTIONS

Volume: 25 mL filtered
Samples were stored frozen

REQUESTED ANALYSIS

LAB USE ONLY	SAMPLE ID	SAMPLING DATE	SAMPLING TIME	Matrix	#Cont		Chlorophyll-a
	HG-062713-01	06/27/13	0845	filter (FW)	1		X
	HG-062713-02	06/27/13	0845	filter (FW)	1		X

Relinquished	Received by / Affiliation: (Signature)	Date:	Time:
(Signature) (CALSCIENCE)	GSO AB# 522181550	070213	1500
(Signature) 522181550	Received by / Affiliation: (Signature)	7/3/13	10:00A
(Signature)	Received by / Affiliation: (Signature)	Date:	Time:

APPENDIX E

PHOTO LOG

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Transect A looking upstream

Transect F looking downstream

Transect F looking upstream

Transect K looking downstream

APPENDIX F

CHAIN OF CUSTODY

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amec

Chain of Custody

Control Number:

Date: 6/27/13

Project Manager: John Rudolph	phone: 858-514-6465
Project Name: Hines Growers Bioassessment Sampling 2013	
Sampler's Name: John Rudolph	
QC Level:	TAT:

Bill To: John Rudolph
Company: AMEC
Address: john.d.rudolph@amec.com

Report To: John Rudolph
Company: AMEC
Address: john.d.rudolph@amec.com
(electronic copies only)

Lab Use

Preservatives

Sample Station ID	Client ID	Date Collected	Time Collected	# Containers	Soil/Sediment	Seawater	Freshwater	Algae	Benthic Macroinverts	Taxonomy, 600 Count SWAMP, SAFIT 2	Standard SWAMP Taxonomy
HG-062713-BMI		6/27/2013	845	4					x	x	
HG-062713-SBA		6/27/2013	845	2				x			x
HG-062713-DIA		6/27/2013	845	1				x			x

		Date	Time
Samplers Signature	[signature]	6/27/13	1200
Relinquished By:	[signature]	7/1/13	1330
Received By:	Jennifer Reynolds @ EcoA	7/2/13	1030
Relinquished By:			
Received By (LAB):			

For Lab Use

Lab No.:

Does COC match samples: Y or N
Broken container: Y or N
Received within holding time: Y or N
COC seal intact: Y or N
Any other problems: Y or N
If problems, Amec contacted: Y or N
Date contacted: ___/___/___
Temperature (°C): ______

Comments

Calculate SoCal IBI for BMI, voucher BMI samples
BMI decanted prior to shipment
Qualitative and Quantitative soft bodied algae samples included
Soft bodied sample preserved with Gluteraldehyde
Qualitative sample not preserved (stored at 4 degrees C)
Diatoms preserved in 10% formalin