Ali, Mazhar@Waterboards

From: Ruth Custance <RCustance@Geosyntec.com>
Sent: Friday, September 22, 2017 5:45 PM
To: Owens, Cassandra@Waterboards; Raftery, Peter@Waterboards; Ali, Mazhar@Waterboards; King, Buck@DTSC; peter.d.zorba@nasa.gov; Michael K. Stenstrom; jonjones@wrightwater.com; josselyn@wra-ca.com; Pitt, Robert; Robert.Gearheart@humboldt.edu; 'Randy.Dean@CH2M.com'; Dixie Hambrick; Miller, Lissa
Cc: Costa, Paul J (paul.j.costa@boeing.com); Brandon Steets
Subject: Addendum to the Human Health Risk Assessment for Surface Water Runoff - Boeing SSFL
Attachments: SSFL Surface Water HHRA Addendum September 2017.pdf

Cassandra

Attached is the Addendum to the Human Health Risk Assessment for Surface Water Runoff for the Outfalls. The addendum is being submitted in response to agency comments on the HHRA report.

Please do not hesitate to contact us with any questions.

Regards,

Ruth

Ruth Custance, MPH
Senior Principal
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Via Email to cowens@rb4.swrcb.ca.gov

September 22, 2017

Ms. Cassandra Owens
Regional Water Quality Control Board
Los Angeles Region
320 West 4th Street, Suite 200
Los Angeles, CA 90013

Dear Ms. Owens:

Subject: Addendum to the Human Health Risk Assessment for Surface Water Runoff Exiting the Santa Susana Field Laboratory via the Southern Outfalls, Santa Susana Field Laboratory, Ventura County, CA
(Order Pursuant to California Water Code Section 13383; CA0001309, Cl No. 6027)

Geosyntec Consultants, on behalf of The Boeing Company, is providing the enclosed Addendum to the Human Health Risk Assessment for Surface Water Outfalls exiting the Santa Susana Field Laboratory (SSFL) via the Southern Outfalls (Human Health Risk Assessment for Surface Water Outfalls). This addendum was prepared in response to the Office of Environmental Health Hazard Assessment comments dated June 28, 2017 and has been developed with input and in accordance with recommendations from the SSFL Surface Water Expert Panel.

If you have any questions or require any further assistance, please contact Paul Costa at (818) 466-8778.

Sincerely,

Ruth Custance

Ruth Custance
Senior Principal

Enclosure: Human Health Risk Assessment Addendum

Cc: Mr. Peter Raftery, RWQCB
Mr. Mazhar Ali, RWQCB
Mr. Buck King, DTSC
Mr. Peter Zorba, NASA
Dr. Michael Stenstrom, Surface Water Expert Panel
Mr. Jon Jones, Surface Water Expert Panel
Dr. Mike Josselyn, Surface Water Expert Panel
Dr. Robert Pitt, Surface Water Expert Panel
Dr. Robert Gearheart, Surface Water Expert Panel
Mr. Randy Dean, CH2M HILL
Ms. Lissa Miller, Haley & Aldrich
Ms. Dixie Hambrick, Stantec

Addendum to the Human Health Risk Assessment for Surface Water Runoff Exiting the Santa Susana Field Laboratory via the Southern Outfalls, Santa Susana Field Laboratory, Ventura County, CA

Evaluation of Potential Contribution of Water Flow from the SSFL to Offsite Downstream Locations

Introduction

This addendum to the Human Health Risk Assessment was prepared in response to comments from the Office of Environmental Health Hazard Assessment dated June 28, 2017 regarding providing additional information on potential downstream human exposures to aquatic organisms from surface water exiting the Santa Susana Field Laboratory (SSFL). In particular, this addendum addresses potential exposures to fish and the fish consumption pathway. This addendum was developed with input and in accordance with recommendations from the SSFL Surface Water Expert Panel. While the fish consumption pathway is considered incomplete in the outfall drainage areas due to the ephemeral nature of the drainages, there could be the potential for fishing and fish consumption at offsite locations farther downstream of SSFL where water is present in sufficient quantity year-round. To evaluate this potential, available information on fishing in the Calleguas Creek and Los Angeles River watersheds was reviewed with focus on locations where fishing is more likely to occur. An analysis was conducted to determine the percent contribution of the water flow from the SSFL to the total amount received at these locations. Because the Calleguas Creek and Los Angeles River watersheds contain numerous sources of chemicals (e.g., from urban and agricultural runoff, wastewater treatment plant effluent, etc.) that cumulatively control water quality along these receiving waters, it is important to understand the relative contribution of SSFL flows compared to all other flows at these downstream locations.

Downstream and north of the SSFL outfalls in Ventura County, receiving waters include Arroyo Simi, which flows into the Arroyo Las Posas, Calleguas Creek and finally to the Pacific Ocean at Mugu Lagoon, collectively referred to as the Calleguas Creek Watershed (Figure 1). The Southern California Coastal Water Research Project (SCCWRP) performed a study of the frequency of fishing and consuming the fish caught in both Los Angeles and Ventura Counties, which included surveys of some of the waterways (SCCWRP, 2005). Data on extent of fishing were collected by censusing anglers at sites within different fishing areas (habitats) for each watershed. The survey focused on coastal terrace streams and creeks, the mouth of rivers and estuaries, urban lakes, mountain reservoirs and streams.

For the SCCWRP study, fishing areas were targeted within the Calleguas Creek Watershed, including the estuary (Mugu Bay), seven costal terrace streams (Lower Reach Calleguas Creek -- Highway 1 to confluence with Conejo Creek, Revolon Slough, Conejo Creek, Upper Reach Calleguas Creek to Conejo Creek confluence, Arroyo Simi, Fox Barranca, and Happy Camp Canyon), and one urban Lake (Rancho Simi Park Lake). A total of 22 site visits were conducted in this watershed, with Mugu Lagoon being visited the most times (8), followed by upper Calleguas

Creek (4), Lower Calleguas Creek (3), and Arroyo Simi (3). The majority of fishers observed in the study were fishing at mountain reservoirs and urban lakes with the least likely observed at coastal terrace streams.

Over the survey, seven fishers were observed along coastal terrace streams, specifically along Arroyo Simi, which begins approximately 2.5 miles from the SSFL. In addition, it is known that Rancho Simi Park Lake, a lined urban lake adjacent to the Arroyo Simi farther downstream is stocked with fish[1]. This lake was not selected for survey due to the survey design but fishing occurs at the lake.

Downstream and south of the SSFL in the Los Angeles River Watershed, water flows intermittently through Dayton Canyon and Chatsworth Creek and Bell Canyon and Bell Creek where Bell Creek joins the Arroyo Calabasas and forms the beginning of the upper-most main stem of the Los Angeles River. Downstream of the confluence of Bell Creek and Arroyo Calabasas, the Los Angeles River receives flow from Browns Canyon, Aliso Creek and Caballero Creek, along with flows from numerous storm drain outfalls, where water then flows into the Sepulveda Basin and Sepulveda Dam Recreation Area approximately 10 miles from the SSFL (Figure 2). The lower reach of Bell Creek as well as the Los Angeles River in this area are concrete engineered channels with limited access (vertical or near vertical concrete walls and fencing to prevent access) to the Sepulveda Basin area where the river enters an area that is soft bottomed and not concrete lined. During dry weather, when fishing activity is most likely to occur, water depths in the engineered channels are typically a few inches whereas in the Sepulveda Basin depths can reach several feet. The Sepulveda Basin is a 2,150-acre open space area to collect floodwaters and is kept in a semi-natural state. Contributions to the Sepulveda Basin also include treated wastewater effluent from the Donald C. Tillman Water Reclamation Plant and several tributaries such as Bull and Haskell Creeks.

A few studies have been conducted in the Los Angeles River to evaluate the recreational use of the engineered tributaries within the watershed and to survey fish and fishers (RWQCB, 2013, LA River Expedition, 2008 and FOLAR, 2016). In 2008, a group surveyed the Los Angeles River to determine if it was possible to kayak along its length. As a part of the survey observations indicated that no recreational activity was occurring in the lower reaches of Bell Creek and the upper reaches of the Los Angeles River due to prohibited access and limited opportunities for adjacent recreational use. In addition, there is very little flow in this section of the river except for immediately following storm events. However, at the Sepulveda Basin and Sepulveda Dam Area where fishing was observed (Los Angeles River Expedition as cited in RWQCB, 2010) water flow and depth increases and there is tree cover and a soft bottom providing a habitat for fish. The Friends of the LA River (FOLAR) have been conducting studies at popular fishing locations along the Los Angeles River including the Glendale Narrows, Long Beach and the Sepulveda Basin. The Sepulveda Basin Fish Study was started in November 2015 and study results are expected in 2018. Fish have been collected as a part of the study with the majority being small (less than 1 inch) (FOLAR, 2016).

[1] https://www.dfg.ca.gov/m/fishplantings/Details?county=Ventura&water=Rancho%20Simi%20Park%20Lake

Based on the information summarized above, two locations were selected to evaluate the percent contribution of SSFL surface water flow to the overall water flow. For SSFL's northern drainages, the Arroyo Simi at the confluence with Meier Canyon was selected as the nearest location where fishing may occur. For SSFL's southern drainages, the Sepulveda Basin is the nearest location that has fishable water and was therefore selected at the most likely location where fishing could occur.

Water Flow Evaluation

An analysis was performed to determine the percent contribution of flow from the SSFL NPDES outfalls to the total flow at the analysis locations along the Arroyo Simi and Los Angeles River identified above ("analysis locations"). The first is located on Arroyo Simi at the confluence with Meier Canyon, in the Calleguas Creek watershed. The second location is on the Los Angeles River at the beginning of the Sepulveda basin (at Louise Avenue), in the Los Angeles River watershed. These analysis locations receive flow from SSFL outfalls as described below:

- Arroyo Simi
    - Outfalls 003 through 007 and 010 – stormwater runoff draining to these outfalls is typically pumped to Silvernale Pond and then discharged through Outfall 002, as noted below. However, if these storage and pumping systems reach capacity, then overflows are discharged through each outfall to drainages that flow to Arroyo Simi.
    - Outfall 009 – includes the entire Outfall 009 watershed, with the exception of runoff from the Helipad area, which is pumped to Silvernale Pond and therefore included in Outfall 002 discharge volumes, as noted below. Overflows from the Helipad continue down toward Outfall 009.
- Los Angeles River
    - Outfall 001 – also includes flow from Outfall 011[2], which includes stormwater from the Perimeter Pond upstream.
    - Outfall 002 – also includes flow from Outfall 018[3], which includes stormwater pumped to Silvernale Pond from Outfalls 003 through 007 and 010 and the Helipad, up to the systems' storage and pumping capacity.
    - Outfall 019 – this outfall represents the proposed location for discharge from the Groundwater Extraction Treatment System (GETS), for which the analysis was performed both including and not including a constant average flowrate of 60 gallons per minute (gpm).
    - Outfall 008

The drainage areas to each SSFL outfall are shown in Table 1.

[2] Outfall 015 also discharges to Outfall 011, but was discontinued.
[3] Outfall 017 also discharges to Outfall 018, but was discontinued.

Table 1. SSFL Outfall Drainage Areas

SSFL Outfall	Drainage Area (acre)
001	306
002	360
003	11
004	5.9
005	0.0016
006	12
007	3.0
008	62
009	530
010	5.1
011	297
018	540

Analysis

To perform this analysis, the total flow at the selected analysis locations was first estimated. For consistency with the HHRA, the total annual flow during the average hydrologic water year (WY) 2009/10 was determined. The drainage areas to each analysis location were first delineated, then spatial data were compiled in order to determine representative runoff coefficients (or percent of rainfall that is converted to runoff) within the drainage areas. Spatial data describing the soils within the area[4], specifically the hydrologic soil groups, in addition to the imperviousness based on the 2011 National Land Cover Database (NLCD), were used to determine runoff coefficients, as shown in the following equation (Ventura Countywide Stormwater Quality Management Program, 2011):

$$C = 0.95 \times IMP + C_p \times (1 - IMP) \quad \textbf{(1)}$$

Where,
C = runoff coefficient
IMP = impervious fraction
C_p = pervious runoff coefficient, determined based on soil type (see Table 2)

[4] Soils data for Ventura County was provided by the Ventura County Watershed Protection District and soils data for Los Angeles County was downloaded from a National Resources Conservation Service (NRCS) SSURGO database.

Table 2. Pervious Runoff Coefficients (Ventura Countywide Stormwater Quality Management Program, 2011)

Hydrologic Soil Group	C_p
D	0.15
C	0.10
B	0.05
A	0

The Rational Method was then used, with the total annual rainfall of 19.48 inches in 2009/10 and the drainage area sizes previously delineated, to calculate the average annual runoff volume to each analysis location, as shown in the equation below (LACDPW, 2006):

$$Q = \sum_x \frac{P}{12} \times C_x \times A_x \qquad (2)$$

Where:
Q = runoff volume (ac-ft)
P = rainfall depth (in)
C_x = runoff coefficient
A_x = drainage area (ac)
x = each unique imperviousness and soil type combination

Finally, these estimated runoff volumes were calibrated to measured streamflow data (with baseflow removed[5]) from the United States Geological Survey (USGS) Los Angeles River Sepulveda Dam (# 11092450) station. The annual runoff volumes to this station were estimated using the methodology described above for each WY from 2002/03 through 2016/17[6], and a runoff volume adjustment factor was determine based on a comparison of observed and predicted runoff volumes for all WYs examined. This adjustment factor value was found to be 0.92, and the same value was applied to predicted runoff volumes for the Arroyo Simi drainage area, which did not have a nearby streamflow gauge available to allow a separate calibration.

[5] Baseflow removal was performed on the measured streamflow data to extract the flow contribution from discharges such as the treated effluent from the Tillman Water Reclamation Plant, which enters the Sepulveda Basin below the analysis location but above the streamflow gauge at the dam.

[6] These WYs were used based on the availability of recent streamflow data.

Results

The drainage area to each analysis location, in addition to the total contributing drainage area from the SSFL and the percent contributing drainage area from the SSFL, are shown in Table 3.

Table 3. Drainage Area Contributions from SSFL

Location	**Drainage Area (sq. mi.)**	**Contributing Drainage Area from SSFL** (assuming pumping to Silvernale Pond is occurring) (sq. mi.)	**Contributing Drainage Area from SSFL** (assuming pumping/storage to Silvernale Pond has reached capacity) (sq. mi.)	**% of the Total Drainage Area Contributed by SSFL** (assuming pumping to Silvernale Pond is occurring)	**% of the Total Drainage Area Contributed by SSFL** (assuming pumping/storage to Silvernale Pond has reached capacity)
Arroyo Simi (Meier Canyon confluence)	32	0.83	0.89	2.6%	2.8%
LA River (Sepulveda Basin at Louise Ave)	118	2.5	2.4	2.1%	2.1%

Once calibrated total annual runoff volumes to the analysis locations were determined, the contribution from SSFL outfalls was determined by summing daily flows measured from each outfall during the 2009/10 WY (with the exception of Outfall 019, which assumed an average GETS discharge flowrate). The total flow measured from each outfall was then compared to the calibrated total estimated runoff volumes at each downstream analysis location. These results are shown in Table 4 and Figures 1 and 2. With respect to the year to year variability of these estimates, SSFL's percent flow contribution is not expected to increase much in a wet year, when SSFL and the rest of the watersheds are flowing heavily. At these times, percent flow contribution would essentially max out at the percent area contribution (i.e., 2-3%). However, in a dry year, given SSFL's low imperviousness relative to the urban areas, SSFL's percent flow contributions could drop to near zero. For example, this effectively occurred during recent drought years when SSFL's outfalls experienced very low discharge volumes and days with flow (many outfalls were without any discharge).

Table 4. Flow Contributions from SSFL

Location	Predicted Annual Runoff Volume (adjusted) (ac-ft)	Contribution from SSFL excluding OF 019 (ac-ft)	Contribution from SSFL including OF 019 (ac ft)	Percent Contribution from SSFL excluding OF 019	Percent Contribution from SSFL including OF 019
Arroyo Simi (Meier Canyon confluence)	6,347	90.9	90.9 (unaffected)	1%	N/A
LA River (Sepulveda Basin at Louise Ave)	37,339	149.6	246.4	0.4%	0.7%

Conclusions

Based on the review of available information on fishing in the Calleguas Creek and Los Angeles River watersheds, two locations were selected for evaluation where fishing may occur. For SSFL's northern drainages, the Arroyo Simi at the confluence with Meier Canyon approximately 2.5 miles from the SSFL was selected as the nearest location where fishing may occur. For SSFL's southern drainages, the Sepulveda Basin approximately 10 miles from the SSFL was selected as the nearest location where fishing may occur. As shown in Table 4, estimated flow contributions from SSFL at these downstream analysis locations are *de minimus*, with ≥ 99% of these wet weather flows being from stormwater runoff from other urban and undeveloped areas. As a result, the contribution of water flow from the SSFL to water quality at these locations is considered insignificant and would not adversely impact potential fishing activities.

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FIGURES