Golder Associates

August 13, 2014 Project No. 1301525

Mr. Phil Graham
Recology Yuba Sutter
3001 North Levee Road
Marysville, CA 95901

RE: COMPOST STORMWATER RUN-OFF MODELING CALIBRATION FOR THE FEATHER RIVER ORGANICS COMPOSTING OPERATION, RECOLOGY YUBA SUTTER FACILITY, MARYSVILLE, CALIFORNIA

Dear Mr. Graham:

As described below, this letter addresses the RWQCB's questions regarding stormwater run-off volume estimates previously prepared by Golder and submitted to the RWQCB in the Amended Compost Leachate Collection Work Plan (Golder, July 30, 2014). These additional analyses address comments from the Regional Water Quality Control Board (RWQCB) conveyed during a conference call on August 6, 2014 among Recology, the RWQCB, Golder, and Brown and Caldwell Engineers.

Golder has completed this model calibration analysis using 1) actual precipitation data recorded with nearby rainfall gauges for storms occurring during February and March, 2014 and 2) the actual number of (3,000 gallon) truckloads of runoff collected at FRO and hauled to the on-site sanitary sewer.

1.0 BACKGROUND

In Golder's previous report, Golder performed and submitted stormwater run-off modeling for a 3.16-inch storm event which corresponds to a 25-year frequency, 24-hour duration storm event according to the California Department of Water Resources rainfall data for Marysville, Ca, where Recology's Feather River Organics Compost (FRO) Facility is located. This 25-year, 24-hour duration storm event data was used to design and size the drainage conveyance and containment structures and to determine appropriate pump size requirements. Golder's stormwater modeling used to size these stormwater system elements was included in the July 30, 2014 Amended Compost Area Leachate Work Plan for submittal from Recology to the RWQCB.

During a conference call on August 6, 2014 to discuss the July 30th Amended Work Plan, the RWQCB asked for details regarding the engineering judgment behind Golder's selection of the Soil Conservation Service (SCS) run-off curve number (CN) assigned to the FRO compost pad. The value that Golder used resulted in estimating stormwater run-off volumes that were lower than the RWQCB was expecting for the site when they reviewed the model, hence this follow on report.

In this letter, Golder provides the engineering rationale for the selected CN values used in the model and its supporting calculations by comparing the model's predicted surface water run-off to actual runoff volumes encountered during the two largest rain events recorded in Marysville, CA during two consecutive days in February and March 2014.

Golder's May 30th letter noted that Feather River Organics (FRO) operations pumped and disposed of the compost contact water generated from the storms by discharging it to the on-site sewer connection to the Marysville publically-owned treatment works (POTW) sewer system and that there were no discharges to the adjacent Hog Farm portion of the facility or to surface waters. Therefore the existing tank storage system was sufficiently sized and managed to prevent any discharge.

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Table 1 summarizes the daily volumes of compost contact water hauled to the on-site POTW discharge point during February and March, 2014.

Table 1: Summary of Compost Contact Water Transferred by Water Truck to the RYS On-Site POTW Discharge Point

Event #	Date	No. of Loads	Volume (gal.)	Event Total
1	8-Feb	8.75	26,250	
	9-Feb	4	12,000	**38,250**
2	28-Feb	6.5	19,500	
	01-Mar	10	30,610	**50,010**
3	04-Mar	10	30,000	**30,000**
4	06-Mar	8	24,000	**24,000**

2.0 ADDITIONAL ANALYSIS

2.1 Discussion of Precipitation Data

Golder's May 30th letter cites the number of loads of contact water transferred to the POTW and the corresponding daily precipitation recorded by FRO. The cited daily precipitation in our May 30th letter corresponds to a rain gauge at the Beale Air Force Base (AFB), which is approximately seven (7) miles from the site.

The following table compiles daily precipitation during wet weather experienced in February and March 2014, for Marysville which is located approximately two (2) miles from the site. For the purposes of comparing Golder's model to the estimated actual run-off, Golder considers the Marysville data more appropriate based on its closer proximity to the site.

As indicated in Table 2 below, the two largest daily (24-hour) storm events recorded in Marysville over this time period were both approximately 1.4 inches each on two consecutive days on February 8th and 9th. Although these storms occurred following a generally extended dry period, it is notable that two rain events of 0.3-inches and 0.38-inches occurred on the preceding two days (February 6th and 7th). This preceding rain would have reduced the absorptive capacity of the compost operations pad and compost piles during the February 8th and 9th storm events.

Table 2: Historical Precipitation Data

Date	Daily Totals
	Marysville (in.)
5-Feb	0
6-Feb	0.30
7-Feb	0.38
8-Feb	1.38
9-Feb	1.40
10-Feb	0.05
11-Feb to 25-Feb No Precipitation Recorded	
26-Feb	0.06
27-Feb	0.54
28-Feb	0.65
1-Mar	0.27
2-Mar	0
3-Mar	0
4-Mar	0.32
5-Mar	0
6-Mar	0.55

2.2 Supplemental Model Results

Golder's surface water model for FRO utilizes a composite CN number reflecting the highly absorptive, unground (FRO does not grind compost), compost piles that cover approximately 40 percent of the compost operations area and a low-permeability aggregate for approximately 60 percent of the compost operations pad. A CN value of 1 was applied to the compost piles to reflect little or no expected run-off (at least during and immediately following a storm event) from the compost piles themselves and a relatively high CN value of 87 for the low-permeability aggregate surface. It should be noted that a portion of surface water run-off associated with precipitation that directly falls on the low-permeability aggregate surface will also be attenuated by down-gradient compost material/piles in addition to a thin layer of compost material that accumulates on the working surface of compost pads.

The run-off curve number methodology is appropriate only for large storm events and is not considered accurate for small rainfall events, which is often considered to be on the order of 0.5-inch or less. Review of the Marysville precipitation data indicates that there were two days with recorded precipitation of 1 inch or more. All other days of recorded precipitation are either less than or only slightly above 0.5-inch. Therefore, Golder considers the February 8th and 9th rainfall events as the most appropriate for comparing and calibrating the predicted run-off from Golder's model to the actual run-off.

Due to natural variability of rainfall events, runoff and accompanying accumulation of run-off in the on-site storage tanks over the course of the February 8th and 9th event, Golder modeled the combined rainfall event over these two days (a total of 2.78 inches) using the same input parameters as the previously modeled 3.16-inch design event and compared the combined volume of water that was transferred to the POTW over the same period. Note that this combined (two day) rainfall is approximately 10 percent lower than the 3.16-inch design event corresponding to a 25-year, 24-hour storm event per Department of Water Resources database for Marysville.

Golder's model results are shown in Table 3 and Attachment A. The predicted volume of 160,500 gallons of run-off from the February 8th and 9th 2.78-inch storm event significantly exceeds the actual disposal quantity of 38,250 gallons over the same period of time. The actual disposal quantity should be considered a minimum estimate of the actual run-off since there could have been residual run-off and accumulation of liquids after the last pumping and transfer on February 9th. FRO indicates that the site procedures were to pump down the tanks at the end of the day if rainfall were forecast for that evening or the next day. However, given that the total storage capacity of the water management system in February 2014 was 63,000 gallons, the additional amount of actual run-off must be less than an additional 63,000 gallons, and likely only a fraction of this capacity otherwise FRO would have pumped down the tanks the following day. Assuming an upper bound of an additional 20,000 gallons of run-off after the pumping event, Golder estimates that the actual run-off volume is between 38,250 gallons to 60,000 gallons for the February 8th and 9th storm events.

Table 3: Run-off and Disposal Volumes

Precipitation Date(s) used for Model	Total Recorded Precipitation (in.)	SSA Model Calculated Run-off (gal)	Actual Disposal Quantity (gal)
Feb. 8th and 9th	2.78	160,500	38,250

3.0 CONCLUSIONS

Based on our review of the daily precipitation data recorded for Marysville, we consider the two consecutive rainfall events of February 8th and 9th as the most appropriate for comparing and calibrating the results of our model to estimated actual run-off volumes. As noted above, these storms were preceded by a total of approximately 0.7-inches of rainfall that occurred the preceding two days, which would have reduced the absorptive capacity of the compost pad surface following an extended dry period. Furthermore, by considering the combined consecutive rainfall events on Feb 8th and 9th, the potential impact of the preceding dry months is further reduced. Comparison of the predicted run-off of 160,500 gallons to estimated actual run-off of between 38,250 gallons and 60,000 gallons illustrates that significant surface water attenuation of the compost materials and supports Golder's model results.

Furthermore, it is Golder's opinion that the high surface water attenuation is due to a combination of high absorption capacity of the compost materials and the temporary retention of water within the compost materials. Golder anticipates that there may be a relative slow seepage of water from the compost piles in the days to weeks following extended periods of rainfall. However, our review of the water disposal quantities in Table 1 indicates that this post-precipitation seepage is likely less than 10,000 to 20,000 gallons per day. This potential volume of post-precipitation water seepage and storage accumulation is readily manageable and well within the 65,000 gallon daily disposal limit to the POTW.

Please contact us if you have any questions or require further clarification.

Sincerely,

GOLDER ASSOCIATES INC.

Joel Kelsey
Project Engineer

Kenneth G. Haskell, P.E.
Principal/ Sr. Practice Leader

REGISTERED PROFESSIONAL ENGINEER
KENNETH G. HASKELL
No. C058200
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STATE OF CALIFORNIA

Attachments:

Attachment A – Model Calibration

cc: Drew Lehman - Recology
Rob Beggs – Brown and Caldwell Engineers

ATTACHMENT A
MODEL CALIBRATION

Autodesk® Storm and Sanitary Analysis 2014 - Version 8.1.46 (Build 1)

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Project Description
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File Name ................ RYS feb 8-9 storm.SPF


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Analysis Options
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Flow Units ............... cfs
Subbasin Hydrograph Method. EPA SWMM
Infiltration Method ....... SCS Curve Number
Link Routing Method ....... Hydrodynamic
Storage Node Exfiltration.. None
Starting Date ............ FEB-06-2014 00:00:00
Ending Date .............. FEB-10-2014 00:00:00
Antecedent Dry Days ....... 0.0
Report Time Step .......... 00:05:00
Wet Time Step ............. 00:05:00
Dry Time Step ............. 01:00:00
Routing Time Step ......... 2.00 sec


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Element Count
*************
Number of rain gages ...... 3
Number of subbasins ....... 6
Number of nodes ........... 15
Number of links ........... 15
Number of pollutants ...... 0
Number of land uses ....... 0


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Raingage Summary
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Gage ID	Data Source	Data Type	Recording Interval min
Rain Gage-01	2.775_	CUMULATIVE	6.00

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Subbasin Summary
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Subbasin ID	Total Area ft²	Equiv. Width ft	Imperv. Area %	Average Slope %	Raingage
Sub-01	125246.39	311.60	0.00	3.0000	Rain Gage-01
Sub-02	98348.50	308.48	0.00	3.0000	Rain Gage-01
Sub-03	109044.70	321.23	0.00	3.0000	Rain Gage-01

Sub-04	100938.61	274.91	0.00	4.0000	Rain Gage-01
Sub-06	56429.79	165.01	0.00	4.0000	Rain Gage-01
Sub-09	65448.85	43.18	0.00	2.0000	Rain Gage-01

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Node Summary
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Node ID	Element Type	Invert Elevation ft	Maximum Elev. ft	Ponded Area ft²	External Inflow
Jun-01	JUNCTION	92.00	94.00	0.00	
Jun-02	JUNCTION	91.00	93.00	0.00	
Jun-03	JUNCTION	89.00	91.00	0.00	
Jun-07	JUNCTION	87.00	200.00	0.00	
Outlet_HF	JUNCTION	88.34	91.34	0.00	
Out-01	OUTFALL	78.00	85.00	0.00	
Out-04	OUTFALL	0.00	7.00	0.00	
Out-POTW1	OUTFALL	92.00	100.50	0.00	
Out-POTW2	OUTFALL	92.00	100.00	0.00	
2_Tanks_South	STORAGE	100.00	108.00	0.00	
4-baker_tanks_HF	STORAGE	92.00	100.50	0.00	
Jensen_Tank1_exist	STORAGE	79.00	86.00	0.00	
Jensen_Vault2	STORAGE	76.00	83.00	0.00	
SE_Sump	STORAGE	80.00	86.00	0.00	
SW_Sump	STORAGE	80.00	86.00	0.00	

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Link Summary
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Link ID	From Node	To Node	Element Type	Length ft	Slope %	Manning's Roughness
Link-04	Jun-01	Jun-02	CONDUIT	446.1	0.2242	0.0150
Link-05	Jun-02	Jun-03	CONDUIT	395.3	0.5060	0.0150
Link-09	Jun-03	Outlet_HF	CONDUIT	540.0	0.1213	0.0150
Link-11	Outlet_HF	Jensen_Tank1_exist	CONDUIT	40.0	6.4875	0.0240
Link-14	Jensen_Tank1_exist	Jensen_Vault2	CONDUIT	20.0	10.0000	0.0240
pipe_Vault-to-tank4-baker_tanks_HF	Jun-07		CONDUIT	260.7	6.1364	0.0150
Pump-08	Jensen_Vault2	Jun-07	TYPE3 PUMP			
Pump-10	Jensen_Vault2	Jun-07	TYPE3 PUMP			
Pump-Exist	Jensen_Tank1_exist	Jun-07	TYPE3 PUMP			
SE_Sump_Pump	SE_Sump	2_Tanks_South	TYPE3 PUMP			
SW_Sump_Pump	SW_Sump	2_Tanks_South	TYPE3 PUMP			
Orifice-01	Jensen_Vault2	Out-01	ORIFICE			
Orifice-02	Jensen_Vault2	Out-04	ORIFICE			
Weir-01	2_Tanks_South	Out-POTW2	WEIR			

Weir-02 4-baker_tanks_HFOut-POTW1 WEIR

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Cross Section Summary
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Link ID	Shape	Depth/ Diameter ft	Width ft	No. of Barrels	Cross Sectional Area ft²	Full Flow Hydraulic Radius ft	Design Flow Capacity cfs
Link-04	CIRCULAR	1.50	1.50	1	1.77	0.38	4.31
Link-05	CIRCULAR	1.50	1.50	1	1.77	0.38	6.48
Link-09	CIRCULAR	2.00	2.00	1	3.14	0.50	6.83
Link-11	CIRCULAR	2.00	2.00	1	3.14	0.50	31.21
Link-14	CIRCULAR	2.00	2.00	1	3.14	0.50	38.75
pipe_Vault-to-tank	FORCE_MAIN	0.50	0.50	1	0.20	0.13	2.50

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Runoff Quantity Continuity
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	Volume acre-ft	Depth inches
Total Precipitation	2.949	2.775
Evaporation Loss	0.000	0.000
Infiltration Loss	2.404	2.263
Surface Runoff	0.493	0.464
Final Surface Storage	0.051	0.048
Continuity Error (%)	-0.006	

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Flow Routing Continuity
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	Volume acre-ft	Volume Mgallons
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	0.494	0.161
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	0.000	0.000
External Outflow	0.117	0.038
Surface Flooding	0.000	0.000
Evaporation Loss	0.000	0.000
Initial Stored Volume	0.000	0.000
Final Stored Volume	0.373	0.122
Continuity Error (%)	0.669	

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Composite Curve Number Computations Report
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Subbasin Sub-01

Soil/Surface Description	Area (ft²)	Soil Group	CN
COMPACT_CLAYEY-LOAM_SOIL(ACCESS_ROAD)	75147.84	-	87.00
COMPOST_PILE	50098.55	-	1.00
Composite Area & Weighted CN	125246.39		52.60

Subbasin Sub-02

Soil/Surface Description	Area (ft²)	Soil Group	CN
COMPACT_CLAYEY-LOAM_SOIL(ACCESS_ROAD)	59009.10	-	87.00
-	39339.40	-	1.00
Composite Area & Weighted CN	98348.50		52.60

Subbasin Sub-03

Soil/Surface Description	Area (ft²)	Soil Group	CN
COMPACT_CLAYEY-LOAM_SOIL(ACCESS_ROAD)	65426.81	-	87.00
-	43617.89	-	1.00
Composite Area & Weighted CN	109044.70		52.60

Subbasin Sub-04

Soil/Surface Description	Area (ft²)	Soil Group	CN
Dirt roads	60563.18	C	87.00
-	40375.43	-	1.00
Composite Area & Weighted CN	100938.61		52.60

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Subbasin Sub-06
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                                                          Area          Soil
Soil/Surface Description                                  (ft²)         Group
 CN

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Dirt roads                                              33857.88           C
87.00
-                                                       22571.92           -
 1.00
Composite Area & Weighted CN                            56429.79
52.60

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Subbasin Sub-09
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                                                          Area          Soil
Soil/Surface Description                                  (ft²)         Group
 CN

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Brush, Good                                             65448.85           C
65.00
Composite Area & Weighted CN                            65448.85
65.00

**************************************************
EPA SWMM Time of Concentration Computations Report
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        Tc = (0.94 * (L^0.6) * (n^0.6)) / ((i^0.4) * (S^0.3))

        Where:

        Tc = Time of Concentration (min)
        L  = Flow Length (ft)
        n  = Manning's Roughness
        i  = Rainfall Intensity (in/hr)
        S  = Slope (ft/ft)

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Subbasin Sub-01
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        Flow length (ft):                           401.96
        Pervious Manning's Roughness:              0.10000
        Impervious Manning's Roughness:            0.01500
        Pervious Rainfall Intensity (in/hr):       0.05781
        Impervious Rainfall Intensity (in/hr):     0.05781
        Slope (%):                                 3.00000
        Computed TOC (minutes):                      77.26

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Subbasin Sub-02
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        Flow length (ft):                           318.83
        Pervious Manning's Roughness:              0.10000
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        Impervious Manning's Roughness:              0.01500
        Pervious Rainfall Intensity (in/hr):         0.05781
        Impervious Rainfall Intensity (in/hr):       0.05781
        Slope (%):                                   3.00000
        Computed TOC (minutes):                        67.23

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Subbasin Sub-03
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        Flow length (ft):                             339.47
        Pervious Manning's Roughness:                0.10000
        Impervious Manning's Roughness:              0.01500
        Pervious Rainfall Intensity (in/hr):         0.05781
        Impervious Rainfall Intensity (in/hr):       0.05781
        Slope (%):                                   3.00000
        Computed TOC (minutes):                        69.81

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Subbasin Sub-04
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        Flow length (ft):                             367.18
        Pervious Manning's Roughness:                0.10000
        Impervious Manning's Roughness:              0.01500
        Pervious Rainfall Intensity (in/hr):         0.05781
        Impervious Rainfall Intensity (in/hr):       0.05781
        Slope (%):                                   4.00000
        Computed TOC (minutes):                        67.12

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Subbasin Sub-06
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        Flow length (ft):                             341.99
        Pervious Manning's Roughness:                0.10000
        Impervious Manning's Roughness:              0.01500
        Pervious Rainfall Intensity (in/hr):         0.05781
        Impervious Rainfall Intensity (in/hr):       0.05781
        Slope (%):                                   4.00000
        Computed TOC (minutes):                        64.32

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Subbasin Sub-09
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        Flow length (ft):                            1515.78
        Pervious Manning's Roughness:                0.40000
        Impervious Manning's Roughness:              0.01500
        Pervious Rainfall Intensity (in/hr):         0.05781
        Impervious Rainfall Intensity (in/hr):       0.05781
        Slope (%):                                   2.00000
        Computed TOC (minutes):                       444.51

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Subbasin Runoff Summary
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  Subbasin              Total     Total     Total     Total     Total      Peak
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Subcatchment ID	Total Rainfall in	Total Runon in	Total Evap. in	Total Infil. in	Total Runoff in	Peak Runoff cfs	Runoff Coefficient	Time of Concentration days	Time of Concentration hh:mm:ss
Sub-01	2.78	0.00	0.00	2.29	0.44	0.26	0.158	0	01:17:15
Sub-02	2.77	0.00	0.00	2.29	0.44	0.22	0.159	0	01:07:13
Sub-03	2.78	0.00	0.00	2.29	0.44	0.24	0.159	0	01:09:48
Sub-04	2.78	0.00	0.00	2.29	0.44	0.23	0.159	0	01:07:07
Sub-06	2.77	0.00	0.00	2.29	0.44	0.13	0.159	0	01:04:19
Sub-09	2.77	0.00	0.00	2.07	0.64	0.06	0.232	0	07:24:30

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Node Depth Summary
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Node ID	Average Depth Attained ft	Maximum Depth Attained ft	Maximum HGL Attained ft	Time of Max Occurrence days	Time of Max Occurrence hh:mm	Total Flooded Volume acre-in	Total Time Flooded minutes	Retention Time hh:mm:ss
Jun-01	0.03	0.24	92.24	1	00:36	0	0	0:00:00
Jun-02	0.03	0.27	91.27	1	00:37	0	0	0:00:00
Jun-03	0.07	0.58	89.58	1	00:38	0	0	0:00:00
Jun-07	9.80	37.07	124.07	1	00:44	0	0	0:00:00
Outlet_HF	0.03	0.22	88.56	1	00:40	0	0	0:00:00
Out-01	0.00	0.00	78.00	0	00:00	0	0	0:00:00
Out-04	0.00	0.00	0.00	0	00:00	0	0	0:00:00
Out-POTW1	0.00	0.00	92.00	0	00:00	0	0	0:00:00
Out-POTW2	0.00	0.00	92.00	0	00:00	0	0	0:00:00
2_Tanks_South	5.25	7.50	107.50	1	17:28	0	0	0:00:00

4-baker_tanks_HF	5.60	8.00	100.00	1	12:57	0	0	0:00:00
Jensen_Tank1_exist	1.21	4.18	83.18	1	00:44	0	0	0:00:00
Jensen_Vault2	1.33	2.00	78.00	1	00:44	0	0	0:00:00
SE_Sump	1.14	6.00	86.00	1	00:39	0.00	9	0:00:00
SW_Sump	0.94	2.03	82.03	1	00:30	0	0	0:00:00

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Node Flow Summary
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Node ID	Element Type	Maximum Lateral Inflow cfs	Peak Inflow cfs	Time of Peak Inflow Occurrence days	Time of Peak Inflow Occurrence hh:mm	Maximum Flooding Overflow cfs	Time of Peak Flooding Occurrence days	Time of Peak Flooding Occurrence hh:mm
Jun-01	JUNCTION	0.24	0.24	1	00:35	0.00		
Jun-02	JUNCTION	0.22	0.47	1	00:36	0.00		
Jun-03	JUNCTION	0.26	0.72	1	00:36	0.00		
Jun-07	JUNCTION	0.00	0.99	1	00:45	0.00		
Outlet_HF	JUNCTION	0.06	0.76	1	00:39	0.00		
Out-01	OUTFALL	0.00	0.00	0	00:00	0.00		
Out-04	OUTFALL	0.00	0.00	0	00:00	0.00		
Out-POTW1	OUTFALL	0.00	0.17	1	12:57	0.00		
Out-POTW2	OUTFALL	0.00	0.35	1	17:28	0.00		
2_Tanks_South	STORAGE	0.00	0.39	1	00:36	0.00		
4-baker_tanks_HF	STORAGE	0.00	0.99	1	00:45	0.00		
Jensen_Tank1_exist	STORAGE	0.00	0.76	1	00:40	0.00		
Jensen_Vault2	STORAGE	0.00	0.59	1	00:44	0.00		
SE_Sump	STORAGE	0.23	0.23	1	00:35	0.02	1	00:39
SW_Sump	STORAGE	0.13	0.13	1	00:35	0.00		

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Storage Node Summary
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Storage Node ID	Maximum Ponded Volume 1000 ft^3	Maximum Ponded Volume (%)	Time of Max Ponded Volume days hh:mm	Average Ponded Volume 1000 ft^3	Average Ponded Volume (%)	Maximum Storage Node Outflow cfs	Maximum Exfiltration Rate cfm	Time of Max. Exfiltration Rate hh:mm:ss	Total Exfiltrated Volume 1000 ft^3

2_Tanks_South	4.958	94	1	17:28	3.471	66	0.35	0.00	0:00:00	0.000
4-baker_tanks_HF	10.569	94	1	12:57	7.401	66	0.17	0.00	0:00:00	0.000
Jensen_Tank1_exist	0.369	56	1	00:44	0.090	14	0.77	0.00	0:00:00	0.000
Jensen_Vault2	0.683	29	1	00:44	0.453	19	0.82	0.00	0:00:00	0.000
SE_Sump	0.030	100	1	00:39	0.006	19	0.20	0.00	0:00:00	0.000
SW_Sump	0.010	34	1	00:30	0.005	16	0.19	0.00	0:00:00	0.000

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Outfall Loading Summary
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Outfall Node ID	Flow Frequency (%)	Average Flow cfs	Peak Inflow cfs
Out-01	0.00	0.00	0.00
Out-04	0.00	0.00	0.00
Out-POTW1	7.36	0.17	0.17
Out-POTW2	1.49	0.15	0.35
System	2.21	0.32	0.52

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Link Flow Summary
****

Link ID	Element Type	Time of Peak Flow Occurrence days hh:mm	Maximum Velocity Attained ft/sec	Length Factor	Peak Flow during Analysis cfs	Design Flow Capacity cfs	Ratio of Maximum /Design Flow	Ratio of Maximum Flow Depth	Total Time Surcharged minutes	Reported Condition
Link-04	CONDUIT	1 00:36	1.25	1.00	0.24	4.31	0.06	0.17	0	Calculated
Link-05	CONDUIT	1 00:37	1.45	1.00	0.46	6.48	0.07	0.28	0	Calculated
Link-09	CONDUIT	1 00:39	1.61	1.00	0.72	6.83	0.10	0.20	0	Calculated
Link-11	CONDUIT	1 00:40	4.01	1.00	0.76	31.21	0.02	0.11	0	Calculated
Link-14	CONDUIT	1 00:44	4.34	1.00	0.59	38.75	0.02	0.09	0	Calculated
pipe_Vault-to-tank	CONDUIT	1 00:45	6.54	1.00	0.99	2.50	0.39	0.72	0	Calculated
Pump-08	PUMP	1 00:45			0.82					

```
    0.85                          72
Pump-10             PUMP           0  00:00                        0.00
    0.00                           0
Pump-Exist          PUMP           1  00:15                        0.21
    1.00                        1095
SE_Sump_Pump        PUMP           1  00:39                        0.20
    0.96                         346
SW_Sump_Pump        PUMP           1  00:04                        0.19
    0.91                         196
Orifice-01          ORIFICE        0  00:00                        0.00
          0.00
Orifice-02          ORIFICE        0  00:00                        0.00
          0.00
Weir-01             WEIR           1  17:28                        0.35
          0.00
Weir-02             WEIR           1  12:57                        0.17
          0.00
```

****
Flow Classification Summary
****

Link	Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Avg. Froude Number	Avg. Flow Change
	--- Fraction of Time in Flow Class ----								
Link-04	0.25	0.00	0.00	0.75	0.00	0.00	0.00	0.12	0.0000
Link-05	0.68	0.03	0.00	0.29	0.00	0.00	0.00	0.08	0.0000
Link-09	0.25	0.44	0.00	0.32	0.00	0.00	0.00	0.12	0.0000
Link-11	0.25	0.00	0.00	0.00	0.00	0.00	0.75	0.76	0.0000
Link-14	0.93	0.00	0.00	0.00	0.00	0.00	0.07	0.14	0.0000
pipe_Vault-to-tank	0.25	0.56	0.00	0.00	0.00	0.19	0.00	0.12	0.0004

****
Highest Continuity Errors
****
Node Jun-07 (1.34%)

****
Time-Step Critical Elements
****
None

****
Highest Flow Instability Indexes
****
All links are stable.

****
Routing Time Step Summary
****

```
Minimum Time Step           :     2.00 sec
Average Time Step           :     2.00 sec
Maximum Time Step           :     2.00 sec
Percent in Steady State     :     0.00
Average Iterations per Step :     2.04
```

```
  WARNING 108 : Surcharge elevation defined for Junction Jun-07 is below junction
maximum elevation. Assumed surcharge elevation equal to maximum elevation.
  WARNING 110 : Initial water surface elevation defined for Storage Node
Jensen_Vault2 is below storage node invert elevation.
              Assumed initial water surface elevation equal to invert elevation.

  Analysis began on:  Tue Aug 12 15:29:19 2014
  Analysis ended on:  Tue Aug 12 15:29:24 2014
  Total elapsed time: 00:00:05
```

Golder Associates

August 13, 2014 | Project No. 1301525

Mr. Phil Graham
Recology Yuba Sutter
3001 North Levee Road
Marysville, CA 95901

RE: SUPPLEMENTAL COMPOST STORMWATER MODELING FOR THE FEATHER RIVER ORGANICS COMPOSTING OPERATION, RECOLOGY YUBA SUTTER FACILITY, MARYSVILLE, CALIFORNIA

Dear Mr. Graham:

Enclosed is Golder's summary letter describing technical analysis that were performed to support the stormwater model and parameters used to size the pumps and storage requirements presented in Golder's Amended Compost Leachate Collection Work Plan dated July 30, 2014.

The enclosed summary letter compares predicted stormwater run-off to actual storm data obtained during February 2014. Based on this analysis, Golder's model conservatively estimates the quantity of run-off when compared to actual estimated run-off quantities. Therefore, based on the design storm event of 3.16-inches (25-year, 24-hour storm per the Department of Water Resources), Golder recommends that Feather River Organics (FRO) operations install a total of six (6) 21, 000 gallon capacity Baker tanks and other recommended improvements to store the 183,000 gallons of run-off estimated by Golder's model until it can be discharged to the POTW at 65,000 gallons per day or used as compost make-up water. These recommended improvements are detailed Golder's Amended Compost Leachate Collection Work Plan (July 30, 2014).

Please contact us if you have any questions or require further clarification.

Sincerely,

GOLDER ASSOCIATES INC.

Joel Kelsey
Project Engineer

Kenneth G. Haskell, P.E.
Principal/ Sr. Practice Leader

Enclosure:

Compost Stormwater Run-off Modeling Calibration Letter Report

Golder Associates Inc.
1000 Enterprise Way, Suite 190
Roseville, CA 95678 USA
Tel: (916) 786-2424 Fax: (916) 786-2434 www.golder.com

Golder Associates

Golder File Code: 120
CHRON

TRANSMITTAL

Date: 8/6/2014

To: Howard Hold

From: Joel Kelsey

Email: jkelsey@golder.com

Project No.: 1301525 **Phase:** 003

Company: CVRWQCB

Address: 11020 Sun Center Drive, Suite 200
Rancho Cordova, CA 95670-6114

Phone: 916-380-3378

RE: RECOLOGY YUBA SUTTER-FEATHER RIVER ORGANICS LEACHATE MANAGEMENT PLAN

☐ Regular Mail ☐ Courier ☐ Hand Delivered
☐ Fed Ex (First Overnight) ☐ Fed Ex (Priority Overnight) ☒ Fed Ex (Standard Overnight)
☐ Electronic Submittal ☐ Email ☐ Other

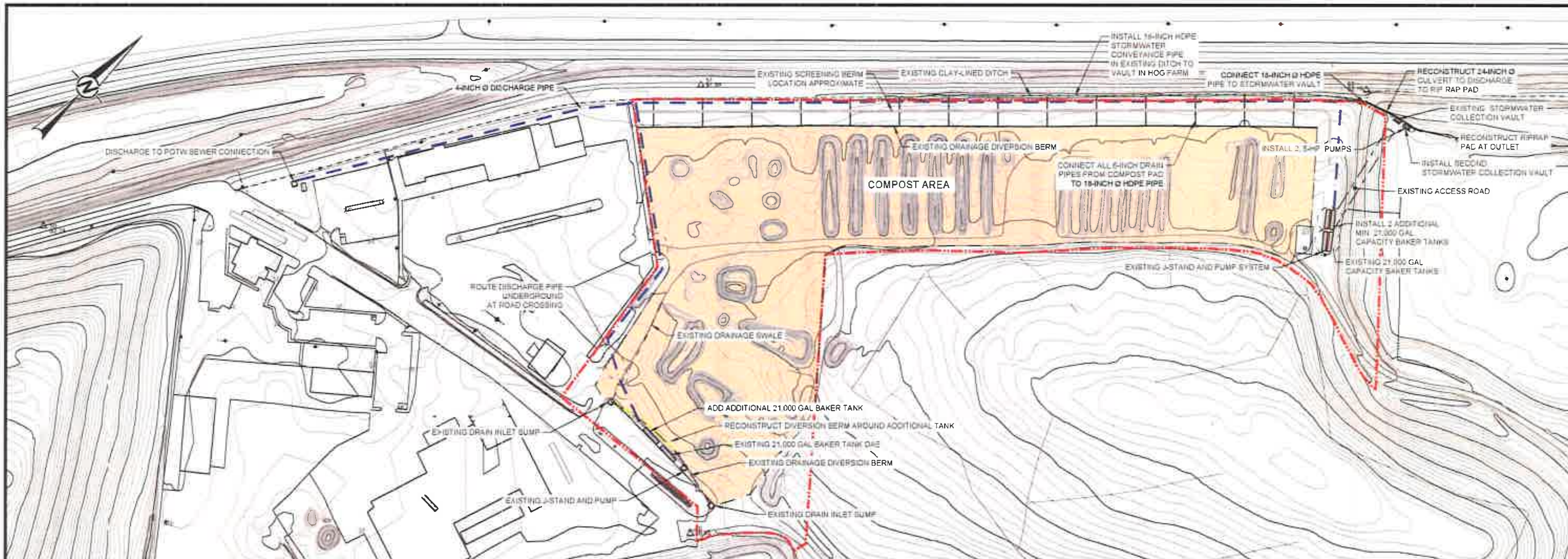
Quantity	Item	Description
1	11x17 Figure	1 REV Conceptual Stormwater Collection Plan
1	22x34 Figure	1 REV Conceptual Stormwater Collection Plan

Notes: Golder is providing the included figures for your reference on behalf of Recology.

Please advise us if enclosures are not as described.

ACKNOWLEDGEMENT REQUIRED:

☐ Yes ☒ No



GENERAL NOTES

1. TOPOGRAPHY PROVIDED BY AERIAL DATA INC. DATE OF TOPOGRAPHY: APRIL 30, 2012
2. EACH BAKER TANK WILL BE UNDERLAIN BY A SOILMOISTURE EQUIPMENT CORP. MODEL 1920F1L36 SOIL WATER SAMPLER (OR EQUIVALENT)
3. PERMITTED BOUNDARY PER THE REPORT OF COMPOSTING SITE INFORMATION FOR FEATHER RIVER ORGANICS COMPOST FACILITY, YUBA COUNTY, CALIFORNIA, REVISED AUGUST 2013.

LEGEND

- PERMITTED COMPOST FACILITY AREA (15.8 ACRES - NOTE 3)
- 4 - INCH Ø HDPE PIPE
- 18 - INCH Ø HDPE PIPE
- COMPOST OPERATIONS AREA (11.4 ACRES)
- 21,000 GALLON BAKER TANK WITH SOIL WATER SAMPLER ("VACUUM LYSIMETER") (NOTE 2)

SCALE 0 100 200 300 FEET

REV	DATE	REVISION DESCRIPTION	DES	CADD	CHK	RVW

PROJECT

COMPOST PAD IMPROVEMENTS
RECOLOGY YUBA SUTTER

TITLE

CONCEPTUAL STORMWATER COLLECTION PLAN

Golder Associates

PROJECT No.		1301525	FILE No.	RYS CPI F1-R1
DESIGN	JTK	7-28-2014	SCALE	AS SHOWN
CADD	DMN	7-28-2014	FIGURE	
CHECK	JTK	8-01-2014		1 REV.
REVIEW	KGH	8-01-2014		

1590 Drew Avenue, Suite 210
Davis, CA 95618

T: 530.747.0650
F: 530.297.7148

August 13, 2014

Brown AND Caldwell

Mr. Drew Lehman
Director Environment & Planning
Recology
50 California Street, 24th Floor
San Francisco, California 94111-9796 1017-146499

Subject: Feather River Organics Stormwater Final Runoff Model Results Review

Dear Mr. Lehman:

Brown and Caldwell (BC) has reviewed the final stormwater runoff design calculations and comparisons with actual runoff prepared by Golder Associates for Feather River Organics (FRO) at the Marysville site dated 8/13/14. Other documents also reviewed include a memorandum from Golder to Recology on 5/30/14 and calculation sheets dated 7/30/14 by Joel Kelsey of Golder. This review supplements our review of options and recommendations submitted by Ron Crites on 7/28/14.

As with any modeling, comparison with data from real events provides the best test of the reasonableness of the model and assumptions. The modeling performed by Golder using rain gauge records for Marysville to simulate effects of antecedent days of rain provided good additional results for comparison purposes. The results showed that the model was conservative.

Based on our professional judgment, the methodology, assumptions and calculations in the Golder model appear to be reasonable for estimating the runoff from the 25 year return period, 24 hour storm.

Very truly yours,

Brown and Caldwell

Robert A. Beggs, Ph.D.

RAB:ds

cc: Joel Kelsey, Golder Associates
Ron Crites, Brown and Caldwell