BMP PILOT STUDIES BI-WEEKLY CONFERENCE CALL
DRAFT AGENDA

DATE:	October 19, 2000 Thursday
TIME:	10:00 am – 11:00 am
PLACE:	Via phone (916-657-4102)
ATTENDEES:	Rich Horner/Chris May, Jeremy Johnstone, Rick Graff, Bruce Reznik, Steve Fleischli, Bob Wu, Steve Borroum, Brian Currier, Cathy Beitia, Cid Tesoro, Sayra Ramos, Barbara Ronimus, Pete Van Riper, Richard Gordon, Dean Messer, Brown and Caldwell, Montgomery Watson/Law, KLI, RBF, Dudek
COPIES TO:	RBF File 34123, 34218
SUBJECT:	BMP Pilot Study Status

AGENDA ITEMS

1. Storm Event October 10-11, 2000 Update – Law/KLI
2. Follow-up on Non-stormwater Discharge (D7)
3. CDS Update on Mosquito-proofing/drain sump
4. Hydraulic Residence Time Estimating Procedure (See Appendix B of the Biweekly)
5. EDBs Residence Time – Procedure Discussion (See Appendix C of the Biweekly)
6. MID Proposed Changes (See Appendix D of the Biweekly)
    a. MCTT- deletion of the reference to use Altosid Briquettes
    b. MF - Acceptance of Changes as discussed at the previous Biweekly

Note: Discussion of Responses to R. Horner's comments on Vector Issues will be deferred to the next Biweekly Meeting (See Appendix A of the Biweekly)

>>Next meeting: Biweekly Conference Call November 2, 2000 Thursday 10am<<

BMP Pilot Studies
Bi-weekly Status Report

BMP Retrofit Pilot Projects in District 7 and District 11

October 13, 2000

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NOTE TO READER: As agreed during the October 5, 2000 Biweekly meeting, biweekly reporting will remain in brief report format to focus primarily on specific issues, and only general reporting of OMM activities will be provided.

UPDATES IN THIS BI-WEEKLY REPORT COVER THE PERIOD SEPTEMBER 28, 2000 – OCTOBER 13, 2000

Non-stormwater Discharge

A non-stormwater discharge was noted at the Foothill MS Fossil Filter DII on October 5, 2000 . No non-stormwater discharge has been noted during routine visits to the District 11 BMPs during this period. A follow-up on the D7 non-stormwater discharge will be provided during the October 19 Biweekly conference call.

Week of	Foothill MS DII
October 2, 2000	Y
October 9, 2000	N

Y – Non-stormwater runoff was observed
N - No non-stormwater runoff observed during follow-up visit
- Discontinued weekly inspections.

October 10-11, 2000 Storm Event

A storm event was forecasted to occur in the Los Angeles area between 10-11 October 2000. The forecast predicted a 60% chance of 0.15 – 0.70 inches of precipitation (classified as a marginal storm). Teams were authorized to mobilize and all stations were readied. However, the storm system was scattered in nature and was downgraded over time to an unlikely storm classification. Subsequently, teams de-mobilized and grab samples were not collected. However, during- or post-storm inspections of BMPs, which received target rainfall were conducted. A storm meeting the mobilization criteria did not materialize in D11. See summary table below for D7 sites

Site	BMP Type	Date of Sample Event	Rainfall Total	Mobilized	Sampled		Empirical Observations
					Comp	Grab	
District 7							
I-605/SR-91	IB	10/11/00	0.25	Y	NA	NA	Y
I-210 East of Orcas	CDS	10/11/00	0.01	N	N	N	N
I-210 East of Filmore	CDS	10/11/00	0.00	N	N	N	N
I-5/I-605	EDB	10/11/00	0.09	N	Y[1]	N	N
I-605/SR-91	EDB	10/11/00	0.25	Y	Y[1]	N	Y
Paxton P & R	MF	NA	NA	NA	NA	NA	NA
Metro MS	MCTT	NA	NA	NA	NA	NA	NA
Alameda MS	OWS	10/11/00	0.13	N	N	N	N
Eastern MS	MF	10/11/00	0.00	N	N	N	N
Foothill MS	MF	10/11/00	0.04	N	N	N	N
Termination P & R	MF	10/11/00	0.27	Y[2]	N	N	N
Via Verde P & R	MCTT	10/11/00	0.01	N	N	N	N
Lakewood P & R	MCTT	10/11/00	0.24	Y	Y	N	Y
Altadena	Bio Strip	10/11/00	0.05	N	N	N	N
	Infiltration Trench	10/11/00	0.05	N	NA	NA	N
Foothill MS	DII north- SG Insert	10/11/00	0.04	N	Y[1]	NA	N
	DII south- FF Insert	10/11/00	0.04	N	Y[1]	NA	N
Las Flores MS	DII north-SG Insert	10/11/00	0.00	N	N	N	N
	DII south-FF Insert	10/11/00	0.00	N	N	N	N
Rosemead MS	DII north-FF Insert	10/11/00	0.13	Y	Y	NA	Y
	DII south-SG Insert	10/11/00	0.13	Y	Y	NA	Y
I-605/SR-91	Bio Strip	10/11/00	0.25	Y	Y[3]	N	Y
	Bio Swale	10/11/00	0.25	Y	Y[3]	N	Y
Cerritos MS	Bio Swale	10/11/00	0.25	Y	Y[3]	N	Y
I-5/I-605	Bioswale	10/11/00	0.09	N	Y[1]	N	N
I-605/ Del Amo	Bioswale	10/11/00	0.25	Y	Y[3]	N	Y

[1] Not enough volume to sample

[2] Team mobilized but event was downgraded to “Unlikely”. Sampling equipment turned off based on forecast.

[3] Influent sample collected; no effluent flow, thus no effluent sample

OMM Activities: Routine inspection and maintenance per MID have been conducted during this reporting period. Additional site-specific inspection and maintenance activities are listed in the table below.

Additional Site-Specific O&M Activities

BMP	Activities
Multi Chambered Treatment Train Via Verde Park & Ride Lakewood Park & Ride	LAW's subcontracted electrician tested the operation of the electric pumps under load, while the Park and Ride lights were on at the Via Verde P&R MCTT on 5 October 2000 and Lakewood P&R MCTT on 6 October 2000. The pumps at Via Verde functioned normally, but at Lakewood it was determined that the operational amperage was running too close to the limits of the 20 amp circuit breakers. The power is too low, which will cause inefficiency in the pumps and the motors to burn out prematurely. A field inspection at the Lakewood MCTT by the Caltrans District 7 electrician and LAW's electrician is scheduled for Monday 16 October 2000 to discuss options to improve power. While initially draining the Lakewood MCTT after the 11 October 2000 storm event, the transfer and effluent pumps were operating simultaneously. After approximately 12 minutes of operation, the effluent pump stopped pumping because it began to overheat from the lack of necessary power. From that point on, both pumps would not operate at the same time. Consequently, the transfer pump was operated when the effluent pump was off and the effluent pump was operated when the transfer pump was off.
Sand Filter Termination Park & Ride	LAW's subcontracted electrician tested the operation of the electric pump under load, while the Park and Ride lights were on at the Termination Sand Filter on 6 October 2000. It was determined that the operational amperage was running too close to the limits of the 20 amp circuit breaker. The power is too low, which will cause inefficiency in the pumps and the motors to burn out prematurely. A field inspection at the Termination Sand Filter by the Caltrans District 7 electrician and LAW's electrician is scheduled for Monday 16 October 2000 to discuss options to improve power.

BMP	Activities
Drain Inlet Inserts Foothill Maintenance Station	A diesel spill occurred at Foothill Maintenance Station on 5 October 2000. A Caltrans employee had started a motor to an "arrow board" up-slope of the Fossil Filter Drain Inlet Insert (FF DII), in order to charge its battery by running the engine (unattended) for awhile. The fuel line to the arrow board engine broke while the engine was running. Another employee noticed that diesel fuel was running along the gutter and into the FF DII, and subsequently shut off the engine. Approximately 6 gallons of fuel leaked into the BMP. Caltrans soaked up the diesel fuel using a super-fine absorbent material on the asphalt and within the BMP. The FF DII was removed and the FF adsorbent material was disposed of with the diesel fuel. The fuel had drained through the subsurface pipe to the monitoring vault. The Palmer-Bowlus flume apparently prevented the fuel from entering the storm drain (where the teflon sample tubing and strainer are located). Caltrans placed a barrier at this point to prevent fuel from entering into the storm drain. A high pressure steam cleaner was used to wash down the concrete/asphalt pavement, the FF DII, the drain inlet, and, as much as possible, the concrete pipe connecting the drain inlet to the monitoring vault. A vacuum truck was used to vacuum out the fuel and rinse water as it entered this chamber. Steam cleaning was continued until there was no longer an oil sheen in the rinse water. No detergents were used during the cleaning, only high-pressure steam. Law Crandall personnel were not present to observe the cleaning of the BMP, but arrived on site later to record cleanup activities. A very slight oil sheen was observed by Law Crandall at the bottom of the inlet box, in one small puddle. The FF DII cartridges appeared to be adequately clean so new adsorbent material was replaced and the DII was reinstalled.
Biofiltration Strip/Infiltration Trench Altadena Maintenance Station	The spreader ditch was drained on 12 October 2000, following the storm event.
Biofiltration Swale Cerritos Maintenance Station	Flow bypass was observed at the Cerritos Maintenance Station Swale. Flow bypass occurred through gopher burrows despite installation of the hardware mesh.
CDS Units I-10 East of Orcas and I-210 East of Filmore	CDS replaced the 1200 micron screens with ones with larger openings during 3 - 5 October 2000. Although the 4700 micron screen was installed at Filmore and the 2400 micron screen was installed at Orcas, contrary to the original plan, CDS said that the screen sizes were appropriate for the sites. CDS will provide a letter confirming this. According to CDS, the larger screen openings have less clogging potential and will be available in the future. Finally, a new sump basket was installed at Orcas, of the same type as previously.

Cover Install Preliminary Schedule Via Verde/Lakewood MCTTs: Below is the schedule, as discussed during the Oct 5 Biweekly.

Action	Completion/ Submittal Date
BC finish PSE revisions and submit to Law for review	10/06/00
Law submits PSE comments to BC	10/13/00
BC finishes incorporating Law comments and send final package to Law	10/20/00
Law send out bid package	11/03/00
Award bid	12/04/00
Cover manufacturer drafts and submits cover plans to Law	12/18/00
Law provides comments on plans to manufacturer	12/26/00
Manufacturer fabricates and delivers the covers	02/19/00
Install covers	02/27/00

BC – Brown and Caldwell, Law – LawCrandall

Paxton/Metro Media Filter/MCTT: District 7 is currently doing final review and modifications of both projects before sending to Headquarters OE for review and processing. D7 expects to submit Metro and Paxton to HQ Office of Engineer on October 16.

Revised Schedule - Paxton/Metro Media Filter/MCTT:

Action	Duration	Milestone	Estimated Completion Date
Incorporate preliminary Structures and D7OE review comments		Submit entire PS&E package	03/08/00 (actual)
Structures and D7OE Review	4 weeks		
		Receive comments from Structures and D7OE	04/06/00 (actual)
Consultant revise PS&E	17.4 weeks		
		Submit to D7	08/07/00 (actual)
Structures final review and Final Revisions	2 weeks		
		Submit final to D7	08/21/00 (actual)
D7 process and format PS&E	8 weeks		
		D7 submit to HQ	10/16/00
HQ review and processing; advertise contract	13 weeks		
		Advertise contract	01/18/00
Bid Period and evaluate bids	4 weeks		
		Notice to Proceed	02/15/01
Construction	17 weeks		
		Construction complete	06/7/01
Install Instrumentation	2 weeks		
		Operational	06/21/01

District 11 BMP Pilot Sites - KLI

OMM activities: Routine inspection and maintenance per MID has been conducted during this reporting period. On October 10, all monitoring stations were activated for an incoming storm and storm control was initiated. The storm did not provide sufficient rainfall for sampling and the event was terminated on October 11. Site specific activities are summarized below.

Additional Site-Specific OMM Activities

BMP	Activities
La Costa Wet Basin	• On October 3-5, field crews conducted the monthly paired baseline sampling.
I-5/SR-78 Sand Filter La Costa Sand Filter	• On October 5, in an effort to extend detention times in the sedimentation chamber, the drain pipe from the sedimentation chamber to the sand filter at both sites was retrofitted with a smaller diameter drain hole.
Kearny Mesa Maintenance Station	• On October 9, accumulated sediment was removed from Stormfilter basins 1 and 2. The removed sediment was stockpiled on site and sediment samples were sent to the lab for analysis.

OMM PLAN ACTIVITIES

Recent changes to the MID pertain to OWS (sediment inspection frequency) , Media Filters (trash inspection frequency), MCTT (trash inspection frequency), and DII StreamGuard (absorbent pack replacement frequency). Changes to the MID have been discussed during the previous Biweekly meeting. The MID Version 14 will be issued week of October 16, 2000 (under separate cover).

VECTOR ACTIVITIES

During this period, both DHS and the VCDs continued monitoring BMPs within their respective districts. In District 7, the sand filter at Termination P&R (site #74204), the sand filter at Eastern Regional MS (site #74202), the CDS unit located at I-210/East of Orcas (site #73102), and the outlet sump at the I-5/I-605 EDB (site #74101) were all abated on September 29, 2000 and October 6, 2000. The MCTT at Lakewood P&R also was abated on October 6, 2000. Similarly, the MCTT at Via Verde P&R (site #74206) and the sand filter at Foothill MS (site #74203) were abated on October 2, 2000. In District 11, breeding was observed at the I-5/SR-56 EDB (site #111101), the La Costa P&R sand filter (site #112203), the SR-78/I-5 P&R sand filter (site #112204), and the StormFilter at Kearney Mesa MS (site #112201), but thus far, no abatement has been required.

DHS has initiated the search for more vector control agencies in the nation to supplement the out of state survey report. A more complete mailing list should be available in the next several weeks.

ENVIRONMENTAL ISSUES

Dudek and Associates Inc. surveyed the BMPs September 27, 28, and October 4, 2000. The survey consisted of reviewing the sites for potential endangered, threatened, or sensitive species issues. Conditions reviewed included presence of water, nesting birds or suitable habitat.

Nesting birds were not detected during the survey. The nets erected at the La Costa and I-5/SR-78 Park-and-Ride Media Filters have been removed since the August monitoring period. The net at La Costa Infiltration Basin likely prevented nesting activities by nearby snowy plover and least tern at these locations.

Wildlife species observed during this monitoring period include: SR-56/I5 Extended Detention Basin- great egret (Casmerodius albus), bushtit (Psaltriparus minimus), California towhee (Pipilo crissalis), black phoebe (Sayornis nigricans), and Anna's hummingbird (Calypte anna); I5/Manchester Ave. (East)- California towhee and mourning dove (Zenaida macroura); 605/5 Biofiltration Swale- no wildlife species observed; 605/5 Extended Detention Basin- rock dove (Columba livia); S605 /91 W Extended Detention Basin- Common raven (Corvus corax); I-605/SR-91 Bio-strip and Bio-swale- common raven; N605/W91 Extended Detention Basin- mourning dove; Cerritos MS Bio-swale- common raven and west coast lady (Vanessa anabella); La Costa Wet Basin- mallard (Anas platyrhynchos), California towhee, house finch (Carpodacus mexicanus), lesser goldfinch (Carduelis psaltria), and song sparrow (Melospiza melodia); La Costa Media Filter- California towhee and common raven; La Costa Infiltration Basin- California towhee; I 5/ Palomar Airport Rd. Bio-swale- common raven; SR--78/ Melrose Ave. Bio-swale- no species observed; SR-78/I-15 Extended Detention Basin - common raven; and I-5/SR-78 Media Filter- Common raven, great-tailed grackle (Quiscalus mexicanus) and mourning dove.

The trapping of pocket gophers was discontinued at all sites per the May 10, 2000 conference call. No trapping activities were conducted during this monitoring period. It should be noted that mitigation/maintenance of the BMP facilities will continue according to the previously agreed to Maintenance Indicator Document (MID).

APPENDIX A: Response to Rich Horner's Oct 2 2000 comments on Vector Issues (Email from Bill Walton)

-------- Original Message --------
Subject: Re: [Fwd: Fwd: Retrofit issues]
Date: Tue, 10 Oct 2000 12:27:40 -0700
From: William Walton <walton@mail.ucr.edu>
To: Cathy Beitia <cathy.beitia@owp.csus.edu>
CC: deanm@lwadavis.com

Cathy,

Thank you for forwarding a copy of "Issues for Discussion during Upcoming Retrofit Status Calls." I concur with many of the points summarized in the memorandum; however, I add the following points to the issues under subheading 1 for "Vectors."

Pre- vs. post-construction comparisons were made for periods of the year when precipitation is low and during periods when control activities against the aquatic-dwelling stages of the mosquito life cycle were being carried out. There is an indication that adult mosquito activity increased at sites where control measures were comparatively less frequent (i.e., Jan. through June 2000 at San Diego sites) during the post-construction period.

Because of ongoing control activities, I see little utility in carrying Out additional paired control-treatment comparisons. The impetus for Carrying out the adult monitoring was Caltrans' desire to have pre- and post-construction data for vectors. The control-treatment comparisons were added following Rich Horner's suggestion. Both reasons for adult monitoring made good sense. However, as was discussed on several occasions by Dr. Wakesa and others, instead of censusing adult activity while control measures were being carried out, a better approach for assessing the effects of the stormwater retrofit BMPs on adult vector activity would have been to forego larval control at some, or all of, the sites. Even had control efforts against mosquito larvae not been carried out, adult activity data may be confounded by movement of adults into a trapping area or by production of mosquitoes resulting from activities, sites, etc. other than the stormwater BMPs. Mosquito production caused by the latter factor would be measured as part of the natural background, provided conditions do not change significantly across the study. If a stormwater BMP were to produce a large number of adult mosquitoes, then this production should be indicated by the trap counts; I view it as very unlikely that migration of Culex mosquitoes into a site would outweigh high local production. Therefore, given that larval control was carried out and that the Presence of immature mosquitoes in standing water, not adult mosquito activity, Is the basis for abatement and any subsequent actions carried out by the vector control and public health agencies, larval presence/absence, larval abundance, and the number of abatement actions represent a better indication of vector potential than do the adult activity data.
Provided that standing water can be adequately sampled, the larval data provide unambiguous evidence of vector activity at a particular site.

I would add the wet basin to the list of BMPs that are likely to be a vector problem.

A point worth reiterating is that chemical control using insect growth regulators or biological control using mosquito-specific microbials is not likely to be practical and cost-effective for large-scale implementation of problematic stormwater BMP designs.

I feel that we could benefit from a more thorough examination of the relationship between larval mosquito abundance (or presence/absence), control efforts and adult mosquito activity.

Bill

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CC: Brian Currier <bkcurrier@ucdavis.edu>

APPENDIX B: HYDRAULIC RESIDENCE TIME

ESTIMATING SWALE HYDRAULIC RESIDENCE TIME (HRT) AT DESIGN FLOW RATE
(From R. Horner sent via email 10/8/2000)

Subscript notation: $_m$—Measured during HRT test; $_c$—Calculated using measured quantities; $_d$—Under swale design conditions or calculated using design conditions; $_a$—Assumed value.

1. Calculate flow velocity (ft/s) during test: $V_c = Q_m/A_c$

   Q_m = Measured flow rate (cfs) [Averaged over one or more periods if fluctuating.]

   A_c = Flow cross-sectional area (ft^2) [In shallow flow can be approximated as a rectangle, regardless of swale shape, and computed as $A_c = d_m*w_m$. In deeper flow use area equation for appropriate shape, e.g., $A_c = b*d_m + Z*d_m^2$ for trapezoid.]

   d_m = Measured flow depth (ft)

   w_m = Measured water surface width (ft)

   b = Swale bed width (ft)

   Z = Side slope as horizontal:vertical ratio

2. Calculate Manning's n under test conditions: $n_c = (1.49/V_c)*R_c^{0.67}*s^{0.5}$

   R_c = Flow hydraulic radius (ft) [In shallow flow can be approximated as a rectangle, regardless of swale shape, and computed as $R_c = (w_m*d_m)/(w_m + 2*d_m)$. In deeper flow use area equation for appropriate shape, e.g., $R_c = (b*d_m + Z*d_m^2)/(b + 2*d_m*(Z^2 + 1)^{0.5})$ for trapezoid.]

   s = Longitudinal slope (ft/ft) [Carefully measured with surveying equipment.]

3. Calculate a value of HRT (HRT_c, min.) under test conditions to compare with value measured by timed dye travel (HRT_m, min.): $HRT_c = L/(V_c*60)$

   L = Swale length (ft)

4. For all swales tested, plot HRT_m versus HRT_c to check agreement based on how close points fall to a 1:1 line or a linear regression calculation. If agreement is relatively good, the scaling calculation below gives a reasonable estimate of HRT under design flow conditions.

5. Determine design flow rate (Q_d), which should be in the record for swales designed for runoff treatment. If unavailable, Q_d can be estimated from Manning's Equation using a known or assumed design flow depth and Manning's n: $Q_d = (1.49/n_a)*A_d*R_d^{0.67}*s^{0.5}$

A_d and R_d are computed with the appropriate equation, assuming a rectangular cross section in shallow flow or the swale shape in deeper flow, known or assumed design flow depth, and water surface width at that depth.

n_a can be taken as 0.2-0.3, with some recent work showing the choice not to be critical for design, but 0.3 to be the slightly superior value.

6. Set up Manning's Equation to solve for the flow depth estimated to exist at design flow conditions (d_d, ft). In shallow flow, assuming a rectangular cross section, the equation would be: $Q_d = (1.49/n_c)*(w_m*d_d)[(w_m*d_d)/(w_m + 2*d_d)]^{0.67}*s^{0.5}$

   Use values of Q_d, n_c, w_m, and s from previous steps and solve iteratively for d_d. This equation assumes that water surface width does not vary much with small changes in flow depth. In deeper flows substitute the expressions for A and R appropriate to the swale shape.

7. Calculate flow cross-sectional area expected at design flow rate: In shallow flow, $A_d = d_d*w_m$ (In deeper flow use equation appropriate for swale shape.)

8. Calculate flow velocity expected at design flow rate: $V_d = Q_d/A_d$

9. Calculate ratio of measured to design velocity: V_m/ V_d

10. Use the ratio from step 9 as a scaling factor to estimate HRT at design flow: $HRT_d = HRT_m*(V_m/ V_d)$

APPENDIX C: EDB Residence Time – for Discussion at the upcoming Biweekly Call

Residence Times for Extended Detention Basins

A number of methods have been suggested for characterizing the amount of time runoff remains in an EDB before discharge. The most common design requirement specifies a basin drawdown or drain time. That is the time it takes for a basin to completely drain from a basin full condition, assuming no influent during the draining cycle. This is, of course, an abstract value that can be calculated from the hydraulics of the outlet orifice and the basin geometry and volume, but does not lend itself to an accurate determination from field measurements. When measured in the field during an actual event, deviations from the ideal situation occur because runoff almost always continues to enter the basin during the draining cycle. In addition, the duration of the event also impacts the measured value. We currently report a "detention time" that is the time between the beginning runoff and the end of discharge from the basin, which could be characterized as a surrogate for drain time. Unfortunately the calculation/measurement of the drain time does not give a direct indication of how long an "average" molecule of runoff remains in the basin.

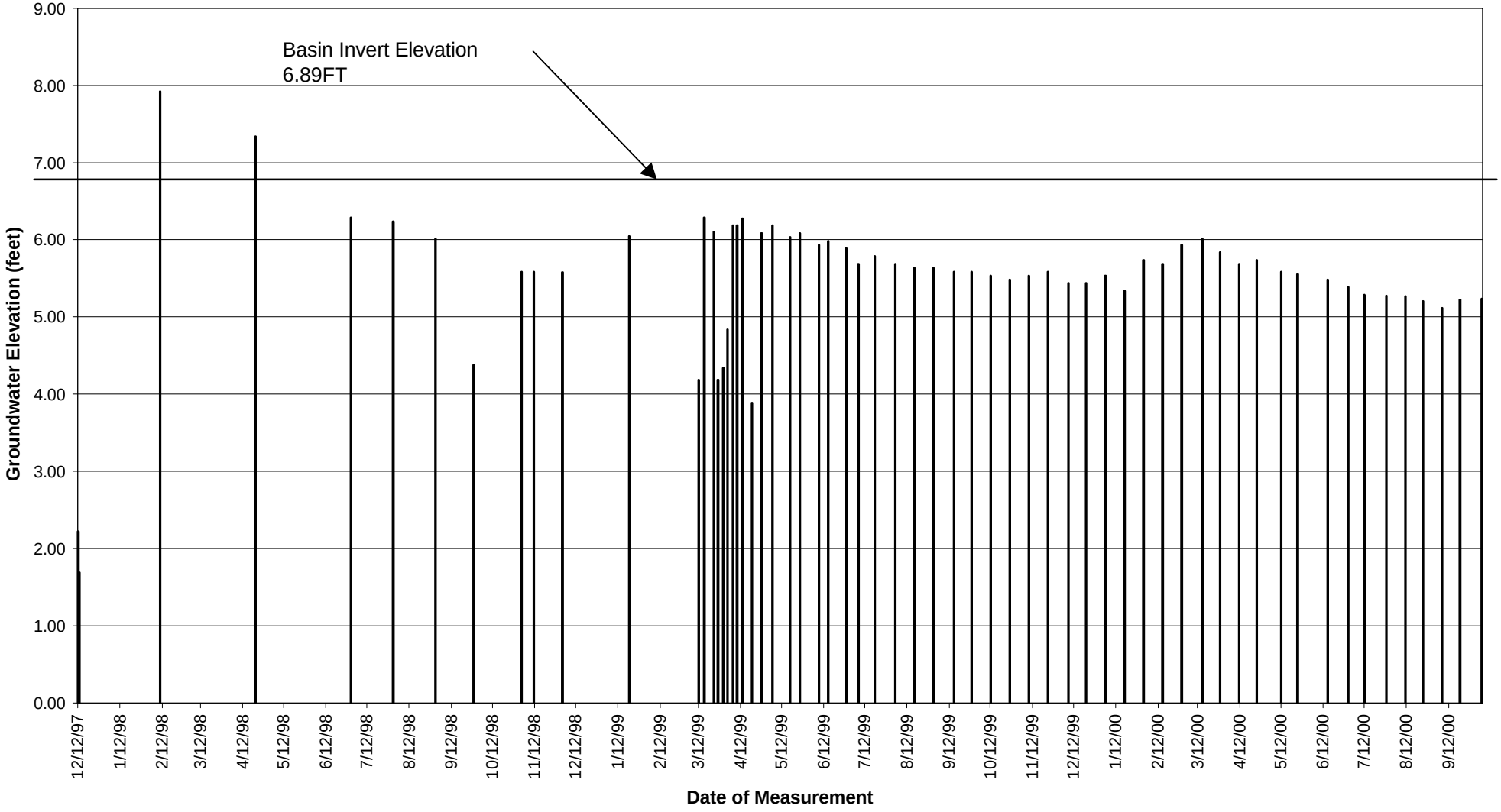
A better indication of the time runoff remains in the basin, the residence time, can be determined from the difference between the centroids of the influent and effluent. This can be done in two ways, theoretical and empirical. To calculate the theoretical residence time of an EDB, one assumes that the water quality volume enters the basin instantaneously at time zero. Then, based on hydraulics of the outlet, basin volume and geometry, one can calculate the discharge hydrograph and from that the centroid of the discharge. This procedure would determine what we might define as the design residence time, which would be analogous to the design drawdown time. One might also calculate the design residence time for any storm volume up to the water quality volume to better understand the performance of EDBs for smaller events.

Alternatively, we can use actual events to determine the difference between the influent and effluent hydrographs. In this case, the residence time will depend on runoff volume and duration and consequently would be subject to the same variability as the measured drain time. These data would allow us to verify (at least approximately) a correlation to the drain time and that the basin is performing as expected. In addition, it would give us a way to evaluate differences in performance among the EDBs.

A note on the language in the Scoping Study. The Scoping Study states: "Detention facility studies indicate that effective detention basins should be designed for a detention time of 24 hours for <u>average</u> conditions rather than full basin conditions. In California, a 24-hour average detention time for the full range of storms up to and including the water quality design storm is generally achieved with a full-basin drawdown time of 72 hours, where the drawdown time is the time required for a full basin to empty."

APPENDIX D: I-5/La Costa Infiltration Basin Groundwater Log

Groundwater Level Monitoring at I-5/La Costa Infiltration Basin Site



WATER SURFACE ELEVATION SUMMARY SHEET

Date	Time	Field Reading		Pond Depth*	Groundwater Elev (FT)*	Delta	By	Comment
		Headwall (FT)	Monitoring Well (FT)	(FT)		(FT)		
12/12/97	---	---	BORING WW-1	---	2.22	4.67	GDC	Existing surface elevation: 10.22 ft (3.117m)
12/13/97	---	---	BORING WW-2	---	1.69	5.20	GDC	Existing surface elevation: 10.69 ft (3.258m)
12/23/97	---	---	---	---	No groundwater encountered.	---	GDC	**SD-7** Initial investigation monitoring well installed. (Bottom at 5 ft bgs.)
2/10/98	---	---	3.00	---	7.92	-1.03	GDC	Reading after a series of rain storms. Adjacent ground saturated and surface ponding observed.
4/21/98	---	---	5.85	---	7.34	-0.45	GDC	**SDMW-1** Permanent monitoring well installed. (Bottom at 20 ft bgs.)
6/30/98	10:00am	---	6.90	---	6.29	0.60	KLI	
7/31/98	4:15pm	---	6.95	---	6.24	0.65	KLI	
8/31/98	11:57am	---	7.17	---	6.02	0.87	KLI	
9/28/98	---	---	---	---	4.38	---	RBF	Exploratory hole excavated by contractor. Ground water elevation 0.54ft below original design invert, 4.92ft (1.5m)
11/2/98	4:04pm	---	7.60	---	5.59	1.30	KLI	
11/11/98	4:55pm	---	7.60	---	5.59	1.30	KLI	
12/2/98	---	---	7.61	---	5.58	1.31	KLI	
12/17/98	---	---	---	---	0.00	---	CT RE	Exploratory holes excavated 10.2 feet below invert elevation. No groundwater observed.
1/20/99	7:05am	---	7.14	---	6.05	0.84	GDC	
2/24/99	10:15am	2.08	---	---	---	---	GC	No signs of mosquitoes. Surface has 2"-3" dia algae.
3/2/99	2:00pm	1.88	---	---	---	---	AW	No vector issues.
3/9/99	11:00am	1.73	---	---	---	---	GC	No vector issues - no algae present from 2/24/99.
3/12/99	1:00pm	1.86	9.00	1.45	4.19	2.70	AW	No vector issues, < 0.1in rain on 3/11/99, no algae.
3/16/99	4:55pm	1.98	6.90	1.57	6.29	0.60	AW	No vector issues, < 0.2in rain on 3/15/99, 2mm dia algae scattered on water surface. Dried high-algae-line observed on headwall at 2.84ft mark.
3/23/99	10:00am	1.76	7.08	1.35	6.11	0.78	AW	No vector issues, no algae.
3/26/99	10:20am	2.48	9.00	2.07	4.19	2.70	AW	No vector issues, < 0.5in rain on 3/25/99, no algae.
3/30/99	9:05am	2.28	8.85	1.87	4.34	2.55	AW	No vector issues, 6-sf algae at NW corner. Vector Control District treated basin with Altosid briquettes and stocked basin with mosquito fish.
4/2/99	8:15am	2.89	8.35	2.48	4.84	2.05	AW	No vector issues, <0.5in rain on 4/1/99, no algae.
4/6/99	2:00pm	2.69	7.00	2.28	6.19	0.70	AW	No vector issues, no algae.
4/9/99	10:00am	2.67	7.00	2.26	6.19	0.70	AW	No vector issues, 1mm dia algae, 8sf at NW corner.
4/13/99	10:00am	2.89	6.91	2.48	6.28	0.61	AW	No vector issues, <0.8in rain on 4/11/99, <1mm dia algae approx 8sf.
4/20/99	9:50am	2.52	9.30	2.11	3.89	3.00	AW	No vector issues, alga mats at NW corner.
4/27/99	2:25pm	2.50	7.10	2.09	6.09	0.80	AW	No vector issues, 6-1-2ft dia alga mats.
5/5/99	1:10pm	2.06	7.00	1.65	6.19	0.70	AW	No vector issues, few scattered 1-5mm dia algae.

5/18/99	5:55pm	1.66	7.15	1.25	6.04	0.85	AW	Minor vector issues, refer to OMM Vector Issues, collection of small floating algae mats varying 4-8" wide and approx. 10ft long.
5/25/99	5:40pm	1.50	7.10	1.09	6.09	0.80	AW	No vector issues, 6-12" wide alga mat at perimeter of the basin.
6/8/99	5:40pm	1.30	7.25	0.89	5.94	0.95	AW	No vector issues, alga mats at perimeter and interior of the basin. <0.14" Rain rcvd June 1,2,3
6/15/99	1:45pm	1.10	7.20	0.69	5.99	0.90	AW	No vector issues, alga mats at perimeter and interior of the basin.
6/28/99	1:50pm	0.82	7.30	0.41	5.89	1.00	AW	No vector issues, alga mats at perimeter and scattered 2/3 length within basin interior.
7/7/99	12:45pm	0.62	7.50	0.21	5.69	1.20	AW	No vector issues, alga mats 2/3 length of the basin at perimeter and scattered 10inch mats within interior.
7/19/99	10:30am	0.43	7.40	0.02	5.79	1.10	AW	No vector issues, alga mats cover 60% of basin.
8/3/99	11:45am	0.22	7.50	-0.19	5.69	1.20	AW	No vector issues, alga mats cover 90% of basin.
8/17/99	10:50am	0.12	7.55	-0.29	5.64	1.25	AW	Basin is empty. Residual water is ponded in the scour hole at the outlet (approximately 2ft x 2ft). No vector issues.
8/31/99	9:50am	0.12	7.55	-0.29	5.64	1.25	AW	Basin is empty. Surface of the southern portion of the basin is dry. Residual water is ponded in the scour hole at the outlet (approximately 2ft x 2ft). No vector issues.
9/15/99	11:45am	-0.26	7.60	-0.67	5.59	1.30	AW	Basin is empty. Surface of the southern portion of the basin is dry. A 1sft, 1in deep puddle of water is located at the scour hole adjacent to the outlet. No vector issues.
9/28/99	11:55am	0.08	7.60	-0.33	5.59	1.30	AW	Basin is empty. Surface of the southern portion of the basin is dry. Residual water is ponded in the scour hole at the outlet (approximately 2ft x 2ft). No vector issues.
10/12/99	10:05am	0.08	7.65	-0.33	5.54	1.35	AW	Basin is empty. Surface of the southern portion of the basin is dry. Residual water is ponded in the scour hole at the outlet (approximately 2ft x 2ft). No vector issues.
10/26/99	3:00pm	0.08	7.70	-0.33	5.49	1.40	AW	Basin is empty. Surface of the southern portion of the basin is dry. Residual water is ponded in the scour hole at the outlet (approximately 2ft x 2ft). No vector issues.
11/9/99	2:35pm	0.08	7.65	-0.33	5.54	1.35	AW	Basin is empty. Surface of the southern portion of the basin is dry. Residual water is ponded in the scour hole at the outlet (approximately 2ft x 2ft). No vector issues.
11/23/99	4:05pm	No standing water.	7.60	No standing water.	5.59	1.30	FP	Basin is empty. Surface of the basin is dry. The invert of the scour hole at the outlet is saturated. No ponding was observed. No vector issues.
12/8/99	10:15am	No standing water.	7.75	No standing water.	5.44	1.45	AW	Basin is empty. Surface of the basin is dry. The invert of the scour hole at the outlet is saturated. No ponding was observed. No vector issues.
12/21/99	3:30pm	No standing water.	7.75	No standing water.	5.44	1.45	AW	Basin is empty. Surface of the basin is dry. The invert of the scour hole at the outlet is saturated. No ponding was observed. No vector issues.
1/4/00	12:20pm	No standing water.	7.65	No standing water.	5.54	1.35	AW	Basin is empty. Surface of the basin is dry. The invert of the scour hole at the outlet is saturated. No ponding was observed. No vector issues.

1/18/00	8:50am	No standing water.	7.85	No standing water.	5.34	1.55	AW	Basin is empty. Surface of the basin is damp. The invert of the scour hole at the outlet is saturated. No ponding was observed. No vector issues.
2/1/00	10:15am	Small Pools.	7.45	No standing water.	5.74	1.15	CW	Ponding was observed in several small pools in center of basin. Strong H2S smell from well.
2/15/00	4:45pm	1.60	7.50	1.19	5.69	1.20	MZ	Strong H2S smell from well. Basin has a large pool of water at 1.6ft. No vectors present.
2/29/00	12:30pm	2.90	7.25	2.49	5.94	0.95	MZ	Groundwater was sampled for water quality. Strong H2S smell from well. Basin at capacity with a 2.9 ft stage. No vectors present.
3/15/00	2:30pm	2.90	7.18	2.49	6.01	0.88	CW	Strong H2S smell from well. Basin at capacity with a 2.9 ft stage. No vectors present.
3/28/00	11:15am	1.51	7.35	1.10	5.84	1.05	CW	Strong H2S smell from well. Basin stage has dropped to 1.51 feet. No vectors present.
4/11/00	10:00am	1.20	7.50	0.79	5.69	1.20	BJ	Strong H2S smell from well. Basin level continues to drop during dry weather. No vectors present.
4/24/00	9:30am	1.60	7.45	1.19	5.74	1.15	MZ	Strong H2S smell from well and groundwater very saline. Basin level has risen from last observation because of April 17 storm event. No vectors present.
5/12/00	10:00am	0.78	7.60	0.37	5.59	1.30	CW	Strong H2S smell. No vectors present. Woody wetland vegetation present in basin
5/24/00	2:10pm	0.59	7.63	0.18	5.56	1.33	MZ	Weak H2S smell. No vectors present. Woody wetland vegetation present in basin
6/15/00	11:30am	0.47	7.70	0.06	5.49	1.40	BJ	Weak H2S smell. No vectors present. Basin level continues to drop during dry weather.
6/30/00	10:30am	No standing water.	7.80	No standing water.	5.39	1.50	BJ	Weak H2S smell. No vectors present. Basin is now dry.
7/12/00	11:30am	No standing water.	7.90	No standing water.	5.29	1.60	CW	H2S odor not present. Basin is dry.
7/28/00	12:10am	No standing water.	7.91	No standing water.	5.28	1.61	VG	Musty odor present. Basin is dry.
8/11/00	1:00pm	No standing water.	7.92	No standing water.	5.27	1.62	CW	No odor. Basin Dry.
8/24/00	9:45am	No standing water.	7.98	No standing water.	5.21	1.68	VG	No odor. Basin Dry.
9/7/00	11:15am	No standing water.	8.07	No standing water.	5.12	1.77	CW	No odor. Basin Dry.
9/20/00	10:00am	No standing water.	7.96	No standing water.	5.23	1.66	BB	No odor. Basin Dry.
10/6/00	11:00 AM	No standing water.	7.95	No standing water.	5.24	1.65	CW	No odor. Basin Dry.
* **Temporary Well:** Well Cover elevation 10.99 ft (3.35m). Well rim elevation 10.92 ft.								
	WSE at monitoring well = Well cover elevation (FT) - Monitoring Well Reading (FT)							

* **Permanent Well:** Monitoring well notch at elevation 13.186 ft (4.02m)								
	WSE at monitoring well = Notch elevation (FT) - Monitoring Well Reading (FT)							
	Monitoring Well reading = Distance to groundwater surface							
* **Pond Depth** = Headwall Field Reading (FT) - Pipe Invert Location on the Headwall Gauge (FT)								
	Pipe Invert Location on the Headwall Gauge (FT) = 0.41 ft							
	Note: Negative Pond Depths indicate ponded water is below invert. This is due to scour and settlement of the invert material.							
Delta = Basin Invert - Groundwater elevation								
	Basin Invert = 6.89 FT (2.1m)							
AW- RBF FP- RBF GC- RBF GDC-Group Delta Consultants (Formerly LKR- The LKR Group, Consulting Geotechnical Engineers) KLI- Kinnetic Laboratories, Inc. CT RE- Caltrans Resident Engineer								

APPENDIX E: MID Proposed Revisions