

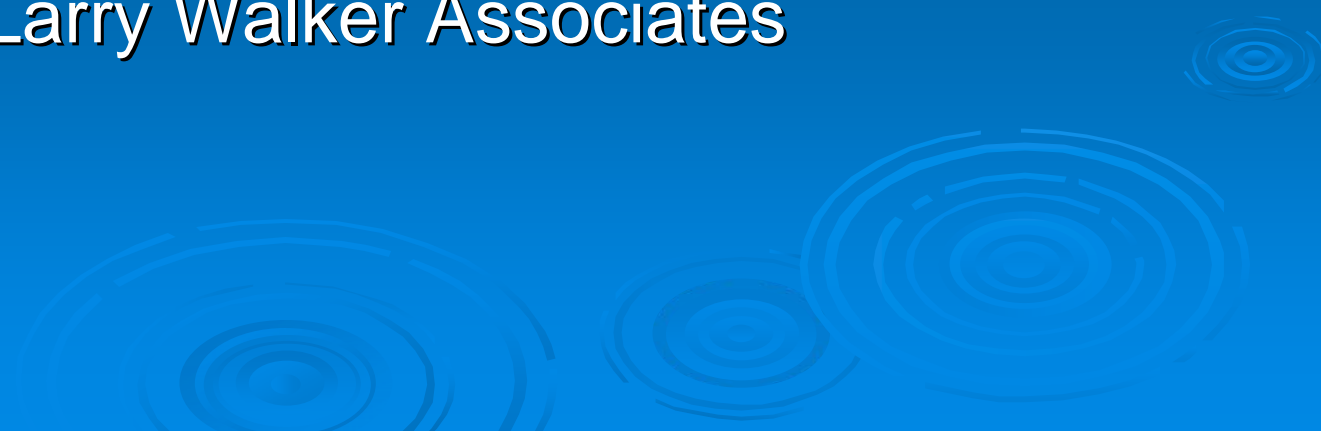
REMOVAL OF ORGANIC COMPOUNDS IN DRY DETENTION BASINS

Armand Ruby

The background of the slide is a solid blue color. In the lower right quadrant, there are several faint, concentric circular ripples, resembling water droplets or raindrops, which add a decorative touch to the presentation.

ACKNOWLEDGEMENTS

Fresno Metropolitan Flood Control District
Sacramento Stormwater Permittees
Larry Walker Associates



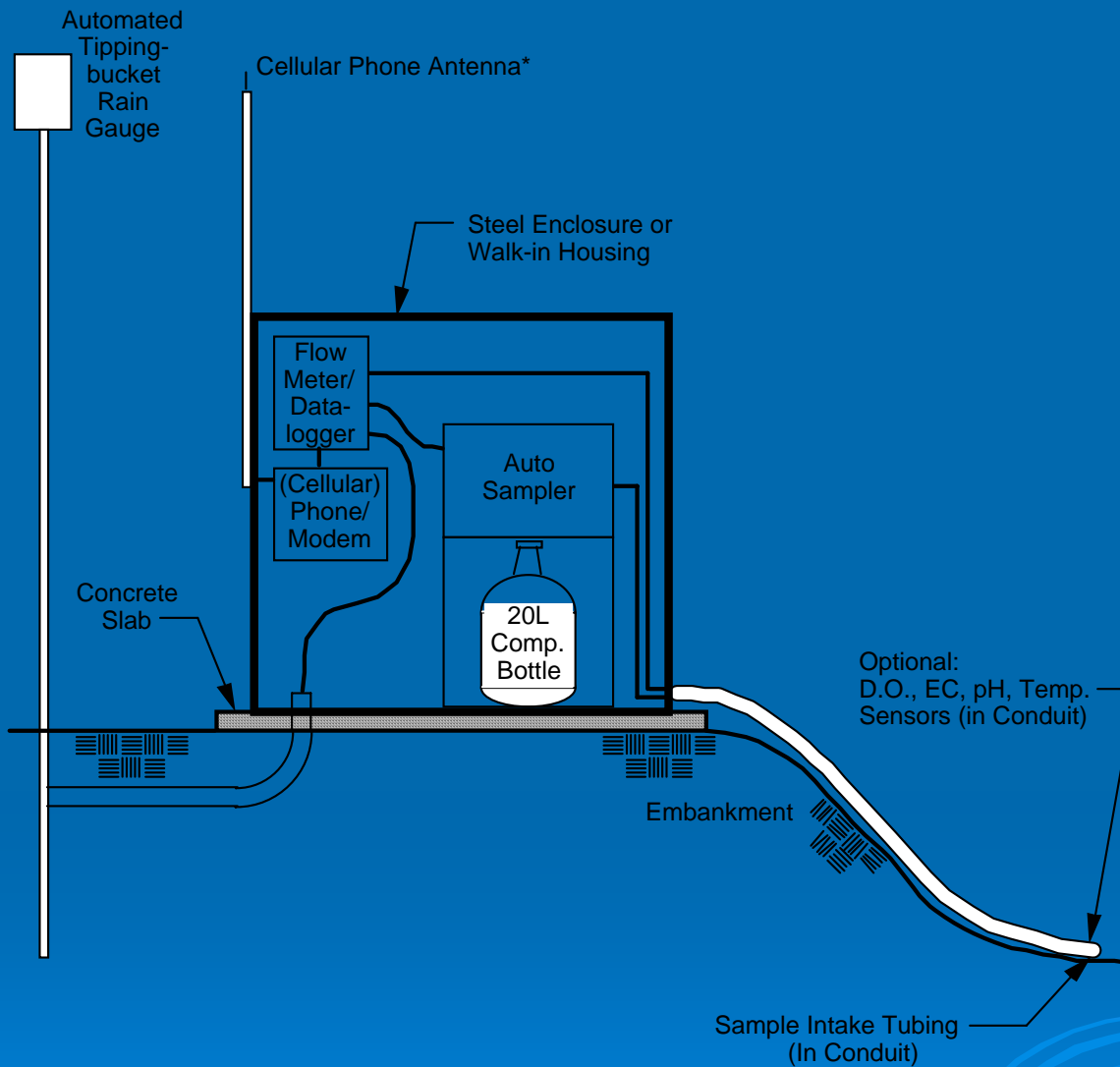
OVERVIEW

Detention Basins in Central Valley, California:

- One basin in Sacramento
- Three basins in Fresno

Inlet/Outlet Composite Samples

- Automated equipment, flow-proportioned
- Clean sampling/low analytical det. limits



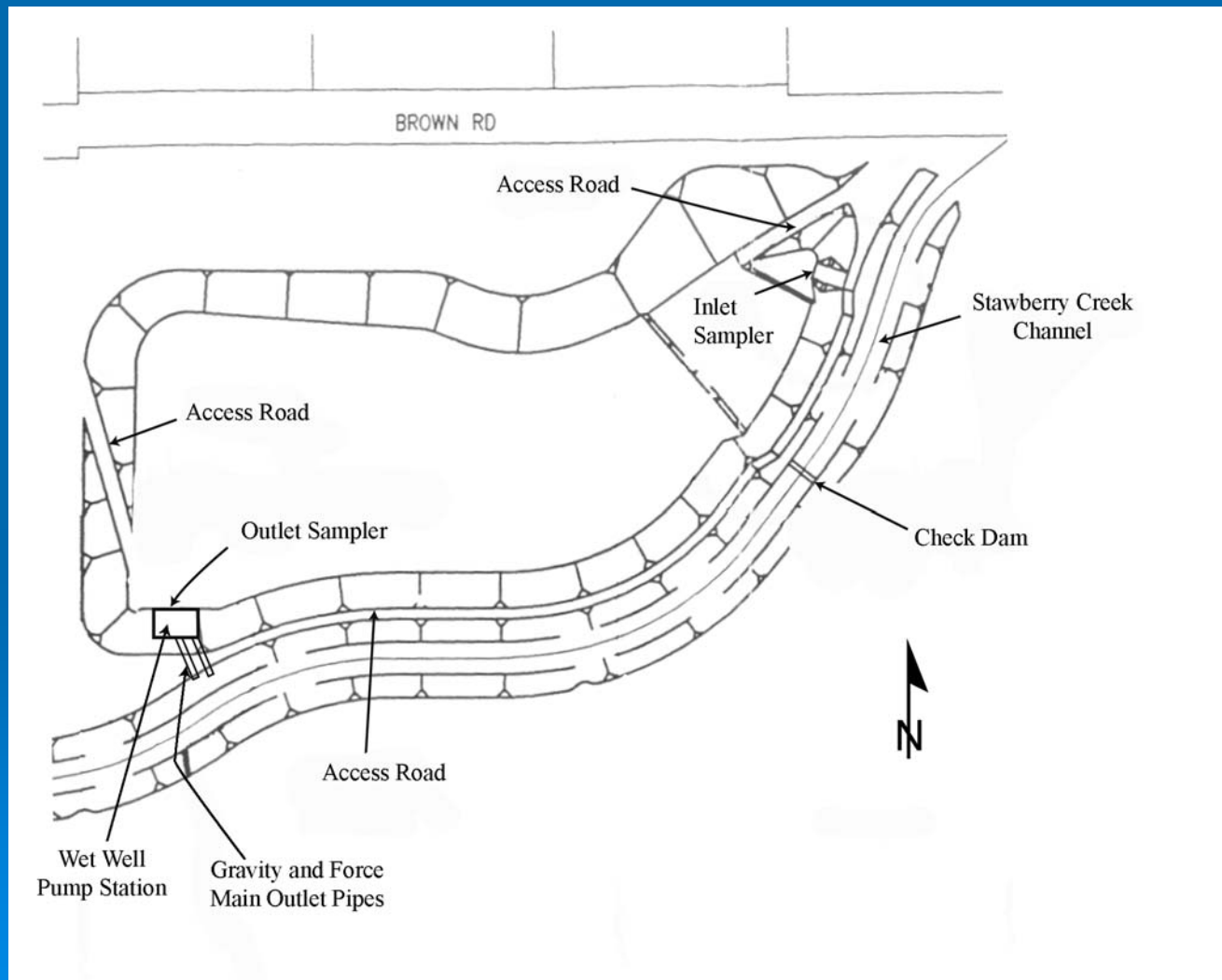
*Cellular phone module and antenna not needed if land line is available.

Note: 12 volt deep cycle marine batteries (with optional solar charging system) are required if AC power is not available.

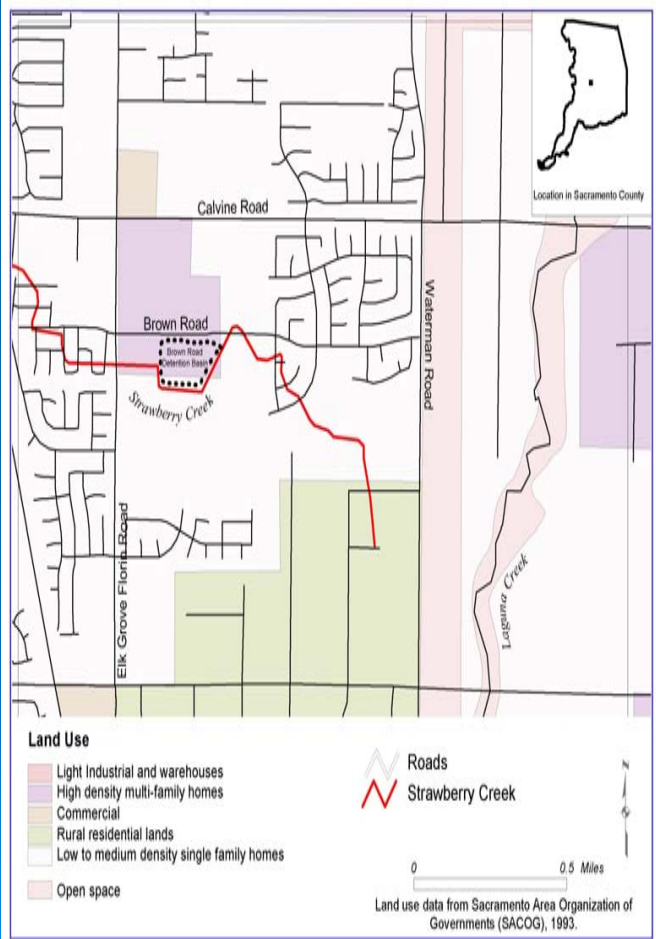
Brown Road Detention Basin, Sacramento, California

- Flood control design with water quality treatment design features
- Off-line dry detention basin, for small-to-moderate storm flows
- Pumped discharge after 36 hours

Plan View of Brown Road Detention Basin, Sacramento, CA



Land Use in the Brown Road Detention Basin Watershed





2.20.2001

Constituents and Analytical Methods – Brown Road Basin, Sacramento

<i>Constituent</i>	<i>Method¹</i>	<i>Type of Sample</i>	<i>Reporting Limit (mg/L)</i>
Total Organic Carbon	415.1	Composite	1
Dissolved Organic Carbon	415.1	Composite	1
Biochemical Oxygen Demand	405.1	Composite	3
Total Suspended Solids	160.1/160.2	Composite	20
Copper Lead Zinc	1638M ICP/MS	Composite	0.01 0.007 0.01
Coliform, fecal and total	SM 9221 B&E	Grab	2 to 2E6
Organochlorinated Pesticides	8081	Composite	*
Organophosphate Pesticides	8141	Composite	*
Semi & non-volatile organics	625	Composite	*

Storm Event-based Monitoring Issues

Add to the list:

For detention basins, water goes in,
but doesn't come out:

Inlet Sample without Outlet Sample

Brown Road Basin Monitoring Dates

<i>Event</i>	<i>Location</i>	<i>Date</i>
Basin Event 1	Inlet	10/9/1997
	Outlet	NA
Basin Event 2	Inlet	11/25/1997
	Outlet	11/27/1997
Basin Event 3	Inlet	1/9/1998
	Outlet	1/14/1998
Basin Event 4	Inlet	1/29/1998
	Outlet	1/31/1998
Basin Event 5	Inlet	1/18/1999
	Outlet	1/20/1999
Basin Event 6	Inlet	1/31/1999
	Outlet	2/1/1999
Basin Event 7	Inlet	2/17/1999
	Outlet	2/21/1999
Basin Event 8	Inlet	4/8/1999
	Outlet	4/10/1999
Basin Event 9	Inlet	11/7/1999
	Outlet	NA
Basin Event 10	Inlet	11/18/1999
	Outlet	NA
Basin Event 11	Inlet	1/23/2000
	Outlet	1/27/2000
Basin Event 12	Inlet	2/20/2000
	Outlet	2/25/2000
Basin Event 13	Inlet	4/17/2000
	Outlet	4/19/2000
Basin Event 14	Inlet	1/8/2001
	Outlet	NA
Basin Event 15	Inlet	2/19/2001
	Outlet	2/21/2001
Basin Event 16	Inlet	2/22/2001
	Outlet	2/25/2001
Basin Event 17	Inlet	3/2/2001
	Outlet	3/6/2001
Basin Event 18	Inlet	4/6/2001
	Outlet	4/10/2001

Results of t-Test Comparisons for Event Mean Concentration Data, 1997-2001

Total Copper (ug/L)	-3.19	-38%	0.0067	Yes
Total Lead (ug/L)	-1.42	-51%	0.0054	Yes
Total Zinc (ug/L)	-35.94	-59%	0.0019	Yes
Dissolved Copper (ug/L)	-0.10	-3%	0.8995	No
Dissolved Lead (ug/L)	+0.08	+25%	0.9852	No
Dissolved Zinc (ug/L)	-5.58	-28%	0.1737	No
BOD (mg/L)	+25.95	+190%	0.4635	No
DOC (mg/L)	+1.41	+9%	0.5438	No
TOC (mg/L)	-9.58	-32%	0.7134	No
TSS (mg/L)	-87.02	-77%	0.0005	Yes
Total Coliform (MPN/100ml)	-67155	-53%	0.4828	No
Fecal Coliform (MPN/100ml)	-21758	-67%	0.4602	No
Chlorpyrifos (ug/L)	-0.03	-38%	0.5333	No
Diazinon (ug/L)	-0.18	-38%	0.1133	No
Bis(2-ethylhexyl) phthalate (ng/L)	-202.0	-38%	0.1622	No
Butylbenzyl phthalate (ng/L)	-88.0	-47%	0.0562	No
Diethyl phthalate (ng/L)	-27.3	-24%	0.9707	No
Dimethyl phthalate (ng/L)	-20.4	-42%	0.4709	No
Di-n-octyl phthalate (ng/L)	-61.6	-58%	0.0542	No

Three Fresno Detention Basins

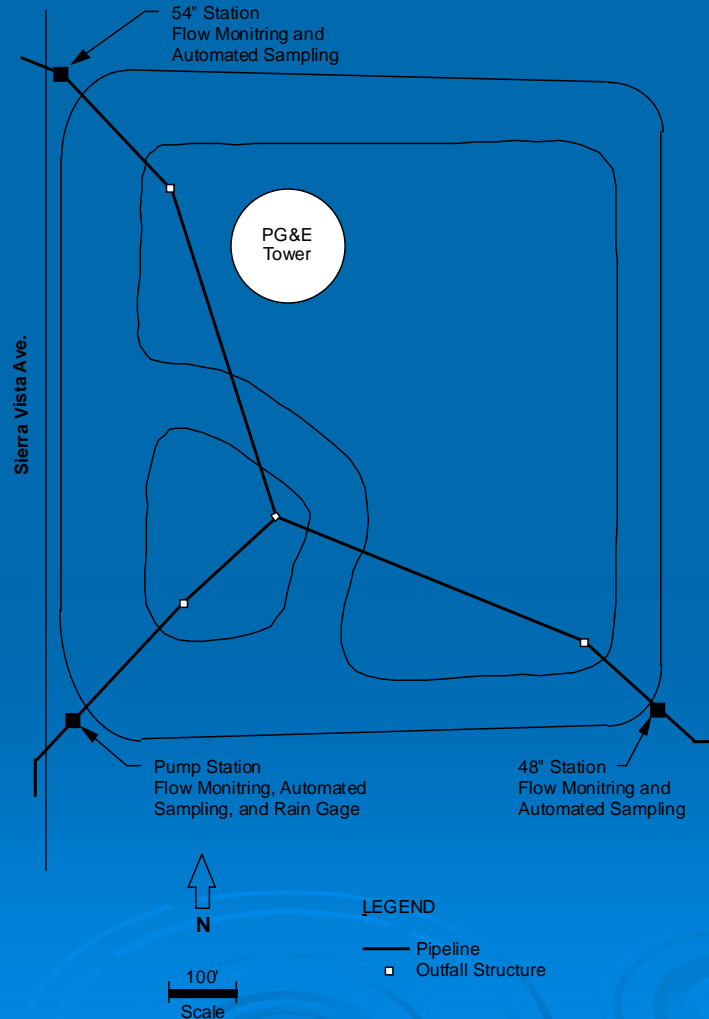
Basin C and Basin V

- Older: Flood control, GW recharge, some water quality benefit
- Fully landscaped, recreational use in dry season
- Pumped outlet

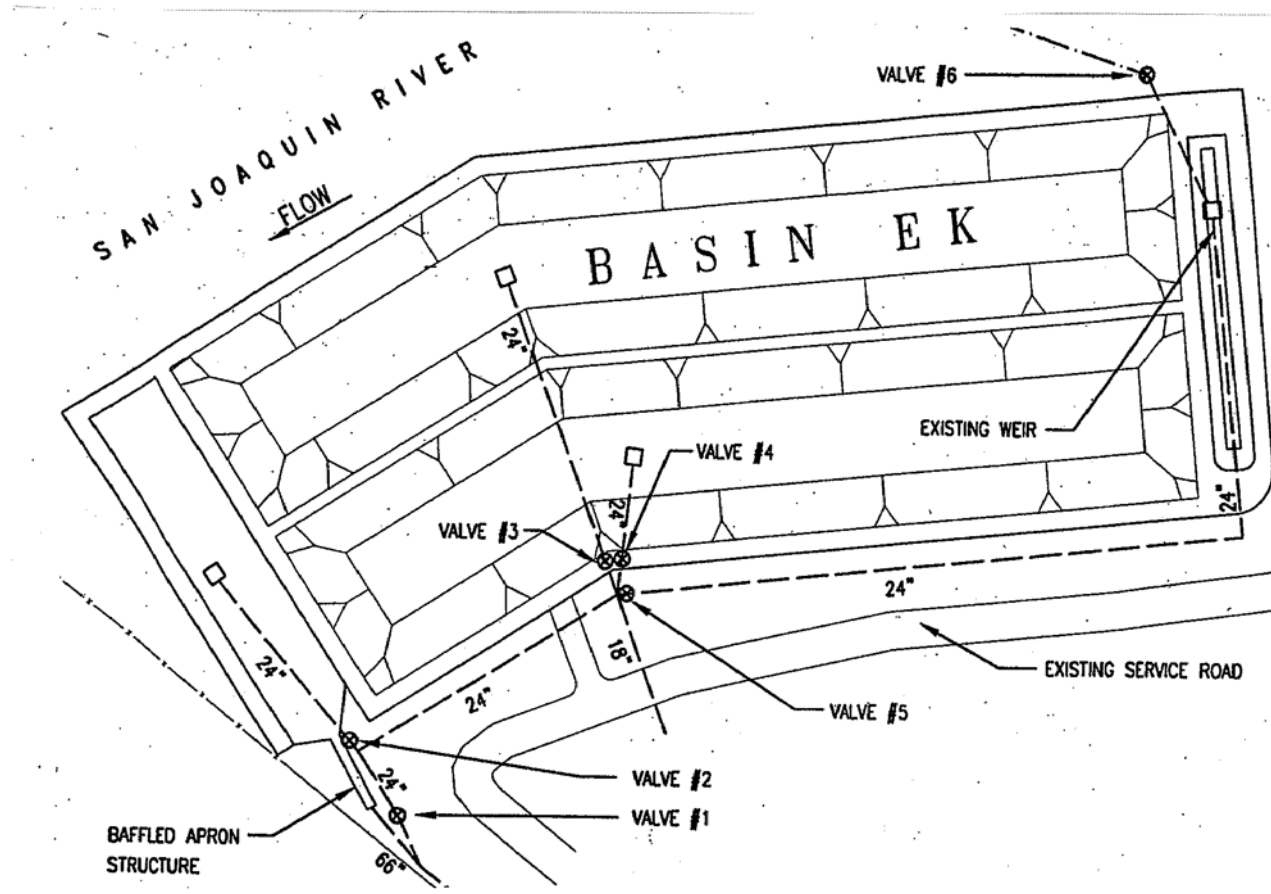
Basin EK

- Newer: Flood control with water quality treatment design
- Gravity-flow outlet

Schematic of Basin "V", Fresno, CA



Schematic of Basin EK







Percent Removals for Fresno Basins C, V, EK – Conventionals

		Inlet	Outlet	% Removal
Chemical Oxygen Demand (COD)	mg/L	88.1	46.8	47%
Solids, Total Dissolved (TDS)	mg/L	67.9	49.6	27%
Solids, Total Suspended (TSS)	mg/L	53.3	14.3	73%
Carbon, Total Organic (TOC)	mg/L	24.5	14.5	41%

Percent Removals for Fresno Basins C, V, EK – OP Pesticides

		Inlet	Outlet	% Removal
Chlorpyrifos	µg/L	0.06	0.06	8%
Diazinon	µg/L	0.9	0.63	30%
Malathion	µg/L	0.12	0.14	-11%
Prowl	µg/L	0.17	0.13	26%

Percent Removals for Fresno Basins C, V, EK – Semi/Non-Volatiles

		Inlet	Outlet	% Removal
Bis(2-ethylhexyl) phthalate	ng/L	1780	708	60%
Butylbenzyl phthalate	ng/L	313	348	-11%
Diethyl phthalate	ng/L	851	597	30%
Dimethyl phthalate	ng/L	140	85	39%
Di-n-butyl phthalate	ng/L	403	360	11%
Di-n-octyl phthalate	ng/L	290	86	70%
Pentachlorophenol	ng/L	153	115	25%

Percent Removals for Fresno Basins C, V, EK - PAHs

		Inlet	Outlet	% Removal
2-Methylnaphthalene	ng/L	20	6.1	69%
Benzo(a)anthracene	ng/L	183	9.9	95%
Benzo(a)pyrene	ng/L	279	13.4	95%
Benzo(b)fluoranthene	ng/L	538	40.7	92%
Benzo(e)pyrene	ng/L	96	29.4	69%
Benzo(ghi)perylene	ng/L	321	23.5	93%
Benzo(k)fluoranthene	ng/L	288	34.9	88%
Chrysene	ng/L	512	60.5	88%
Fluoranthene	ng/L	717	91.3	87%
Indeno(1,2,3-cd)pyrene	ng/L	301	22.6	93%
Naphthalene	ng/L	25.5	8.7	66%
Phenanthrene	ng/L	206	24.1	88%
Pyrene	ng/L	612	75.6	88%

Keys to Producing Meaningful/Useful Data

- **Appropriate Sampling/Analytical Techniques**
 - Event-based, flow-proportioned composite samples
 - Clean sampling techniques
 - Low lab detection limits
- **Commitment to monitoring**
- **Appropriate data analysis**
 - Statistical techniques/use of NDs

NEW CONTACT INFO

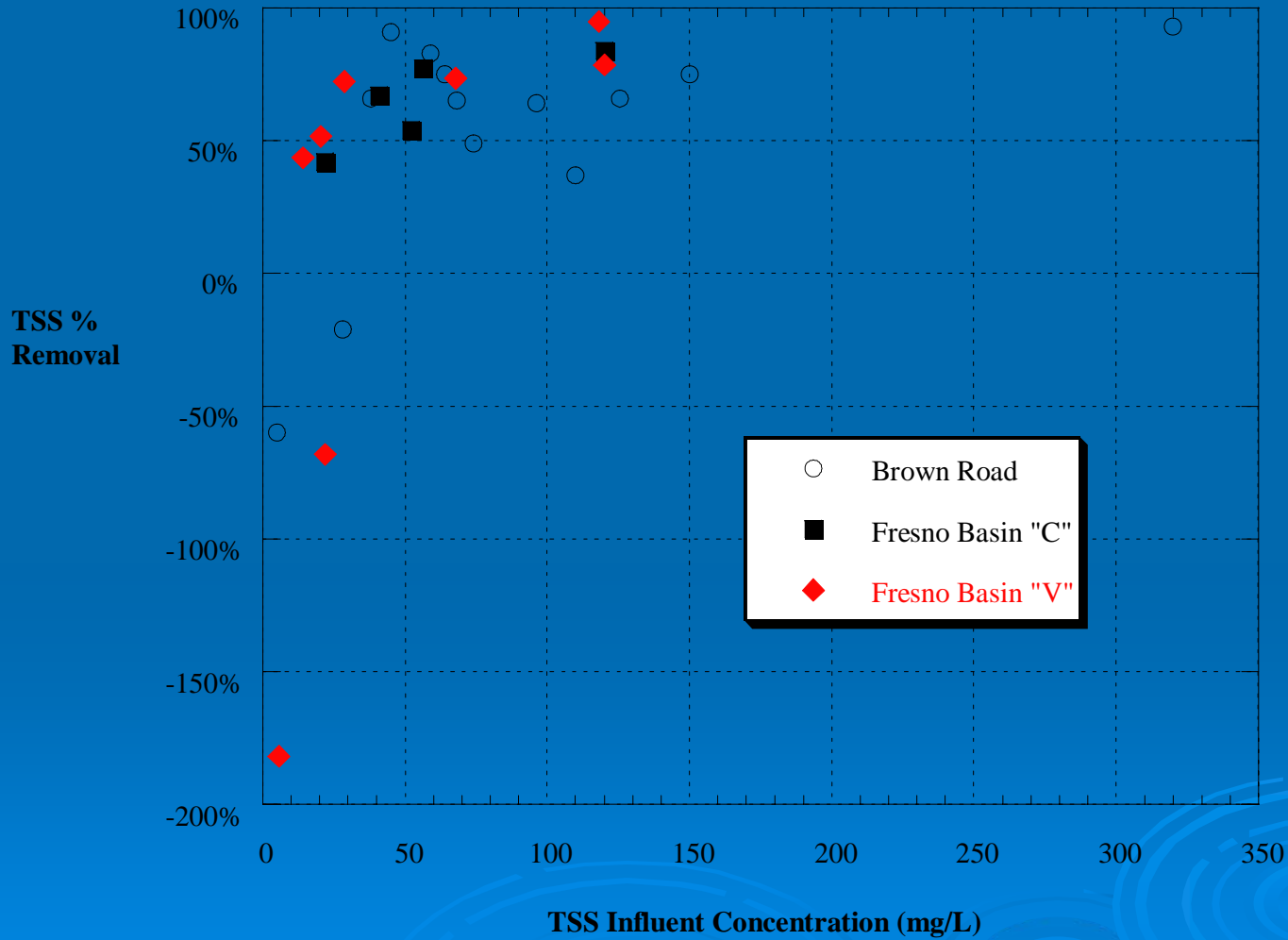
As of July 31st:

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530-668-5612

**Percent TSS Removal vs. Influent Concentration,
Brown Road Basin and Fresno Basins**



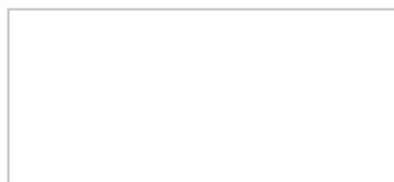
DATA ANALYSIS TOOL - REGRESSION ON ORDER STATISTICS (ROS) RESULTS



Constituent: Pb, Total (µg/L)

n: 22

% Detected: 77.27%



Regression on Order Statistics

Mean: 5.31082047 JackKnife

Std. Dev.: 5.87001234 6.27925339

95% Lower C.I.: 2.85789843 2.68688748

95% Upper C.I.: 7.76374251 7.93475346

Grouping

Geographical

Site_ID_10-02

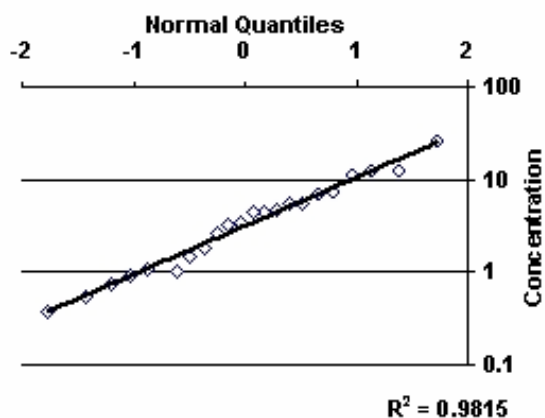
Analytical

NA

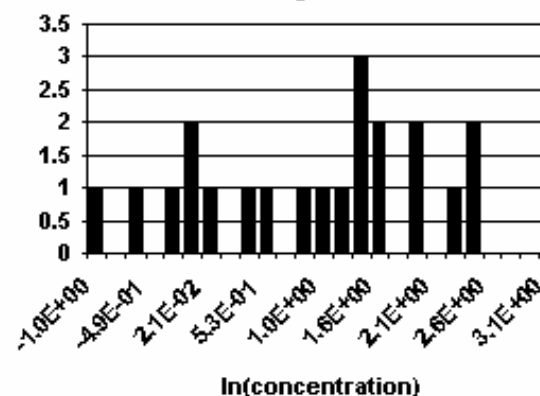
Sampling

NA

Regression on Order Statistics



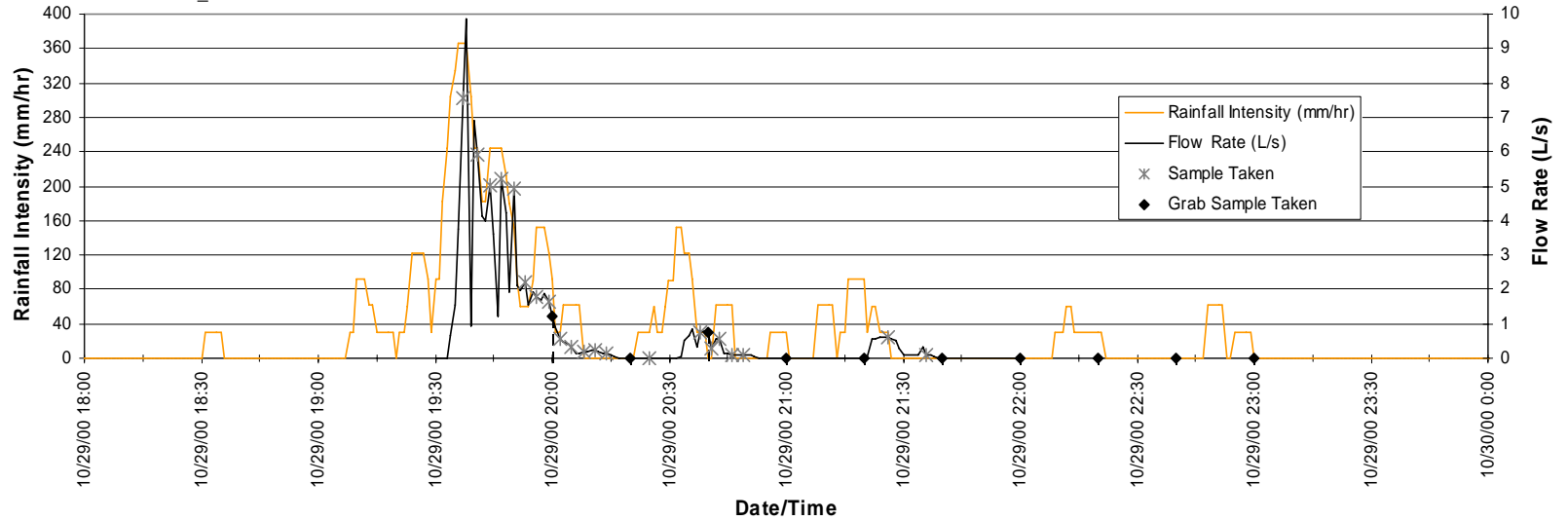
Log Transformed ROS Data Histogram



Event Summary

Site: HWY (HWY-01)
Event: LAW_CT-01

Catchment Area (ha): 0.001
Assumed Fraction Runoff/Rain Volume: 1



Rain Data

Start Date/Time: 10/29/00 18:31
Stop Date/Time: 10/30/00 00:03
Event Rain (mm): 197.20
Max Intensity (mm/hr): 366.00

Runoff Data

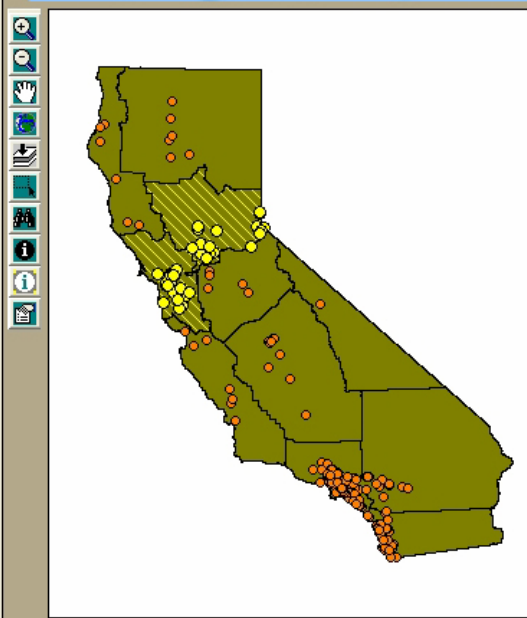
Start Date/Time: 10/29/00 19:30
Stop Date/Time: 10/29/00 22:00
Total Flow Volume (L): 6378
Peak Flow (L/s): 9.84
Obs. Fraction Runoff/Rain Volume: 3.234

Sample Data

Start Date/Time: 10/29/00 19:30
Stop Date/Time: 10/29/00 21:38
Estimated Percent Capture: 95%
Successful Aliquots: 21

Notes: Sample 2 data.

CALTRANS Storm Water Management Program



Select For Query District Clear Map Selections

Site ID: All Sites Selected

View By Site ID
View By CT District
View By RWQCB

Show Additional Map Features

Major Interstate Highways All California Roadways
 All Interstates, Freeways, and Expressways

Select Data Type
Water Chemistry

Select Primary Query Parameters

Regional Board
 1 2 3 4 5 6
 All Confirm

Caltrans District
 1 2 3 4 5 6
 All Confirm

Caltrans Site IDs
 3-01 3-02 3-03 3-04 3-05 3-06 3-07 3-08 3-201 3-202
 All Confirm

Select Secondary Query Parameters

Runoff Characterization
 Construction CVIF Hwy
 Maintenance Confirm

Surface Type
 Construction Site Landscape Pavement Right-of-Way Confirm

Sample Source
 Rain Snow melt Snowfall Storm Confirm

Event Representation
 Whole Confirm

Select Remaining Query Parameters

Date: Start 10/30/2001 End 4/26/2002

Constituent Type
 All M N PEST Confirm

Constituent
 Ag As Cd Confirm

All Fraction Diss Total TR Confirm

Get Data For Preview
Show Data Table
Data Analysis Tool
Clear All Selections