Field Collection and Laboratory Measurement Methods

Melissa Turner, M.S.

ESJ Surface Water Quality Monitoring Program Review

January 7, 2020

Order Requirements

- "Monitoring data collected to meet the requirements of the Order must be collected and analyzed in a manner that assures the quality of the data. The third-party must follow sampling and analytical procedures as specified in Attachment C, Order No. R5-2008-005, Coalition Group Monitoring Program Quality Assurance Project Plan Guidelines (QAPP Guidelines) and any revisions thereto approved by the Executive Officer."

(Order R5-2012-0016-08; MRP Attachment B, page 3)

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Who Does ESJWQC Sampling?

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MLJ Samplers

- MLJ has conducted ESJWQC sampling since 2007
- Teams of 2
- Standard Operating Procedure (SOP) trainings
- Annual training refreshers
- Annual safety trainings

Where Does Sampling Occur?

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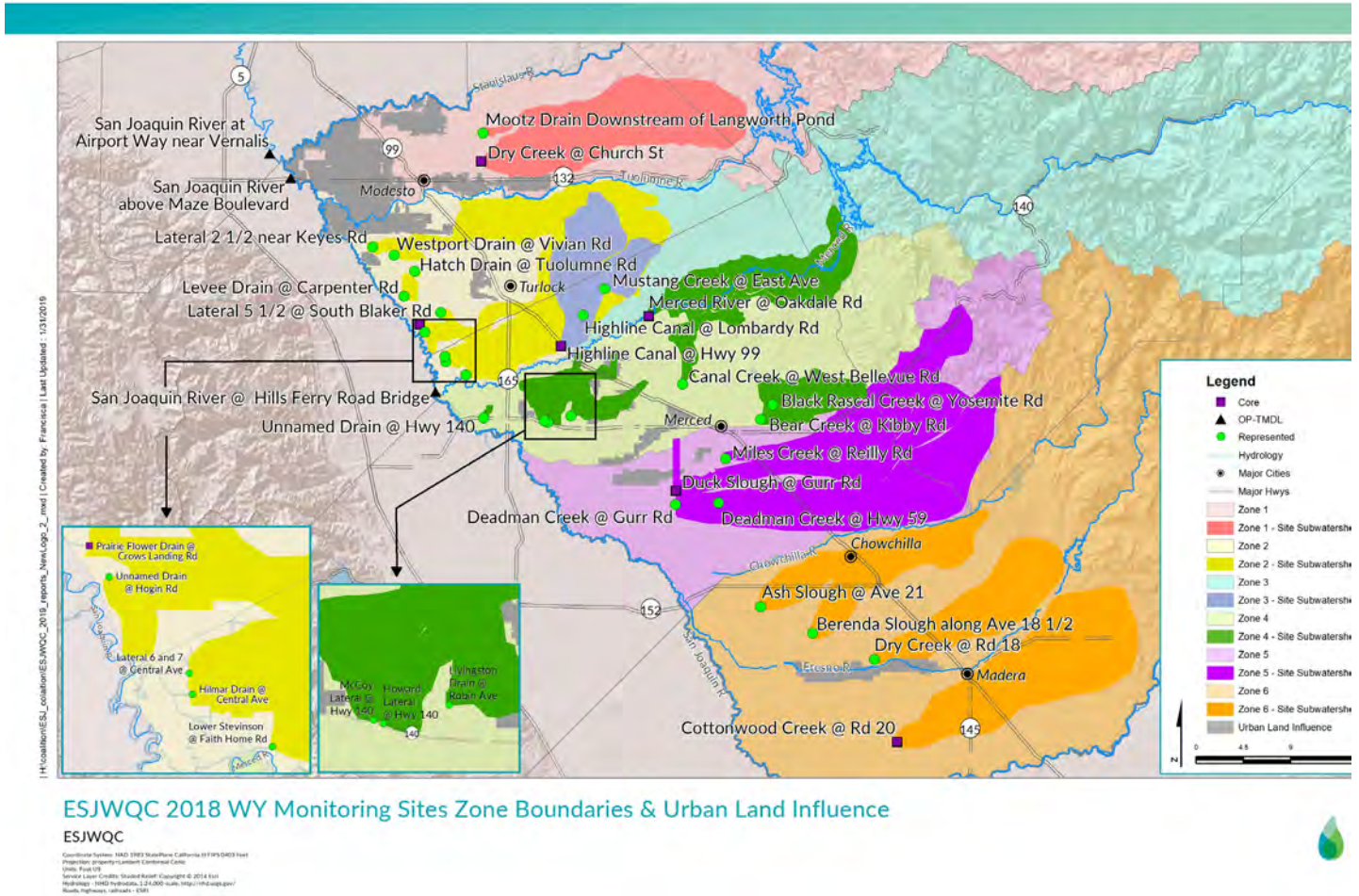
ESJWQC Sampling Locations

- 2018 Water Year
  - 10 – 23 sites per event
- 2 -3 Teams sampling per event (on average 12-hour days)
- Sampling locations range from 1.5 – 3 hours away (from Davis)



ESJWQC 2018 WY Monitoring Sites Zone Boundaries & Urban Land Influence

ESJWQC

When Does Sampling Occur?

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Sampling Frequency

- Monthly sampling for water column constituents
  - Field parameters
  - Water column toxicity
  - Metals
  - Physical Parameters
  - Nutrients
  - Pesticides
- Twice a year sampling for sediment
  - August 15 –October 15, March 1 – April 30
  - *Hyalella azteca* toxicity analysis
  - Grain size and TOC
  - If toxic, additional pesticide analysis

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How Does Sampling Occur?

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Field Parameters

- Field Parameters Collected Every Event
  - Dissolved Oxygen
  - pH
  - Specific Conductance
  - Temperature (water)
  - Temperature (air)
- Collected with a Multi Parameter (YSI)
  - Calibrated prior to sampling and again after sampling to assess instrumentation drift

Site Information

- Actual Latitude / Longitude
- Habitat
  - Color
  - Odor
  - Wind
  - Estimate of rain prior to sampling
  - Documentation of structures near sampling (e.g. culvert, bridge, etc)
- Flow
  - Flow measurements using USGS methods or existing stream gauge
  - Used to calculate cubic feet per second (cfs)

Sample Collection – Surface Water

- Goal is to have the sample representative of the water body
- Avoid eddies and stagnant water
- In most cases samples are a grab sample (direct to bottle)
- When suitable, samples may be depth and width integrated
- Sampler safety is always first

	Analytical Parameter	Sample Volume	Sample Container	Initial Preservation/Holding Requirements	Holding Time
Physical Parameters	Total Suspended Solids	2000 mL	1x 2000 mL Polyethylene	Store at <6°C	7 Days
	Turbidity	2000 mL			7 Days
	Total Dissolved Solids	500 mL	1x 500 mL Polyethylene	Store at 4°C	7 days
	Total Organic Carbon	120 mL	3x 40 mL Amber glass VOA with PTFE-lined cap	Preserve with HCl, store at <6°C	28 Days
Nutrients	Ammonia and Nitrate-Nitrite as N	500 mL	1x 500 mL Polyethylene	Store at <6°C, preserve to pH < 2 with H2SO4	28 Days
	Soluble Orthophosphate	2000 mL	1x 2000 mL Polyethylene	Store at <6°C	48 Hours
Metals	Metals/Trace Elements, Hardness	500 mL	1x 500 mL Polyethylene	Filter as necessary; Store at <6°C, preserve to pH ≤ 2 with HNO3	180 Days
Pathogens	E. coli	150 mL	1x 150 mL Polyethylene	Preserved with Na2S2O3, store at <8 °C	24 Hours
Pesticides	Pesticides	1 L	2x 1 L Amber Glass Jar	Store at <6°C; extract within 7 days	40 Days
	Paraquat	500 mL	1x 500 mL polyethylene		21 Days
	Glyphosate	80 mL	2x 40 mL Amber glass VOA with PTFE-lined cap		6 Months
Water and Sediment Column Toxicity	Aquatic Toxicity	3 Gallons	3x 1 Gallon Amber Glass Jar	Store at <6°C; freeze (-20°C) within 2 weeks	36 Hours
	Sediment Toxicity	2 L	2x 1L Clear Glass Jar	Store at <6°C, do not freeze	14 Days
	Sediment Grain Size	8 oz.	1x 250 mL Glass Jar		28 Days
	Sediment Total Organic Carbon	8 oz.	1x 250 mL Glass Jar	Store at <6°C (not frozen), analyze or freeze (-20C) within 28 days	28 Days (not frozen) 12 Months (frozen)
	Sediment Chemistry	8 oz.	1x 250 mL Amber Glass Jar	Store at <6°C (not frozen), freeze within 48 hours	12 Months
	Sediment Total Solids	8 oz.	1x 250 mL Glass Jar	Store at <6°C	7 Days

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Sample Collection

- Sample Preservation
  - Bottles contain preservative in them (received from the laboratory)
  - Filtering is done in the field
  - Samples put on ice right away
- Reduce Potential for Contamination
  - Direct to bottle when possible
  - Clean hands / dirty hands procedures
  - Ice is monitored throughout the day to ensure that samples are not submerged in melted ice water
  - Small bottles are ziplocked inside of ice chest

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Sample Collection- Sediment

- Integrated sample
- Goal is to collect the top 2 cm of recently deposited sediment

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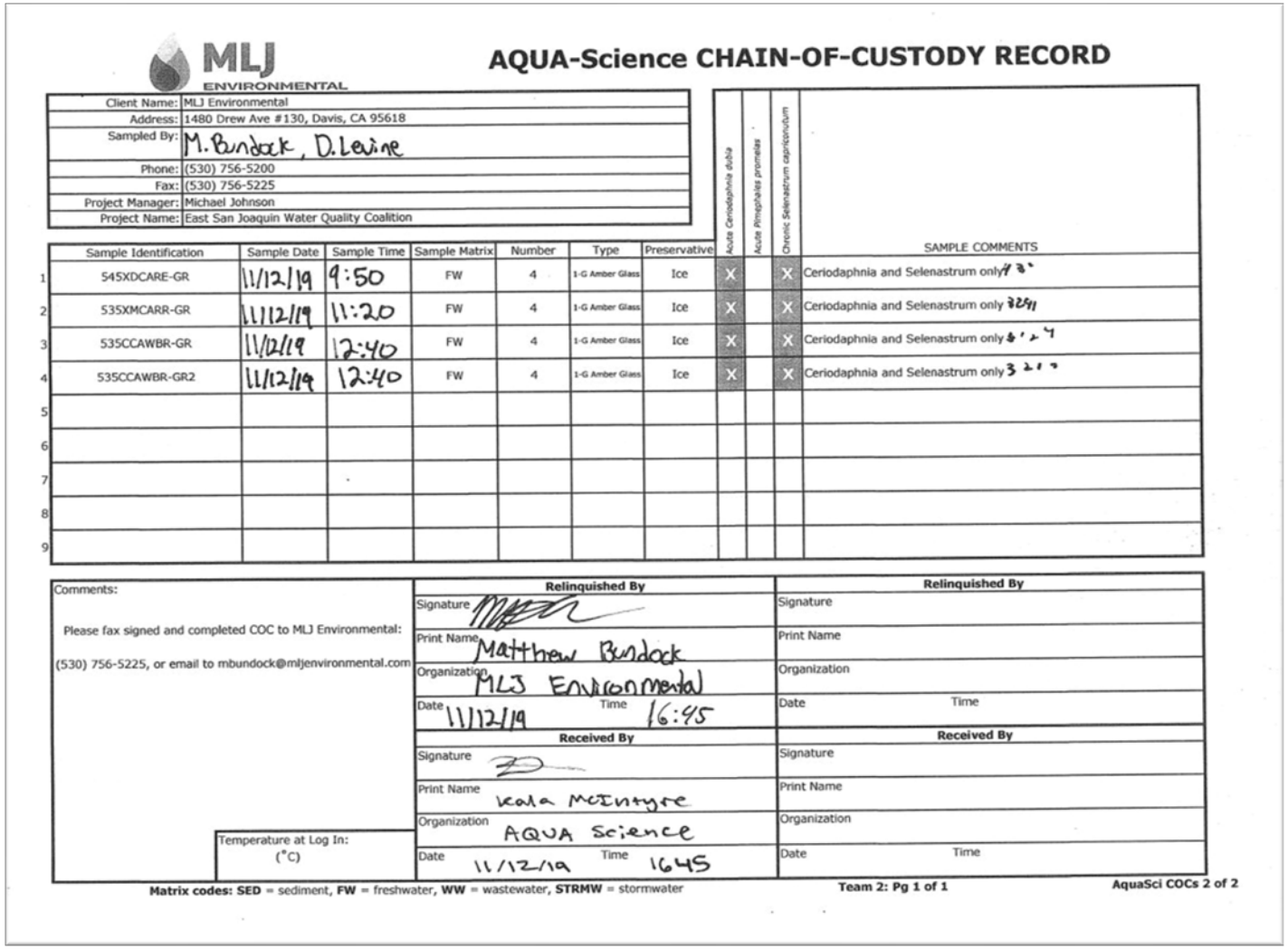
Field QC

- Field Blanks
- Field Duplicates
- Equipment Blanks
- Travel Blanks

Chain of Custody Forms

- Sample ID
- Sample Date
- Sample Time
- Constituent to be analyzed
- Special instructions (e.g. specified sample to do Matrix Spike)
- Signed each time the sample transfers hands



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AQUA-Science CHAIN-OF-CUSTODY RECORD

Client Name:	MLJ Environmental
Address:	1480 Drew Ave #130, Davis, CA 95618
Sampled By:	M. Bundock, D. Leine
Phone:	(530) 756-5200
Fax:	(530) 756-5225
Project Manager:	Michael Johnson
Project Name:	East San Joaquin Water Quality Coalition

	Sample Identification	Sample Date	Sample Time	Sample Matrix	Number	Type	Preservative	Acute Ceriodaphnia dubia	Acute Pimephales promelas	Chronic Selenastrum capricornutum	SAMPLE COMMENTS
1	545XDCARE-GR	11/12/19	9:50	FW	4	1-G Amber Glass	Ice	X		X	Ceriodaphnia and Selenastrum only
2	535XMCARR-GR	11/12/19	11:20	FW	4	1-G Amber Glass	Ice	X		X	Ceriodaphnia and Selenastrum only
3	535CCAWBR-GR	11/12/19	12:40	FW	4	1-G Amber Glass	Ice	X		X	Ceriodaphnia and Selenastrum only
4	535CCAWBR-GR2	11/12/19	12:40	FW	4	1-G Amber Glass	Ice	X		X	Ceriodaphnia and Selenastrum only
5											
6											
7											
8											
9											

Comments:

Please fax signed and completed COC to MLJ Environmental:

(530) 756-5225, or email to mbundock@mljenvironmental.com

Temperature at Log In: (°C)

Relinquished By		Relinquished By	
Signature		Signature	
Print Name	Matthew Bundock	Print Name	
Organization	MLJ Environmental	Organization	
Date / Time	11/12/19 / 16:45	Date / Time	
Received By		**Received By**	
Signature		Signature	
Print Name	Kala McIntyre	Print Name	
Organization	AQUA Science	Organization	
Date / Time	11/12/19 / 1645	Date / Time	

Matrix codes: SED = sediment, **FW** = freshwater, **WW** = wastewater, **STRMW** = stormwater

Team 2: Pg 1 of 1 **AquaSci COCs 2 of 2**

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Sample Delivery

- After sample collection, field sheets, COCs and labels are verified.
- Samples stored on ice in MLJ receiving room until courier pick up
- FedEx delivery next day

Who Does the Analysis?

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APPL LABS

North Coast Laboratories Ltd.

AQUA SCIENCE

Caltest
ANALYTICAL LABORATORY

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What Analysis are Performed?

Davis, CA

- **Water Column Toxicity**
  - Acute toxicity to *Ceriodaphnia dubia* and *Pimephales promelas* by EPA 821-R-02-012
  - Chronic toxicity to *Selenastrum capricornutum* by EPA 821-R-02-013
- **Sediment Toxicity**
  - 10-day survival and Growth of *Hyalella azteca* by EPA 600/R-99-064
  - Subcontracted to Enthalpy Analytical/Nautilus Laboratories

AQUA SCIENCE

NAUTILUS ENVIRONMENTAL
TOXICITY LABORATORY & CONSULTING

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Clovis, CA

- **Organic Pesticides**
  - Organochlorines by EPA 8081A
  - Organophosphates and Triazines by EPA 8141A
  - Chlorinated Herbicides by EPA 8151A
  - Solvent-Extractable Nonvolatiles by EPA 8321A

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Napa, CA

- Pyrethroid Pesticides in Surface Water and in Sediments by EPA 8270M (with negative chemical ionization)
- *E. coli* by SM 9223 B
- **Water Column Physical Parameters**
  - Turbidity by EPA 180.1
  - Total Suspended Solids by SM 2540 D
- **Inorganics**
  - Hardness by SM2340C
  - Total and Dissolved Organic Carbon by SM 5310 B
- **Metals** by EPA 200.8 (ICPMS)
- **Nutrients**
  - Nitrate + Nitrite (as N) - EPA 353.2
  - Total Ammonia - SM 4500-NH3C
  - Soluble Orthophosphate - SM 4500-P E
- **Sediment Physical Parameters**
  - Total Organic Carbon in Sediments by by EPA 9060
  - Grain Size by Plumb, 1981, GS
  - Subcontracted to Soil Control Lab

Caltest
ANALYTICAL LABORATORY

ANALYTICAL CHEMISTS
and
BACTERIOLOGISTS
Approved by State of California
SOIL CONTROL LAB
42 HANGAR WAY
WATSONVILLE
CALIFORNIA
95076
USA

MLJ
ENVIRONMENTAL

Arcata, CA

North Coast Laboratories Ltd.

- **Organic Pesticides**
  - Volatiles by EPA 8260BM
  - Glyphosate by EPA 547M
  - Paraquat by EPA 549.2M
  - Dithiocarbamates by EPA 630
  - Organonitrogen pesticides by EPA 633
  - Assorted pesticides by NCL ME 340

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How are the analysis performed?

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Laboratory Analysis

- EPA or Standard Methods (SM) – ILRP QAPP Guidelines
  - Alternative methods by the United States Geological Survey (USGS), American Society of Testing Materials (ASTM), and Association of Official Analytical Chemist (AOAC) may be used by accredited laboratories.
- Performed according to Standard Operating Procedures and requirements outlined within the QAPP
  - Any changes to the methods must be submitted as an amendment to the QAPP including the associated SOP
  - Rational must be provided for using a method not listed by the Guidelines

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Quality Assurance Project Plan

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Annual QAPP Amendments

QAPP documents all measurement quality objectives and standard operating procedures

Any changes to laboratory or sampling protocols are submitted in a QAPP Amendment once a year

Any deviations to methods (field or laboratory) are documented in the Annual Report; if needed, corrective actions are implemented

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Measurement Quality Objectives

Precision	Accuracy	Contamination	Completeness
• Field Duplicates • Laboratory Duplicates	• Calibration • Matrix Spikes • Laboratory Control Spikes	• Field Blanks • Laboratory Blanks	• 90% within MQOs

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East San Joaquin Water Quality Coalition

Questions