Chapter Four

Sample Processing

Reservoir Sites

Water quality samples or lake profiles should be taken from established reservoir stations marked by an anchored buoy or identified by a prominent landmark. This location should be verified using a GPS. Surface samples should be collected at about 3-feet (1-meter) depth. Reservoir elevations can be included as a note and entered into FLIMS in the "Sample Description" field. Do not collect surface samples from the surface film. Unusual reservoir conditions should also be noted.

Sample Type

Most water quality samples collected from the SWP are grab or *discrete* samples. That is, they are a single sample from one place and point in time.

Other types of samples can be collected that integrate a number of individual samples into a composite sample. Composite samples are useful if the target parameter is expected to change in concentration in either time or space (depth). Automatic samplers such as those made by ISCO and Manning are available to collect individual samples at specific time intervals and composite them into one sample.

Normally, a single grab sample will be used for ongoing assessment of water quality conditions; however, on some occasions, composite samples may be required.

Automated water quality stations provide composite samples by averaging a series of twelve discrete readings collected at five-minute intervals.

Table 6. Sample Bottles, Preservatives and Holding Times

Code	Analysis	No	Size	Container	Filter	Preserv-ative	Hold Time
1	Standard Mineral 32-34, 39,41, 54,58 27-29	1 1	1 qt 0.5 pt	poly poly	yes yes	None 1 mL HNO_3	7 days
2	Standard Nutrient 40,43,45,46,48	1 1	0.5 pt 0.5 pt	poly poly	yes no	Cool 4 °C Cool 4 °C	28 days
3	O&M Misc. Pesticides Sulfur pest. & glyphosate	1 1	1 L [a] 125mL	glass-clear (s) glass-clear (s)	no no	Cool 4 °C Cool 4 °C	7 days
4	Chlorinated Pesticides	1	1 L [a]	glass-clear (s)	no	Cool 4 °C	7 days
5	Nitrogen/Phosphorus Pesticides	1	1 L [a]	glass-clear (s)	no	Cool 4 °C	7 days
6	Herbicides(chlor. phenoxy acid)	1	1 L [a]	glass-clear (s)	no	Cool 4 °C	7 days
7	Volatile Organics (Incl. MTBE)	3 1	40 mL trip blank	Glass-amber	no	Cool 4 °C	14 days
8	THMFP	4	40 mL	Glass-amber	no	Cool 4 °C	14 days
9	Carbamates (531.1)	1	125 mL	glass-clear	yes	Cool 4 °C	28 days
*	*Unassigned*						
11	Arsenic	1	1 pt	poly-acid rinse	yes	1 mL HNO_3	6 months
12	Barium	1	1 pt	poly-acid rinse	yes	1 mL HNO_3	6 months
13	Cadmium	1	1 pt	poly-acid rinse	yes	1 mL HNO_3	6 months
14	Strontium	1	1 pt	poly-acid rinse	yes	1 mL HNO_3	6 months
15	Chromium (all valences)	1	1 pt	poly-acid rinse	yes	1 mL HNO_3	6 months
16	Copper	1	1 pt	poly-acid rinse	yes	1 mL HNO_3	6 months
17	Iron	1	1 pt	poly-acid rinse	yes	1 mL HNO_3	6 months
18	Aluminum	1	1 pt	poly-acid rinse	yes	1 mL HNO_3	6 months
19	Lead	1	1 pt	poly-acid rinse	yes	1 mL HNO_3	6 months
20	Manganese	1	1 pt	poly-acid rinse	yes	1 mL HNO_3	6 months
21	Mercury	1	1 pt	poly-acid rinse	yes	1 mL HNO_3	28 days
22	Nickel	1	1 pt	poly-acid rinse	yes	1 mL HNO_3	6 months
23	Selenium	1	1 pt	poly-acid rinse	yes	1 mL HNO_3	6 months
24	Silver	1	1 pt	poly-acid rinse	yes	1 mL HNO_3	6 months
25	Zinc	1	1 pt	poly-acid rinse	yes	1 mL HNO_3	6 months
26	Molybdenum	1	1 pt	poly-acid rinse	yes	1 mL HNO_3	6 months
27	Calcium	1	1 pt	poly	yes	1 mL HNO_3	6 months
28	Magnesium	1	1 pt	poly	yes	1 mL HNO_3	6 months
29	Sodium	1	1 pt	poly	yes	1 mL HNO_3	6 months
30	Potassium	1	1 pt	poly	yes	1 mL HNO_3	6 months
31	Lithium	1	1 pt	poly-acid rinse	yes	1 mL HNO_3	6 months
32	Alkalinity	1	1 pt	poly	yes	None	14 days
33	Sulfate	1	1 pt	poly	yes	None	28 days
34	Chloride	1	1 pt	poly	yes	None	28 days
35	Fluroide	1	1 pt	poly	yes	None	28 days
36	Bromide	1	1 pt	poly	yes	None	28 days
37	*Unassigned*						
38	Silica	1	1 pt	poly	yes	Cool 4 °C	28 days
39	Boron	1	1 pt	poly	yes	None	6 months
40	Nitrate+Nitrite	1	1 pt	poly	yes	Cool 4 °C	28 days
41	Nitrate	1	1 pt	poly	yes	Cool 4 °C	28 days

Filtering

A water sample should be filtered immediately after collection to minimize sample degradation in the bottle. Filtering the sample in the field is generally preferred unless the sample can be returned to the office within an hour and filtered.

Water samples are filtered to remove suspended particles from the water while the filtrate (dissolved portion) passes through to a collecting vessel. A 0.45 μ pore size filter is used which is the size that separates suspended from dissolved particles. Filtering is important since a number of chemical analyses are aimed at measuring dissolved concentrations.

Filter Cartridges

Disposable cartridge filters are easy to use and will reduce processing contamination **(Figure 4)**.

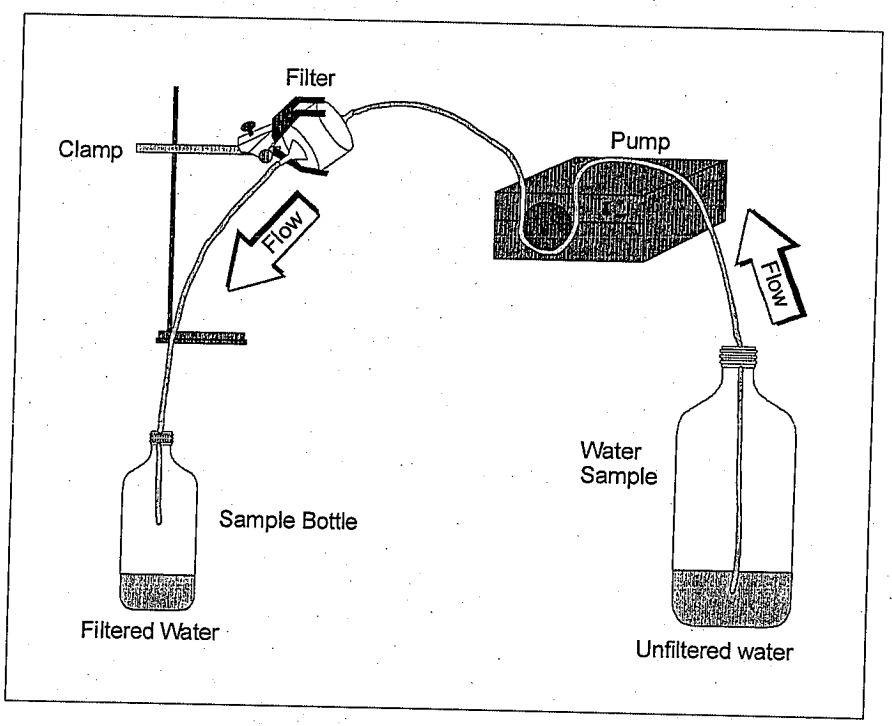
Materials

- Gelman 12176 filter
- Ring stand with clamp
- Pump

Procedure

1. Place the outlet of the sampling pump tubing over the inlet fitting of the filter. The flow label on the filter should point away from the pump. Make sure that the fitting is inserted far enough to avoid leakage around the seal. Tubing should be securely connected to the hose barbs (use a hose clamp if necessary).

Figure 4. ***Cartridge filtering apparatus.***



Sample Preservation

Samples are preserved in the field to prevent degradation of the constituents. Typical preservation techniques include cooling the sample, adding acid, or Lugol's solution for phytoplankton. Specific requirements for the field preservation of samples are in **Table 6**, and general considerations are listed below by category:

1. **Metals** - Fixed with 1 mL of nitric (HNO_3) acid to pH<2. Samples are preserved for 6 months.

2. **Nutrients** - Refrigerate or chill to 4 °C and deliver to the laboratory within 24 hours. If delivery to the laboratory within 24 hours is not possible, freeze the samples immediately after collection and keep them frozen until delivery to the laboratory.

3. **Pesticides** - Refrigerate or chill to 4°C and store in a dark location, deliver to lab within 24 hours. Pesticides do not store well and will degrade in light.

4. **Bacteria -Total and fecal coliform** Refrigerate or chill to 4°C and deliver to the lab within 24 hours. Do not add preservatives.

5. **Taste and Odor- MIB and Geosmin** Refrigerate or chill to 4°C and ship to Metropolitan Water District's Laboratory by overnight express mail within 24 hours to:

   MWD
   700 Moreno Avenue
   LaVerne, CA 91750

Sample Quality Control Data

Quality control during collection, processing, and transportation is an integral part of the SWP water quality program. Quality control procedures are used to assess potential sampling and analytical bias as a result of sample contamination. The quality of the data collected and the validity of any interpretation cannot be evaluated without quality control data.

Two types of samples are used to test sample procedures; blanks and duplicate or replicate samples. Blanks come in three types; trip or blanks, and equipment blanks.

Travel Blanks

Vials or bottles filled with specially prepared water that accompany the sample through all steps of collection and transportation are called travel blanks. These blanks are handled, stored, and treated the same as collected samples. Bryte laboratory prepares and provides these blanks.

Travel blanks are returned to the laboratory and analyzed with the collected sample for the same constituents to determine contamination. Travel blanks accompany VOA samples since contamination from auto exhaust vapors, cleaning chemicals or gasoline could enter the sample vial during collection and transport.

Field Blanks

A field blank is a sample bottle filled with laboratory checked deionized/purified water that is processed in the field, handled the same, and analyzed for the same constituents as the collected sample. The proper preparation of field blanks will ensure that laboratory results reflect actual water quality conditions.

Field Blanks -continued

Field blanks are routinely analyzed for trace metals since their low detection limits can pick up low levels of contamination from dust, surface materials, etc.

Field blanks are used to determine if any steps during sample collection, processing, or transportation altered the concentration of the target constituent. Specifically, field blanks demonstrate that:

1. Equipment cleaning protocols adequately remove residual contamination from previous use.

2. Sampling and sample processing procedures do not result in contamination.

3. Equipment handling and transport between periods of sample collection do not introduce contamination.

One set of field blanks should be collected for each sampling event or run (regular monthly, quarterly, annual or special samples) and type of analysis **(Table 7).** Field blanks should be collected at one selected station, as recommended in **Table 8**. Alternative stations are acceptable if selected randomly. Do not use the same station every month for the field blank.

Field blank bottles must be supplied by the laboratory conducting the analysis and be identical to the collected sample in terms of bottle type and preservative

Replicate Samples

Replicate samples refer to two or more discrete samples collected at the same location and time. These samples are designed to estimate the precision of the analytical results with the combined potential errors from sampling and analysis.

One replicate sample should be collected for each sampling event or run (regular monthly, quarterly, annual or special samples).

Split Samples

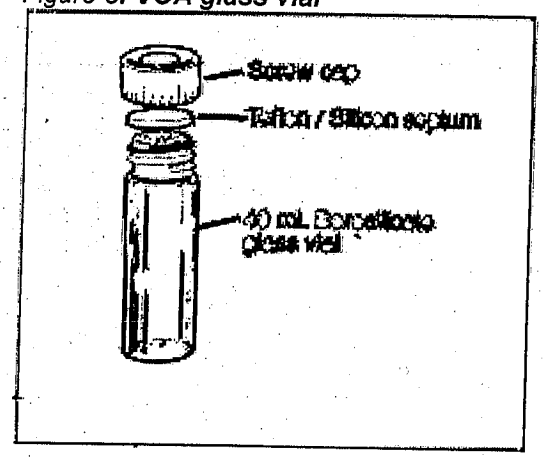
In a split sample, the collected water is divided into two equal portions and placed into two sample bottles. This method is often used to determine analytical variance between different laboratories running the same type of analysis. Split sampling assumes that the two sub samples of the collected sample contain equal constituent levels and any variability in the end product (analytical results) is the result of errors introduced in the laboratory analysis.

Asbestos monitoring uses split samples because of the high variances in the analytical techniques and the sample environment.

In contrast to split samples, replicate samples refer to two or more discrete samples collected at the same location and time.

Volatile Organic Analysis Continued

Figure 5. VOA glass vial



VOA Quality Assurance

Two types of QA samples are utilized during organics monitoring:

Travel or Trip blank
Filled travel blanks should be obtained from Bryte Lab. The travel blank should not be re-opened and should accompany the samples at all times. One travel blank is needed for each group of samples.

Field blank
Fill 2 vials with organic free water during each sampling day. Organic free water is available at Bryte Laboratory.

Giardia and Cryptosporidium

The pathogenic protozoa's *Giardia* and *Cryptosporidium* in water supplies are responsible for Cryptosporidiosis outbreaks of diarrhea or gastroenteritis. Animals and humans may serve as sources of the protozoa. Possible pathways of contamination in the Aqueduct are runoff from cattle grazing and other surface drainage from surrounding watersheds, or from human waste contamination from swimmers in drinking water sources such as reservoirs, as well as inflow from the delta.

A 10-liter unfiltered sample is needed for a Giardia and Cryptosporidium sample. These samples are not processed by Bryte Laboratory and will need to be sent to a contract laboratory.

Method 1623: Cryptosporidium *and* Giardia *in Water by Filtration/IMS/FA is utilized (EPA 821-R-01-025). Details are available at:* http://www.epa.gov/nerlcwww/1623ap01.pdf.

Repeat Sampling

If a routine sample is Total Coliform positive, collect repeat samples within 24 hours of being notified of the positive result.

1. The repeat sample set must include 3 samples for each Total Coliform positive sample.

   a) The repeat sample set must include the site where the original Total Coliform positive sample was taken. The other two samples should include one sample upstream and one sample downstream of the original Total Coliform positive sample site.

2. The repeat samples must be analyzed for Total and Fecal Coliform and e-coli using the multiple tube fermentation method (SM 9221-B).

3. If any of the repeat samples are positive, collect and analyze additional sets of repeat samples. This shall be repeated until no coliforms are detected in one complete repeat sample set.

4. The Department of Health Services must be notified within 24 hours of a positive result.

Bacteriological Collection Procedure Continued

7. The collected samples must reach the laboratory in time for analysis to begin the same day it was collected. The time elapsing between collection and examination should not exceed 24 hours for the results to be valid. The collected samples must be transported using an iced cooler to at least 4 °C.

FLIMS

All samples are processed and tracked through Bryte Lab by a computerized application known as FLIMS. FLIMS stands for **F**ield and **L**aboratory **I**nformation **M**anagement **S**ystem. FLIMS was developed in house by DWR to manage sample collection information, field data, and laboratory data produced by Bryte Labs. Samples sent to external laboratories can be entered in to FLIMS when creating a sample run, but the final analysis information is not tracked by FLIMS.

Each DWR office that routinely collects samples needs to have a local copy of FLIMS. If your office does not have a local copy of FLIMS or you need training in its use, contact Bryte Laboratory.

FLIMS automates many steps that were previously done by hand. FLIMS allows field staff to generate analytical requests, prepare container labels and chain of custody sheets, record field measurements, and integrate Quality Control samples.

FLIMS has a complete user's guide incorporated into the application. Refer to this guide for specific questions. Below is a discussion of points of particular importance to O&M sampling and data analysis.

FLIMS Continued

When setting up run templates and individual samples keep the following in mind:

- Unless there is some kind of emergency, the priority should be "5".
- WDL fate should be changed to 1000 if the sample is an atypical sample i.e. samples taken during a copper treatment.
- Sample matrix for most samples is "natural water" and is "purified water" for blanks.
- Be sure to change the sample depth if the sample is not going to be a surface sample (1 meter).
- The sample description box can be used to indicate any additional information that might help identify this sample. If a sample is drawn in an emergency situation and the station information is incomplete or incorrect, this is the place to note the problems.
- Sample Purpose is typically either "normal sample', "sample blank" or "replicate sample". If a sample is atypical use "experimental sample" for the sample purpose. Examples of atypical samples would include: copper treatments, floodwater inflows, chemical spills. Using this code allows the data to be easily separated out when filling data requests for data users outside of DWR.
- Do not forget to enter field measurements into FLIMS within a week of sampling.

Addresses

Filter Cartridges -vendors
Gelman Model 12176

Gelman Lab
600 South Wagner Road
Ann Arbor, MI 48103-9019

800-521-1520

VWR Scientific
PO Box 7900
San Francisco, CA 94120

Phone: 800-841-0617

Baxter - Healthcare Corporation
Scientific Products Division
PO Box 5011
Hayward, CA 94540-5011

Phone: 800-234-5277

EMSL
1720 South Amphlett Blvd
Suite 130
San Mateo, CA 94402

Phone: 415-570-5401
Fax: 415-570-5402