Florida Department of Environmental Protection

South District

DEP Requirements for Sample Collection

May 2015







What we will cover today:

- General sampling considerations
- Meter calibration and verification
  - Field testing and measurement
- General sampling procedure
  - Surface, Ground and Waste water
- Quality assurance requirements (blanks)
- Documentation requirements

DEP QA Rule Requirements

- Use DEP SOPs (Effective date 7/30/14)

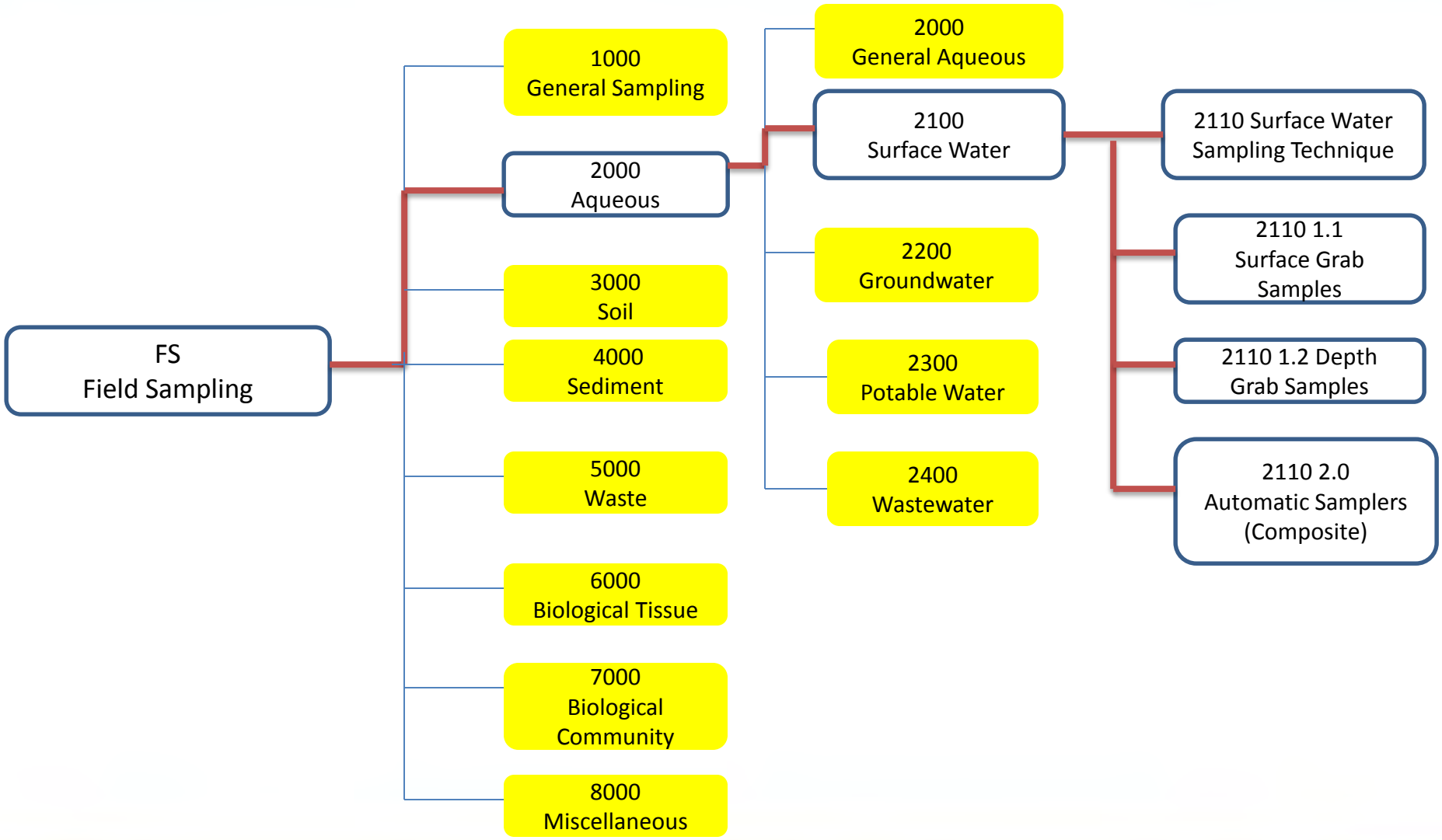
http://www.dep.state.fl.us/water/sas/sop/sops.htm

- Pre-approval for alternative field procedures
- Create and retain mandatory documentation
- Follow preservation & holding times
- Submit to audits

Naming Conventions for Field SOPs

- FA Administrative & Quality Systems
- FC Field Cleaning
- FD Documentation
- FM Mobilization & Laboratory
- FQ Quality Control
- FS Sampling Procedures
- FT Field Testing

SOP Design


FS
Field Sampling
1000
General Sampling
2000
Aqueous
3000
Soil
4000
Sediment
5000
Waste
6000
Biological Tissue
7000
Biological
Community
8000
Miscellaneous
2000
General Aqueous
2100
Surface Water
2200
Groundwater
2300
Potable Water
2400
Wastewater
2110 Surface Water
Sampling Technique
2110 1.1
Surface Grab
Samples
2110 1.2 Depth
Grab Samples
2110 2.0
Automatic Samplers
(Composite)

FT 1000 General Field Testing and Measurement

Using meters to collect data in the field

- Verification
- Calibration
- Documentation

Five terms to know:

- Verification
- Calibration
- Acceptance criteria
- Chronological bracket
- Quantitative bracket

Verification:

- Measuring a known standard with the instrument *as if* the standard was a water sample.

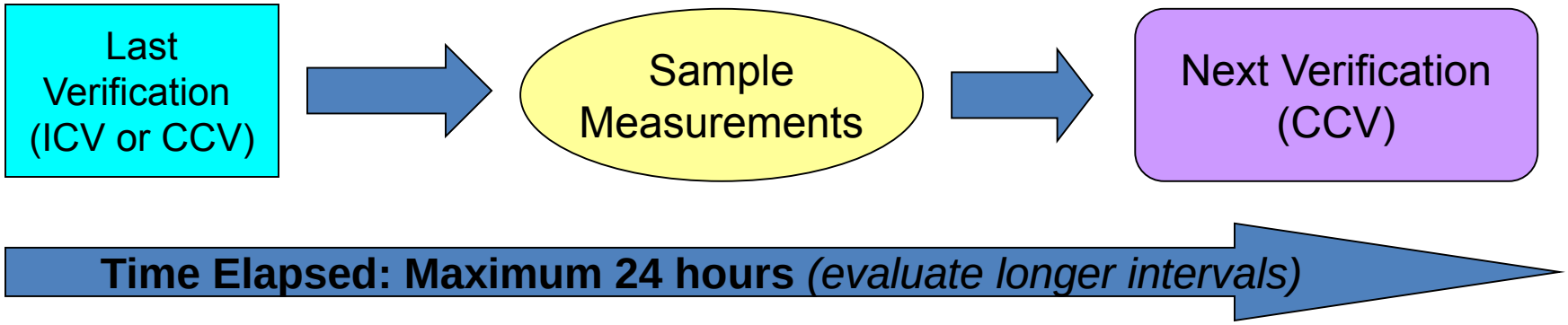
Calibration:

- Changing the reading of an instrument by setting it to a known standard.

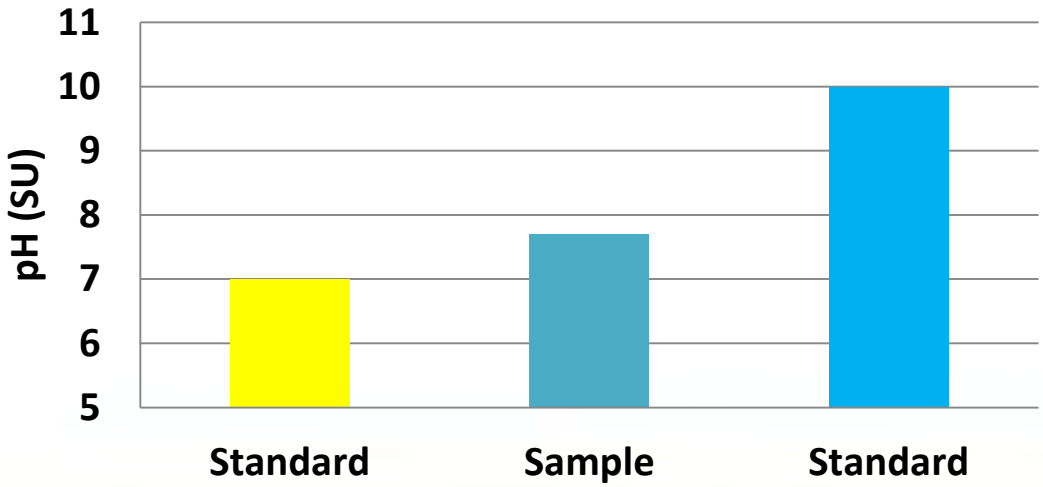
WHY VERIFY?

- Instrument calibrations are not always reliable or stable due to drift or other errors
- Establishes *chronological and quantitative brackets* for the sample measurements

Chronological Verification Bracket



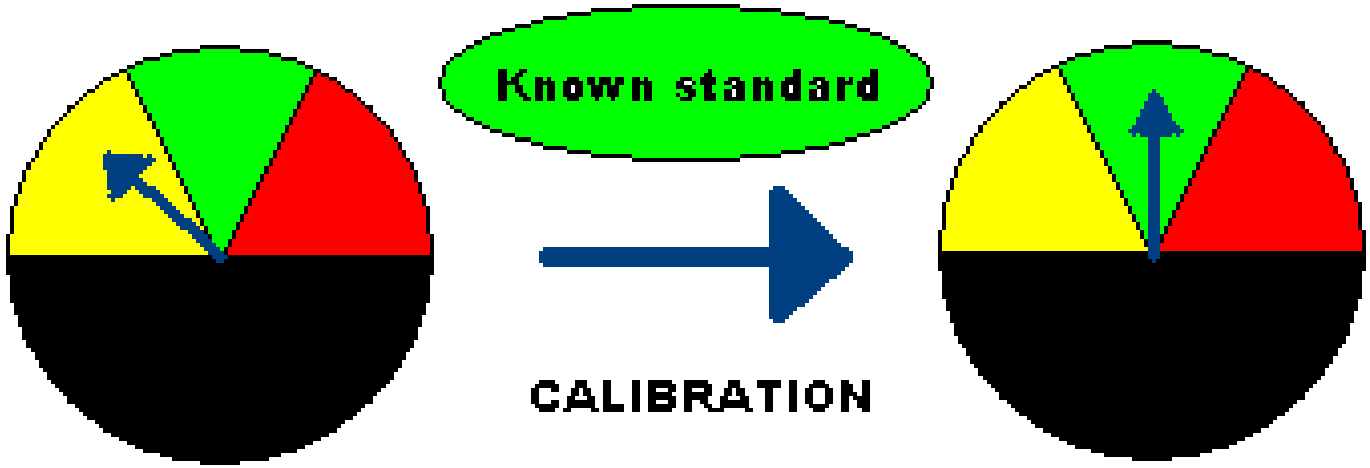
Quantitative Verification Bracket



What if verification fails?

- Repeat verification, if it still fails…
- “J” qualify the sample data

  (J = estimated value)
- Perform calibration



Field Testing Acceptance Criteria per DEP-SOP-001/01

Parameter	Acceptance Criteria
pH	± 0.2 Standard pH Units of calibration buffer
Specific Conductance	± 5% of calibration standard value
Dissolved Oxygen	± 0.3 mg/L of theoretical value
Temperature	± 0.5 °C. of NIST-traceable value (w/correction factors) Verification over range of sample values
Turbidity	0.1-10 NTU : ± 10% of standard value 11-40 NTU : ± 8% of standard value 41-100 NTU : ± 6.5% of standard value > 100 NTU : ± 5% of standard value
Total residual chlorine	0.995 calibration curve correlation coefficient ± 10% of primary standard value ± 10% of secondary standard value Color comparator acceptance criterion ± 10% of primary standard value

FT 1100 pH

- Calibrate with 2 standards (2-point)
    - Start with pH 7
- Rinse probe with deionized water between standards
- Verify with 1 standard
- Bracket with verifications
- Acceptance criterion is ± 0.2 s.u.
- Weekly check % theoretical slope, if meter allows

pH Sample Measurement

- Select representative sampling point
- Ensure flow of refreshed sample around probe
- Stabilize reading before recording
- Because of temperature dependence also be sure of stable temperature reading before recording
- Record value to one decimal place

FT 1200 Specific Conductance

- Conductivity: 1-point calibration
- 100 µmhos standard sufficient for lower end of quantitative bracket
- Ensure stable temperature prior to calibration, verification or sample measurement
- Rinse probe between standards with deionized water.
- Acceptance criteria: ± 5% of calibration standard value

Specific Conductance Sample Measurement

- Select representative sampling point
- Ensure flow of refreshed sample around probe
- Stabilize reading before recording
- Because of temperature dependence also be sure of stable temperature reading before recording

FT 1500 Dissolved Oxygen

- Calibrate and verify with 100% humid air (enclosed chamber)
- Ensure that the temperature is stable
- Set atmospheric pressure (760 mm Hg default)
- Compare meter reading to theoretical saturation (look-up table)
- Acceptance criterion is ± 0.3 mg/L

Dissolved Oxygen

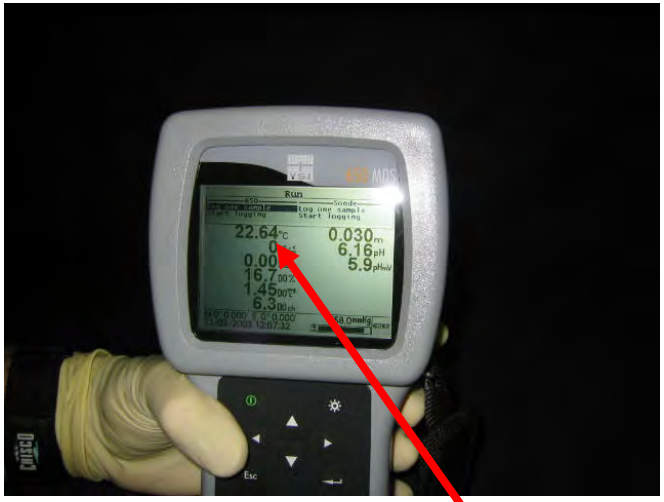


Inspect membrane

Vent to atmosphere



Enclose with saturated air



Ensure stable temperature

DO Sample Measurement

- Select representative sampling point
- Ensure flow of refreshed sample around probe
- Stabilize reading before recording
- Unstable readings indicate temperature fluctuation or DO sensor malfunction
- Low readings may indicate anoxic water column near sediments
- Hydrogen sulfide damages electrode

FT 1400 Temperature

- Verify field-temperature devices against NIST-traceable thermometer
- Bracket sample measurements with appropriate verification temperatures
- Verify at demonstrated time intervals
- Document all deviations from NIST thermometer verification values
- Measure samples *in situ,* to one decimal place

FT 1600 Turbidity



Standard turbidimeter design





In-situ turbidity probes for monitoring well purging and other applications

FT 1600 Turbidity

- Hand-held turbidimeter typically used
- Primary standards for initial calibration
- Secondary standards for everyday use



Settled formazin



Gel standard
(Use for field verification)

Turbidity *Calibration and Secondary Standard Verification*

Calibrate turbidimeter with series of formazin or styrene divinylbenzene standards and turbidity-free water blank

Verify with formazin or styrene divinylbenzene standard

Verify acceptance

±10% for 1 – 10 NTU

±8% for 11 – 40 NTU

±6.5% for 41 – 100 NTU

±5% for >100 NTU

Calibrate or verify secondary standards (if required)

Measure samples

Secondary Turbidity Standards

- ***Use secondary standards for <u>continuing calibration verification only</u>***
- Typically manufacturer-specific
- Field-rugged for routine use
- Assign values using calibrated meter
- Verify against manufacturer tolerances
- Discard when no longer verifiable





Keep fingers away from clean optical vials



Align index marks



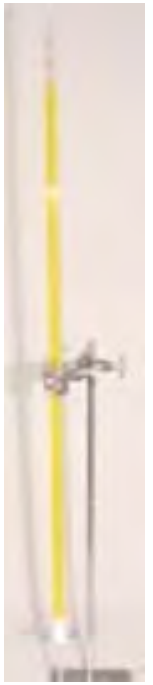
Rinse vial & dry exterior between samples

FT 2000 Residual Chlorine Methods



DPD Colorimetric

Titration







DPD Color comparator
(drinking water only)



Electrode

Basics – DPD Chlorine Meters



- ***Initial calibration verification*** with *primary* standards.
  - Primary standards are made from known concentrations using laboratory techniques
  - Verify meter before first time use (factory-calibrated meters)
    - Annual verification with primary standards thereafter
- The instrument readings must be within 10% of the standard values.
- Secondary standards for everyday use





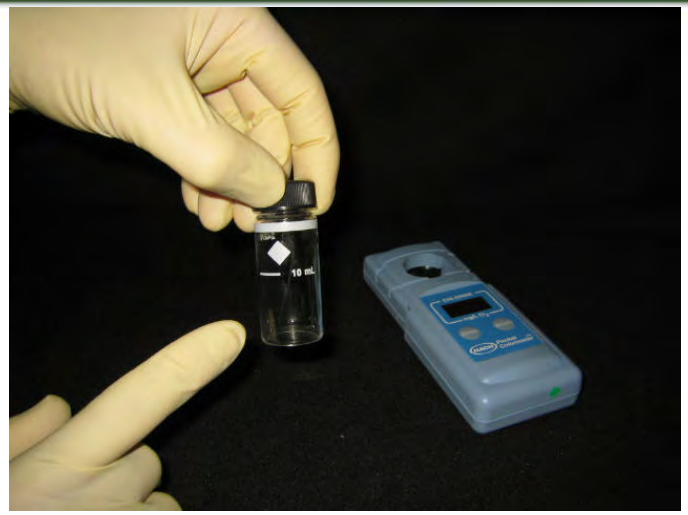


Secondary Standards for Chlorine

Use secondary standards for field verifications

- **Measure** (read) secondary standards with a calibrated meter that has been verified with primary standards
  - At least annually
  - If routine (daily or other) field verifications fail
  - If standards have been discolored or damaged
- **Assign** measured values to the secondary standards
  - Or **accept** previously assigned values
    - Measured values within ±10% of assigned values?
    - If not, are measured values within manufacturer's tolerances?
      - If **yes**, assign new measured values
      - If **no**, discard secondary standards





Keep fingers away from clean optical vials



Mix color reagents with sample



Rinse vial & dry exterior between samples



Align index marks



Cover optical chamber prior to reading sample

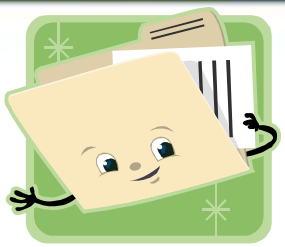
Continuous Monitoring

- Calibration & verification for installed meters
- Same calibration, verification, and bracketing rules apply
  - Calibration prior to installation
- Daily verification with *grab sample*
  - Use *grab sample* acceptance criteria in FT 1900
- Maximum period between verifications is one month

Continuous Monitoring (con't)

- If verification fails-
  - Perform instrument maintenance and reduce time interval.
  - Perform initial calibration when instrument is taken off-line, after preventative maintenance, or immediately after verification criteria are not met.

FD 1000 Documentation



- Sign or initial all documentation.
- Record enough information so interpretations are not necessary.
- Clearly link documentation with the associated sample or measurement.
- Make corrections with a line through the error so that it is still legible. Initial the error and its correction.
- Keep electronic or hard copies of all documentation for at least 5 years after the date of generation or completion of the documentation.

BLAB Water Field Form 031306.doc

SITE NAME: Water Pond DATE: 01/01/2006 TIME 1200 (military) EST CST DEPTH^: 1 ft m FIELD ID: 1234ab

SAMPLING TEAM MEMBERS	WQ MEASUREMENTS	DOCUMENTATION	SAMPLE COLLECTION	PRESERVATION	PRESERVATION CHECK
Holly Sample			✓		✓
Mark Metric	✓	✓			
John Gather				✓	

SAMPLING EQUIPMENT

- ☑ Sample Container
- ☐ Pole
- ☐ Pump ID#: _____
- ☐ Tubing type: _____
- ☐ Other _____
- ☐ Other

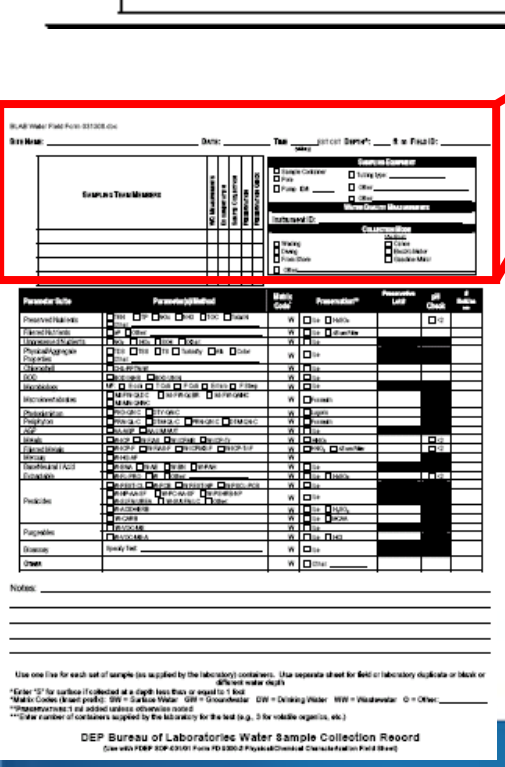
WATER QUALITY MEASUREMENTS

Instrument ID: A4567

COLLECTION MODE

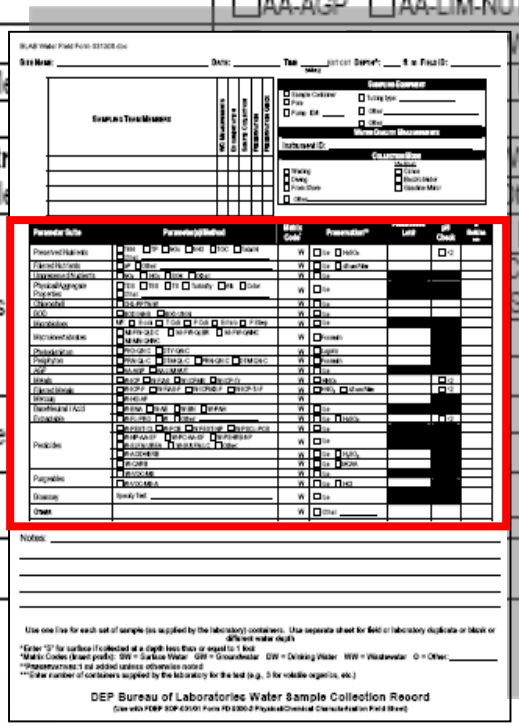
- ☑ Wading
- ☐ Diving
- ☐ From Shore
- ☐ Other _____

Via Boat
- ☐ Canoe
- ☐ Electric Motor
- ☐ Gasoline Motor



- Details about sample method, samplers, and site

Parameter Suite	Parameter(s)/Method	Matrix Code*	Preservation**	Preservative Lot #	pH Check	# Bottles ***
Preserved Nutrients	☑ TKN ☑ TP ☑ NOx ☑ NH3 ☐ TOC ☑ Total N ☐ Other:	W	☑ Ice ☑ H_2SO_4	A6897	☑ <2	1
Filtered Nutrients	☐ oP ☐ Other:	W	☐ Ice ☐ .45 um Filter			
Unpreserved Nutrients	☐ NO_2 ☐ NO_3 ☐ SO4 ☐ Other:	W	☐ Ice			
Physical/Aggregate Properties	☐ TDS ☐ TSS ☐ TS ☐ Turbidity ☐ Alk ☐ Color ☐ Other:	W	☐ Ice			
Chlorophyll	☑ CHL-PPTN-W	W	☑ Ice			1
BOD	☐ BOD-INHB ☐ BOD-UNIN	W	☐ Ice			
Microbiology	MF: ☐ E coli ☑ T Coli ☑ F Coli ☐ Entero ☐ F Strep	W	☑ Ice			2
Macroinvertebrates	☐ MI-FW-QLDC ☐ MI-FW-QLBR ☐ MI-FW-QNNC ☐ MI-MN-QNNC	W	☐ Formalin			
Phytoplankton	☐ PKD-QN-C ☐ DTY-QN-C	W	☐ Lugol's			
Periphyton	☐ PRN-QL-C ☐ DTM-QL-C ☐ PRN-QN-C ☐ DTM-QN-C	W	☐ Formalin			
AGP	☐ AA-AGP ☐ AA-LIM-NUT	W	☐ Ice			
Metals	☐ W-ICPMS ☐ W-ICP-Tr	W	☐ HNO_3		☐ <2	
Filtered Me	☐ W-ICPMS-F ☐ W-ICP-Tr-F	W	☐ HNO_3 ☐ .45 um Filter		☐ <2	
Mercury		W				
BaseNeutr	☐ W-BN ☐ W-PAH	W	☐ Ice			
Extractable	☐ Other:	W	☐ Ice ☐ H_2SO_4		☐ <2	
Pesticides	☐ W PEST-NP ☐ W-PSCL-PCB	W	☐ Ice			
	☐ AA-SF ☐ W-PSHRB-NP	W	☐ Ice			
	SULFN-LC ☐ Other:					
		W	☐ Ice ☐ H_2SO_4			
		W	☐ Ice ☐ MCAA			
Purgeable		W	☐ Ice			
		W	☐ Ice ☐ HCl			
Bioassay		W	☐ Ice			
OTHER		W	☐ Other:			


DEP Bureau of Laboratories Water Sample Collection Record

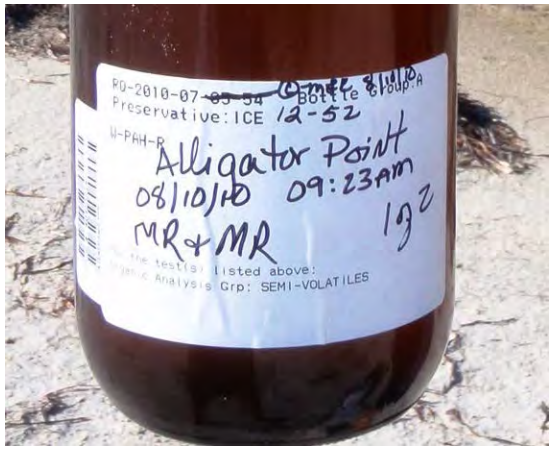
➢Specific information by parameter

Good Documentation Habits

"When in doubt, write it down"

Unique bottle ID
Must link to:

- Site ID
- Date
- Time (≤ 48 hr hold time)
- Analytes
- Preservation
- QC sample type (if applicable)
- Multiple containers for same analyte/group (1 of 2, 2 of 2)



- **Currently available documentation forms**

http://www.dep.state.fl.us/water/sas/qa/forms.htm

FQ 1000 Quality Control Samples

Required

- Field Blanks

Optional

- Duplicates or Replicates
- Split Samples

  - SOP tells you which analytes require QC blanks

Why use blanks?

- Monitor sampling environment (container, cleaning, preservatives, analyte-free water, storage, and transport conditions).
- Show that samples are not contaminated.
- Ensure that samples are representative of the sampling source and not biased by a contamination error.

Field Blanks



Analyte-free water collected directly into a sample bottle at the sampling site.

Equipment Blanks

Analyte-free water collected by rinsing the sampling equipment at the sampling site.



Collect *before* using pre-cleaned equipment
Collect *after* cleaning equipment in the field

Trip Blanks (VOCs Only)

VOC vials filled with analyte-free water accompany the empty vials and real VOC samples through the entire sampling trip.

- **Remain unopened** until analysis
- Minimum of 1 vial per VOC cooler and trip.
- Multiple sites in same cooler OK, if all samples and trip blank analyzed by the same lab.

Blank Collection Frequency

- Equipment & Field Blanks
  - **Minimum of 1 blank <u>annually</u>** for each *required* analyte/matrix combination
  - **5%** of total number of samples collected for each combination *over the life of the project* as applicable
- Trip Blanks (VOCs)
  - Each sampling trip, at least one per cooler with VOCs

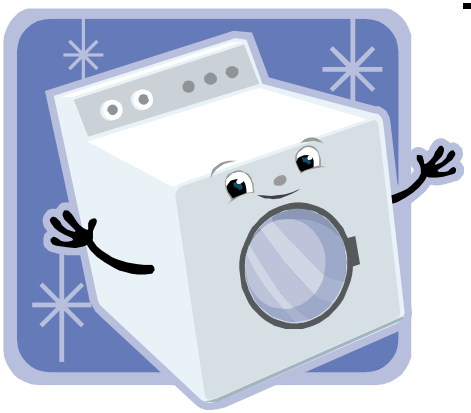
Handle blanks exactly like the associated environmental samples!

- Same sample containers
- Same preservation
  - Add maximum amount of preservative that was added to any samples
  - Don’t preserve with too much acid (may interfere with analysis)
- Same storage conditions

“Performance-Based” Cleaning

- **Demonstrate effective cleaning with blanks**
- See Table FC 1000-1





Cleaning to meet a performance specification (no detections in field-QC blanks) rather than following a rigid, required procedure



Field Planning and Mobilization

- Not a required SOP
- Working with Labs
- Trip Planning
- Equipment and Supply Preparations
- Table FM 1000-1 Lists Data Qualifier Codes
  - Reproduced from table of required codes in QA Rule
- General Field Equipment Checklists

General Considerations for Sampling

- Understand sampling plan, Data Quality Objectives, and if applicable permit specifications
- Collect a *representative* sample
- Maintain the integrity of the sample
- Complete all documentation

FS 1000 General Sampling Procedures

Important information for all types of sampling

- **Useful tables**:
  - Sample Preservation, Holding Times & Container Types
  - Construction Materials & Approved Sampling Equipment



Table FS1000-4
Table IB Inorganic Tests

Parameter No./Name	Container	Preservation	Maximum holding time
38. Nitrate	P, FP, G	Cool, ≤6 °C[18]	48 hours
39. Nitrate-nitrite	P, FP, G	Cool, ≤6 °C[18], H_2SO_4 to pH<2	28 days
40. Nitrite	P, FP, G	Cool, ≤6 °C[18]	48 hours
41. Oil and grease	G	Cool, ≤6 °C[18], HCl or H2SO4 to pH<2	28 days
42. Organic Carbon	P, FP, G	Cool, ≤6 °C[18]HCl, H_2SO_4, or H_3PO_4 to pH<2.	28 days
44. Orthophosphate	P, FP, G	Cool, ≤6 °C[18], [24]	Filter within 15 minutes; Analyze within 48 hours
46. Oxygen, Dissolved Probe	G, Bottle and top	None required	Analyze within 15 minutes
47. Winkler	G, Bottle and top	Fix on site and store in dark	8 hours
48. Phenols	G	Cool, ≤6 °C[18], H_2SO_4 to pH<2	28 days
49. Phosphorous (elemental)	G	Cool, ≤6 °C[18]	48 hours
50. Phosphorous, total	P, FP, G	Cool, ≤6 °C[18], H_2SO_4 to pH<2	28 days

Sampling Strategies

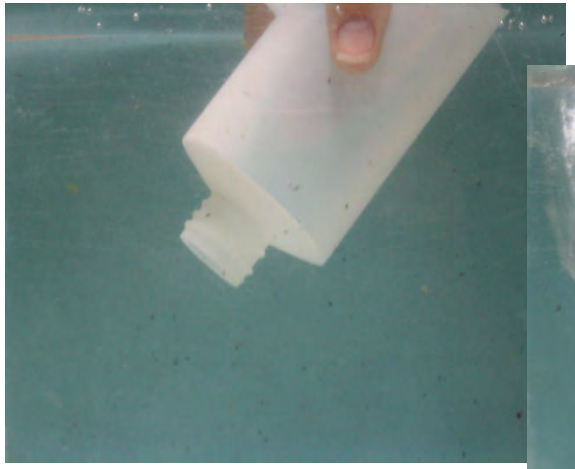
- Consider
  - Representative sampling points
  - Location relative to artificial structures
- Collect
  - Least to most contaminated
    - Downstream to upstream
  - Upwind and away from fuel sources
    - Bow of the boat
  - Upstream and away from body
  - Sample water before sediments
  - Don’t suspend bottom material into water column

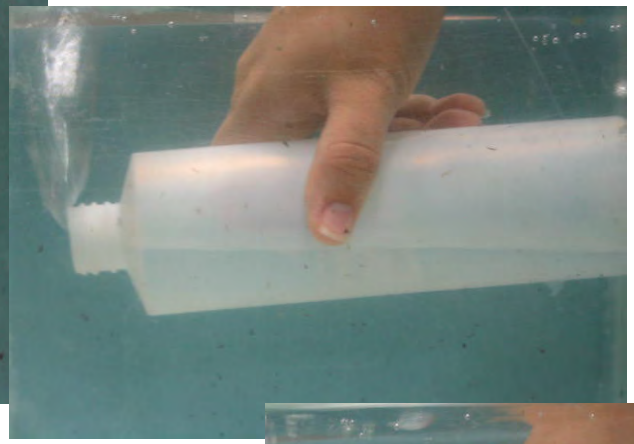
Collecting Grab Samples

- A grab sample is a snapshot in time.
- A discrete sample collected over a period of time not to exceed 15 minutes.

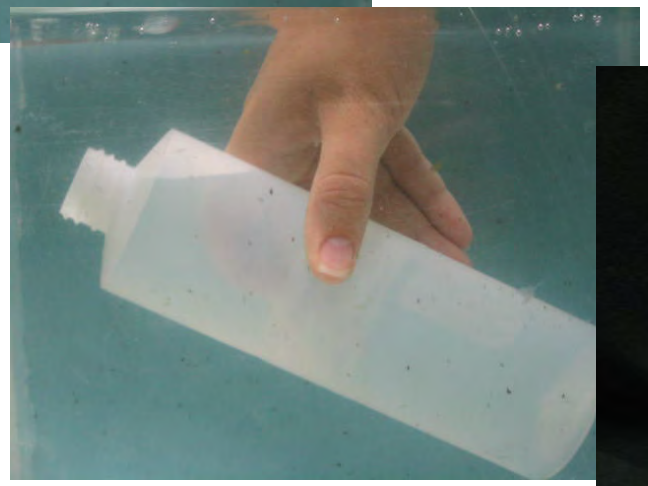


Direct Grab Technique





(Surface Sample)



Leave head space



- Avoid skimming
- Collect within top foot
- May use pole extension

Intermediate Device (Using Sample Container Or Other Device)

Direct grab is preferred, but some samples may require an intermediate device.

- Pre-preserved containers
- Depth sampling

Examples of Intermediate Devices









Equipment depends on project objectives and analyte groups

Grabs using an intermediate device

- Rinse the intermediate vessel with ample amounts of site water prior to collecting the first sample.
- Discard rinsate away from and downstream of the sampling site.
- Do not touch the sample container with the intermediate vessel.



Composite Sample

A sample collected over time, taken either by continuous sampling or by mixing discrete samples. Composite samples reflect the average characteristics during the compositing period

Indicated Uses:



- Continuous flow
- Limited analytical capacity
- Calculating mass/unit time loadings
- Correlating concentration data with flow
- Average analyte concentration over time
- Reducing sampling errors and hazard exposure using autosamplers
- Unattended sampling with autosamplers

Most Common Composite Types

- Time
  - Discrete aliquots collected in 1 container at constant time intervals
    - Use if flow rate varies less than ±10% of the average flow rate
  - Manual or automatic collection
- Flow Proportional
  - Collect with:
    - Autosampler & flow measuring device
    - Semi-automatically w/ flow chart & autosampler
    - Manually
  - Methods:
    - Collect constant volume @ time intervals proportional to stream flow
    - Collect volume proportional to flow @ constant time interval

DEP SOPs – Autosampler Info

- **FC 1000** – Decontamination
- **FS 1000** – Sample preservation & holding time
  - Table FS 1000-4
- **FS 2100** – Surface water deployment*
- **FS 2400** – Wastewater deployment*

*Includes equipment blank requirements for autosampler

FS 2000 – General Aqueous Sampling

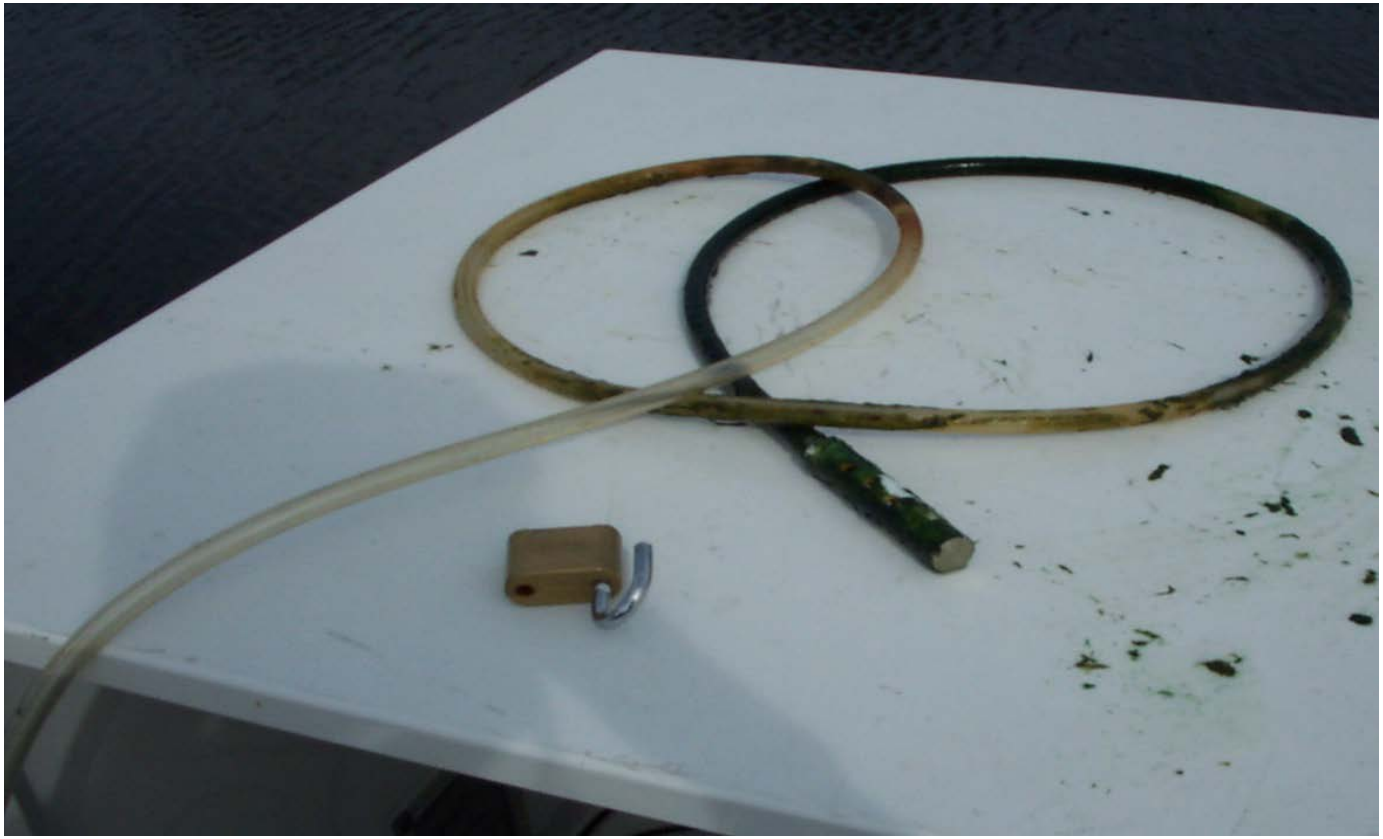
- **Do not composite (unless required in permit):**
  - Oil & Grease/TRPH/FL-PRO
  - Microbiological analytes
  - Orthophosphate
  - Cyanide
  - VOCs
  - Total Phenols
  - Un-ionized ammonia
  - Others

Cleaning and Replacement (see manufacturer's manual also)



- **Tubing**
  - Inspect at each site visit
  - Replace discolored tubing
    - Use new* or pre-cleaned tubing (delivery and pump)
      - New tubing for each installation (EPA Region 4 SOP)*
      - Teflon delivery tubing if organic analytes (EPA Region 4 SOP)*
    - Tubing material choices per FS 1000 equipment tables for collected analytes
    - Recommend replace every six months, with loss of elasticity, algal growth, or other degradation
  - Recommended cleaning in FC 1000
    - Field cleaning not recommended
- **Composite sample containers**
  - Recommended cleaning in FC 1000 (field or lab/base of operations)
  - Container materials per FS 1000 (Table FS 1000-4)

Inspect tubing and strainer



Equipment Blanks

- Tubing and composite containers are *intermediate devices* used for sample collection
- Collect equipment blanks **by** pumping analyte-free water through **entire clean sample compositing train**
  - Frequency of compositing train blanks:
    - 5% of tubing changes (recommended if routinely changed at each site visit) or with each tubing change (recommended if changed infrequently)
    - At least annually (if applicable)
- Collect **composite container** blanks per FQ 1000
    - Frequency: per 5% of samples collected, over project or permit duration (e.g., 5-year permit cycle)
    - At least one container blank annually (if applicable)

Set-up and Inspection (see manufacturer's manual also)



- **Autosampler & tubing placement**
  - Elevate above sample point (25 feet or less)
  - Taut tubing run with no kinks, bends, twists
    - Inspect tubing for pooling of sample or restricted flow
    - Tubing and intake/strainer placement must be at correct location and depth (per permit, or in a position for representative sampling)
    - Use conduit or other support for tubing (installation should prevent potential contamination from support structures)
  - Secure autosampler against tampering (lock, housing, tamper seals, etc)
  - Protect against weather extremes (insulation, reflective paint, etc)
- **Programming**
  - Follow manufacturer instructions for autosampler (and flow meter/pacer)
  - Program sample collection settings according to permit, or per project sampling design
    - Programming must ensure that enough total volume is collected for all analytes and lab sample containers

Autosampler Function Check

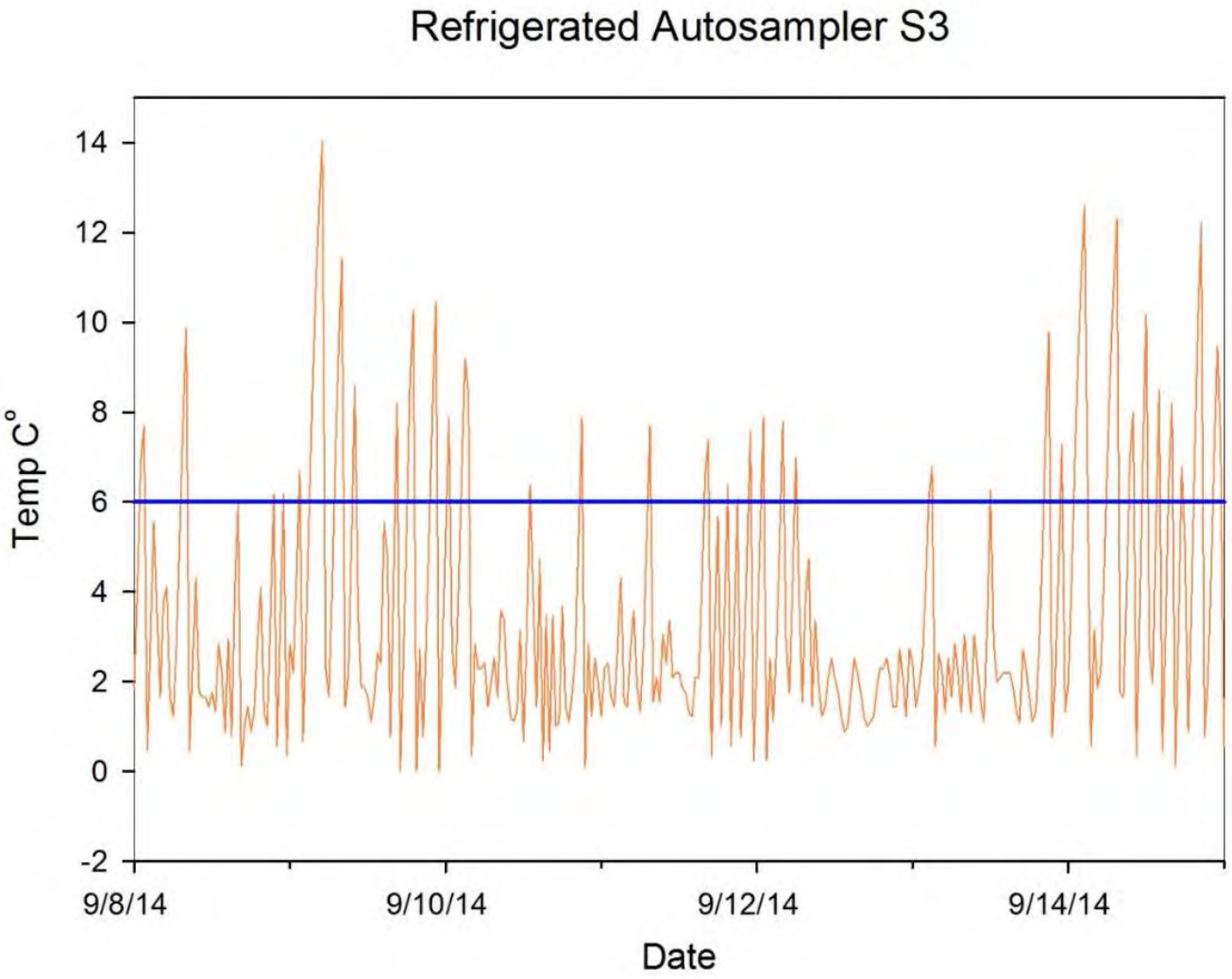
- **Measure minimum volume collected**
  - Verify minimum 100 mL collection volume
    - –Lift height (head) should not affect volume collected
      - »Minimum volume should be adjustable manually or automatically
- **Check flow meter/pacer** functioning
- **Check programmed purge/sample collection** functioning
  - – Verify pre-rinse and purge for each sample collection cycle
  - – Pump speed should not allow solids to settle in tubing
    - – At least 2 ft/sec (EPA Region 4 SOP)
    - Velocity is also a function of tubing diameter
      - – Use at least 0.25 inch I.D. tubing
- **Look for bubbles in tubing** during pump test
- **Follow manufacturer's suggested checks, diagnostics and maintenance**

Sample Preservation Prior to Sample Retrieval

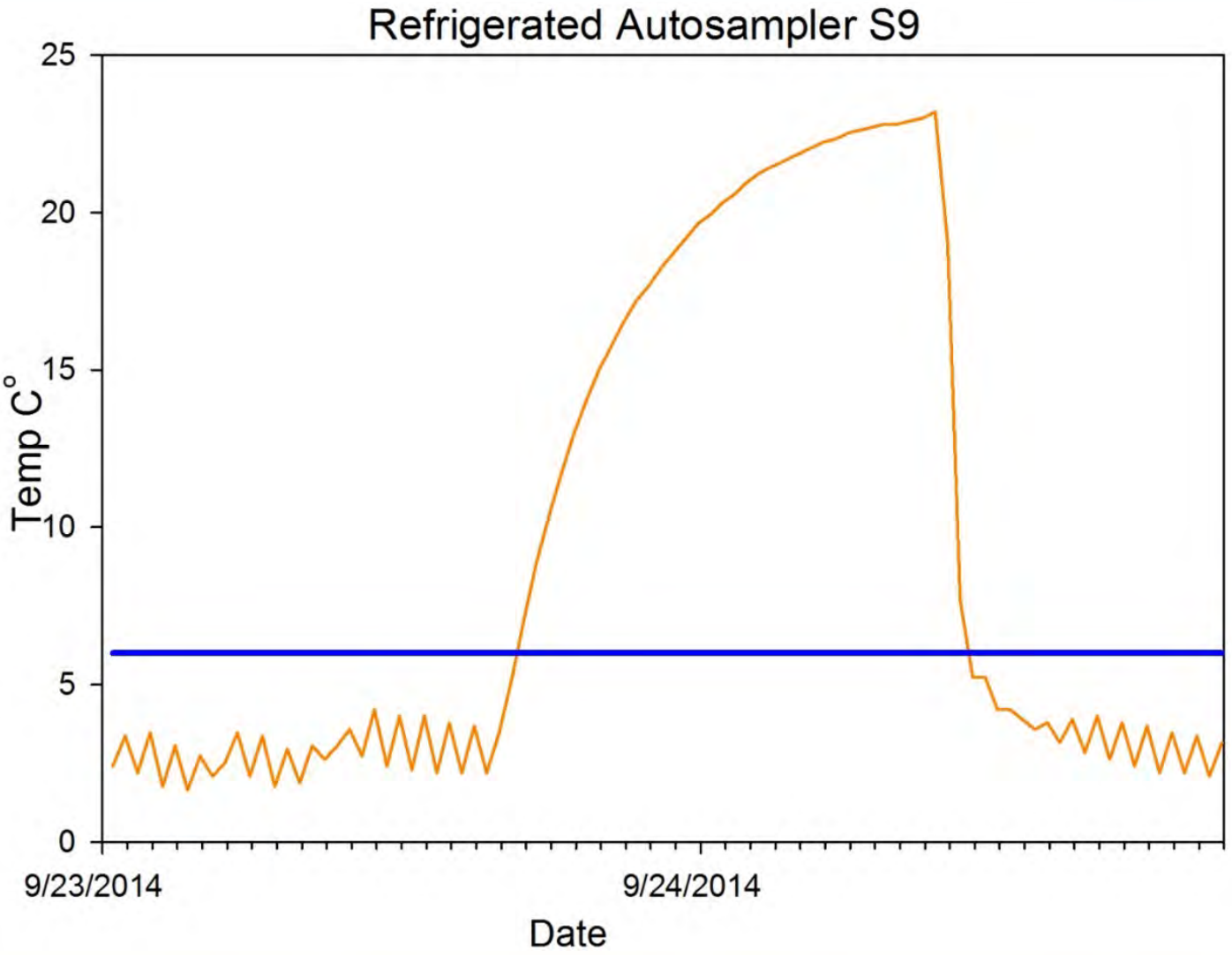
- If cooling required for analytes per FS 1000:
  - Use packed ice or refrigeration
    - Refrigerated Autosampler
      - Can be difficult to maintain temperature under 6° C
- Pre-preserved Bottles
    - Sample can inadvertently be over acidified due to low-flow conditions



Refrigerated Autosampler daily flux



Refrigerated Autosampler power outage



Composite Sample Retrieval

- **Start of holding time depends on composite collection period:**
  - 24 hours or less – holding time begins at the end of the composite period (i.e., after collection of last sample)
  - Exceeds 24 hours – holding time begins at first sample collection
- **Thoroughly mix composite sample** prior to transferring to lab bottles
- **Any additional preservation** must occur within 15 minutes of end of composite period (i.e., after last sample collected)
  - Preservation and holding times per FS 1000 tables (Table FS 1000-4)

Documentation

- **FD 1000 Requirements**
  - Universal documentation for all samples – FD 1100
  - Cleaning documentation – FD 2000
  - Maintenance & diagnostic testing – FD 3000
  - Requirements for all sample collection – FD 5000
  - Aqueous sample documentation – FD 5100, including surface water (sec. 4) or wastewater (sec. 5)
    - Composite sample documentation
      - Composite type (e.g., flow-proportional)
      - Composite begin/end (dates & times)
  - Equipment blank documentation – FD 5100 (sub-sec. 2.15) and FQ 1250

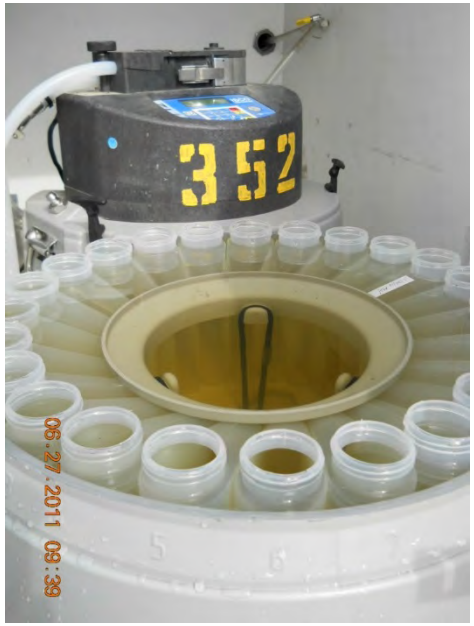
Tubing Issues





Other Autosampler Issues

- Distributor arm (if used)
- Tubing slips or holes
- Tubing depth placement
- Lightning issues
- Strainer
- Programing errors
- Liquid detect errors



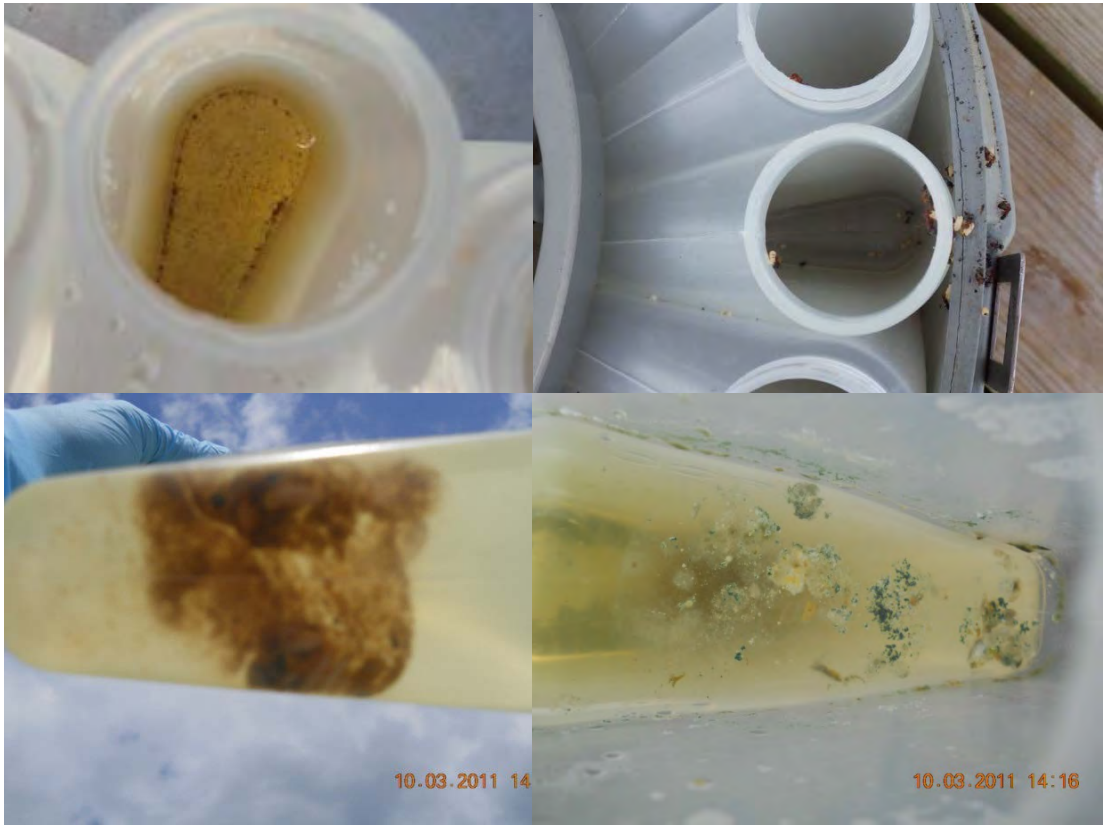
Theft and Vandalism







Discrete Bottle Contamination



Collecting VOC Samples

- Teflon-coated silicone cap liner (septum)
- Prevent contamination from fuel sources
- Do not open VOC vial until ready to fill
- No aeration or agitation of sample
- Reduce flow: pumps 100-400 mL/min; faucets ≤100 mL/min
- Dechlorinate per SOP instructions and restrictions
- Do not overfill pre-preserved vials
- Do not pour sample into vial cap
- No headspace in VOC vial after collection
- Do not re-open vials to refill or to remove bubbles (≤ 5mm total bubble diameter OK)

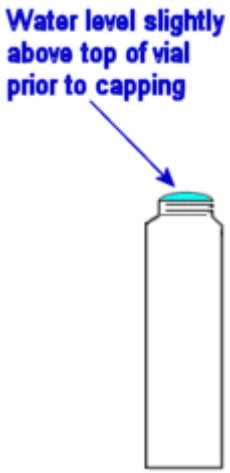






Sampling VOCs

- Can use gloves to help prevent sample contamination
- No insect repellent or other sprays
- Don’t park vehicle by sampling site
- Avoid other fuel sources
- Fill VOC vial to form convex meniscus
- Slide cap septum over bottle opening (Teflon side down) and screw cap tightly into place
- Overturn bottle and tap side to see if air bubbles are present



Sampling for Hydrocarbons (Oil &Grease, TRPH, FL-PRO)

- Do not skim surface of water (unless required by sampling plan)
- Do not pre-rinse bottles with sample
- Do not use automatic samplers
- Preserve with sulfuric or hydrochloric acid and chill

Sampling for Bacteria





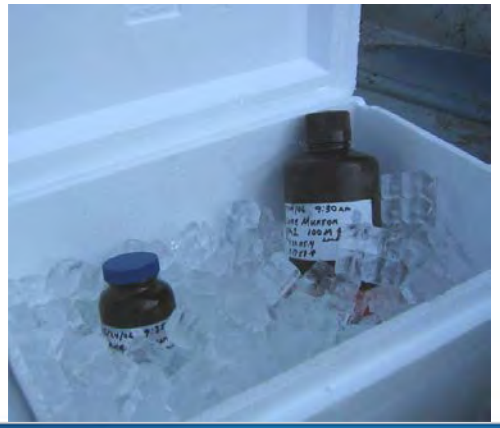
- Sterilized containers required
- Use dechlorinating agent (if applicable)
- Thoroughly rinse any intermediate devices
- Keep fingers away from container opening
- Cool immediately with wet ice

* See allowance in DEP SOPs (FS 2000 and FS 2300) for sterilizing taps and spigots of questionable condition

What about Preservation?







- Dechlorinate and/or filter (if applicable) **before** preserving
- Preserve per tables in FS 1000 Appendix (**matrix-specific**)
- Preserve (and filter) **within 15 minutes of collection**
- Check pH of pH-preserved samples (see check frequencies in FS 2000) with **narrow range pH paper** (including pre-preserved containers, except VOCs)
- Don't dip pH paper into the sample
- pH checks not required for VOCs
- Carry and add extra preservative if needed
- Avoid excess preservative (can dilute sample or cause analytical problems)
- Use ice to cool & keep samples at required temperatures
- Use refrigeration or ice for automatic samplers

FS 2400 Wastewater Sampling

- Representativeness
  - The sampling location should be specified in the permit
  - If no other specifications, SOP requires sampling at a depth in the center of flow (adequate mixing)

FS 2450 *Cryptosporidium* and *Giardia* Wastewater Sampling

- Use EPA method 1623
- Follow bacteriological sampling restrictions in FS 2005

FS 2440 Biosolids

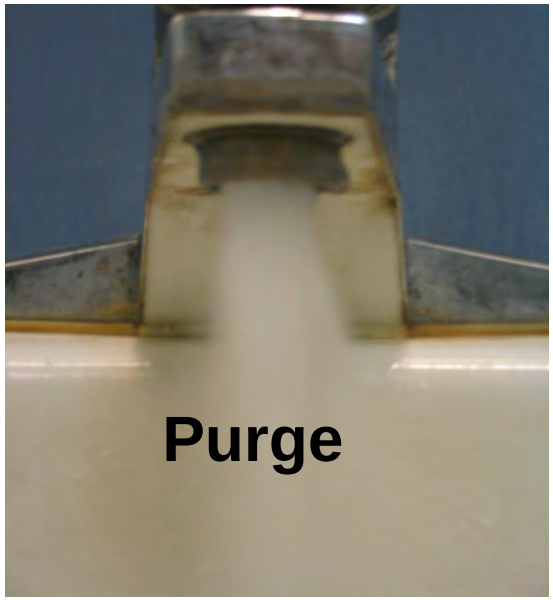
Important considerations for:

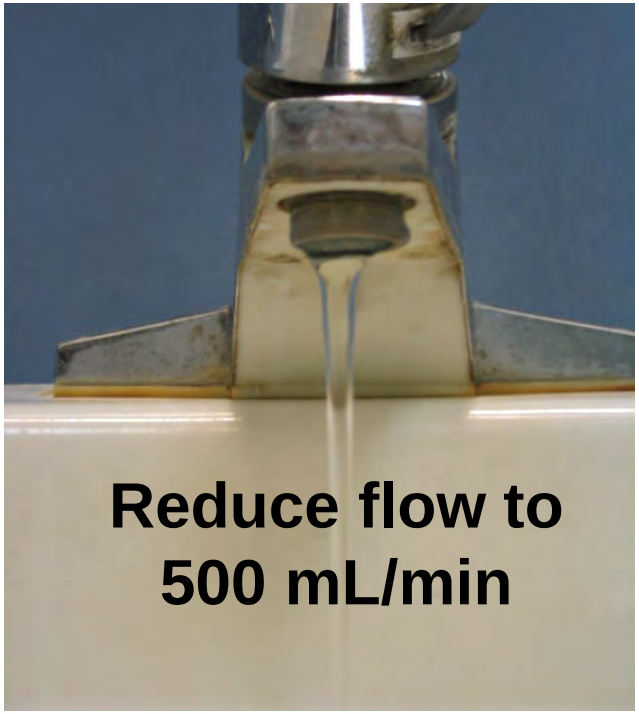
- Sampling techniques and containers
- Safety precautions
- Compositing
- Transporting infectious waste



✓ Collect samples per rule, permit or sampling plan requirements

Sampling Taps and Spigots







Sampling VOCs from taps and spigots





Reduce flow to ≤100 mL/min

FS 2200 Groundwater Sampling

- Equipment Selection
- Measuring Water Level in Monitoring Wells
- Calculating Required Purge Volume
- Placement of Purging Devices in the Well
- Stabilization Parameter Measurement
- Purging Completion Criteria
- Purging & Sampling Techniques for Monitoring Wells
- Purging & Sampling Wells with Installed Plumbing
- Purging & Sampling Remediation Installations

Monitor wells

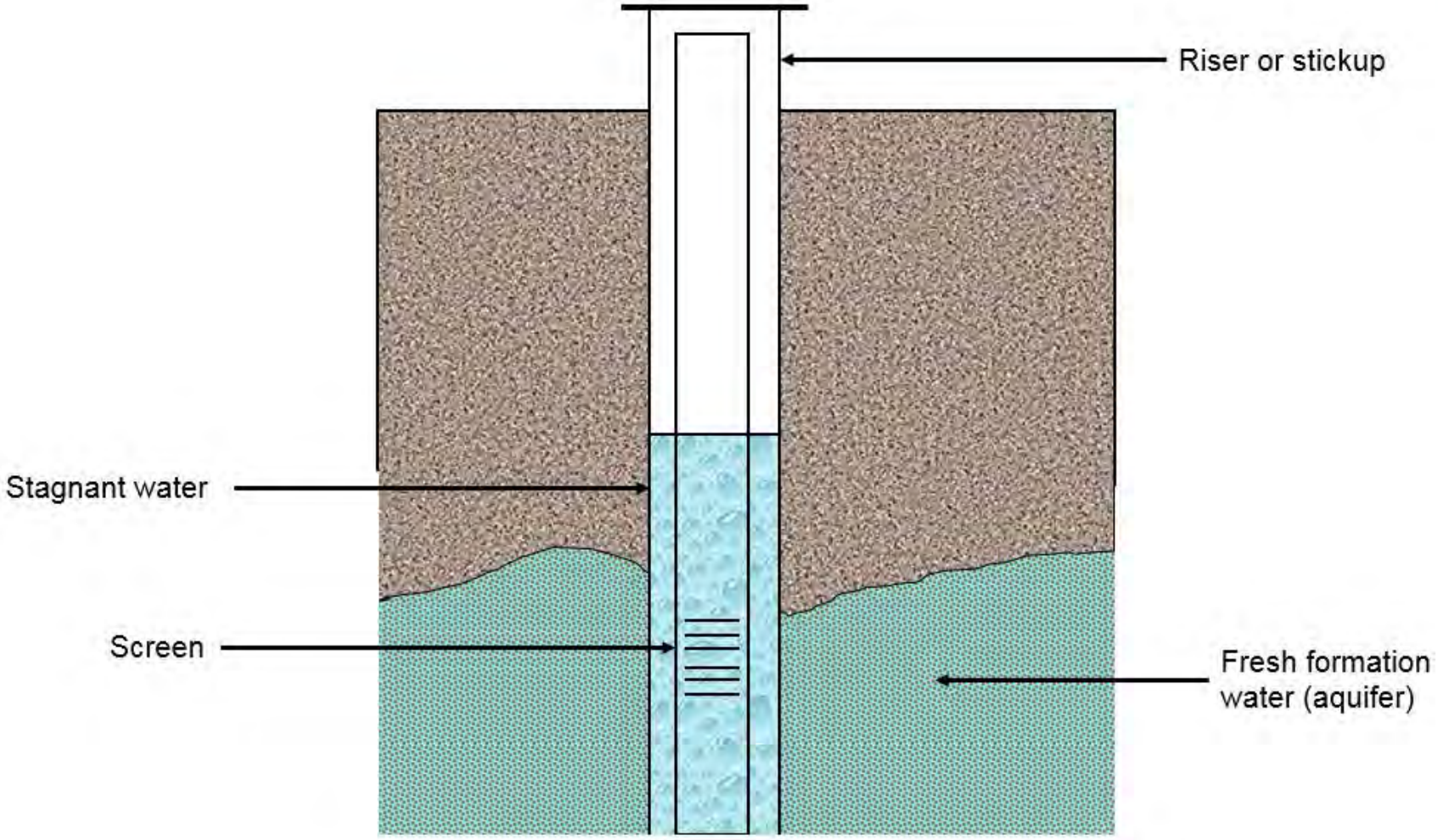








Simplified well diagram



Simplified well diagram without pump or tubing

Purging & Sampling Groundwater

Specifications to ensure:

Representative sample

- Collect fresh formation (aquifer) water

No Contamination

- Proper placement of purging devices

Appropriate equipment

- Bailers are not recommended

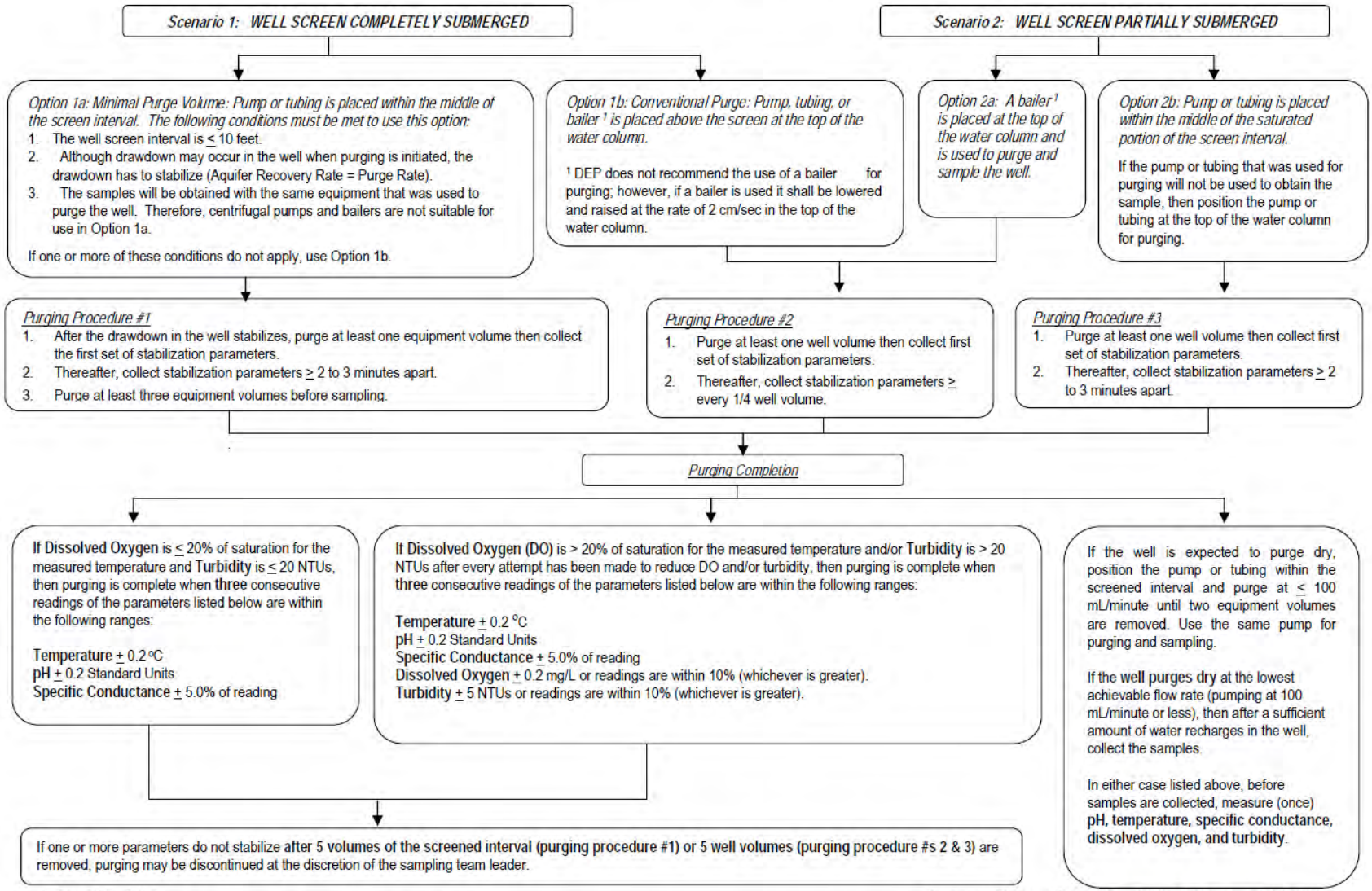
Proper purging completion

- Stable field measurements per SOP

Groundwater Scenarios

Important considerations also discussed for:

- Can't achieve purging completion criteria
- Purging low-recharge wells
- Maximum time between purging and sampling
- Sampling wells with installed plumbing



Use Ground Water Sampling Flow Chart for Monitor Well Scenarios

Common Sampling Mistakes

- Not following DEP SOPs
- Poor contamination control and sample handling (e.g., touching inside the lid with fingers, not rinsing intermediate vessels)
- DEP SOP calibration/verification protocols for testing instruments not followed
  - Standards did not bracket sample values
  - Calibration acceptance criteria were not assessed
  - Pre-deployment checks on field testing and sampling equipment were not conducted
  - Equipment does not work during sampling event

Common Documentation Errors

- Not documenting required information:
- Date and time of calibration, verification or sample measurement
- Sample measurement results are not legible
- Forms are incomplete
- Linkage between meter calibration records and sample measurement data
- No meter identification information
- Sources for field calibration standards not documented

SITE NAME: Claw Bayou DATE: 11/1/11 TIME 1215 (military) EST CST DEPTH^: 0.2 ft (m) FIELD ID: CLB5

SAMPLING TEAM MEMBERS	WQ MEASUREMENTS	DOCUMENTATION	SAMPLE COLLECTION	PRESERVATION	PRESERVATION CHECK
[redacted]					
M [redacted]					
S [redacted]					
T					

SAMPLING EQUIPMENT

- [x] Sample Container
- [ ] Pole
- [ ] Pump ID#: _____
- [ ] Tubing type: _____
- [ ] Other _____
- [ ] Other

WATER QUALITY MEASUREMENTS

Instrument ID:

COLLECTION MODE

- [ ] Wading
- [ ] Diving
- [ ] From Shore
- [ ] Other _____

Via Boat

- [ ] Canoe
- [ ] Electric Motor
- [ ] Gasoline Motor

Parameter Suite	Parameter(s)/Method	Matrix Code	Preservation**	Preservative Lot #	pH Check	# Bottles ***
Preserved Nutrients	[x] TKN [x] TP [x] NOx [x] NH3 [ ] TOC [ ] Total N [ ] Other:	S W	[x] Ice [x] H_2SO_4		[ ] <2	
Filtered Nutrients	[ ] oP [ ] Other:	W	[ ] Ice [ ] 45 um Filter			
Unpreserved Nutrients	[ ] NO_2 [ ] NO_3 [ ] SO4 [ ] Other:	W	[ ] Ice			
Physical/Aggregate Properties	[ ] TDS [ ] TSS [ ] TS [x] Turbidity [x] Alk [x] Color [ ] Other:	S W	[x] Ice			
Chlorophyll	[x] CHL-PPTN-W	S W	[x] Ice			
BOD	[ ] BOD-INHB [ ] BOD-UNIN	W	[ ] Ice			
Microbiology	MF: [ ] E coli [ ] T Coli [ ] F Coli [ ] Entero [ ] F Strep	W	[ ] Ice			
Macroinvertebrates	[ ] MI-FW-QLDC [ ] MI-FW-QLBR [ ] MI-FW-QNNC [ ] MI-MN-QNNC	W	[ ] Formalin			
Phytoplankton	[ ] PKD-QN-C [ ] DTY-QN-C	W	[ ] Lugol's			

SEDIMENT / SUBSTRATE

Sediment Oils
☐ Absent ☐ Slight ☐ Moderate ☐ Profuse

Sediment Odors
☐ Normal ☐ Sewage ☐ Petroleum ☐ Chemical ☐ Anaerobic ☐ Other (Specify) :

Sediment Deposition
☐ Sludge
Sand Smothering : None Slight Moderate Severe
Silt Smothering : None Slight Moderate Severe
☐ Other (Specify) :

SUBSTRATE TYPE
Assessment Tool: ☐ SCI ☐ BioRecon ☐ LCI ☐ LVI

	% Coverage	INVERT # Times Sampled	PERI # Times Sampled
Woody Debris (Snags)			
Undercut Banks / Roots			
Leaf Packs or Mat			
Aquatic Vegetation			
Rock or Shell Rubble..			
Sand.....			
Mud / Muck / Silt			
Other			
Other			

WATER QUALITY

	Depth (M)	Temp. (°C)	pH (SU)	D.O. (MG/L)	Cond. (UMHO/CM)	Salinity (PPT)	SECCHI (M)
Top :	0.2	22.44	8.09	4.99	48403	31.65	0.35
Mid-Depth :	0.6	2203	8.13	4.71	SC 300 ~~2200~~	34.44	☐ VOB
Bottom :							

Water Surface Oils : ☒ None ☐ Sheen ☐ Globs ☐ Slick

Water Odors : ☒ Normal ☐ Sewage ☐ Petroleum ☐ Chemical ☐ Other (Specify) :

Water Sample Taken ? ☒ Yes ☐ No

Algae Sample Taken ? ☐ Yes ☒ No

SYSTEM TYPE ☐ Stream ☐ Lake ☐ Wetland ☒ Estuary ☐ Other (Specify) :

Clarity ☐ Clear ☒ Slightly Turbid ☐ Turbid ☐ Opaque

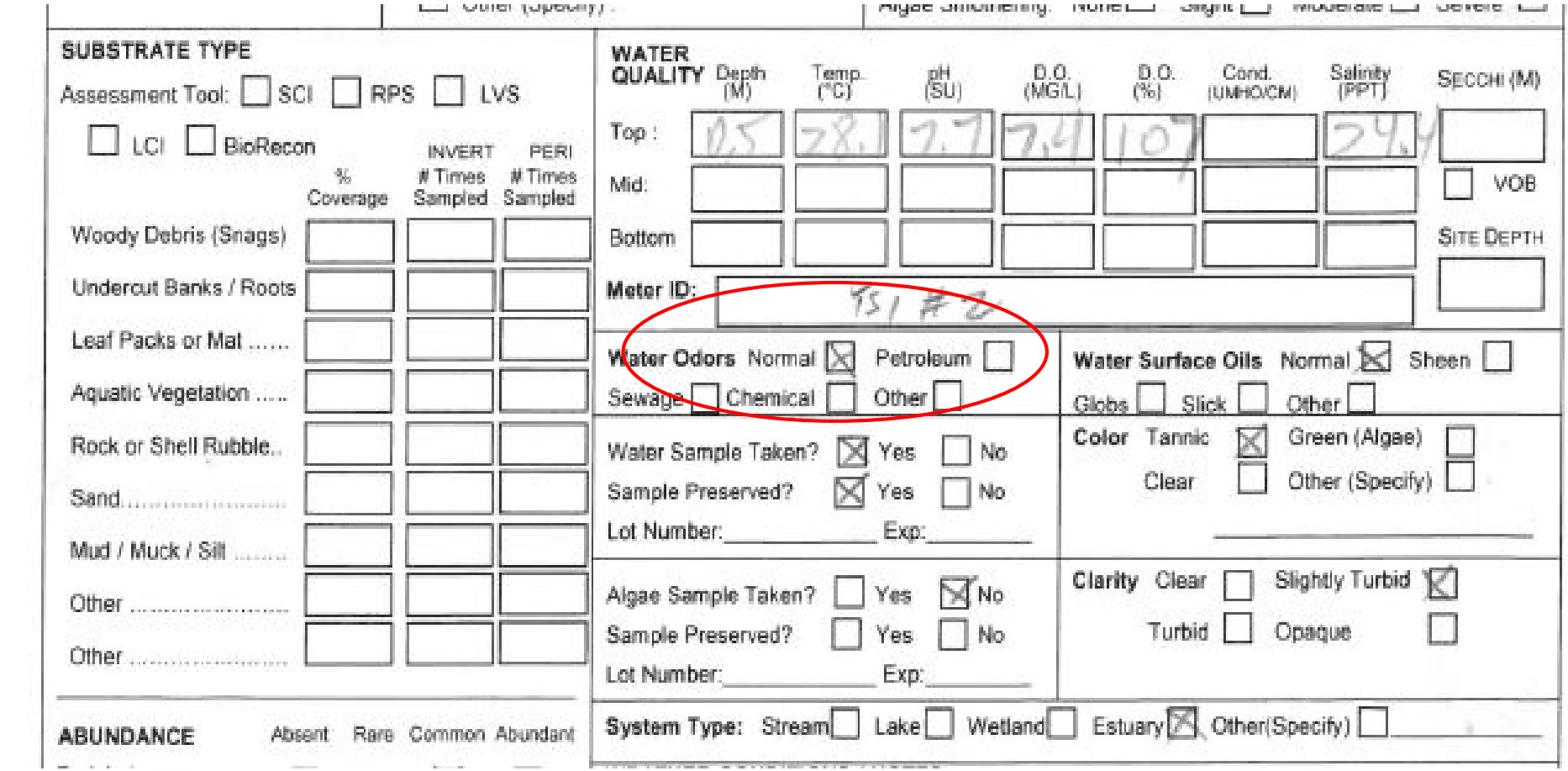
Color ☐ Tannic ☒ SLIGHTLY Green (Algae) ☐ Clear ☐ Other (Specify) :

WEATHER CONDITIONS / NOTES :
Sunny, breezy, ~70F

☒ The antecedent hydrologic conditions have been met to my best knowledge.
Water samples preserved ? ☐ Yes ☐ pH<2 ☐ No Algae samples preserved ? ☐ Yes ☐ No

ABUNDANCE

	Absent	Rare	Common	Abundant
Periphyton :	☐	☒	☐	☐
Fish :	☐	☐	☒	☐
Aquatic Macrophytes :	☐	☒	☐	☐
Iron/Sulfur Bacteria :	☒	☐	☐	☐



SUBSTRATE TYPE

Assessment Tool: ☐ SCI ☐ RPS ☐ LVS

☐ LCI ☐ BioRecon

	% Coverage	INVERT # Times Sampled	PERI # Times Sampled
Woody Debris (Snags)			
Undercut Banks / Roots			
Leaf Packs or Mat			
Aquatic Vegetation			
Rock or Shell Rubble..			
Sand.....			
Mud / Muck / Silt			
Other			
Other			

ABUNDANCE Absent Rare Common Abundant

WATER QUALITY

	Depth (M)	Temp. (°C)	pH (SU)	D.O. (MG/L)	D.O. (%)	Cond. (UMHO/CM)	Salinity (PPT)	SECCHI (M)
Top :	0.5	28.1	7.7	7.4	107		24.4	
Mid:								☐ VOB
Bottom								SITE DEPTH

Meter ID: YSI #2

Water Odors Normal ☒ Petroleum ☐
Sewage ☐ Chemical ☐ Other ☐

Water Surface Oils Normal ☒ Sheen ☐
Globs ☐ Slick ☐ Other ☐

Water Sample Taken? ☒ Yes ☐ No
Sample Preserved? ☒ Yes ☐ No
Lot Number:_____ Exp:_____

Color Tannic ☒ Green (Algae) ☐
Clear ☐ Other (Specify) ☐

Algae Sample Taken? ☐ Yes ☒ No
Sample Preserved? ☐ Yes ☐ No
Lot Number:_____ Exp:_____

Clarity Clear ☐ Slightly Turbid ☒
Turbid ☐ Opaque ☐

System Type: Stream ☐ Lake ☐ Wetland ☐ Estuary ☒ Other(Specify) ☐

Questions?



Stay up to date…

Quality of Science Newsletter

http://www.dep.state.fl.us/water/sas/training/listserv.htm