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QSD/QSP Module 5 Monitoring

Module Purpose

- Provide Qualified SWPPP Developers with the information needed to plan the monitoring required by the CGP
- Provide SWPPP Practitioners with the information needed to implement the monitoring required by the CGP.

Module Organization

- For all covered projects, the permit requires a combination of
  - visual monitoring
  - inspection
  - sampling
- Requirements vary as a function of:
  - Project Type/Risk Level – Traditional or LUP
  - General Site Conditions, Progress of Construction
  - Whether or Not Active Treatment System (ATS) is Used
  - Other potential requirements (Risk Level 3) – Bioassessment, Receiving Water Monitoring

Module Organization

- Types of monitoring
- Roles
- Where to monitor
- What to monitor
- How often to monitor
- Requirements according to Risk Level or LUP Type

Uncontrolled flow over a slope… don't let this happen!

Shaker Plate Maintenance

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How Not to Maintain a Concrete Washout


SUPER DUTY

Types of Monitoring

- **Visual Inspection** of BMPs
- **Visual Monitoring** of site discharge
  - Qualifying Storm Events
  - Non-stormwater discharges
- **Sampling and Analysis** of
  - Construction site runoff
  - Non-stormwater discharges
  - Receiving waters
  - Contained runoff
- **Conditional/Optional Monitoring** – Run-on

Cautions and Limitations

- As a QSD or QSP you may need to retain specialists or obtain additional training on developing monitoring plans or collecting samples
- Know the local agency requirements as well as the CGP requirements

Monitoring As A Function of Risk and Site Factors

Summary of Site Specific Factors

- Monitoring requirements vary depending on specific site factors
  - Size (bioassessment - > 30 acres)
  - BMPs selected (ATS, Use of Basins, Baker Tanks, etc)
  - Presence of non-stormwater discharges
  - Spills and BMP failures
  - Effluent Quality
  - Construction Status

Summary of Visual Monitoring by Project Risk/Type

Traditional Projects

- Documented Weekly, Year Round BMP inspections

  (Level 1, 2, 3)

- Documented Storm event triggered visual monitoring

  (Level 1, 2, 3)

- Documented Quarterly non-stormwater inspections

  (Level 1, 2, 3)

LUPs

- Daily routine visual inspections (Type 1, 2, 3)
- Site photographs before, during and post storm events

  (Type 1, 2, 3)

- Storm event triggered visual inspections

  (Type 2, 3)

Summary of Sampling Requirements by Risk/Type

Risk Level 1 / LUP Type 1

- Non-visible pollutant monitoring as necessary

Risk Level 2 / LUP Type 2

- Non-visible pollutant monitoring as necessary
- Stormwater runoff monitoring
- Non-stormwater discharges from site
- Contained rainwater when discharged

Sampling and Analysis by Risk and Site Factors

- Risk Level 3 / LUP Type 3
  - Non-visible pollutant monitoring as necessary
  - Stormwater runoff monitoring
  - Non-stormwater discharges from site
  - Contained rainwater when discharged
  - Receiving water monitoring and SSC sampling if an NEL for turbidity is violated
  - Receiving water benthic macroinvertebrate bioassessment if project
    - *Disturbs 30+ acres, and*
    - *Has a direct discharge to fresh water wadeable stream*

Factors to Consider in Selecting Monitoring Locations

Where to Monitor

- QSD will identify locations for
  - Visual Monitoring
  - Water quality sampling and analysis
    - Effluent monitoring
    - Non-stormwater monitoring
    - Non-visible pollutant monitoring
    - Run-on monitoring
  - Receiving Water Monitoring
    - Bioassessment

Where to Monitor

- Locations will differ based on type of monitoring
  - Where activity occurs
    - BMP inspections, non-stormwater discharge observations
  - Where discharge leaves the site
    - Water quality sampling
  - Where run-on enters site
- Effluent monitoring locations may change over life of the project due to
  - Grading progression
  - Construction stage/phase
  - Installation of inlets
- QSD must modify SWPPP as site evolves

Effluent Monitoring Locations

Traditional Projects

- All discharge points from site
  - Site boundary
  - Storm drain inlets
  - Monitor downstream of last BMP
- Must monitor 100% of active areas

Linear Construction Projects

- Representative locations

Effluent Monitoring Locations

Effluent Monitoring Locations

Effluent Monitoring Locations

Non-Stormwater Monitoring Locations

- QSD should anticipate non-stormwater discharges
- Non-stormwater discharges encountered during construction should be added to the SWPPP
- Treat non-stormwater discharges like stormwater runoff:
  - Monitor where required (Risk Level 2 & 3)
  - Treat with BMPs
  - Eliminate where feasible

Non-Stormwater Monitoring

Non-Visible Pollutant Monitoring Location

- QSD will indicate upstream and downstream sampling locations
- Should correspond with all potential locations for spill of non-visible pollutants
- Additional locations (e.g. if a laydown area is moved or added) should be added to SWPPP

Non-Visible Pollutant Monitoring

Run-On Monitoring Location

- QSD will indicate run-on monitoring in SWPPP
- More often, run-on issues will be seen during construction
  - If need for run-on monitoring is seen, QSD will modify SWPPP

Run-On Monitoring

Receiving Water Monitoring Location

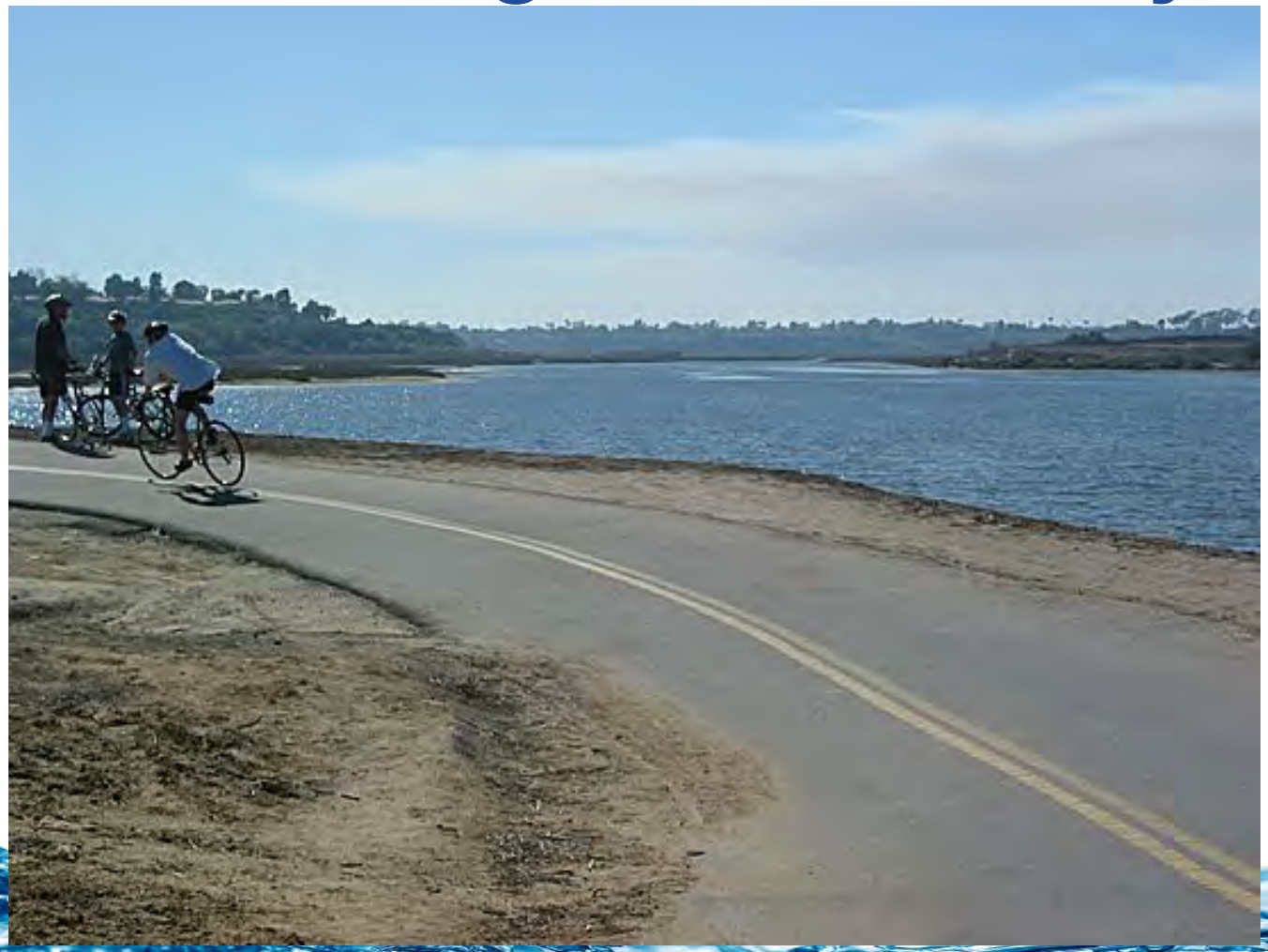
- Sample the receiving water
  - Upstream of the construction site
    - Background; unaffected by site runoff
  - Downstream of the site
  - Affected by site runoff
  - Can use one downstream location if a site has more than one discharge point into the receiving water
- Selecting locations in a lake, bay, or lagoon requires more creativity

Receiving Water Locations

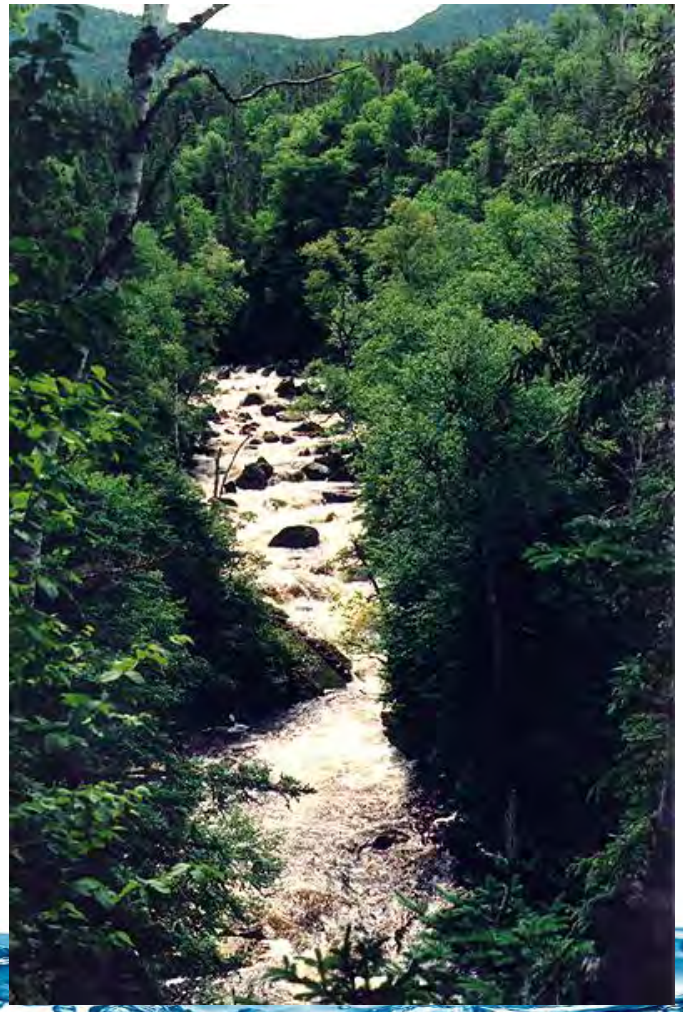
- **Identify upstream and downstream locations on a map first**
- **Field truth proposed locations**
  - Preferably when raining
- **Location consideration**
  - Need to collect samples away from the bank
  - Need to avoid stagnant or sluggish water
  - Try to sample in the main flow current
  - Select locations that will be safe during a rain event
  - Consider tidal influence

Receiving Water Monitoring: Rivers

Receiving Water Monitoring: Coastal Lagoons and Bays



Receiving Water Monitoring: Alpine Stream



Receiving Water Monitoring: Estuary/Wetland

Receiving Water Monitoring: Large Lake

Receiving Water Monitoring: Pond/Small Lake

Modified Receiving Water : Flood Control Channel

Receiving Water Monitoring: Pond/Small Lake

CSMP and M&RPs

Traditional Projects: Construction Site Monitoring Program (CSMP)

- Site specific implementation plan to meet the CGP monitoring requirements and achieve monitoring objectives
- CASQA developing a CSMP template

LUPs: Monitoring and Reporting Program (M&RP) *Not Called a CSMP for LUPs*

- Site specific implementation plan to meet the CGP monitoring requirements implemented at the start of construction
    - The monitoring program must be implemented at the appropriate level to protect water quality at all times throughout the life of the project
- Visual and effluent quality monitoring are part of the M&RP

CSMP and M&RP Implementation

- Monitoring programs are developed by the QSD as part of the SWPPP
  - Appendix or separate SWPPP chapter
  - Must be amended by a QSD
  - Implementation overseen by the QSP

CSMP and M&RP Content

- Plans should provide information and tools to effectively implement CGP requirements
  1. Identify purpose of monitoring program
  2. Identify applicable monitoring requirements from CGP
  3. Identify monitoring locations
     - Effluent, Visual, Non-stormwater, Receiving Water
  4. Identify safety factors- site hazards for samplers, especially related to inclement weather

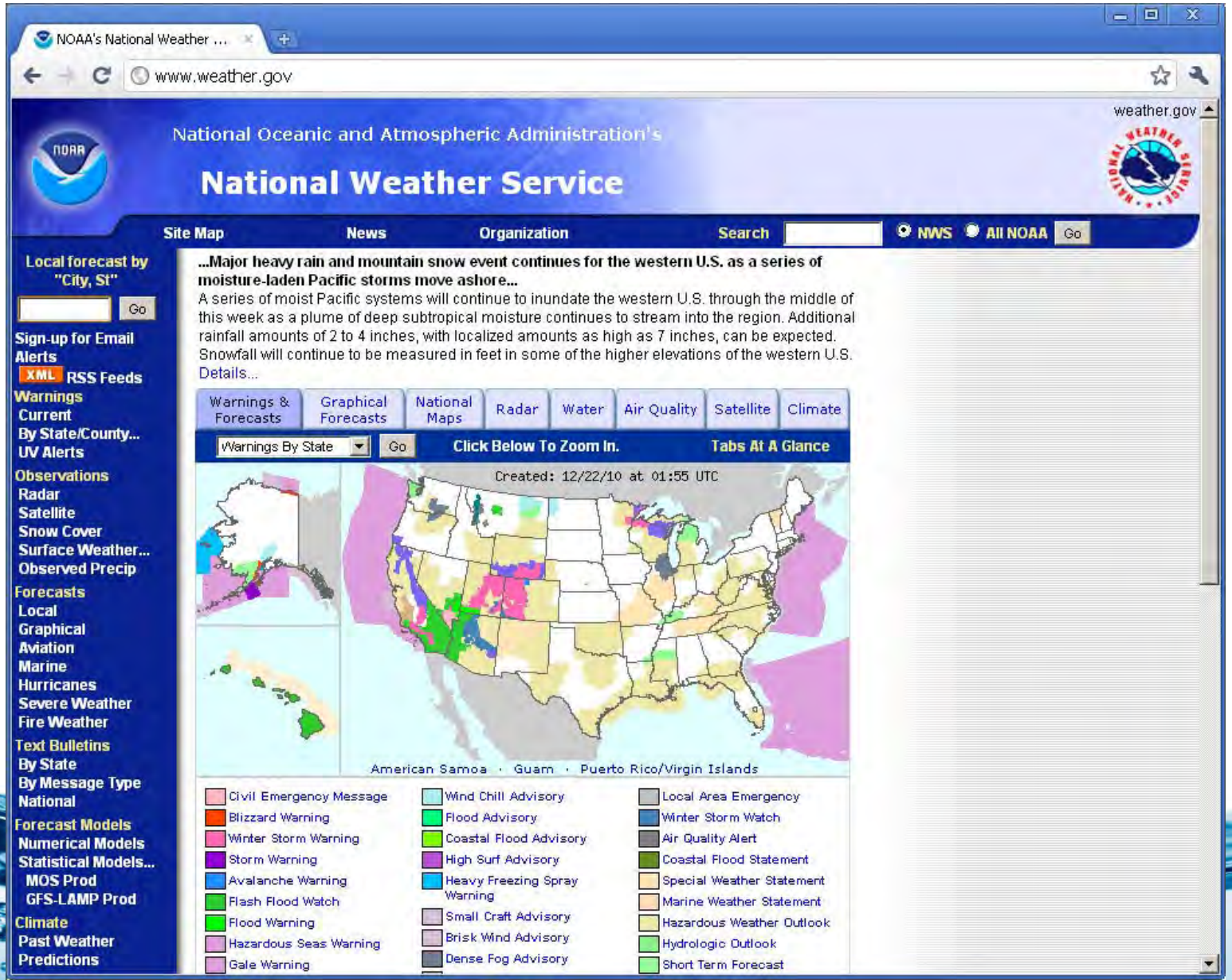
CSMP and M&RP Content (Continued)

5. Visual monitoring frequencies, triggers, documentation requirements, checklists for inspections and observations
6. Effluent Monitoring frequencies, triggers for routine and non-visible pollutants
7. Identify if a watershed monitoring option has been approved (not likely to be a viable alternative any time soon)
8. Sample taking and handling procedures, chain of custody
9. Identify quality assurance and quality control
10. Identify reporting and records retention requirements
11. Identify follow up Procedures for Exceedance, Violations and Action Thresholds

Rain Event Tracking: Daily Requirement!

- Risk Level 2 & 3
- QSP must check weather.gov daily for storm event forecast
- Hard copy must be saved daily
- Copies may be submitted with Annual Report

Weather.gov



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7-Day Forecast for Latitud...

forecast.weather.gov/MapClick.php?CityName=Irvine&state=CA&site=SGX&textField1=33.6694&textField2=-117.822&e=0

Your National Weather Service forecast

Irvine CA

Enter Your "City, ST" or zip code | Go | BOOKMARK

NWS San Diego, CA
Point Forecast: Irvine CA
33.68°N 117.81°W (Elev. 56 ft)

Mobile Weather Information | En Español
Last Update: 1:02 pm PST Dec 21, 2010
Forecast Valid: 6pm PST Dec 21, 2010-6pm PST Dec 28, 2010

Forecast at a Glance

Tonight	Wednesday	Wednesday Night	Thursday	Thursday Night	Friday	Friday Night	Christmas Day	Saturday Night
100%	100%	50%						
Heavy Rain	Heavy Rain	Chance Showers	Mostly Sunny	Mostly Clear	Sunny	Mostly Clear	Mostly Sunny	Chance Showers
Lo 53 °F	Hi 59 °F	Lo 46 °F	Hi 60 °F	Lo 43 °F	Hi 64 °F	Lo 44 °F	Hi 63 °F	Lo 45 °F

Detailed 7-day Forecast

Hazardous weather condition(s):

Flash Flood Watch
Flood Advisory
Wind Advisory
Special Weather Statement
Hazardous Weather Outlook
Short Term Forecast

Tonight: Showers and possibly a thunderstorm. Some of the storms could produce heavy rainfall. Low around 53. Southeast wind between 10 and 20 mph, with gusts as high as 35 mph. Chance of precipitation is 100%.

Wednesday: Showers and possibly a thunderstorm. Some of the storms could produce heavy rainfall. High near 59. South wind between 15 and 20 mph, with gusts as high as 35 mph. Chance of precipitation is 100%.

Wednesday Night: A chance of showers and thunderstorms. Mostly cloudy, with a low around 46. West wind between 5 and 10 mph. Chance of precipitation is 50%.

Detailed Point Forecast

[Move Down]

Click Map for Forecast | Disclaimer

Requested Location | Forecast Area
Lat/Lon: 33.68°N 117.81°W **Elevation:** 56 ft

XML

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7-Day Forecast for Latitud...

forecast.weather.gov/MapClick.php?CityName=Irvine&state=CA&site=SGX&textField1=33.6694&textField2=-117.822&e=0

Thursday Night: Mostly clear, with a low around 43. Southwest wind around 5 mph becoming northeast.

Friday: Sunny, with a high near 64.

Friday Night: Mostly clear, with a low around 44.

Christmas Day: Mostly sunny, with a high near 63.

Saturday Night: A chance of showers. Mostly cloudy, with a low around 45.

Sunday: Mostly sunny, with a high near 61.

Sunday Night: A slight chance of showers. Mostly cloudy, with a low around 43.

Monday: A slight chance of showers. Mostly sunny, with a high near 62.

Monday Night: Partly cloudy, with a low around 46.

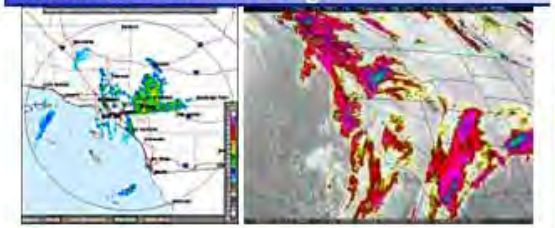
Tuesday: Mostly sunny, with a high near 63.

Santa Ana, John Wayne Airport-Orange County Airport

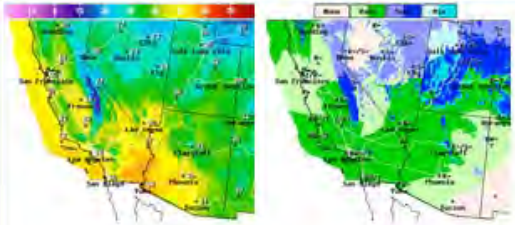
Last Update on 21 Dec 16:53 PST

Lt Rain, Fog	**Humidity:**	90 %
	Wind Speed:	ESE 5 MPH
58°F (14°C)	**Barometer:**	29.90 in (1012.50 mb)
	Dewpoint:	55°F (13°C)
	Visibility:	2.00 Miles
	More Local Wx:	**3 Day History:**

Radar and Satellite Images



National Digital Forecast Database



Additional Forecasts & Information

Zone Area Forecast for Orange County Coastal Areas, CA	
Forecast Discussion	
Printable Forecast	Text Only Forecast
Hourly Weather Graph	Tabular Forecast
Quick Forecast	
International System of Units	About Point Forecasts
Observations Map-San Diego	Observations Map-Los Angeles
Rainfall	Visible Satellite Image (daytime)
Local Climate Data	Product Quick Select
How to use this page	
Forecast Weather Table Interface	

Webmaster
National Weather Service:
San Diego, CA

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National Weather Service -...

www.wrh.noaa.gov/forecast/wxtables/index.php?lat=33.688&lon=-117.81

National Weather Service Forecast Office

San Diego, CA

www.weather.gov

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Get Local Forecast for: Enter location ... GO

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En español

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Wireless

Current Hazards
Local
West
National
Thunderstorms
Tropical
Storm Reports
Spotter Report

Current Conditions
Observations
Mapped Weather
Satellite
Radar KML
Rivers&Lakes AHPS

Forecasts
Activity Planner
Local
Discussion
GIS Shapefiles
Graphical
Digital
Aviation
Fire Weather
Hydrology
Marine
Numerical Models
International

Climate
Local
National

Warnings and/or Advisories In Effect for this Point:

Flash Flood Watch
Flood Advisory
Hazardous Weather Outlook
Short Term Forecast
Special Weather Statement
Wind Advisory

For warnings and/or advisories in effect for adjacent areas to this point, see http://www.wrh.noaa.gov/sgx

Change Table Font Size Increase Decrease

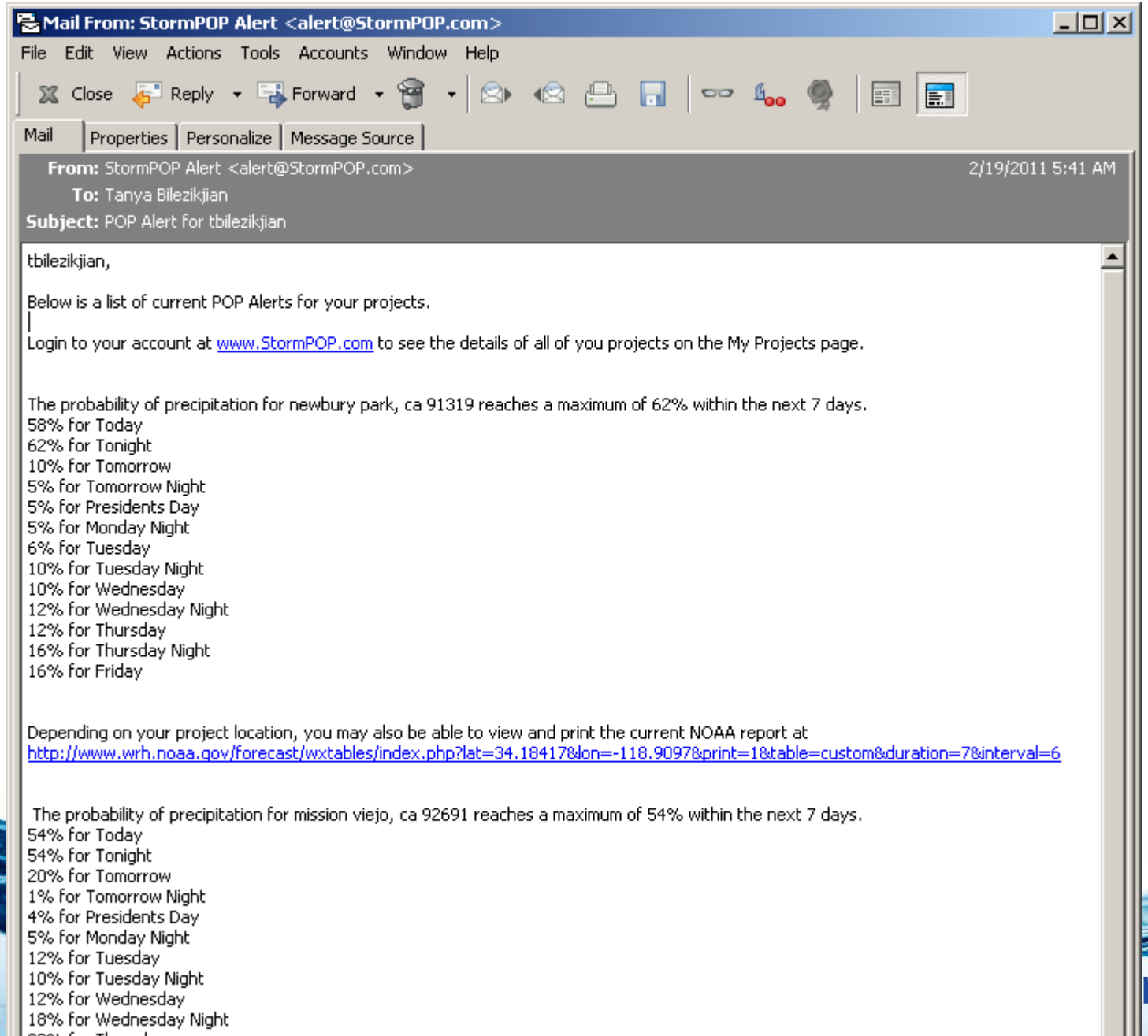
Forecast For Lat/Lon: 33.6810/-117.8110 (Elev. 56 ft)
Irvine CA

Custom Weather Forecast Table

	Tue Dec 21				Wed Dec 22				Thu Dec 23				Fri Dec 24				Sat Dec 25				Sun Dec 26				Mon	
Weather	Rain and Fog	Rain	Rain Showers and TStorms	Rain Showers and TStorms	Rain Showers and TStorms	Chance Rain Showers and TStorms	Chance Rain Showers												Chance Rain Showers			Slight Chance Rain Showers					
Daily-Temp	High 58 Low 53				High 59 Low 53				High 60 Low 46				High 64 Low 43				High 63 Low 44				High 61 Low 45				Hi Lo	
Chance of Precip	100%	100%	100%	95%	100%	95%	45%	25%	10%	5%	0%	0%	0%	0%	0%	0%	10%	10%	40%	40%	10%	10%	25%	25%	20%	20%
Precip	0.19"	0.23"	0.23"	0.71"	0.31"	0.28"	0.11"	0.00"	0.00"	0.00"	0.00"	0.00"	0.00"	0.00"	0.00"	0.00"	0.00"									
12-hr Snow Total	0"		0"		0"		0"		0"		0"		0"				0"									
FRET	0.04"				0.04"				0.05"				0.06"				0.05"				0.04"				0	
6-Hour	4am	10am	4pm	10pm	4am	10am	4pm	10pm	4am	10am	4pm	10pm	4am	10am	4pm	10pm	4am	10am	4pm	10pm	4am	10am	4pm	10pm	4am	10a
Temp	55	56	58	53	59	59	57	51	49	57	58	52	47	58	62	49	44	54	61	49	45	53	59	47	43	53
Cloudiness	100%	100%	100%	94%	100%	83%	70%	51%	35%	30%	28%	22%	20%	20%	21%	21%	29%	29%	62%	62%	47%	47%	52%	52%	51%	51%
Dewpoint	51	51	53	53	53	54	51	48	44	51	49	45	40	46	47	47	43	46	47	46	42	50	51	47	42	48
Relative Humdity	93%	84%	84%	100%	83%	84%	81%	90%	82%	80%	71%	76%	78%	64%	59%	92%	94%	74%	60%	89%	87%	88%	76%	99%	95%	84%
Wind	E 2	SE 10	SE 13	SE 15	S 23	S 16	SW 14	W 12	SE 3	S 6	SW 6	NE 3	NE 6	NW 7	W 6	N 2	E 3	S 7	W 7	E 2	NE 3	NW 5	W 7	NW 3	E 3	S 7
Snow Level (ft)	6029	6538	6372	6462	6176	5774	4996	5196											5695	5695			7252	7252	7555	755

Stormwater RBF CONSULTING

stormPOP.com New Features



Mail From: StormPOP Alert <alert@StormPOP.com>

File Edit View Actions Tools Accounts Window Help

Close Reply Forward

Mail | Properties | Personalize | Message Source

From: StormPOP Alert <alert@StormPOP.com> 2/19/2011 5:41 AM
To: Tanya Bilezikjian
Subject: POP Alert for tbilezikjian

tbilezikjian,

Below is a list of current POP Alerts for your projects.

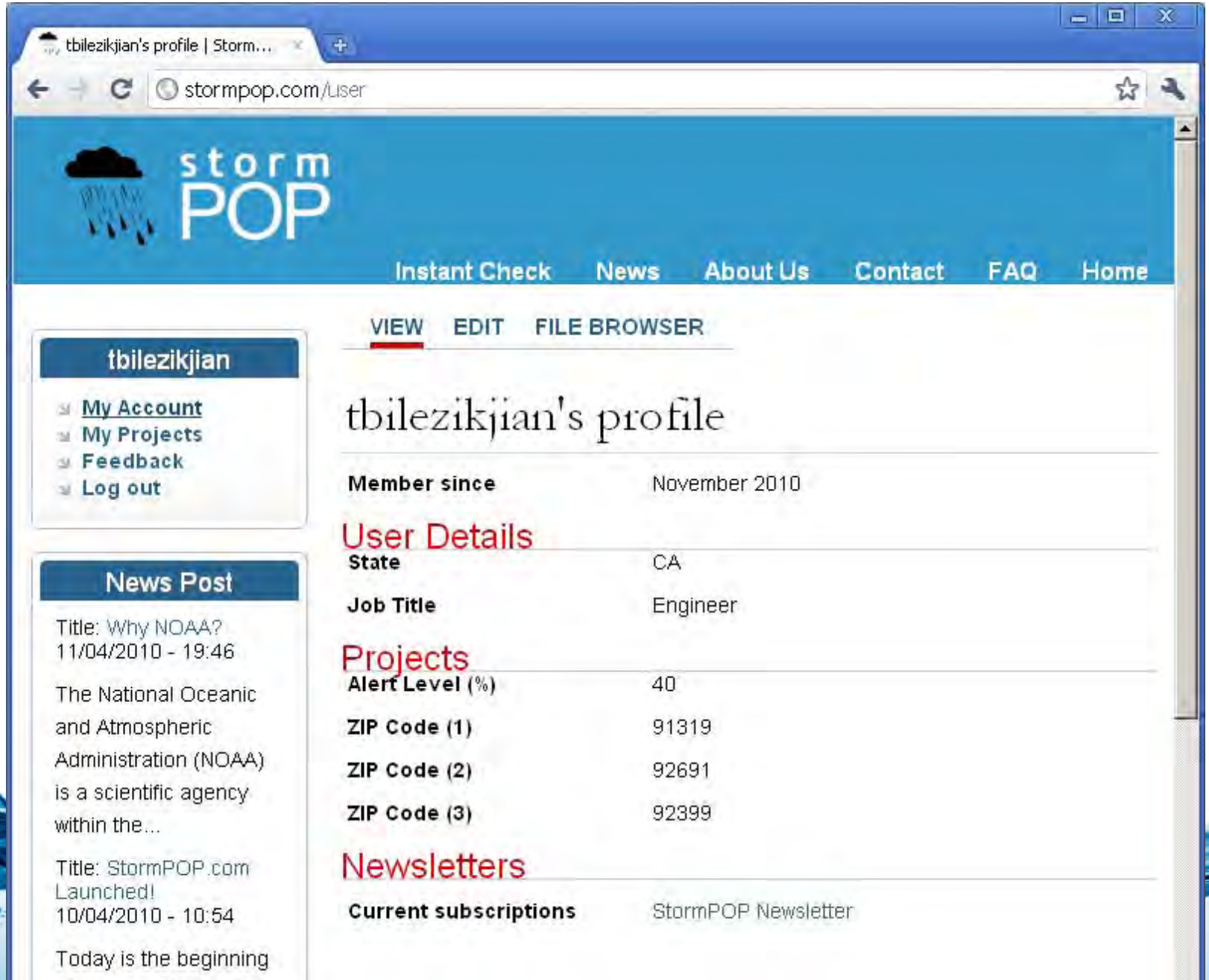
Login to your account at www.StormPOP.com to see the details of all of you projects on the My Projects page.

The probability of precipitation for newbury park, ca 91319 reaches a maximum of 62% within the next 7 days.
58% for Today
62% for Tonight
10% for Tomorrow
5% for Tomorrow Night
5% for Presidents Day
5% for Monday Night
6% for Tuesday
10% for Tuesday Night
10% for Wednesday
12% for Wednesday Night
12% for Thursday
16% for Thursday Night
16% for Friday

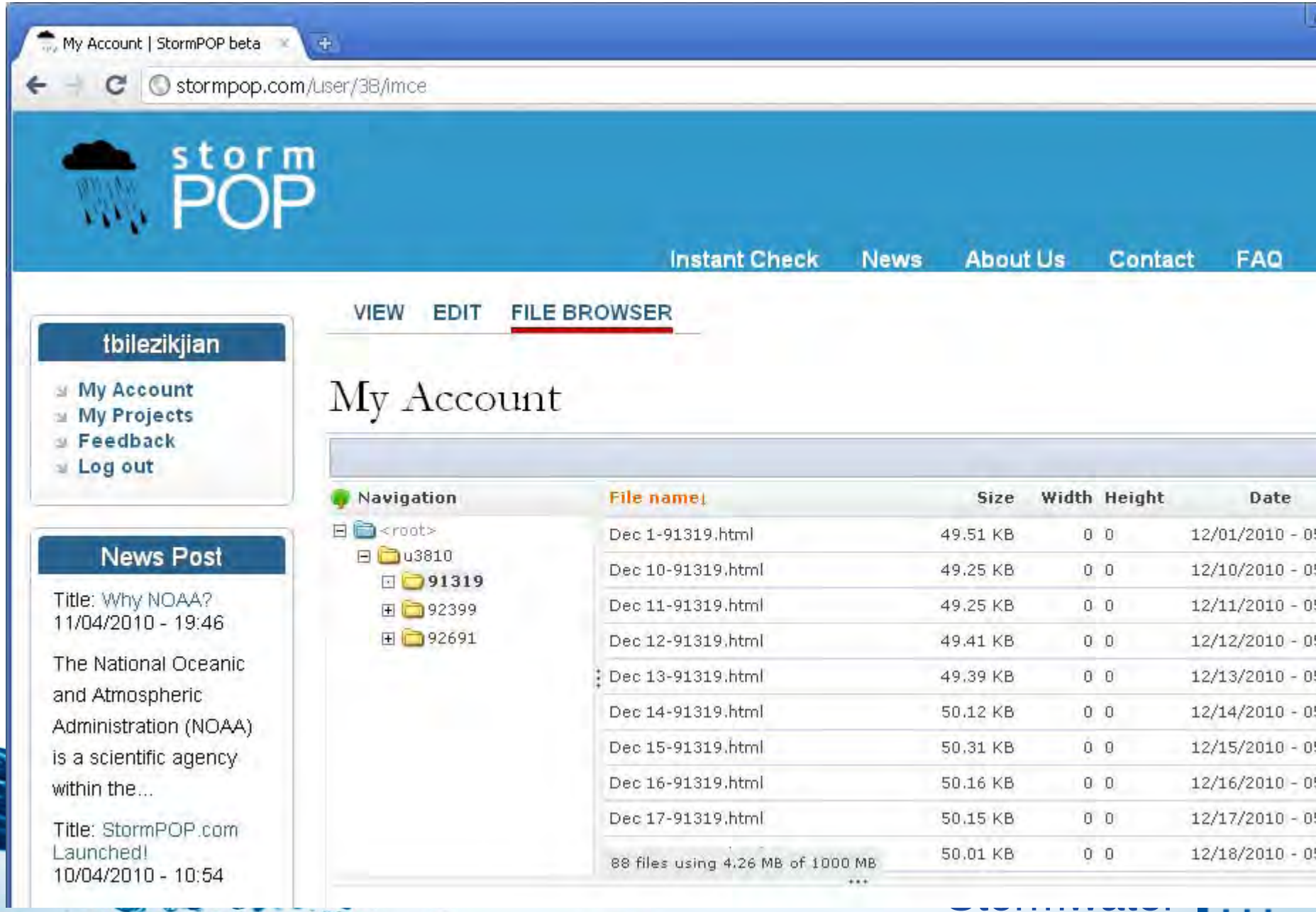
Depending on your project location, you may also be able to view and print the current NOAA report at
http://www.wrh.noaa.gov/forecast/wxtables/index.php?lat=34.18417&lon=-118.9097&print=1&table=custom&duration=7&interval=6

The probability of precipitation for mission viejo, ca 92691 reaches a maximum of 54% within the next 7 days.
54% for Today
54% for Tonight
20% for Tomorrow
1% for Tomorrow Night
4% for Presidents Day
5% for Monday Night
12% for Tuesday
10% for Tuesday Night
12% for Wednesday
18% for Wednesday Night

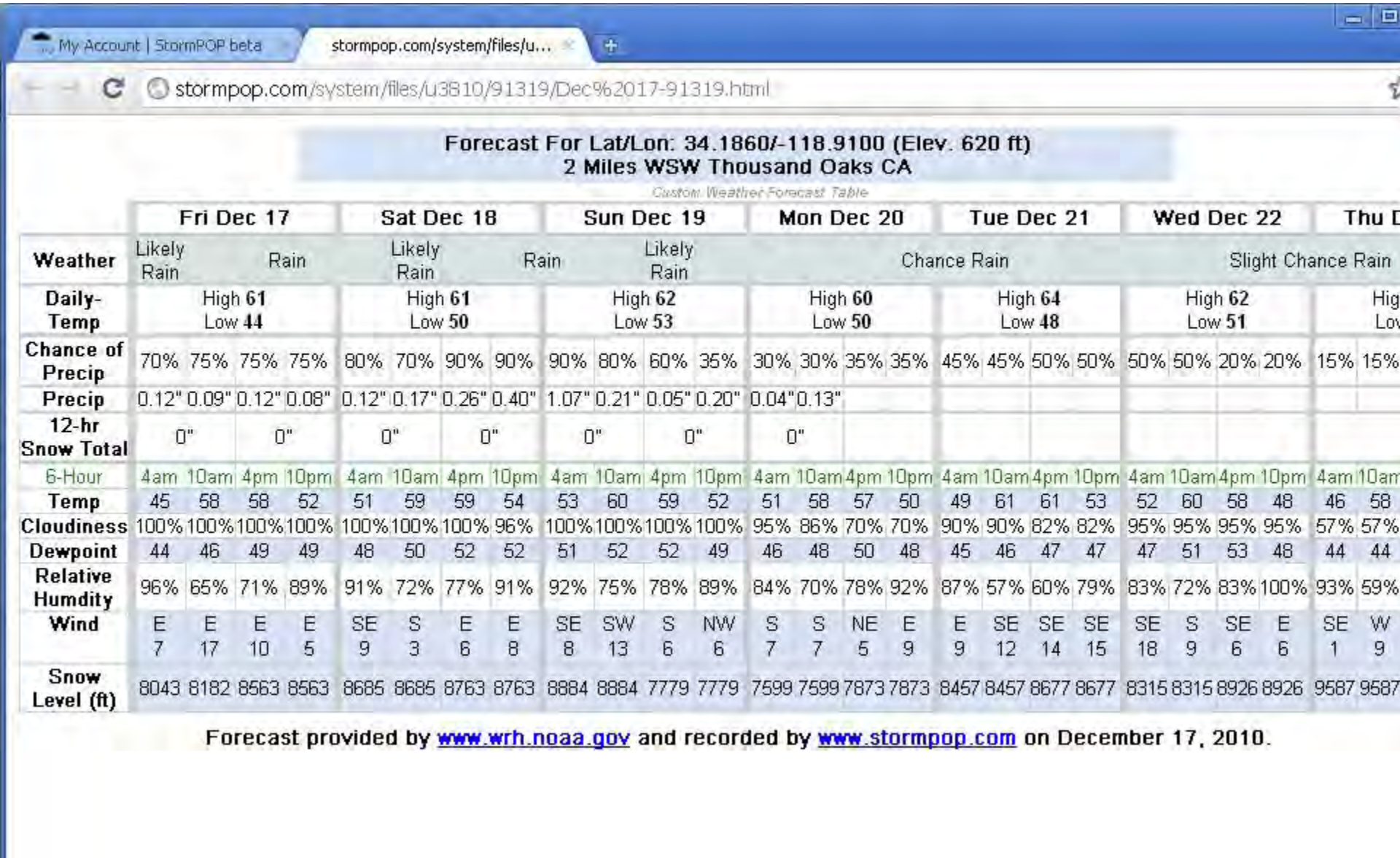
stormPOP.com



stormPOP.com



stormPOP.com – now holds 1 year of weather reports



My Account | StormPOP beta

stormpop.com/system/files/u...

stormpop.com/system/files/u3810/91319/Dec%2017-91319.html

Forecast For Lat/Lon: 34.1860/-118.9100 (Elev. 620 ft)
2 Miles WSW Thousand Oaks CA

Custom Weather Forecast Table

	Fri Dec 17				Sat Dec 18				Sun Dec 19				Mon Dec 20				Tue Dec 21				Wed Dec 22				Thu D	
Weather	Likely Rain		Rain		Likely Rain		Rain		Likely Rain				Chance Rain								Slight Chance Rain					
Daily-Temp	High **61** Low **44**				High **61** Low **50**				High **62** Low **53**				High **60** Low **50**				High **64** Low **48**				High **62** Low **51**				Hig Lo	
Chance of Precip	70%	75%	75%	75%	80%	70%	90%	90%	90%	80%	60%	35%	30%	30%	35%	35%	45%	45%	50%	50%	50%	50%	20%	20%	15%	15%
Precip	0.12"	0.09"	0.12"	0.08"	0.12"	0.17"	0.26"	0.40"	1.07"	0.21"	0.05"	0.20"	0.04"	0.13"												
12-hr Snow Total	0"		0"		0"		0"		0"		0"		0"													
6-Hour	4am	10am	4pm	10pm	4am	10am	4pm	10pm	4am	10am	4pm	10pm	4am	10am	4pm	10pm	4am	10am	4pm	10pm	4am	10am	4pm	10pm	4am	10am
Temp	45	58	58	52	51	59	59	54	53	60	59	52	51	58	57	50	49	61	61	53	52	60	58	48	46	58
Cloudiness	100%	100%	100%	100%	100%	100%	100%	96%	100%	100%	100%	100%	95%	86%	70%	70%	90%	90%	82%	82%	95%	95%	95%	95%	57%	57%
Dewpoint	44	46	49	49	48	50	52	52	51	52	52	49	46	48	50	48	45	46	47	47	47	51	53	48	44	44
Relative Humdity	96%	65%	71%	89%	91%	72%	77%	91%	92%	75%	78%	89%	84%	70%	78%	92%	87%	57%	60%	79%	83%	72%	83%	100%	93%	59%
Wind	E 7	E 17	E 10	E 5	SE 9	S 3	E 6	E 8	SE 8	SW 13	S 6	NW 6	S 7	S 7	NE 5	E 9	E 9	SE 12	SE 14	SE 15	SE 18	S 9	SE 6	E 6	SE 1	W 9
Snow Level (ft)	8043	8182	8563	8563	8685	8685	8763	8763	8884	8884	7779	7779	7599	7599	7873	7873	8457	8457	8677	8677	8315	8315	8926	8926	9587	9587

Forecast provided by www.wrh.noaa.gov and recorded by www.stormpop.com on December 17, 2010.

Detailed Description of Monitoring Requirements

Compliance Activities: Risk Level 1

Task	Submittal Requirement
Weekly Inspection Report	Hold in SWPPP, submit with Annual Report
Storm Event Inspection Report	Hold in SWPPP, submit with Annual Report
SWPPP Modifications	Upload major modifications Upload revised SWPPP quarterly at a minimum
Quarterly Non-Stormwater Inspection	Hold in SWPPP, submit with Annual Report
Non-visible pollutant Monitoring	Hold in SWPPP, submit with Annual Report
Annual Report	Covers July 1 – June 30, Due September 1

Compliance Activities: Risk Level 2

Task	Submittal Requirement
Weekly Inspection Report	Hold in SWPPP, submit with Annual Report
Storm Event Inspection Report	Hold in SWPPP, submit with Annual Report
Daily BMP and Trackout Inspections	Log in SWPPP, submit with Annual Report
Rain Event Action Plan (REAP)	Hold in SWPPP, submit with Annual Report
Weather forecast	Hold in SWPPP, submit with Annual Report
NAL compliance monitoring data	Hold in SWPPP, submit with Annual Report If NAL exceedance, submit to SMARTS within 10 days
NAL Exceedance Report	Submit to SMARTS if requested by RB
SWPPP Modifications	Upload major modifications Upload revised SWPPP quarterly at a minimum
Quarterly Non-Stormwater Report	Hold in SWPPP, submit with Annual Report
Non-visible pollutant Monitoring	Hold in SWPPP, submit with Annual Report
Annual Report	Covers July 1 – June 30; due on September 1

Compliance Activities: Risk Level 3

Task	Submittal Requirement
Weekly Inspection Report	Hold in SWPPP, submit with Annual Report
Storm Event Inspection Report	Hold in SWPPP, submit with Annual Report
Daily BMP and Trackout Inspections	Log in SWPPP, submit with Annual Report
Rain Event Action Plan (REAP)	Hold in SWPPP, submit with Annual Report
Weather forecast	Print daily, hold in SWPPP, submit with Annual Report
NAL compliance monitoring data	Hold in SWPPP, submit with Annual Report If NAL exceedance, submit to SMARTS within 10 days
NAL Exceedance Report	Submit to SMARTS if requested by RB
NEL compliance monitoring data	Submit to SMARTS within 5 days of conclusion of rain event
NEL Violation Report	Submit to SMARTS within 24 hours of NEL violation
SWPPP Modifications	Upload major modifications Upload revised SWPPP quarterly at a minimum
Quarterly Non-Stormwater Report	Hold in SWPPP, submit with Annual Report
Non-visible pollutant Monitoring	Hold in SWPPP, submit with Annual Report
Annual Report	Covers July 1 – June 30; due on September 1

Compliance Activities: LUP Type 1

Task	Submittal Requirement
Daily BMP Inspections	Hold in SWPPP, submit with Annual Report
SWPPP Modifications	Upload major modifications Upload revised SWPPP quarterly at a minimum
Annual Report	Covers July 1 – June 30 Includes

Note that weekly inspection report and Quarterly Non-Stormwater Report are not required for LUP Type 1 projects

Compliance Activities: LUP Type 2

Task	Submittal Requirement
Weekly Inspection Report	Hold in SWPPP, submit with Annual Report
Storm Event Inspection Report	Hold in SWPPP, submit with Annual Report
Daily BMP and Trackout Inspections	Log in SWPPP, submit with Annual Report
Weather forecast	Hold in SWPPP, submit with Annual Report
NAL compliance monitoring data	Hold in SWPPP, submit with Annual Report If NAL exceedance, submit to SMARTS within 10 days
NAL Exceedance Report	Submit to SMARTS if requested by RB
SWPPP Modifications	Upload major modifications Upload revised SWPPP quarterly at a minimum
Annual Report	Covers July 1 – June 30; due on September 1 Includes

Compliance Activities: LUP Type 3

Task	Submittal Requirement
Weekly Inspection Report	Hold in SWPPP, submit with Annual Report
Storm Event Inspection Report	Hold in SWPPP, submit with Annual Report
Daily BMP and Trackout Inspections	Log in SWPPP, submit with Annual Report
Weather forecast	Print daily, hold in SWPPP, submit with Annual Report
NAL compliance monitoring data	Hold in SWPPP, submit with Annual Report If NAL exceedance, submit to SMARTS within 10 days
NAL Exceedance Report	Submit to SMARTS if requested by RB
NEL compliance monitoring data	Submit to SMARTS within 5 days of conclusion of rain event
NEL Violation Report	Submit to SMARTS within 24 hours of NEL violation
SWPPP Modifications	Upload major modifications Upload revised SWPPP quarterly at a minimum
Annual Report	Covers July 1 – June 30; due on September 1

Visual Monitoring

- All sites are required to conduct specified types of visual monitoring
- Visual monitoring includes the following types of activity
    - Routine and Event Based BMP Inspection
    - Visual site monitoring of stormwater discharge
    - Non-stormwater inspection

  (in different sections of the permit)
- Traditional and LUP visual monitoring requirements differ

Traditional Projects: Routine BMP Inspections

- Requirements are the same for all Risk Levels
  - Routine BMP Inspections
    - Weekly
    - Note that some BMPs like tracking control require more frequent inspections
    - Year round requirement
  - Rain Event Triggered Inspections
    - Pre, during and post storm
- Goal – identify BMPs that need maintenance to operate effectively, have failed, or could fail

Traditional Project: BMP Inspection Response

- Initiate correction of deficiencies within 72 hours of identification
- Complete corrective actions as soon as possible
- As needed, initiate SWPPP or REAP revisions
- Document corrective actions – you will be asked to describe in Annual Report

Traditional Project: BMP Inspection Documentation

- Document on an Inspection Checklist
  - Develop site specific checklists based on BMPs implemented
    - Check with Regional Board, State Board, MS4 for preferred inspection checklist
    - CASQA (2009 Construction BMP Handbook) provides a detailed example of a BMP checklist that is useful for the current permit
  - Checklist must include the basic permit required information

Inspection Form:

Basic CGP Required Information

Supplement with Detailed BMP Inspection Notes and Photos

GENERAL INFORMATION				
Project Name				
Construction Contractor				
Inspector's Name		Inspector's Title		
Pictures taken?				
Date of Inspection		Date Inspection Report Written		
Inspection Type (Check Applicable)	❒ Weekly ❒ 24-hr intervals during extended rain ❒ Other _____		❒ Prior to forecast rain ❒ After a rain event ❒ Quarterly Non Stormwater	
Precipitation (Check Applicable)	Was it raining during the inspection?		❒ Yes	❒ No
Most Recent Storm Data	Storm Start Date & Time:		Storm Duration (hrs):	
	Time elapsed since last storm (Circle Applicable Units)	Mn. Hr. Days	Approximate Rainfall Amount (inches)	
Stage of Construction				
Activities Completed				
Approximate Exposed Site Area				

GENERAL INFORMATION		
Is the site in compliance with the SWPPP and the permit requirements?	❒ Yes	❒ No
If NO, indicate tasks necessary to bring the site into compliance in the area below. Include dates each task will be completed.		
_____		
_____		
_____		
Was water quality sampling part of this inspection?	❒ Yes	❒ No
If YES, see the results on the final page of the inspection form.		
Sign the following certification:		
"I certify that this inspection form is true, accurate, and complete, to the best of my knowledge and belief."		
Signature		
_____		

LUP: BMP Inspections

- CGP does not identify separate BMP inspection requirements for LUPs
    - BMPs are inspected as part of the daily visual site inspections
    - No requirement to document inspections with a checklist
    - Use a log sheet in SWPPP to indicate inspection was done

Traditional Monitoring: Visual Site Monitoring (Event Based)

- Requirements are the same for all Risk Levels
  - Qualifying Rain Event Triggered Inspections
    - Pre-Rain Event: within 48 hours in advance of predicted event
    - Implement when NOAA predicts a probability of precipitation of 50% or more in the project area
    - Weather.gov
  - Post-Rain Event: within 48 hours following an actual event
- Required during scheduled construction site business hours
- *Note: you won't know if event is a QE until after the storm*

Qualifying Rain Event

Rain event that produces ½ inch or more of precipitation with a period of 48 hours or more between rain events

Traditional Projects: Pre-Rain Event Inspection

- Goal – Ensure the site and BMPs are ready for the predicted rain by inspecting:
  - Drainage areas for spills or uncontrolled pollutant sources
  - BMPs for proper installation per SWPPP or REAP
  - Stormwater containment and storage areas for adequate capacity
  - Observations for floating or suspended materials, sheen, odors, turbidity, or other pollutants within stored stormwater
- Combine the pre-storm inspection with the REAP

Traditional Projects: Post-Rain Event Inspection

- Goal – determine if the BMPs functioned effectively by inspecting:
  - All site stormwater discharge locations
  - Discharge from stormwater containment and storage areas
  - All BMPs to determine if they were adequately designed, implemented, and effective

Traditional Project: Visual Monitoring Documentation and Response

- Maintain records of inspections and weather forecasts
- Records must include the basic permit required information
  - Personnel conducting inspections
  - Observations including date and time
  - Weather conditions, including rain gauge readings
  - Locations observed
  - Corrective actions taken in response to observations
    - Document this (required)

LUP: Visual Site Monitoring

- Type 1
  - Routine – Daily inspections (undocumented)
  - Rain Event Triggered – photos only
    - Photographs taken during daily inspections of the site before, during, and after storm events (must be uploaded every 3 storm events)
- Types 2 & 3
  - Routine – Daily inspections (undocumented)
  - Rain Event Triggered – written inspection required
    - Site inspections before, during and after storm events with photographs

LUP: Visual Monitoring Documentation and Response

- LUP Type 1, 2, 3
  - Maintain photographs from inspections
  - Upload to SMARTS every three storm events
- LUP Type 2, 3
  - Maintain log of inspections in SWPPP
  - Date & Times of inspections
  - Personnel conducting inspections
  - Maintain inspection checklists
  - Rain gauge readings (site or local public gauge)
  - Record of BMPs that require maintenance, failed or could fail

Traditional Project: Non-Stormwater Inspections

- Inspection requirements are the same for all risk levels
- Routine quarterly non-stormwater inspections of all project drainage areas
- Goals
  - Detect unauthorized non-stormwater discharges
  - Observe authorized non-stormwater discharges

Traditional Project: Non-stormwater Inspection Documentation

- Document on an Inspection Checklist
  - Checklist must include the basic permit required information
    - Presence or indications of authorized or unauthorized non-stormwater discharges and their sources
    - Pollutant characteristics (floating or suspended material, sheen, turbidity, odor or discoloration)
    - Personnel performing inspection
    - Dates and times of the inspection of each drainage area
    - Observations
    - Response taken

LUP: Non-stormwater Inspections

- CGP does not identify separate non-stormwater inspection requirements for LUPs
  - Non-stormwater discharges should be identified as part of visual site inspections

Effluent Monitoring

- Objective of monitoring is to determine if BMPs are effective in controlling potential pollutants and demonstrate compliance with NELs and NALs
  - Requirements vary by risk level or project type
  - Qualifying Rain Event Triggers sampling requirement
    - Dischargers will not know if a rain event is a QE at the start of the event
  - Required during normal construction site business hours

Qualifying Rain Event

Rain event that produces ½ inch or more of precipitation with a period of 48 hours or more between rain events

Traditional and LUP:Non-Visible Pollutant Sampling

- **Required of all Traditional Risk Levels and LUP Types**
  - Triggered by the potential for non-visible pollutants to be discharged from site
  - Typically associated with a BMP failure or spill
- **Samples must be collected within two hours of start of discharge from site**
- **Sample two locations**
  - Runoff from area affected by spill or BMP failure
  - Runoff from area not affected by spill or BMP failure
- **All sites must have a plan to conduct non-visible monitoring**

Traditional and LUP: Non-Stormwater Discharge Sampling

- Required for Traditional Project Risk levels 2 and 3 where non-stormwater discharged off the project site
  - Triggered by:
    - Observation of unauthorized discharge
    - Planned non-stormwater discharge
- Samples must be collected at the time of discharge or discovery

* Non-stormwater discharge that is:
  - Not allowed by the permit,
  - Described in the SWPPP or discharged without the required BMPs
  - Prohibited by the regional board

Traditional and LUP: Stormwater Discharge Sampling

- Sampling required for each qualifying event
- Minimum of 3 samples for each day of discharge
- Traditional Risk level 2 and 3
  - Collect samples at ALL site discharge locations
- LUP Type 2 and 3
  - Collect samples to characterize discharge associated with active areas of construction
- Collect samples of contained or stored stormwater from a qualifying event, at time of discharge

Traditional and LUP: Effluent Sampling for Turbidity and SSC

- Turbidity
  - Required at sites subject to NELs and NALs
    - Traditional Risk Level 2, 3 and LUP Type 2, 3
- SSC
  - Required at Traditional Risk Level 3 or LUP Type 3 sites that exceed the turbidity NEL
  - Once the NEL has bee exceeded, SSC sampling continues for the duration of the project

Traditional and LUP: Effluent Sampling for pH

- Traditional Risk Level 2 & 3
  - Required at sites that have high risk of high pH discharge for each qualifying event
    - During utilities, vertical construction phases, and other times when pH altering materials are exposed
- LUP Type 2 & 3 sites
  - Required for each qualifying event
    - LUPs are assumed to have a high risk of pH discharge for the entire project

Traditional and LUP: Effluent Sampling for Other Pollutants

- Potentially required at any site if mandated by
  - Regional Water Quality Control Board
    - Most likely will notify you in writing
  - Established Total Maximum Daily Loads (TMDL)
  - http://www.swrcb.ca.gov/water_issues/programs/tmdl/
- Frequency and location would be specified by the requirements outside the CGP

QSDs need to understand and check monitoring requirements of the area for which they are developing each specific monitoring program

Traditional and LUP: Receiving Water Monitoring

- Required at sites subject to NELs (Traditional Risk Level 3 and LUP Type 3) where:
  - Site effluent exceeds the pH or Turbidity NEL
  - Site has a direct discharge to the receiving water
- Turbidity Exceedance
  - Sample receiving water for SSC and Turbidity
- pH Exceedance
  - Sample receiving water for pH

Direct Discharge Definitions

- CGP Glossary - Appendix 5
  - A discharge that is routed directly to waters of the United States by means of a pipe, channel, or ditch (including a municipal storm sewer system), or through surface runoff.
- State Board's FAQ Clarification
  - Discharges from a construction site to a MS4 where commingling with upstream and/or downstream discharges can occur are not considered "direct discharges".

Conditional/Optional Monitoring

- Risk Level 3 must monitor run-on if there is reason to believe it is contributing to a NEL or NAL exceedance
- Other Risk Level monitoring run-on is not required, but may be a good idea
  - Monitor stormwater that runs onto the construction site for all required constituents
  - Provides information background quality of water
    - Assists in understanding site sources vs. off-site sources of pollutants

Onsite Rain Gauge

- All sites should maintain an onsite rain gauge
  - Required for Risk Level 3 sites
- Document daily rainfall amounts (all sites)
- If no rain gauge, QSD should identify closest government rain gauge in SWPPP

Monitoring Exceptions

- Monitoring is not required during dangerous weather conditions (e.g. electrical storms, flooding etc.)
- When the site/sampling locations are unsafe to access due to the storm event
- Outside of scheduled site operation hours
- Sampling locations need to be selected with due consideration of safe wet-weather access
- **Monitoring not completed due to safety factors must be documented and reported**

Monitoring Quick Reference
Risk Level 1

Table 1- Summary of Monitoring Requirements

Risk Level	Visual Inspections					Sample Collection	
	Quarterly Non-storm Water Discharge	Pre-storm Event		Daily Storm BMP	Post Storm	Storm Water Discharge	Receiving Water
		Baseline	REAP				
1	X	X		X	X		

Monitoring Quick Reference
Risk Level 2

Table 2- Summary of Monitoring Requirements

Risk Level	Visual Inspections					Sample Collection	
	Quarterly Non-storm Water Discharge	Pre-storm Event		Daily Storm BMP	Post Storm	Storm Water Discharge	Receiving Water
		Baseline	REAP				
2	X	X	X	X	X	X	

Monitoring Quick Reference
Risk Level 3

Table 2- Summary of Monitoring Requirements

Risk Level	Visual Inspections					Sample Collection	
	Quarterly Non-storm Water Discharge	Pre-storm Event		Daily Storm BMP	Post Storm	Storm Water Discharge	Receiving Water
		Baseline	REAP				
3	X	X	X	X	X	X	X[4]

[4] When NEL exceeded

Monitoring Quick Reference
LUP

Table 3. LUP Summary of Monitoring Requirements

LUP Type	Visual Inspections				Sample Collection		
	Daily Site BMP	Pre-storm Event / Baseline	Daily Storm BMP	Post Storm	Storm Water Discharge	Receiving Water	Non-Visible (when applicable)
1	X						X
2	X	X	X	X	X		X
3	X	X	X	X	X	X	X

Review Questions!

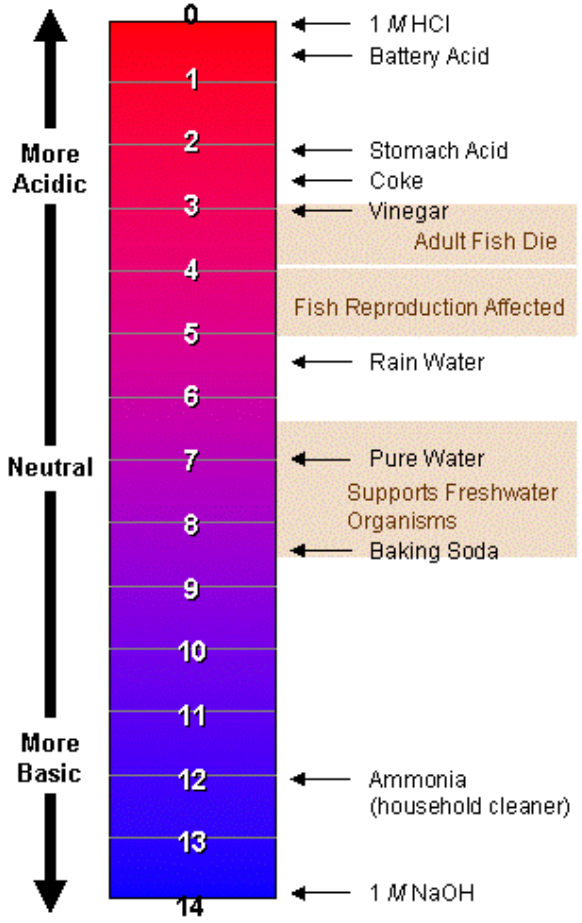
1. What is the minimum number of samples required per day for RL 2 or 3 sites?
2. What is the NAL for pH?
3. What is the NEL for turbidity?
4. What is the required frequency for non-stormwater inspections?
5. Which RL are required to complete a REAP?
6. What is the Qualifying Rain Event?

Water Quality Parameters

How do we measure water quality?

pH

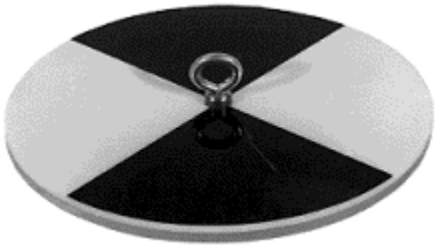
- Measure of the acidity/basicity of water
- Measured on a scale of 0 – 14
- Expressed in pH units
- Receiving waters tend to be in the range of 5 – 9
- CGP requires field measurement



Source: http://www.fst.vt.edu/extension/valueadded/pH.html

Turbidity

- An expression of the optical properties of a liquid that causes light rays to be scattered and absorbed rather than transmitted in straight lines through a sample
- Expressed in nephelometric turbidity units (NTU)
- Field or Lab Measurement



Suspended Sediment Concentration (SSC)

- Measure of the dry weight of all the sediment from a known volume of a water-sediment mixture
- Typically expressed in milligrams of dry sediment per liter of water-sediment mixture (mg/L)
- Laboratory measurement
- TSS is not SSC
  - SSC uses full volume of samples which avoids bias toward smaller particulates
  - TSS measures the dry weight of sediment from a known volume of a subsample of the original

Non-Visible Pollutants

- Pollutants that would not be detected during visual inspections
- Monitoring required if a spill may result in discharge of pollutants to surface waters
- Requires lab analysis
- Table at right is a useful tool for planning non-visible pollutant sampling kit.

Activity	Potential Pollutant Source	Laboratory Analysis
Water line flushing	Chlorinated water	Residual chlorine
Portable toilets	Bacteria, disinfectants	Total/fecal coliform
Concrete & Masonry	Acid wash	pH
	Curing compounds	pH, alkalinity, Volatile organic compounds (VOCs)
	Concrete rinse water	pH
Painting	Resins	Semi-volatile organic compounds (SVOCs)
	Thinners	Phenols, VOCs
	Paint Strippers	VOCs
	Solvents	Phenols, VOCs
	Adhesives	Phenols, SVOCs
	Sealants	SVOCs
Cleaning	Detergents	Methylene Blue Activated Substances (MBAS), phosphates
	Bleaches	Residual chlorine
	Solvents	VOCs
Landscaping	Pesticides/Herbicides	Check with analytical laboratory
	Fertilizers	$NO_3/NH_3/P$
	Lime and gypsum	Acidity/alkalinity
	Aluminum sulfate, sulfur	Total dissolved solids (TDS), alkalinity
Treated wood	Copper, arsenic, selenium	Metals
Soil amendments & dust control	Lime, gypsum	pH
	Plant gums	Biochemical oxygen demand (BOD)
	Magnesium chloride	Alkalinity, TDS
	Calcium chloride	Alkalinity, TDS
	Natural brines	Alkalinity, TDS
	Lignosulfonates	Alkalinity, TDS

Source: CASQA BMP Portal

Sampling Methodologies

Grab Samples

- Definition: A single sample collected at a particular time and place that represents the composition of the water, only at that time and place (US EPA)
- Effluent Monitoring: concentrated flow
  - Immerse the container beneath the water surface to a depth of 0.1 m
- Effluent Monitoring: sheet flow
  - Use a rubber dust pan to collect sheet flow sample
- Receiving Water Monitoring:
  - Sites accessed by bridge or shore can be sampled with a sample container suspending device (e.g. pole sampler)

Must Collect a Representative Sample

- Don’t dip containers with preservatives
- Avoid ponded or sluggish water
- Avoid sampling downstream of a bridge
- Safety first. Do not wade into fast moving streams.
- Access to receiving waters may be restricted by owner of RW, e.g. entering a flood control channel may require an encroachment permit

Composite Samples

- Composite samples not required by the CGP
- Takes samples over a pre determined time period
- Samples may be weighted by volume or by time
  - Every 15 minutes (time)
  - Every 5 cu ft (volume)
- Composite sampler blends samples over sample period

Measurement and Analysis

Field Measurements

- The CGP presumes that pH and turbidity will be sampled in the field with meters
- Field measurements provide immediate feedback
  - Allow corrective actions to be taken sooner, perhaps before daily NEL or NAL is exceeded
- Field meters require knowledgeable and trained staff to operate and maintain

Meter Basics

- Numerous manufacturers and types
  - Hand held meters tend to be the least costly
  - Multi-parameter sensors are more costly
    - $4,000 and up
    - Instantaneous in-stream readings for multiple parameters
    - Cables provide measurement at a distance
    - Generally not necessary for CGP requirements
    - May be needed to meet 401/404 requirements, e.g. DO monitoring

Meter Selection Factors

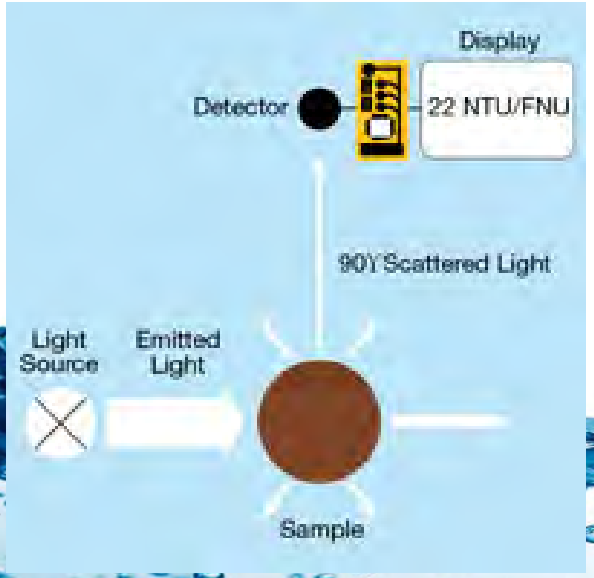
- Meet measurement quality objectives
- Ability to be calibrated
- Rugged design
  - Field use, resistance to water
  - Long term storage
- Ease of use and user-friendly interface
- Detailed operating manual with toubleshooting guide
- Customer Support
- Cost – Likely will need more than one (backup)

Turbidity Meter Calibration

- Meters should be calibrated using standards close to the expected sample value
  - Two point calibration unless otherwise specified by manufacturer
  - Stormwater runoff should be less than 250 NTU (NAL)
  - Calibrate within 0 – 1000 NTU range

Turbidity Measurements

- Follow manufacturers manual for instructions on how to operate the instruments
- The turbidity sample has to be representative of the sampled water mass
- Take several measurements during each sampling during each sampling event

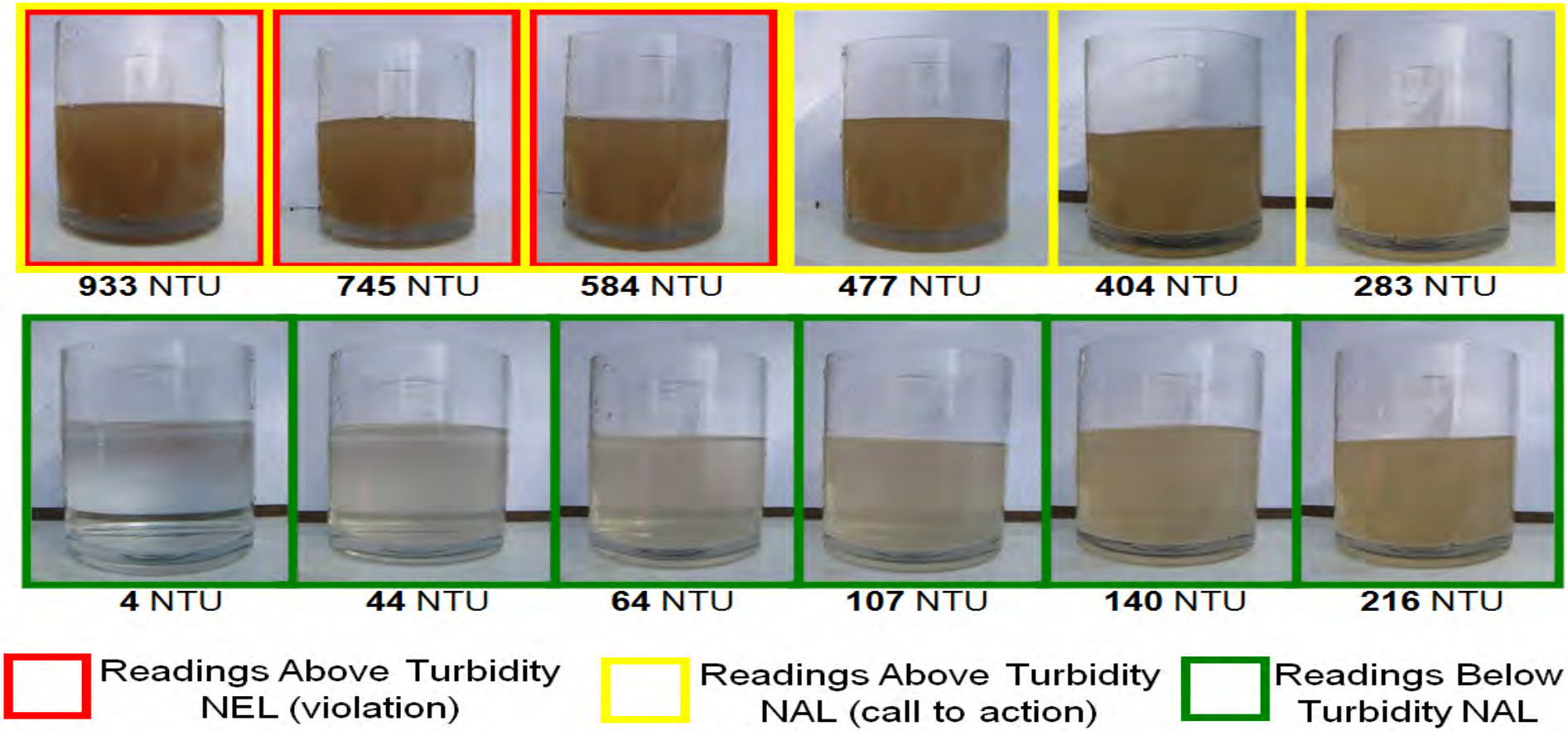


Turbidity Measurement Tips

- Make sure no gas bubbles are trapped in the vial
- Make sure the outside of the vial is completely clean
  - Free of scratches
  - Free of moisture
  - Free of lint
  - Free of fingerprints
- If settling particles are present, record a reading before and one after settling
- If the sample readings are outside the calibration standard limits, recalibrate with a different standard

Turbidity

- An expression of the optical properties of a liquid that causes light rays to be scattered and absorbed rather than transmitted in straight lines through a sample
- Expressed in nephelometric turbidity units (NTU)



Drop in Turbidity Readings with Time

Time = **0**

Initial Reading: **663** NTU

Time = **1** Minute

Reading: **631** NTU

Time = **5** Minutes

Reading: **574** NTU

Time = **10** Minutes

Reading: **502** NTU

Time = **15** Minutes

Reading: **422** NTU

Time (minutes)	Overall Change in Reading (NTU)
1	-32
5	-89
10	-161
15	**-241**

*Note: Changes in turbidity readings over time will vary with sediment properties (particle size, weight, etc).

Let's Play a Game: Guess My Turbidity!

Sample #1

Sample #2

pH Meter Calibration

- With care, pH can be accurately measured to the nearest 0.1 pH unit

pH Test Kits: Allowed by CGP

- Based on the Phenol Red Method
  - Method is calorimetric
- Check pH range
  - Kits typically have a limited pH range
    - Measurements outside the accepted range may differ by several pH units
  - Calibrate with manufacturer provided buffer solutions
  - Typical precision will vary by kit (e.g. , +/- .1 pH unit)

pH Sampling Procedures

- Calibrate pH meter
- Collect sample from discharge point
- Allow the pH probe to equilibrate for at least one minute before pH is recorded to the nearest 0.1 pH unit

pH Sampling Procedures

- pH Measurement from a Bucket
  - Precautions
    - The bucket must be large enough to allow full immersion of the probe
    - The bucket must be brought to the same temperature as the water before it is filled
    - The probe must be placed in the bucket immediately, before the temperature changes
    - The bucket must be shaded from direct sunlight and strong breezes during measurement

Potential pH Measurement Problems

- Out-gassing or settling of charged clay particles may prevent pH value from stabilizing
  - If out-gassing is suspected as the cause, collect a fresh sample, immerse the pH probe and read pH at one minute
  - If suspended clay particles are the suspected cause, allow the sample to settle for 10 minutes, then read the pH in the upper layer of sample without agitating the sample
- Check manufacturer trouble shooting guide

Measurement Requirements

- Source: SWAMP Quality Assurance Management Plan

Parameter	Device	Units	Resolution	Reporting Limit	Accuracy
Turbidity	Portable turbidity meter	NTU	1 NTU	5 NTU	+/- 1
pH	pH meter	None	0.1	n/a	+/- 0.2

Meter and Probe Storage

- Carefully review storage requirements and shelf life of meters and probes
  - Meters may be temperature sensitive
  - Probes usually are temperature sensitive
  - Probes have limited use and shelf lives
  - Probes may need to stay wet
  - Calibration standards have limited shelf lives opened and unopened
- Anticipate regular replacement of probes, calibration standards, and batteries
- Perform maintenance of all meters at the end of the dry season

Sampling Kit

Laboratory Analysis

- Lab analysis is typically <1% of CGP monitoring
- Lab analyses must be conducted by State-certified analytical laboratories
  - Non-visible pollutants in stormwater runoff
  - Non-stormwater discharges (if suspected to contain non-visible pollutants)
  - Other parameters required by Regional Boards or TMDLs
- Currently the SSC method is not state-certified
  - ASTM method

Laboratory Analysis

- State certified labs can be found through the Environmental Laboratory Accreditation Program Website
  - http://www.cdph.ca.gov/certlic/labs/Pages/ELAP.aspx
- ELAP certification means the lab
  - Has undergone a rigorous demonstration of proper analytical procedures
  - Meets precision and accuracy requirements
  - Provides required level of quality assurance and quality control for analysis and data management

Analytical Methods

- USEPA specifies the methods to be used for NPDES permit sampling
  - Commonly referred to at Part 136 methods
    - CWA Section 304(h) Part 136
- A useful listing of the methods is located at
  - http://epa.gov/waterscience/methods/method
- Each method specifies the type of container, minimum sample volume, and sampling handling requirements including hold time

Potential Analysis

Activity	Potential Pollutant Source	Laboratory Analysis
Cleaning	Detergents	Methylene Blue Activated Substances Phosphates
	Bleaches	Residual Chlorine
	Solvents	VOCs
Landscaping	Pesticides/Herbicides	Check with analytical laboratory
	Fertilizers	N03, NH3, Phosphorous
	Aluminum Sulfate, Sulfur	Total dissolved solids (TDS), alkalinity

Finding and Contracting with a Lab

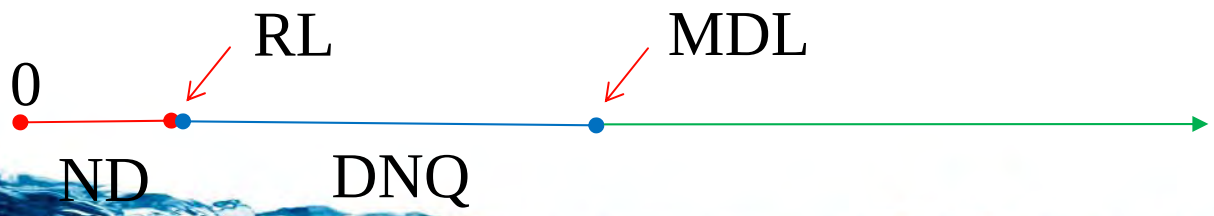
- Select lab with ELAP certification
  - Find lab that conducts SSC
  - Typical SSC cost is $25 (Test America)
- Consider proximity of lab to sampling location
  - CGP requires the lab receive samples within 48 hours
- Consider shipping/courier needs
  - Overnight shipping
  - Lab pick up
  - You deliver

Finding and Contracting with a Lab

- Discuss data turn around time
  - Speed relates to cost
  - 1 week turnaround time is typical
- Discuss needed analysis sensitivity
- Arrange on-call contracts before you need to send in samples
  - Get specific, put your needs in the contract
  - Labs are great resources
    - Can help identify methods, containers, hold times
  - Lab will provide the necessary containers

Detection Terms

- Method Detection Limit (MDL)
  - The minimum concentration of an analyte that undergoes the entire measurement process and can be reported with a stated level
  - This is the value required by the EPA Method
- Reporting Limit (RL)
  - The minimum value below which data are documented as non-detected
  - This is the value typically reported by the labs
- Detected But Not Quantified (DNQ)
  - Values below the MDL and above the RL



Detection Terms

- Dilution factor
  - Labs may dilute sample
  - Look for dilution factor if other than 1.0; confirm result with lab to make sure the result has been adjusted

Quality Assurance and Quality Control

QA/QC Defined

- Definition: A system of procedures, checks, audits, and corrective actions to ensure that environmental monitoring and sampling, and reporting activities are of the highest achievable quality. US EPA
- Definition: An integrated system of management activities (planning, implementation, assessment, reporting, and quality improvement) that focuses on providing confidence in the data or product by ensuring that it is of the type and worth needed and expected by the client. SWAMP QA PrP

QA/QC Elements Already Discussed

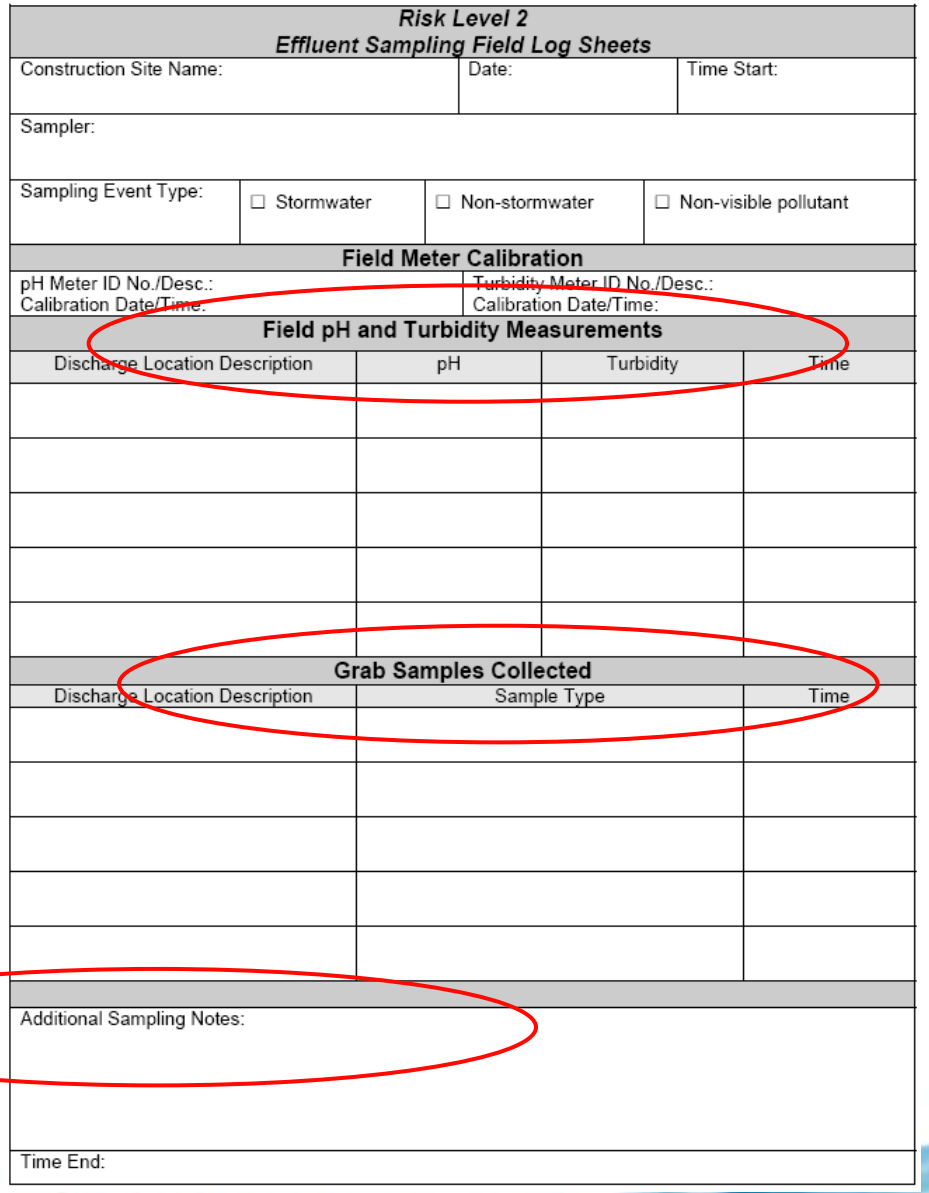
- Written sampling plan
- Field logs to document observations and inspections
- Measurement Quality Objective
- Selecting equipment to meet objectives
- Standardized sampling methodologies
- Meter calibration
- ELAP Certified Labs (ensures Lab QA/QC)
- Approved analytical methods

Basic QA Elements for Construction

- Field Logs
  - Written documentation of monitoring event
  - Should be used to document all QSP activities
- Clean Sampling Techniques
  - Techniques to prevent inadvertent contamination
    - E.g. Changing gloves between samples
- Chain of Custody
  - Tracks samples from collection through data reporting
- Data Verification
  - Process to review data to ensure complete, accurate
  - Calibration (sample should be inside calibration range)

Field Logs

- Written record of field observations and sampling
  - Date and Time of Inspection, Sample collection or Measurement
  - Personnel
  - Container ID numbers
  - Type of samples collected
  - Abnormalities



Risk Level 2
Effluent Sampling Field Log Sheets

Construction Site Name:	Date:	Time Start:
Sampler:		
Sampling Event Type: ☐ Stormwater	☐ Non-stormwater	☐ Non-visible pollutant

Field Meter Calibration

pH Meter ID No./Desc.:	Turbidity Meter ID No./Desc.:
Calibration Date/Time:	Calibration Date/Time:

Field pH and Turbidity Measurements

Discharge Location Description	pH	Turbidity	Time

Grab Samples Collected

Discharge Location Description	Sample Type	Time

Additional Sampling Notes:

Time End:

Visual Inspection Field Log

- Required for all risk levels and LUP types
- Visual inspection does not require documentation

Risk Level 1, 2, 3 *Visual Inspection Field Log Sheet*						
Date and Time of Inspection:				Report Date:		
Inspection Type:	☐ Weekly	☐ Before predicted rain	☐ During rain event	☐ Following qualifying rain event	☐ Contained stormwater release	☐ Quarterly non-stormwater
Site Information						
Construction Site Name:						
Construction stage and completed activities:				Approximate area of exposed site:		
Weather and Observations						
Date Rain Predicted to Occur:				Predicted % chance of rain:		
Estimate storm beginning: _____ (date and time)		Estimate storm duration:_____ (hours)		Estimate time since last storm: _____ (days or hours)		Rain gauge reading: _____ (inches)
Observations: If yes identify location						
Odors	Yes ☐	No ☐				
Floating material	Yes ☐	No ☐				
Suspended Material	Yes ☐	No ☐				
Sheen	Yes ☐	No ☐				
Discolorations	Yes ☐	No ☐				
Turbidity	Yes ☐	No ☐				

Clean Sampling Technique

- No smoking during sampling
- Never collect sample near a running vehicle
- Avoid sampling near a parked vehicle
- Don’t eat or drink during sampling
- Don’t breathe, sneeze or cough in the direction of an open sample container
- Ultra clean techniques may be required for some constituents, e.g. mercury

Chain of Custody (CoC)

- Follows sample from collection through data reporting; provides legal traceability of sample
- Identifies
  - Samples by unique identifier on sample container label
  - Samplers
  - Date and Time of sample collection
  - Required analyses
  - Other instructions for the lab

Sample Chain of Custody

Irvine
17461 Derian Ave
Suite 100
Irvine, CA 92614
phone 949.261.1022 fax 949.260.3299

TestAmerica

TestAmerica Laboratories, Inc.

Chain of Custody Record

Client Contact	Project Manager:	Site Contact:	Date:	COC No:
Your Company Name here	Tel/Fax:	Lab Contact:	Carrier:	____ of ____ COCs
Address	Analysis Turnaround Time			Job No.
City/State/Zip	Calendar (C) or Work Days (W) _____			
(xxx) xxx-xxxx Phone	TAT if different from Below _____			SDG No.
(xxx) xxx-xxxx FAX	☐ 2 weeks			
Project Name:	☐ 1 week			
Site:	☐ 2 days			
P O #	☐ 1 day			

Sample Identification	Sample Date	Sample Time	Sample Type	Matrix	# of Cont.	Filtered Sample																		Sample Specific Notes:

Preservation Used: 1= Ice, 2= HCl; 3= H2SO4; 4=HNO3; 5=NaOH; 6= Other _____

Possible Hazard Identification
☐ *Non-Hazard* ☐ *Flammable* ☐ *Skin Irritant* *Poison B* ☐ *Unknown* ☐

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
☐ *Return To Client* ☐ *Disposal By Lab* ☐ *Archive For* _____ *Months*

Special Instructions/QC Requirements & Comments:

Relinquished by:	Company:	Date/Time:	Received by:	Company:	Date/Time:
Relinquished by:	Company:	Date/Time:	Received by:	Company:	Date/Time:
Relinquished by:	Company:	Date/Time:	Received by:	Company:	Date/Time:

Stormwater RBF CONSULTING

QC Samples: Field Duplicates

- Field Duplicates
  - Field samples collected in duplicate provide precision information as it pertains to the sampling process.
  - The duplicate sample must be collected in the same manner and as close in time as possible to the original sample. This effort is to attempt to examine field homogeneity as well as sample handling, within the limits and constraints of the situation.
- SWAMP requires duplicates at a frequency of 5% of the planned sample count (20 samples -> 1 duplicate)
- Provide duplicate requirements to the lab

QC Samples: Travel Blanks

- Travel Blanks (Trip Blanks)
  - Travel blanks are used to determine if there is any cross-contamination of volatile constituents between sample containers during shipment from the field to the laboratory.
- Only needed if VOCs are sampled
- Frequency identified in EPA method

QC Samples: Equipment Blanks

- Only needed if equipment used to collect samples could add the pollutants to sample
- Frequency identified in method
- Staff responsible for equipment generate blanks in advance of sampling

QC Samples: Field Blanks

- Assesses potential sample contamination levels that occur during field sampling activities.
- Field blanks are taken to the field, transferred to the appropriate container, and treated the same as the corresponding sample type during the course of a sampling event.
- Only required if sampling method calls for field blanks.

Data Verification

- Review of data after measurement or receipt of data from lab
  - Ensure data is complete, accurate and QA/QC requirements were met
  - Conduct verification as soon as possible

Field Data Verification

- Conduct as soon as field logs are received
  - Verify logs are complete
  - All locations were sampled
  - All measurements were conducted
  - Confirm calibrations were completed and recorded
  - Identify equipment problems
  - Review observations
- Check for outlier values
  - Follow up with field crews immediately to identify any equipment or recording errors

Lab Data Verification

- Conduct as soon as data reports are received
  - Review COCs and reports
    - All data received;
    - All samples accounted for
    - All analyses conducted
    - Hold times met
    - Reporting levels meet objectives and contract
    - QA/QC criteria met
- Check for outlier values and follow up with the lab

Preparing for and Conducting Sampling

Sampling Preparation

- Confirm access to sampling sites
- Gather needed equipment
- Prep sampling equipment
  - Clean/calibrate sampling equipment
- Pre-label and organize sample bottles
- Prepare field log sheets
- Prepare chain-of-custody forms
- Plan sample pick-ups or delivery to laboratory
- Always *Always* remember: Safety First!

*sample prep is part of your REAP

Typical Equipment List (part 1)

- Field meters
- Digital Camera
- Sampling Locations Map
- Plastic Buckets
- Powder-free Nitrile Gloves
- Waders
- Pole Sampler
- Labeled* sample containers
- Extra containers and labels*
- Coolers and Ice
- Packing or Duct Tape
- CoC and Field Logs*
- Rain Gear

*Water proof paper

Typical Equipment List (part 2)

- Deionized water
- Cell Phone
- Extra Batteries / Chargers
- Permanent Marking Pens
- CSMP/M&RP
- Contact phone numbers
- Safety Equipment and PPE
  - Traffic cones
  - Safety vests
  - Hard hats
  - Safety shoes
- Paper towels
- Lint free wipes

Meters and Probes Calibrated

- Turbidity Meter calibrated with appropriate standards
  - Sample vial clean
- pH meter calibrated
- Meter back ups
- Extra calibration standards

Containers, Coolers on Hand

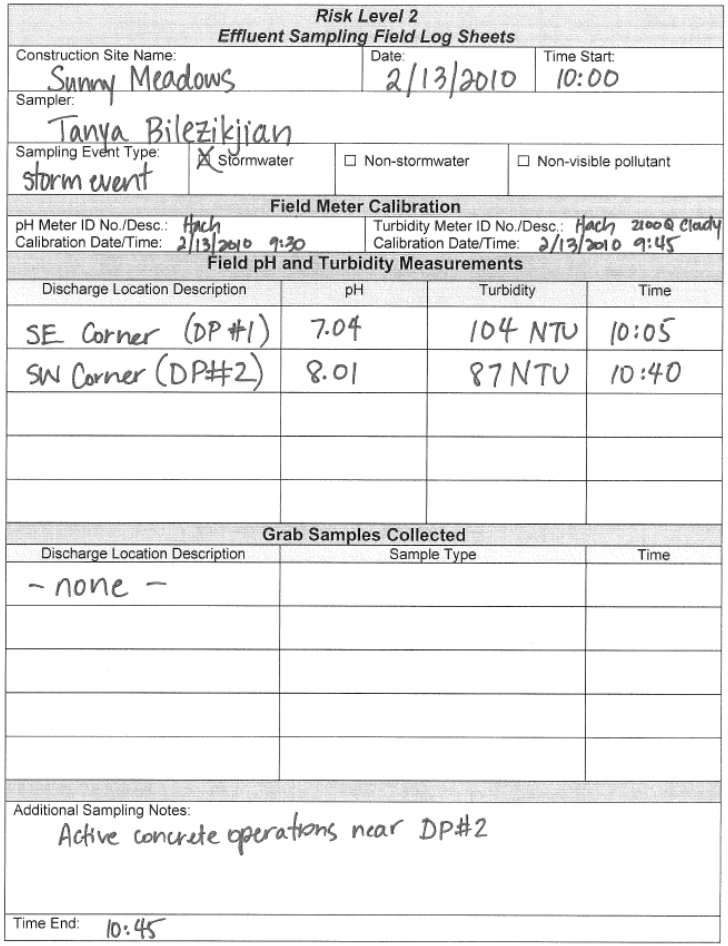
- Bottle size and material
- Preservatives
- Ice/refrigerate samples to 0-6 ^{o}C

Sample Handling

- Collect samples in lab provided containers
- Use clean, powder-free nitrile gloves
  - Change gloves when something not known to be clean is touched
  - Only clean gloved hands touch inside bags, bottles, buckets and tubing
- Decontaminate all equipment
  - Rinse with deionized water
  - Collect and dispose wash and rinse water properly

Field Log

- Errors must be crossed out and initialed – not blotted out
- Field meter calibration date and time is recorded
- Use 24 hour clock to avoid confusion



Risk Level 2
Effluent Sampling Field Log Sheets

Construction Site Name:	Date:	Time Start:
Sunny Meadows	2/13/2010	10:00

Sampler: Tanya Bilezikjian

Sampling Event Type:	☒ Stormwater	☐ Non-stormwater	☐ Non-visible pollutant
storm event			

Field Meter Calibration

pH Meter ID No./Desc.: Hach	Turbidity Meter ID No./Desc.: Hach 2100Q Cladv
Calibration Date/Time: 2/13/2010 9:30	Calibration Date/Time: 2/13/2010 9:45

Field pH and Turbidity Measurements

Discharge Location Description	pH	Turbidity	Time
SE Corner (DP #1)	7.04	104 NTU	10:05
SW Corner (DP#2)	8.01	87 NTU	10:40

Grab Samples Collected

Discharge Location Description	Sample Type	Time
– none –		

Additional Sampling Notes:
Active concrete operations near DP#2

Time End: 10:45

Maintaining Monitoring Records

- Completed field logs – 3 years
  - Visual inspections
  - Field monitoring data
  - Non-stormwater inspections
  - Photographs
- BMP inspection checklists
- Lab Analysis
  - COCs
  - Original lab data reports
  - QA/QC data

Maintaining Monitoring Records

- Corrective action records
  - BMP maintenance and repair
  - Additional/improved BMPs installed
- Sample exception documentation
- Weather reports (NOAA)
- Plan for the retention of the records that will be generated for each monitoring event
- Records must be kept at the site with the SWPPP.
- Consider means to back up records and convert to PDF files. Portable document scanners are <$100

Interpreting the Results

Using Your Data – Effluent pH, Turbidity, SSC

- Compare data to the appropriate limits for the project
  - NALs
    - Turbidity 250 NTU; pH 6.5 - 8.5
  - NELs
    - Turbidity 500 NTU; pH 5.0 – 9.0
- Initiate reporting as required
- CGP does not specify a limit for SSC
  - Information only

Using Your Data – Receiving Water

- Permit does not specify limits in the receiving water
  - Water Quality Objectives may be applicable
- Compare data from location affected by site runoff (downstream) to data from unaffected (upstream) location
- Look for significant increases from the upstream to the downstream
  - May be the result of the site runoff
  - Observations of sampling team may indicate other potential sources

Using Your Data – Non-Visible Pollutants

- Limits are not specified in the permit
- Compare data from affected location to data from unaffected (background) location
- If there is a significant difference (between upstream and downstream samples) initiate corrective action and resample as soon as possible

ATS Monitoring

Active Treatment Systems (ATS)

CGP Establishes ATS Specific Requirements

- ATS monitoring requirements are specified in Attachment F of the CGP
  - Visual monitoring
  - System influent and effluent monitoring
  - Effluent toxicity or chemical residual testing

More ATS Requirements

- CGP requires ATS qualified designers and operators
  - QSDs and QSPs need to understand the basics of ATS monitoring, but monitoring plan will be developed by an ATS designer and implemented by an ATS operator
  - Note: QSD/P training does NOT qualify you as an ATS designer or operator

  * If using an ATS, QSD/P may not operate unless also qualified

Active Treatment Systems Defined

- ATS is any system that uses chemical coagulation, chemical flocculation, or electro-coagulation to reduce turbidity
- Typically these systems have a system of basin(s), pump(s), and filtration units, as well as online monitoring systems

What is Active Treatment?

- The State Water Board considers any system that uses a chemical to remove turbidity or sediment from water to be an ATS
  - Currently BMPs that passively incorporate these chemicals are considered ATS, e.g., Floc-Logs
- Ok to use PAM/polymer as an erosion control

  *if used as a sediment control then it is an ATS

ATS Monitoring, Sampling and Reporting Plan (MSRP)

- MSRP is one component of the ATS Plan that the ATS designer will develop
- ATS MSRP should be referenced in the CSMP or M&RP
- Type of system will determine specific monitoring elements
  - Flow-through Treatment
  - Batch Treatment

ATS Visual Monitoring

- Designated responsible person on-site at all times when ATS is operating
- Must perform daily visual monitoring of system to ensure performance
- Record observations and readings in a data log
  - Date and Time (Startup and Shutdown)
  - Flow meter totalizer readings (Startup and Shutdown)
  - Instrument calibration records and dose rate
  - Hand Sampling/Confidence Checks

Visual Monitoring: Confidence Checks

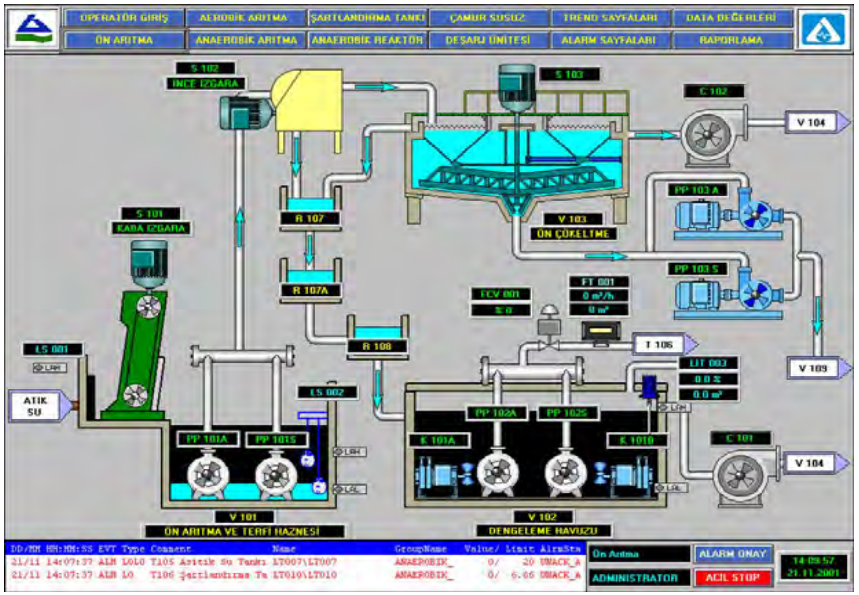
- **Handheld** probes and meters are used to verify that online instrumentation is supplying accurate data
- Bench-top instruments are easily used for checking water quality in **remote** parts of the ATS (tanks, basins, etc.)

Operational and Compliance Monitoring

- ATS incorporates automatic monitoring instruments that measure water quality and flow
  - Continuous flow monitoring; daily flow volume
  - Continuous influent and effluent pH
  - Continuous influent and effluent turbidity
- Additional monitoring
  - Type and amounts of pH adjustment
  - Dose rate
  - Residual chemical (flow-through systems)
  - Toxicity (batch systems)

Operational and Compliance Monitoring

- ATS must have the ability to **read and record** water quality parameters, accept **pre-determined** set points and route water based on CGP requirements
- This is accomplished by using flow meters, online probes and automated valves all tied to a **SCADA** system
- SCADA has the ability to auto shut off or recirculate when out of compliance values detected



SCADA = supervisory control and data acquisition

Operation and Compliance Monitoring: Flow/Volume

- Automated/On-line
- Continuously monitored
  - Flow logged 15-minute intervals or less
  - Total Volume treated and discharged daily
- Data recorded by the SCADA
- Other flow measurements recommended for good system operations
  - Influent flow is recorded
  - Flow recycled back through the treatment system

Operation and Compliance Monitoring: pH and Turbidity

- Automated/On-line
- Continuously monitored
  - pH logged 15-minute intervals or less
  - Turbidity (as NTU) logged 15-minute intervals or less
- Data recorded by the SCADA
  - SCADA must recycle (recirculate) if measured outside of ATS NELs

ATS Turbidity NELs
10 NTU daily flow weighted average
20 NTU single sample maximum

Operation and Compliance Monitoring: Dose Rate

- Document type of chemical used
- Monitor and report amount of chemical used at mg/L
  - 15 minutes after start up
  - Every 8 hours of operation
- Calculated based on chemical use and flow/volume of treated effluent
- Record in Data Log

Operation and Compliance Monitoring: pH Adjustment

- Acids or bases may be needed to adjust pH for proper treatment or discharge
- Document type of chemical used
- Monitor and report amount of chemical used
- Record in Data Log daily

Chemical Residual Test and Toxicity Tests

- CGP required testing of ATS effluent to assure the treatment chemical does not cause toxicity
- Two methods are available to demonstrate there is no toxicity
  - Chemical residual tests
    - Field test based on lab validated methods
  - Toxicity tests
    - Lab tests, Whole Effluent Toxicity

- If there is no acceptable chemical residual test, ATS must operate as a batch treatment system

Operation and Compliance Monitoring: Chemical Residual Test

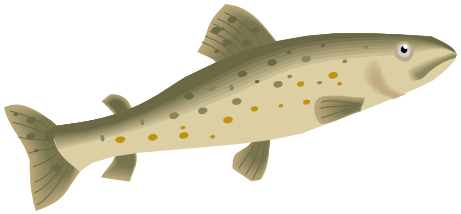
- Used with Flow-through ATS
- Residual testing assures that the ATS is removing chemical additives before discharge
- Method must be validated by a State-certified Laboratory
- Field test capable of producing results within one hour of sampling
- MDL must be 10% or less than the Maximum Allowable Threshold Concentration (MATC)
- Duplicates must be sent to contract lab monthy

Operation and Compliance Monitoring: Chemical Residual Test

*Residual tests are currently available for a very limited number of chemicals (chitosan only)

- Each chemical will have its own method proposed in the ATS Plan
  - Sample frequency
  - Handling requirements
  - Detection levels
- Record in Data Log
- Report MATC exceedances

Operation and Compliance Monitoring: Toxicity Test



- Used with Batch Treatment Systems
  - Whole Effluent Toxicity (WET) Test (EPA-841-R-02-012) *Methods for Measuring the Acute Toxicity of Effluents and Receiving Water to Freshwater and Marine Organisms*
- Test of effluent to determine toxicity to test species
  - Species are exposed to the effluent for 96-hours and survival is compared to a control
- Testing is required after each batch is treated but prior to discharge
- Analysis conducted by state certified analytical laboratory

Operation and Compliance Monitoring: Toxicity Test

- Collect Composite or Grab sample representative of treatment system effluent
  - *Composite Sample: A series of water samples taken over a give period of time and weighted by flow rate*
- Complete chain of custody and field log

	Sample Size	Hold Time	Preservation	Container
WET	4 liters	36 hours (72 hour variance)	0-6 degrees Celsius	Plastic

Maintaining Monitoring Records

- Data Log
  - Diary of recordings and observations
    - Name and signature of operator (on each daily entry)
    - Documentation of operator training
    - Visual observations
    - Results of Hand Sampling/Confidence Checks
      - Date and time of measurements
    - Relevant notes section (system upsets, pressures, etc.)
- Calibration records for field equipment and instrumentation

Maintaining Monitoring Records

- Results of field chemical residual tests
- Results of all lab analytical tests
  - COCs
  - Original lab data reports
  - QA/QC data
- Rain gauge readings
- Weather reports

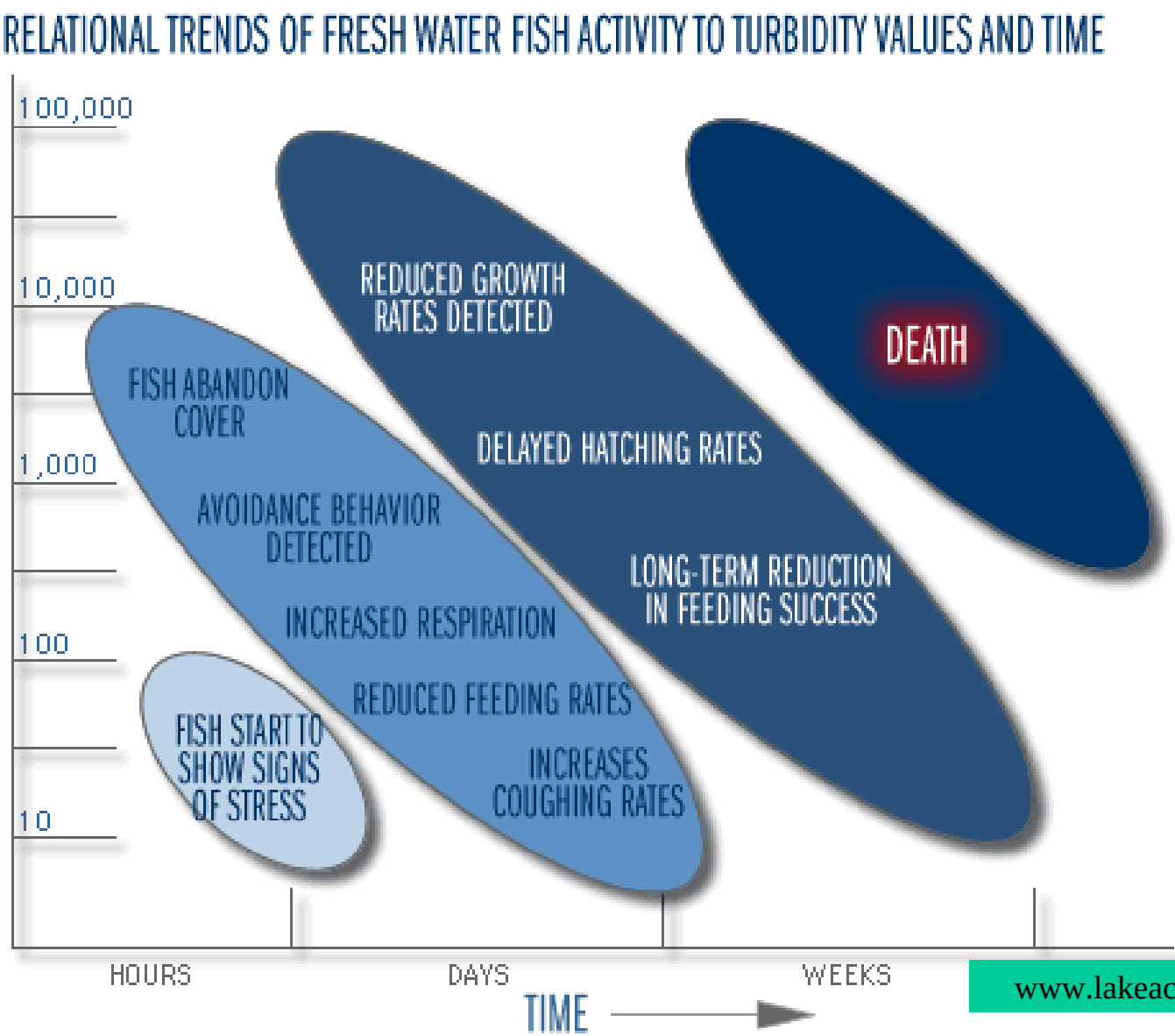
ATS Reporting - Routine

- Monthly – electronically report to the State Water Board
  - Field data (hand samples, chemical residual tests)
  - Lab data (toxicity tests, chemical residual QA tests)
  - Continuous monitoring data sets

ATS Reporting – Non-compliance

- Within 24 hours of identification – electronically report to the State Water Board
  - Exceedance of ATS NELs file NEL Violation Report
    - Date, time, place, desription and rainfall data
    - Description of BMPs and corrective actions
    - Rain gauge data if greater than the compliance storm event
      - ATS compliance storm event is a 10-year, 24-hour event
- Any indication of toxicity – report to appropriate agency (may include CDFG and RB)
- Exceedance of Water Quality Standards – report to Regional Water Board

Turbidity is Toxic to Aquatic Organisms



www.lakeaccess.org/russ/turbidity.htm

Questions and Discussion