

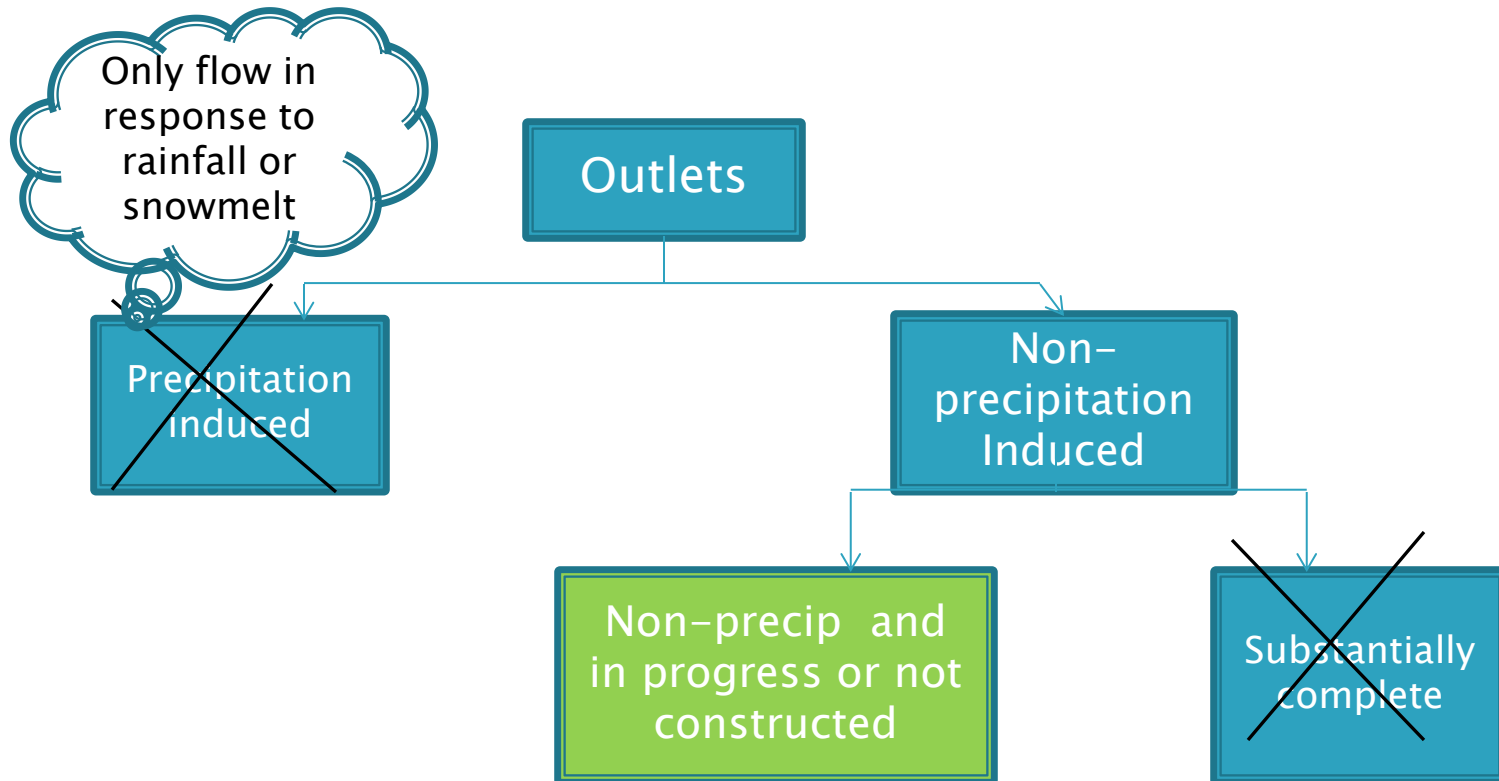
WET FAILURES AND THE ADAPTIVE MANAGEMENT PLAN (AMP)

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Permitting Guidance

- ▶ WVDEP's "Permitting Guidance for Surface Coal Mining Operations to Protect West Virginia's Narrative Water Quality Standards, 47 CSR 2 §§ 3.2.e and 3.2.i" was issued on August 12, 2010 (revised May 11, 2012).
- ▶ Identifies which operations are required to conduct:
 - Whole Effluent Toxicity (WET) testing
 - Annual benthic surveys at the established biological assessment stations (BAS).

Which outlets apply?



What requires WET testing?

- ▶ Non-precipitation induced discharge
 - New or expanded discharges
 - Existing, but not “substantially complete”
- ▶ Examples:
 - Deep mine discharges
 - Valley fills
 - Refuse toes
 - Slurry impoundments
 - In-stream ponds
 - Groundwater influenced on-bench outlets

WET Requirements in NPDES Permit

Limits

Chronic Toxicity– Ceriodaphnia Dubia

0.82 TUc Monthly Average / 1.64 TUc Daily Max

Triggers

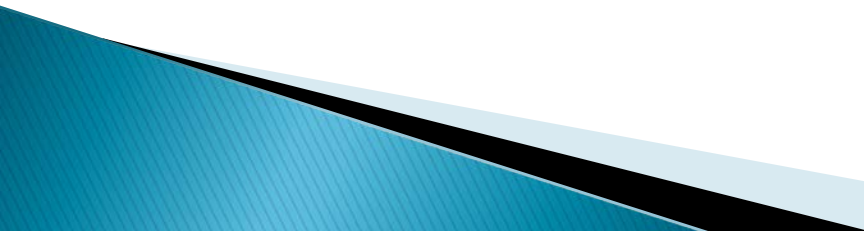
Chronic Toxicity– Ceriodaphnia Dubia

Report Only

Trigger value = 1.0 TUc

Section D – Whole Effluent Toxicity Trigger

Which parameter code do we look for in DMRs for WET?

- ▶ 41426 Chronic Toxicity – Ceriodaphnia
 - ▶ 41427 Acute Toxicity – Ceriodaphnia
 - ▶ 42428 Chronic Toxicity – Pimephales
 - ▶ 41429 Acute Toxicity – Pimephales
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- ▶ Will always use the parameter code in red, except in rare instances such as site-specific mixing zones.
 - ▶ Both acute parameters have been assigned to site-specific mixing zone discharges where the discharge is <1% of the receiving stream.
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WET Exceedances

- ▶ If discharge exceeds WET limitations or trigger:
 - Permittee must resample **within 30 days**.
- ▶ If the retest shows non-compliance:
 - Permittee must submit an Adaptive Management Plan (AMP) **within 60 days** identifying actions to achieve compliance.
- ▶ If permit has WET triggers and the initial WET test and retest fail:
 - An NPDES modification must be submitted to apply WET limitations to the permit.

Retest compliant?

- ▶ If retest shows compliance:
 - Permittee shall continue regular WET testing frequency in accordance with permit requirements (usually quarterly).

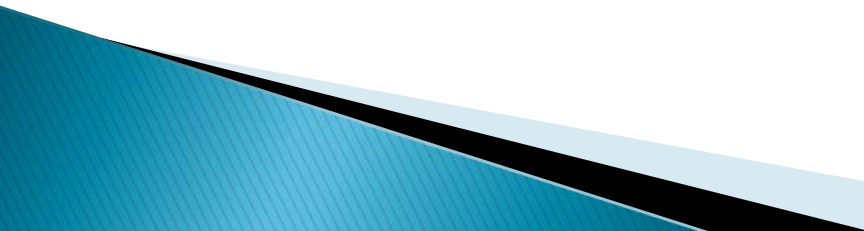
WET Failures

- ▶ Once a WET failure has occurred, permittee should be in discussion with:
 - WVDEP Inspector
 - WVDEP Regional Analyst
 - Logan – Tom Satterfield
 - Oak Hill– Alyce Lee
 - Philippi– Pam Drooger / Ken Stewart
 - Consultant??

WET Failure

- ▶ Cooperative effort b/w WVDEP and permittee
- ▶ Discussions of :
 - WET results and thorough review of WET report and associated data
 - Field conditions
 - Walking through AMP process together
- ▶ Continue Monthly WET testing at the affected outlet(s) until toxicity is abated and confirmed by WVDEP

WET Failure – Case Study

- ▶ Received data of toxicity result at a loadout sump of 8.0 chronic toxic units (TUc).
 - ▶ Permit Limit 1.0 TUc.
 - ▶ Previous quarterly WET test passed.
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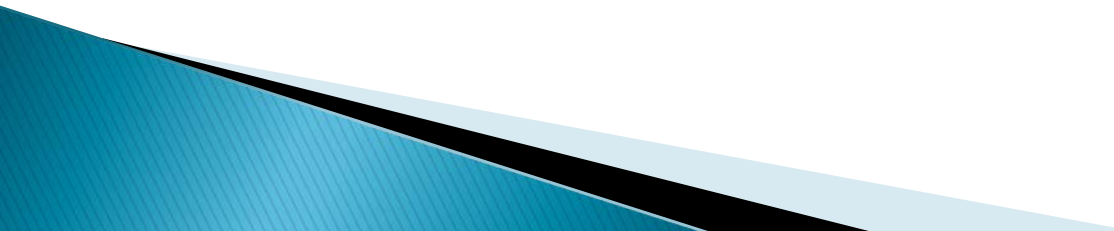
Diagnostics

- ▶ Upon failure, samples of the inflows to the sump were taken and tested for toxicity. Toxicity tests indicated no toxicity.
- ▶ Concluded that toxicity was being introduced in the sump.
- ▶ Only 2 potential additives in sump:
 - dust suppressant from railroad loadout
 - new flocculant started 2 weeks prior to testing
- ▶ MSDS sheets reviewed for dust suppressant and flocculant

MSDS

- ▶ Dust suppressant
 - Biodegradable
 - Would require much higher concentration that currently applied to cause toxic effects
- ▶ Flocculant
 - No toxicity information provided
 - Permittee requested toxicology tests be performed by chemical supplier

Interim Measures

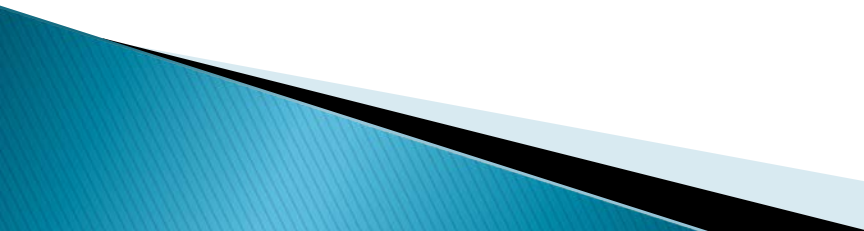
- ▶ Retest of WET required within 30 days, but permittee voluntarily ceased discharge once piping was in place to divert flow to the slurry impoundment since diagnostic testing indicated toxicity introduced in the sump
 - ▶ Deep mine water directly pumped into sump was pumped back to thickener and up to slurry impoundment with temporary pumps and piping
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Flocculant Toxicity Results

- ▶ LC50 (lethal concentration to 50% of test organisms) occurred at 10 ppm
- ▶ Dosing at sump was calculated closer to 40 ppm due to minimal residence time in sump

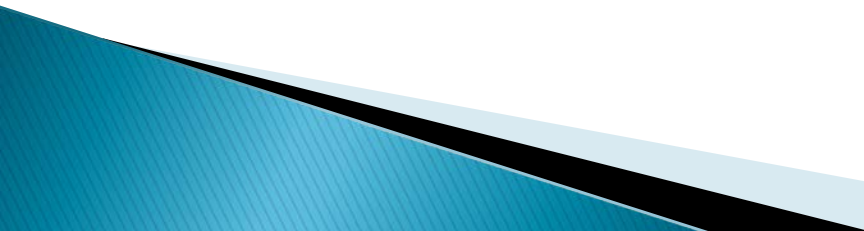
Long Term Management

- ▶ Completion of underground piping to send encountered deep mine water directly to impoundment where more dilution and residence time is available
 - ▶ Pumped residual water in loadout sump to impoundment
 - ▶ Dug out solids, laden with flocculant, and placed high and dry
 - ▶ Allowed precipitation to fill sump and pumped up to impoundment several times to remove residual flocculant
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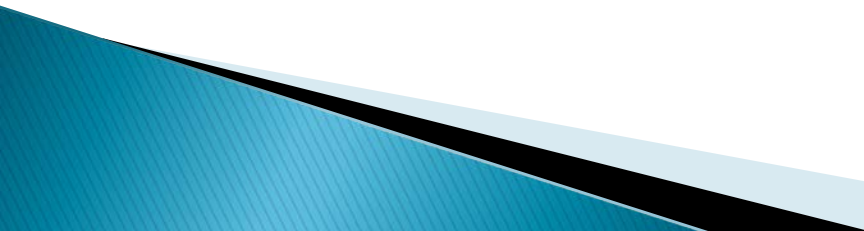
Long Term Management

- ▶ Identified replacement flocculant and assessed toxicity levels vs. required dosage rate
 - ▶ Removed capability to send deep mine water to loadout sump
 - ▶ Allowed sump to fill final time with precipitation
 - ▶ Performed diagnostic WET tests to ensure no remaining toxicity prior to resuming discharge
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Contributing Factors

- ▶ Early mine development stages do not make it feasible to provide pumping capability of deep mine water directly to the slurry impoundment.
 - ▶ Loadout sump designs are generally based on runoff, not designed to target a specific residence time for several hundred gpm of deep mine water.
 - ▶ Sump met required acre-ft due to depth of sump. Short circuiting was likely during high flows, greatly reducing retention time.
 - ▶ Toxicity of flocculant was not known prior to its utilization.
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Contributing Factors

- ▶ Flocculant dosing was increased beyond recommended rates due to utilization of small sump for control of high volume deep mine discharge.
 - ▶ During startup, underground sumps were not yet available to assist in settling prior to water being discharged to the surface.
 - ▶ Capability to send deep mine water to the sump was designed to be a back up, not primary discharge point.
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Other WET Failures

▶ **Ionic strength**

- TIE abated toxicity by increasing hardness
- Hardness addition was deemed not feasible onsite
- Water was pumped to another mine pool and discharged from another outlet

▶ **Flocculant**

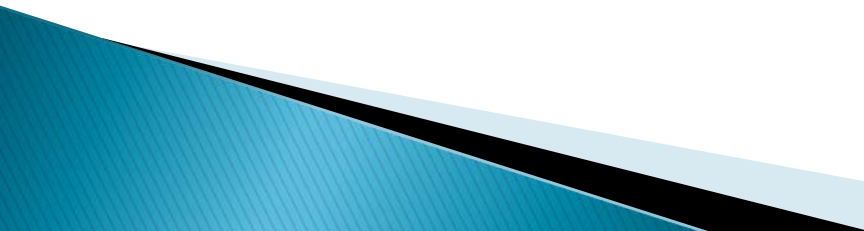
- 2 other permittees are associating WET failures with flocculant

▶ **Low Hardness**

- Adjustments made to WET protocol to raise lab organisms in low hardness water

▶ **Sampling error** of pooled water

Adaptive Management Plans (AMP)

- ▶ AMP document submitted to DEP within 60 days of failure of retest generally includes:
 1. What information permittee knows
 2. What information permittee plans to collect to identify toxicity source
 3. Consideration of TIE/TRE lab testing
 4. Timing of collection of new information
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Adaptive Management Plans (AMP)

5. How they will keep WVDEP in the loop

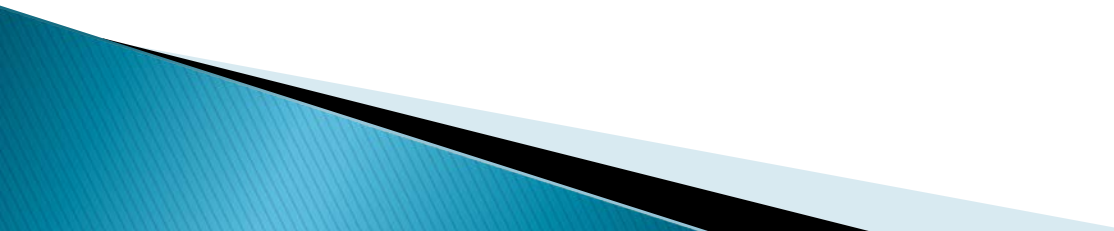
6. What, if any, short term/immediate control measures they could implement to minimize toxic effects

7. When they expect to receive results of investigation, so long term management plan can be developed

AMP Process

- ▶ Different from a compliance schedule for Se, for example, because:
 - The source of the toxicity may not be identified, so the AMP includes an investigation component.
 - Until the source of toxicity is understood, a plan to abate toxicity long term cannot be developed.

AMP Process

- ▶ AMP will likely contain a large investigation and information sharing component
 - ▶ AMP will be fluid document that will continue to develop and be revised as toxicity is identified and management strategies developed.
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AMP Process

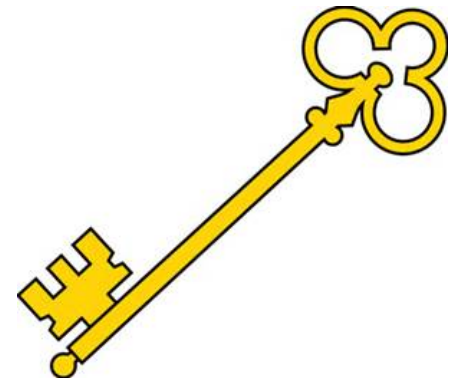
- ▶ Once the source of toxicity has been identified, permittee can update the AMP document to include:
 - Results of the toxicity identification investigation
 - Adjustments to any short term management measures
 - Long term management plan
 - actions to take to abate toxicity
 - timing of each action
 - Sampling plan to ensure toxicity is abated after long term management plan has been fully implemented

Closing out the AMP Process

- ▶ After the toxicity is abated, permittees are generally providing:
 - Several months of passing WET results
 - Written request to close out the AMP and resume normal quarterly WET sampling frequency
- ▶ DEP has responded with a letter of confirmation based on review of the results and successful implementation of management plans.

AMP Process

- ▶ The permittee, WVDEP inspector and analyst should be working in close coordination:
 - sharing information
 - communicating ideas
 - evaluating success of permittee's toxicity identification and management strategies



AMP Process

- ▶ Article 3 Revision needed?
 - If new operational measures are implemented in the AMP process, they may need to be incorporated into the Hydrologic Reclamation Plan and may require an Article 3 revision.

Food for Thought:

How will/should AMPs, the identified toxicity sources, and remedial measures taken to abate the toxicity impact future AEPPs?