



FERC Expectations in Owner Review of DSSMPs and DSSMRs



Topics

- Dam Safety Monitoring
- Chapter 14, Appendix J & K Changes
- Owner Review of DSSMPs
- Owner Review of DSSMRs
- Expectation Summary



Dam Safety Monitoring

“Monitoring of every dam is mandatory because dams change with age and may develop defects. There is no substitute for systematic and intelligent surveillance.”

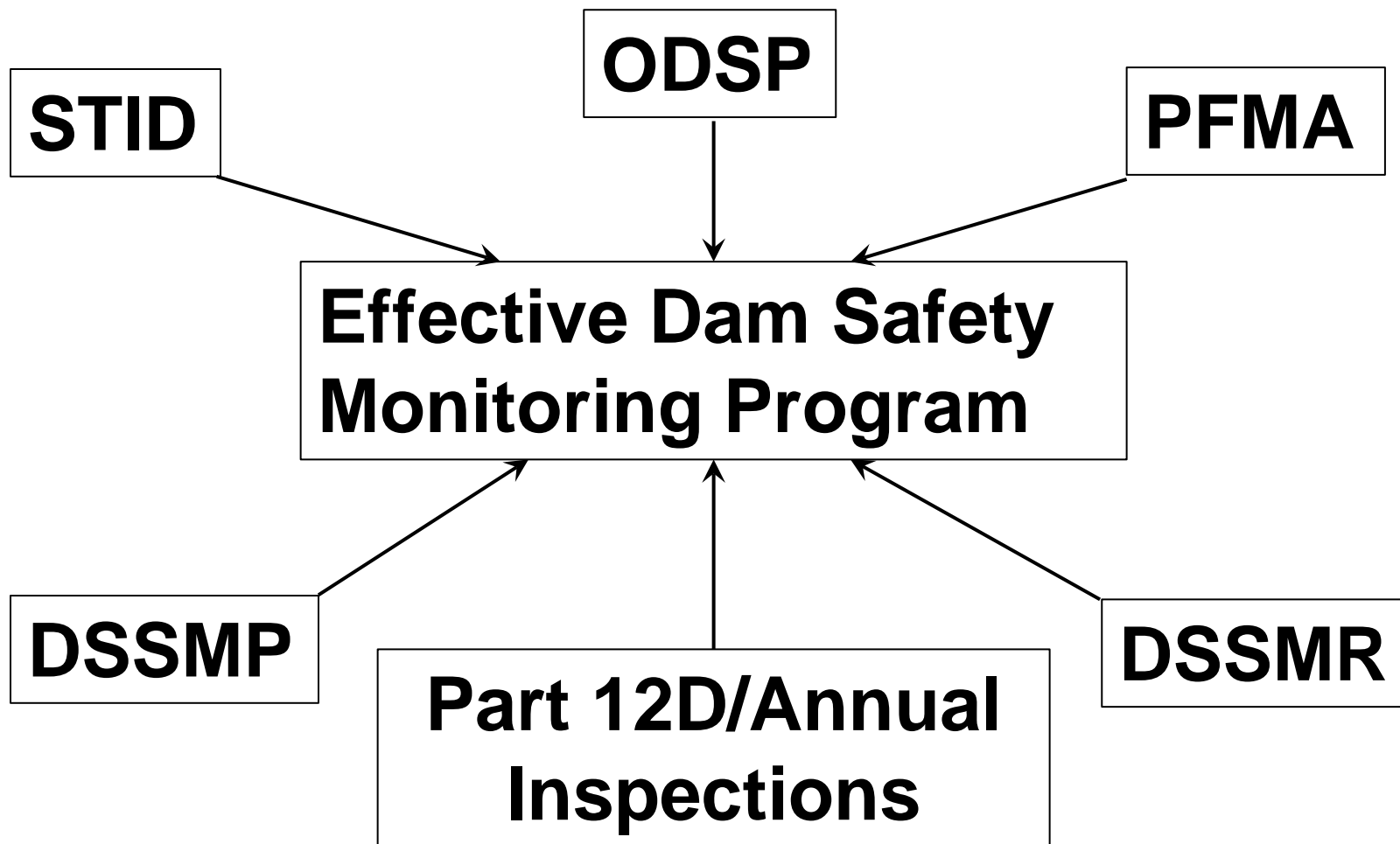
Ralph Peck, 2000

“Monitoring programs have failed, because the data generated were never used, if there is a clear sense of purpose for a monitoring program, the method of data interpretation will be guided by that sense of purpose. Without purpose, there can not be interpretation.”

Dr. John Dunnycliff



Dam Safety Monitoring





Dam Safety Monitoring

- Most failures are not caused by a single easily analyzed cause.
- Failures often result from several separate components or subsystems interacting in an unforeseen manner. An uncommon combination of common events.
- “There are known knowns. These are things we know that we know. There are known unknowns. That is to say, there are things that we know we don't know. But there are also unknown unknowns. There are things we don't know we don't know.” Donald Rumsfeld



Ch.14, App. J & K Changes

Commission Letter to all licensees and exemptees of high and significant hazard dams – August 2014

Two items in future DSSMR's (After Jan. 1, 2015)

1. Annual statement from Chief Dam Safety Engineer (CDSE)
2. Grouping of Potential Failure Modes (PFMs) and Instrumentation



CDSE Statement

“Based on my personal knowledge and meetings and discussions with my engineering staff and/or consultant(s), along with review of the DSSMR, Part 12 Inspection Report, Dam Safety Inspection(s), and Dam Safety Studies, I conclude, that the dam(s) is safe for continued operation, with the following issues noted: (*List of outstanding items (instrumentation anomalies, detailed stability analyses, PMP/PMF studies, etc.)*.”

The statement should be signed.



If the CDSE can't certify safe for operation....

- Submit a Justification for Continued Operation plan and schedule to remediate the dam so that the dam can be considered safe for continued operations.
- The plan should include interim measures to reduce risk until remediation is complete, and the dam is judged safe for continued operation.



Appendix J & K Changes

- CDSE statement is a reflection of continual process of:
 - Collecting and analyzing performance data
 - Using results to add to the understanding of project structures
 - Confidence or lack of confidence that the structures will perform under all loading conditions



Group and Evaluate Instrumentation to PFM's (Tabular Format)

- Instrumentation associated with a PFM.
- PFM's that have been identified, but not associated with an instrument.
- PFM's not previously identified, but discovered when reviewing STID, historical data and evaluation of instrumentation readings.
- Instrumentation not associated with a PFM – General Health



Federal Energy Regulatory Commission Division of Dam Safety and Inspections



Example Tables to be included with Annual DSSMR submittal

EXISTING PFM_s WITH INSTRUMENTATION:

PFM – Number/Title(s)	Monitoring Effort	Result
PFM 1 - Sliding failure of the spillway during the Probable Maximum Flood (Category I – Highlighted PFM)	PZ-1 (uplift piezometer)	No adverse trends, no thresholds exceeded
	PZ-2 (uplift piezometer)	Rising trend but below thresholds, flushed and readings returned to historic range
	PZ-3 (uplift piezometer)	No adverse trends, no thresholds exceeded
	Deformation Surveys	Adverse trend detected for BM-3 through BM-7, see evaluation on page 16
	Annual dive inspection	No adverse findings related to PFM 1
	Daily operator inspections	No adverse findings related to PFM 1
	Monthly supervisor inspection	No adverse findings related to PFM 1
PFM 2 - Operational gate failure (Category II – Considered not Highlighted PFM)	Annual engineer inspection	No adverse findings related to PFM 1
	Annual dive inspection	No adverse findings related to PFM 2
	Daily operator inspections	No adverse findings related to PFM 2
	Monthly supervisor inspection	No adverse findings related to PFM 2
	Annual engineer inspection	No adverse findings related to PFM 2
	Annual gate testing	Current readings in normal range
	10-year detailed gate inspection	All maintenance actions complete

EXISTING PFM_s WITHOUT INSTRUMENTATION:

PFM – Number/Title(s)	Monitoring Effort	Comment
PFM 3 - Failure of low level outlet during normal loading conditions (Category II – Considered not Highlighted PFM)	None identified	Low level outlet is submerged and silted in - could not locate during last dive inspection

Note: Some instruments may be used to monitor development of multiple PFM_s and should be listed with each associated potential failure mode. All instrumentation, including visual monitoring, should be used to monitor the overall condition of the dam and help identify new PFM_s.



Federal Energy Regulatory Commission Division of Dam Safety and Inspections



NEWLY IDENTIFIED PFMs (Follow Procedure in Chapter 14, Section 14.3.6 for Updating PFM's)

PFM – Number/Title(s)	Monitoring Effort	Result
Sliding of the non-overflow under normal loading conditions (candidate PFM identified during evaluation of deformation survey results)	Deformation Surveys	Differential movement detected and further evaluation of stability is needed
	Daily operator inspections	New cracks found on 9/18
	Monthly supervisor inspection	No adverse findings
	Annual engineer inspection	No adverse findings
Failure of Penstock No. 1 due to corrosion under normal loading (candidate PFM identified during review of STID)	Daily operator inspections	No visual changes to corrosion or leakage detected
	Monthly supervisor inspection	No visual changes to corrosion or leakage detected
	Annual engineer inspection	No visual changes to corrosion or leakage detected
	Ultrasonic thickness measurements	Section loss detected, see evaluation on page 19

INSTRUMENTATION NOT ASSOCIATED WITH A PFM: (General Health of Dam)

Monitoring Effort	Result
PZ-5	No adverse trends, no thresholds exceeded
PZ-6	No adverse trends, no thresholds exceeded
Deformation Surveys	No adverse trends, no thresholds exceeded
Daily operator inspections	No adverse findings
Monthly supervisor inspection	No adverse findings
Annual engineer inspection	No adverse findings



Appendix J & K Changes

- Tables are output from this process of identifying instruments related to individual PFMs.
- Part of the purpose of the changes is to verify that this is an ongoing process at all significant and high hazard dams.



Purpose of DSSMR & DSSMP (Chapter 14, Appendix J & K)

- A good DSSMP is designed with a clear understanding of PFMs so that early warning signs of failure can be detected and provide opportunity for intervention.
- The key to a good monitoring program at a dam is to have a complete understanding of the design intent, installation details and proper maintenance procedures for the instruments.



Chapter 14 Review Process

- A good instrumentation system at an FERC project starts with the following steps:

– Review and understanding of the basic information

Iteratively completed with evaluation of data and visual monitoring results as well as DSSMR development and Part 12D Proceedings

performance of the dam

Completed with PFMA and PFMA Review Processes during Part 12D Proceedings



Federal Energy Regulatory Commission Division of Dam Safety and Inspections



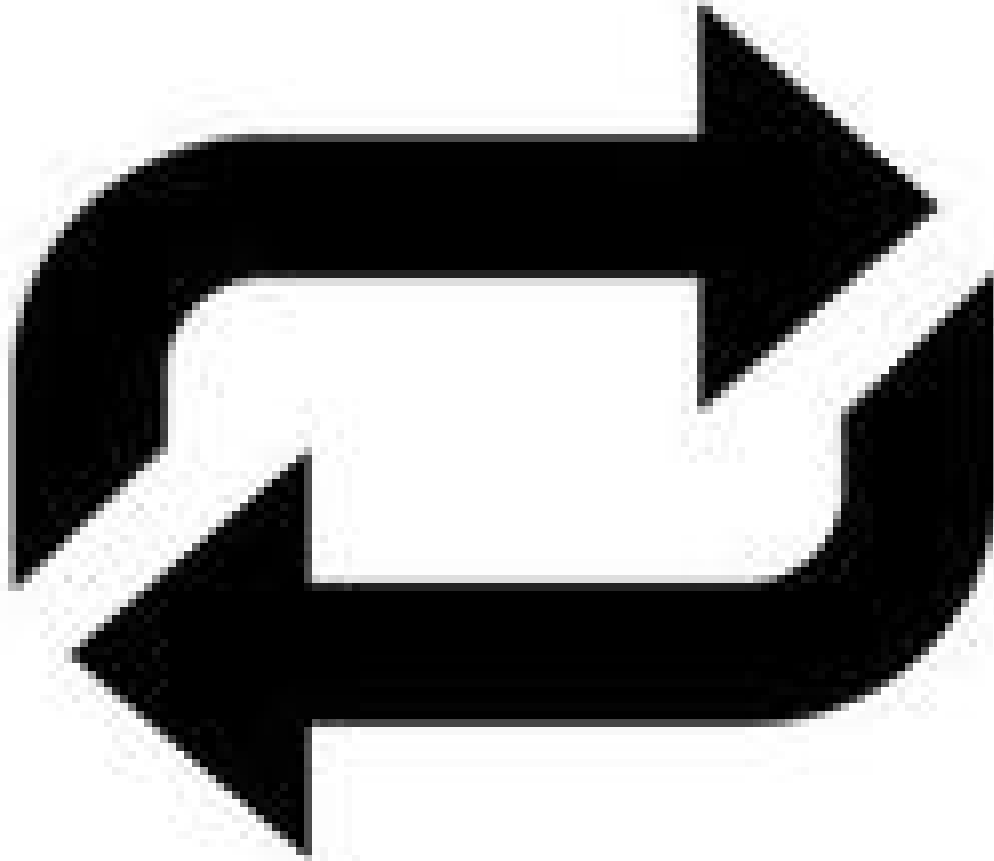


DSSMP Evaluation

- The **DSSMP** provides the details of how an owner will monitor and evaluate the performance of a dam or project structure.
- Basis of Evaluation: Does the DSSMP describe an appropriate level of monitoring for the identified PFMs and general health of the project? **Repetitive question that should be evaluated over and over throughout the life of the project.**



Federal Energy Regulatory Commission Division of Dam Safety and Inspections





DSSMP Expectations

- Follow guidance and outline from Appendix J
- Developed with the PFMA and revised with PFMA reviews
- Critical to have detailed PFM descriptions for specific loading conditions and locations
- Basis for determining appropriate instrumentation and visual monitoring with meaningful threshold values and action levels
- Poorly defined PFMs may result in a poor DSSMP, misunderstanding of performance and wasted time and resources



DSSMP Expectations

- Frequency of readings and inspections justified by a combination of past performance and critical evaluation of the PFM that is being monitored
- Establish procedures to ensure:
 - Properly trained personnel complete inspections and measurements
 - QC measures in place to verify results
 - Timely evaluation of results
 - Appropriate action taken and documented



DSSMP Expectations

- Action levels for all instruments associated with a PFM
- Action levels appropriately assigned based on related PFMs, historic performance of the dam and design calculations where appropriate
- Instrumentation data plots have meaning relative to identified PFMs and for understanding performance of the dam
- If appropriate time sensitive actions identified



Federal Energy Regulatory Commission Division of Dam Safety and Inspections





Pre-Workshop Comment:

Also, sometimes an increasing or decreasing trend while not yet exceeding threshold values could prompt an action. In addition, the threshold values could change throughout time. How can this be better clarified and set in a DSSMP? Furthermore, when annual DSSMRs are to review the data with relation to these values, how can recommendations be made more concretely?



DSSMR Evaluation

- The **DSSMR** is a separate periodic report that presents careful analysis, evaluation, and interpretation of the dam safety surveillance and monitoring data, and provides findings on the overall performance of the dam
- **Basis of Evaluation**: Does the report provide a complete summary of instrument readings and surveillance efforts with a meaningful evaluation with regard to dam safety? Do the findings warrant action?

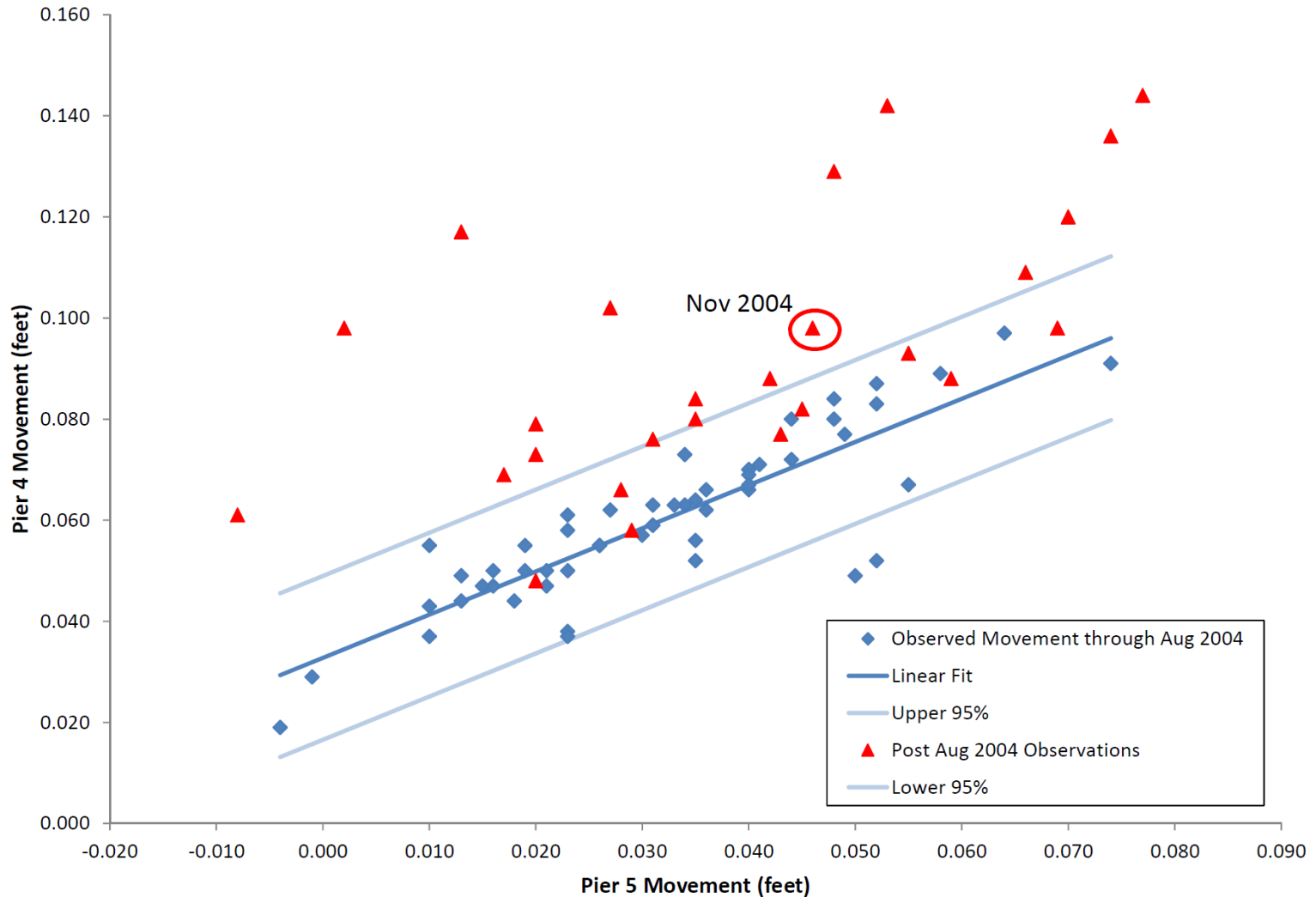


DSSMR Expectations

- Follow outline and guidance in Appendix K
- Include an evaluation of:
 - Anomalous readings
 - Trends
- Create additional plots as needed as part of the evaluation
- Submit digital copy of report with Excel data files
- Don't wait for FERC to tell you to:
 - Flush or bail a piezometer
 - Perform maintenance on instruments
 - Institute additional quality control



DSSMR Review Expectations

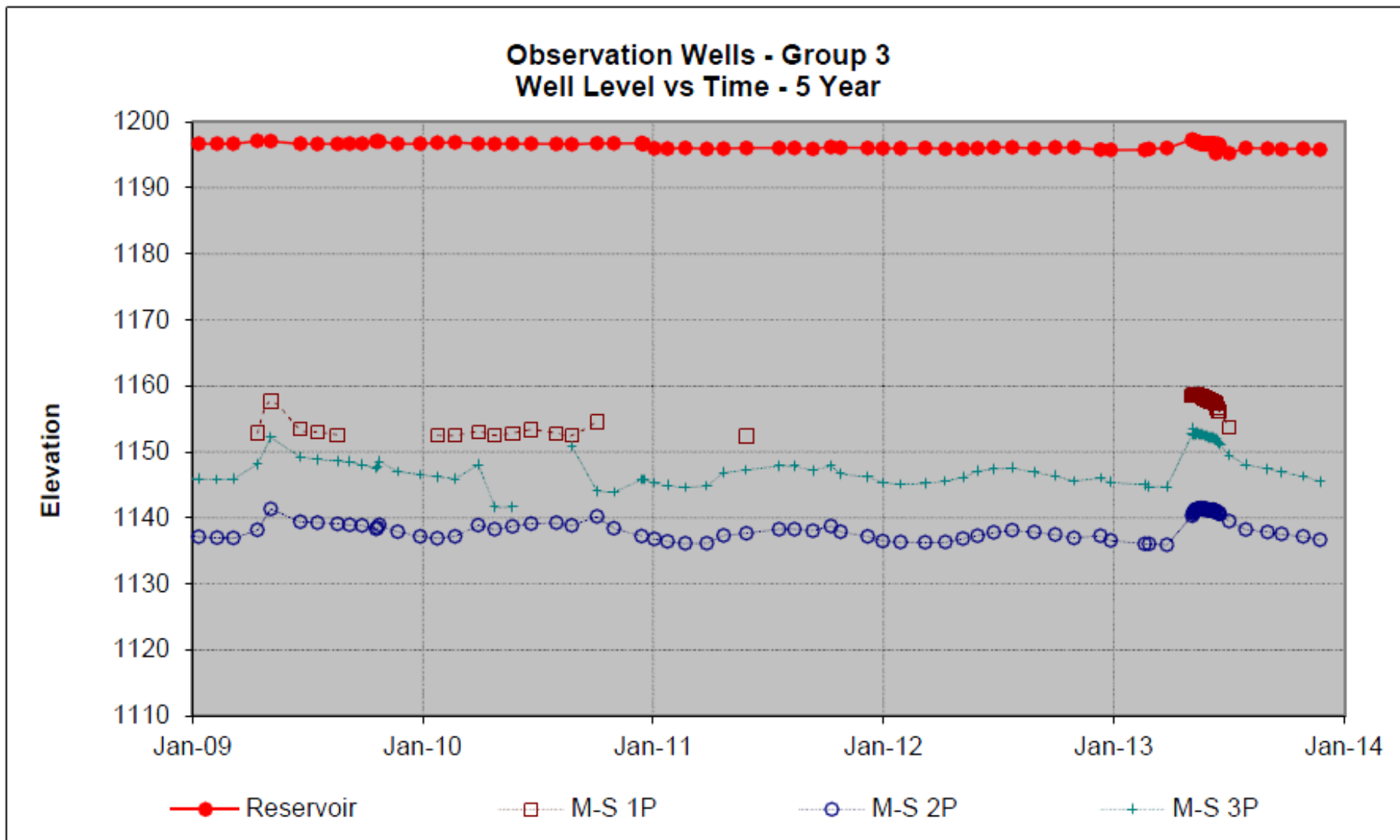




Federal Energy Regulatory Commission Division of Dam Safety and Inspections



DSSMR Review Expectations





DSSMR Expectations

- Include a critical evaluation of your monitoring program to include:
 - Further need for training, maintenance or supervisory controls
 - Possible improvements to include need for modified procedures, additional instruments or more frequent instrument readings or inspections
 - Ability to monitor identified PFMs with current DSSMP



DSSMR Expectations

- Identify each time action levels were exceeded during the report period for all instruments and then document actions taken.
- Document new historic highs and lows with an evaluation of the readings



Federal Energy Regulatory Commission Division of Dam Safety and Inspections





Expectation Summary

- Good PFMA is the foundation for good monitoring.
- Remember that we do not have a complete understanding of the ways the dam can fail.
- Continuous evaluation of monitoring data leads to better understanding of the performance of the dam.
- Seek improvement in your monitoring program as your understanding of your dam improves.
- Take action when necessary!



Federal Energy Regulatory Commission Division of Dam Safety and Inspections



Questions

