5.1 Intake Structure

5.1.1 Summary of Intake Structure

Baseline information for the Intake Structure is provided in Section 2.0, Site History, Description, and Baseline Condition.

The Intake Structure is located at the extreme east side of the PA and is constructed directly into the riverbank. This structure is subjected to unbalanced soil loads from east to west with the basement walls backfilled on the west and subjected to the river on the east face.

The Intake Structure is a multi-floored Class I structure below operating floor el. 1007.5 ft. From foundation mat at approximately el. 960.8 ft to el. 1014.5 ft, the structure is cast-in-place reinforced concrete with integral pilasters that align with the steel columns above grade. The basement walls are braced by vertical concrete walls and horizontal floor slabs. The mat foundation is on 20-in.-diameter steel pipe piles driven to bedrock. From el. 1014.5 ft to the roof at approximately el. 1035.6 ft, the structure is a braced rigid steel frame clad with Ar-lite precast concrete sandwich panels. The roof is a multi-layer built-up roof supported by metal decking spanning between open-web steel joists. The roof structure is seismically braced independent of the metal deck.

The Intake Structure houses major systems and components, both CQE and non-CQE, in designated rooms. The major function of the Intake Structure is to provide water from the Missouri River that is required for component cooling and fire fighting at FCS, and to provide the structural support and environmental protection necessary to ensure the functional integrity of the CQE systems and components under operational and environmental conditions.

5.1.2 Inputs/References Supporting the Analysis

Table 5.1-1 lists references provided by OPPD and other documents used to support HDR's analysis.

Table 5.1-1 - References for Intake Structure

Document Title	OPPD Document Number (if applicable)	Date	Page Number(s)
System Design Basis Document	SDBD-STRUC-503 Rev. 10	6/22/2010	46, 57–61
2009 Structural Inspection of the Intake Building and Misc. Areas	SE-PM-AE-1002	7/16/2009	All
Incident Report Summary	CR 2011-5369	6/5/2011	All
Incident Report Summary	CR 2011-5254	6/1/2011	All
Incident Report Summary	CR 2011-5321	6/3/2011	All
Incident Report Summary	CR 2011-5323	6/3/2011	All
Incident Report Summary	CR 2011-5377	6/5/2011	All
Incident Report Summary	CR 2011-5384	6/6/2011	All
Incident Report Summary	CR 2011-5473	6/10/2011	All
Incident Report Summary	CR 2011-5737	6/22/2011	All
Incident Report Summary	CR 2011-5805	6/26/2011	All
Incident Report Summary	CR 2011-5932	7/1/2011	All

Table 5.1-1 - References for Intake Structure			
Document Title	**OPPD Document Number (if applicable)**	**Date**	**Page Number(s)**
Structures, Piling	USAR-5.7	05/19/2011	All
Summary of Vibroflotation		1/27/1972	All
Naval Facilities Engineering Command, Design Manual 7.01, Soil Mechanics		9/1986	All

Detailed site observations—field reports, field notes, and inspection checklists—for the Intake Structure are provided in Attachment 8.

Observed performance and pertinent background data are as follows:

- The foundation slab is cast with the pipe piles embedded within the concrete mass to provide a "fixed head" condition for the pile design (see SDBD-STRUC-503).
- The piles consist of 20-in.-outside-diameter pipe with 1.031-in. wall thickness, which meets American Petroleum Institute (API) standard 5L Grade B (minimum yield stress [F_y] = 35 kips per square inch [ksi]). The piles were driven open-ended into sound bedrock and load tested for compression, tension, and lateral loads. The pile design allowed for .0625-in. corrosion of the wall thickness and was considered to be an additional level of conservatism due to the cathodic protection system (see USAR-5.7).
- The coefficient of lateral subgrade modulus is based on lateral load testing of test piles in the in situ soil condition, which is conservative because the granular soils were subsequently compacted.
- The in situ granular soils were compacted via vibroflotation to minimize the possibility of seismic liquefaction (see Summary of Vibroflotation).
- For the majority of the flood event, the structure was protected by a sandbag wall along the entire west face combined with interior sandbags and portable pumps located at the exterior doors on the east and west walls.
- The riverbank surrounding the structure is protected by revetment and slopes downward at 3H:1V.
- The Trenwa cable trench connects to the north and south sides of the structure.
- Concrete-encased service lines, including the Raw Water return line, connect to the south side of the structure.
- The Raw Water supply line and two Fire Protection lines connect to the north side of the building.
- Incident report summaries listed in Table 5.1-1 document many areas of the structure where groundwater has infiltrated the building through previously monitored cracks in the concrete, through wall penetrations, and through conduit.
- The Intake Structure is designed to withstand an external hydrostatic load due to flooding of the Missouri River to el. 1014 ft (see SDBD-STRUC-503).
- Without special provisions, the Intake Structure can accommodate flood levels of up to 1004.5 ft without water entering the structure. For higher flood levels, protection can be provided by steel flood barriers equipped with seals (up to el. 1009.5 ft) and sandbags and other methods to el. 1014 ft (see SDBD-STRUC-503).
- The building was located outside the perimeter of the Aqua Dam that surrounded much of the PA but was protected by steel flood barriers and sandbags, with small portable pumps to remove light water infiltration.
- A layer of dried river sediment was present on the north and south grades adjacent to the structure.
- Small localized areas directly at the soil and exterior wall interface had signs of subsidence and scour. However, globally there were no signs of large-scale soil movement.

- Visual observation was not made to the river (east) side of the structure due to high water levels in the Missouri River at the time of the field inspection.
- General observations of the interior of the structure indicated minor concrete cracking with both current water infiltration (damp to slight running water) and dry walls with signs of water infiltration that occurred at an earlier time. The observed cracking appears to be a condition previously recorded and monitored.

5.1.3 Assessment Methods and Procedures

5.1.3.1 Assessment Procedures Accomplished

Assessments of the Intake Structure included the following:

- Visual inspection of the interior of the structure with the exception of the recirculation tunnel, the north stairwell, and the operating floor at el. 993.5 ft.
- Visual inspection of the exterior of the structure where accessible. Inspection of the river (east) side of the structure was not possible due to high river levels at the time of the inspection.
- An assessment of collected survey data to-date for indications of trends in the movement of the structure.
- A review of previously referenced documents listed in Table 5.1-1.

Additional investigations were performed. These included the following non-invasive geophysical and invasive geotechnical investigations:

- Seismic surveys (seismic refraction and refraction micro-tremor) in the PA. (Test reports were not available at the time of Revision 0.)
- Geotechnical test borings in the PA. Note that OPPD required vacuum excavation for the first 10 ft of proposed test holes to avoid utility conflicts. Therefore, test reports will not show soil conditions in the upper 10 ft of test boring logs. (Test reports were not available at the time of Revision 0.)
- Inclinometer readings along the river that will provide an indication of slope movement were not installed at the time of Revision 0.

5.1.3.2 Assessment Procedures Not Completed

No additional assessment procedures have been identified for this structure.

5.1.4 Analysis

Identified PFMs were initially reviewed as discussed in Section 3.0. The review considered the preliminary information available from OPPD data files and from initial walk-down observations. Eleven PFMs associated with five different Triggering Mechanisms were determined to be "non-credible" for all Priority 1 Structures, as discussed in Section 3.6. The remaining PFMs were carried forward as "credible." After the design review for each structure, the structure observations, and the results of available geotechnical, geophysical, and survey data were analyzed, a number of CPFMs were ruled out as discussed in Section 5.1.4.1. The CPFMs carried forward for detailed assessment are discussed in Section 5.1.4.2.

5.1.4.1 Potential Failure Modes Ruled Out Prior to the Completion of the Detailed Assessment

The ruled-out CPFMs reside in the Not Significant/High Confidence category and for clarity will not be shown in the Potential for Failure/Confidence matrix.

Triggering Mechanism 2 – Surface Erosion
CPFM 2b – Loss of lateral support for pile foundation

Reasons for ruling out:

- The pile foundation is located below basement elevation of approximately 974.7 ft, while grade is at approximate el. 1004.0 ft. Field observations of surface erosion have been isolated to a fencepost at the river's edge.
- The bathymetric survey did not indicate significant surface erosion at the east side, which was under water.

Triggering Mechanism 3 – Subsurface Erosion/Piping
CPFM 3b – Loss of lateral support for pile foundation (due to pumping)

Reasons for ruling out:

- There is no condition at this structure where pumping of water would result in differential head, thus resulting in loss of lateral support for the pile foundation.
- The small portable pumps that were used in this area removed surficial seepage, which would not create subsurface erosion or piping.

Triggering Mechanism 3 – Subsurface Erosion/Piping
CPFM 3e – Loss of lateral support for pile foundation (due to river drawdown)

Reason for ruling out:

- The pile foundation is located below basement elevation of approximately 974.7 ft, which is well below designated normal or low river levels. Therefore, the pile foundation is below the river level regardless of the rate of drawdown. Soil material around the piles will not be drawn upward as the river level subsides.

Triggering Mechanism 4 – Hydrostatic Lateral Loading (water loading on structures)
CPFM 4c – Wall failure in flexure
CPFM 4d – Wall failure in shear
CPFM 4e – Excess deflection

Reasons for ruling out:

- The Intake Structure is designed to withstand an external water load due to flooding of the Missouri River to el. 1014 ft (see SDBD-STRUC-503). The peak flood elevation in 2011 was approximately 1006.9 ft, which is less than the structural design basis.

- The structure cannot slide or overturn due to hydrostatic lateral loads because these loads are approximately equal on all sides of the structure.
- Visual observations did not identify distress to the structure that can be attributed to this PFM.

Triggering Mechanism 5 – Hydrodynamic Loading

CPFM 5a – Overturning
CPFM 5b – Sliding
CPFM 5c – Wall failure in flexure
CPFM 5d – Wall failure in shear
CPFM 5e – Damage by debris
CPFM 5f – Excess deflection

Reasons for ruling out:

- The Intake Structure is designed to withstand an external water load due to flooding of the Missouri River to el. 1014 ft (see SDBD-STRUC-503). The peak flood elevation in 2011 was approximately 1006.9 ft, which is less than the structural design basis.
- The reinforced concrete walls of the Intake Structure were originally designed to withstand blast forces, making the likelihood of damage from floating debris small.
- Visual observations did not identify distress to the structure that can be attributed to these CPFMs.

Triggering Mechanism 6 – Buoyancy, Uplift Forces on Structures

CPFM 6a – Fail tension piles
CPFM 6b – Cracked slab, loss of structural support
CPFM 6c – Displaced structure/broken connections

Reasons for ruling out:

- The Intake Structure is designed to withstand an external hydrostatic load due to flooding of the Missouri River to el. 1014 ft (see SDBD-STRUC-503). The peak flood elevation in 2011 was approximately 1006.9 ft, which is less than the structural design basis.
- Visual observations and survey measurements indicate no structure movement. Therefore, failed tension piles (CPFM 6a) and displaced structure and damage (CPFM 6c) did not occur.

Triggering Mechanism 7 – Soil Collapse (first time wetting)

CPFM 7b – Displaced structure/broken connections
CPFM 7c – General site settlement
CPFM 7d – Piles buckling from down drag

Reason for ruling out:

- The Intake Structure is directly adjacent to the Missouri River. The soil surrounding the structure, including the subgrade under buried utilities leading to the structure, is normally in a saturated condition.

Triggering Mechanism 10 – Machine/Vibration-Induced Liquefaction
CPFM 10b – Displaced structure/broken connections

Reasons for ruling out:

- Permanent equipment that has the capacity to produce significant dynamic forces due to vibration is mounted on the base mat foundation slab of the structure. This structure is below the river level regardless of the flood elevation.
- Temporary pumping equipment located on the ground inside the perimeter of the Aqua Dam that surrounded much of the PA produced minimal localized vibrations, which were offset from the structure and therefore deemed to have inconsequential effect.
- No broken structural connections or structural displacement was observed.
- This is not a changed condition due to the flood. The Intake Structure has been in service 38 years under similar saturated soils and machine vibration.
- The in situ granular soils were compacted via vibroflotation to minimize the possibility of liquefaction.

Triggering Mechanism 10 – Machine/Vibration-Induced Liquefaction
CPFM 10c – Additional lateral force on below-grade walls

Reasons for ruling out:

- Permanent equipment that has the capacity to produce significant dynamic forces due to vibration is mounted on the base mat foundation slab of the structure. This structure is below the river level regardless of the flood elevation.
- Temporary pumping equipment located on the ground inside the perimeter of the Aqua Dam that surrounded much of the PA produced minimal localized vibrations, which were offset from the structure and therefore deemed to have inconsequential effect.
- This is not a changed condition due to the flood. The Intake Structure has been in service 38 years under similar saturated soils and machine vibration.
- The in situ granular soils were compacted via vibroflotation to minimize the possibility of liquefaction.

Triggering Mechanism 10 – Machine/Vibration-Induced Liquefaction
CPFM 10d – Pile/pile group instability

Reasons for ruling out:

- Permanent equipment that has the capacity to produce significant dynamic forces due to vibration is mounted on the base mat foundation slab of the structure. This structure is below the river level regardless of the flood elevation.
- Temporary pumping equipment located on the ground inside the perimeter of the Aqua Dam that surrounded much of the PA produced minimal localized vibrations, which were offset from the structure and therefore deemed to have inconsequential effect.
- This is not a changed condition due to the flood. The Intake Structure has been in service 38 years under similar saturated soils and machine vibration. Reviewed condition survey reports do not indicate signs of distress that would be attributed to pile instability.
- The in situ granular soils were compacted via vibroflotation to minimize the possibility of liquefaction.

Triggering Mechanism 11 – Loss of Soil Strength due to Static Liquefaction or Upward Seepage

CPFM 11b – Displaced structure/broken connections
CPFM 11c – Additional lateral force on below-grade walls
CPFM 11d – Pile/pile group instability

Reasons for ruling out:

- The Intake Structure was located outside the perimeter of the Aqua Dam that surrounded much of the PA and was subjected to floodwater; therefore, it was not subjected to static liquefaction.
- This is not a changed condition due to the flood. The Intake Structure has been in service 38 years under similar saturated soils.

Triggering Mechanism 13 – Submergence

CPFM 13b – Corrosion of structural elements

Reasons for ruling out:

- The Intake Structure is directly adjacent to the Missouri River. The soil surrounding the structure, including the subgrade under buried utilities leading to the structure, is normally in a saturated condition.
- This is not a changed condition due to the flood. The Intake Structure has been in service 38 years under similar saturated soils. Reviewed condition survey reports do not indicate signs of distress that would be attributed to corrosion due to submergence.

Triggering Mechanism 14 – Frost Effects

CPFM 14a – Heaving, crushing, or displacement

Reason for ruling out:

- The Intake Structure is not susceptible to frost, and susceptible connecting utilities are below frost level.

5.1.4.2 Detailed Assessment of Credible Potential Failure Modes

The following CPFMs are the only CPFMs carried forward for detailed assessment for the Intake Structure as a result of the 2011 flood. This detailed assessment is provided below.

Triggering Mechanism 12 – Rapid Drawdown

CPFM 12a – River bank slope failure and undermining surrounding structures
CPFM 12b – Lateral spreading

The Triggering Mechanism and CPFMs could occur as follows: the river level drops faster than pore water pressure in the soil can dissipate. The saturated soil is elevated above the dropping river level. The sloped bank of the river provides no lateral pressure support for the saturated soil. At some point, there is insufficient support on the river side to support the saturated soils. At that point, the soils experience slope movements or even failure. Generally, slope failures associated with rapid drawdown are relatively localized and shallow in nature; however, deeper failures can occur.

Floodwater elevations, at the time of HDR's inspection, were above finished floor elevations, and river levels were being lowered at a relatively slow pace. River elevations were still well above normal levels. The drop in elevation of the river is expected to occur at a higher rate than the drop in elevation of the groundwater. This will result in an increased groundwater gradient. This increase could cause localized riverbank slope failure and/or lateral spreading.

At the time of Revision 0, the river level had dropped to a nominal normal level (roughly el. 994 ft). Field observation of the river bank area has not been performed since the river level dropped.

Adverse (Degradation/Direct Floodwater Impact More Likely)	Favorable (Degradation/Direct Floodwater Impact Less Likely)
The Intake Structure is in close proximity to the river.	Drawdown conditions required to trigger this CPFM had not occurred at the time of the field report. Therefore, field observations and data that discredit this CPFM could not be made.
Utilities provide many potential flow paths to and around the structure.	Soils in the area of the Main Underground Cable Bank and to the east are backfill materials that were placed and compacted during construction of site improvements and therefore would be expected to be less susceptible to rapid drawdown impacts.
Elevated saturated soils and elevated floodwater levels provide a water source. A potential path for water and soil migration can extend under the structure to the river, causing adverse effects attributed to river drawdown.	The river bank south of the Intake Structure is protected with riprap.
	The river bank to the north of the Intake Structure is protected by sheet piling.
	Review of survey data to date indicates no trends in structure movement.
	Piles support the Intake Structure, reducing the risk that the structure will be affected by shallow undermining.
	Survey data to date does not identify movement of the building.
Data Gaps: • Observations of the riverbank following drawdown to normal river elevations • Geophysical investigation data to address observed concerns • Inclinometer readings that will provide an indication of slope movement	

Conclusion

Significance

Potential for Degradation/Direct Floodwater Impact

River stage level has dropped and stabilized at a level corresponding to the nominal normal river level at 40,000 cfs as of October 4, 2011. The potential for degradation from drawdown is low because it has not been observed as of October 4, 2011. Rapid drawdown has been controlled, and continued river drawdown is not expected to occur at a rate that would initiate this Triggering Mechanism. Because it is believed that a potential for degradation of the foundation exists but is not likely, the potential for degradation is considered low for this Triggering Mechanism and associated CPFMs 12a and 12b.

Implication

The occurrence of these CPFMs could lead to excessive movement and negatively impact the integrity or intended function of the structures and systems surrounding the Intake Structure. Therefore, the implication of the potential for degradation is high.

Confidence

At the time of the field report, conditions required to initiate the Triggering Mechanism associated with CPFMs 12a and 12b had not yet occurred. Field observations and other investigation data required to evaluate these CPFMs have not been made; therefore, an evaluation cannot be made.

The data available at the time of Revision 0 are not sufficient to rule out these CPFMs or lead to a recommendation for a physical modification to ensure that river bank slope failure and lateral spreading will not occur. Therefore, the confidence in the above assessment at this time is low.

Summary

For CPFMs 12a and 12b, as discussed above, the potential for degradation to the river bank surrounding the Intake Structure is low because the bank is protected. In the unlikely event that these CPFMs were to occur, the implication of this degradation to the structures and systems surrounding the Intake Structure is high. The combined consideration of the potential for degradation and the implications of that degradation to this structure put it in the "not significant" category. The data currently collected are not sufficient to rule out these CPFMs. Therefore, the confidence in the above assessment is low, which means that more data or continued monitoring and inspections are necessary to draw a conclusion. These data will be available in subsequent revisions of this Assessment Report.

5.1.5 Results and Conclusions

The CPFMs evaluated for the Intake Structure are presented in the following matrix, which shows the rating for the estimated significance and the level of confidence in the evaluation.

	Low Confidence (Insufficient Data)	High Confidence (Sufficient Data)
Potential for Failure **Significant**		
Potential for Failure **Not Significant**	CPFM 12a CPFM 12b	

5.1.6 Recommended Actions

Continued monitoring is recommended to include a continuation of the elevation surveys of the previously identified targets on this structure and surrounding site. In addition, a review of the ongoing geophysical investigations and monitoring of inclinometer readings is recommended. The purpose is to monitor for signs of structure distress and movement or changes in soil conditions around the structure. The results of this monitoring will be used to increase the confidence in the assessment results. Elevation surveys should be performed weekly for 4 weeks and biweekly until December 31, 2011. At the time of Revision 0, groundwater levels had not yet stabilized to nominal normal levels. Therefore, it is possible that new distress indicators could still develop. If new distress indicators are observed before December 31, 2011, appropriate HDR personnel should be notified immediately to determine if an immediate inspection or assessment should be conducted. Observation of new distress indicators might result in a modification of the recommendations for this structure.

5.1.7 Updates Since Revision 0

Revision 0 of this Assessment Report was submitted to OPPD on October 14, 2011. Revision 0 presented the results of preliminary assessments for each Priority 1 Structure. These assessments were incomplete in Revision 0 because the forensic investigation and/or monitoring for most of the Priority 1 Structures was not completed by the submittal date. This revision of this Assessment Report includes the results of additional forensic investigation and monitoring to date for this structure as described below.

5.1.7.1 Additional Data Available

The following additional data were available for the Intake Structure for Revisions 1 and 2 of this Assessment Report:

- Additional groundwater monitoring well and river stage level data from OPPD.
- Field observations of the river bank (see Section 5.25).
- Results of geophysical investigation by Geotechnology (see Attachment 6C).
- Results of geotechnical investigation by Thiele Geotech (see Attachment 6A).
- Data obtained from inclinometers by Thiele Geotech (see Attachment 6A).
- Results of continued survey by LRA (see Attachment 6E).

5.1.7.2 Additional Analysis

The following analysis of additional data was conducted for the Intake Structure:

- Groundwater monitoring well and river stage level data from OPPD.

  Data shows that the river and groundwater have returned to nominal normal levels.

- Field observations of river bank

  No significance distress from the 2011 Flood was observed.

- Results of geophysical investigation report by Geotechnology

  Seismic Refraction and Seismic ReMi tests performed around the outside perimeter of the power block identified deep anomalies that could be gravel, soft clay, loose sand, or possibly voids.

- Results of geotechnical investigation by Thiele Geotech

  Six test borings were drilled, with continuous sampling of the soil encountered, to ground truth the Geotechnology seismic investigation results as part of the KDI #2 forensic investigation. Test bore holes were located to penetrate the deep anomalies identified in the seismic investigation. The test boring data did not show any piping voids or very soft/very loose conditions that might be indicative of subsurface erosion/piping or related material loss or movement.

All of the SPT and CPT test results conducted for this Assessment Report were compared to similar data from numerous other geotechnical investigations that have been conducted on the FCS site in previous years. This comparison did not identify substantial changes to the soil strength and stiffness over that time period. SPT and CPT test results were not performed in the top 10 ft to protect existing utilities.

Data from inclinometers to date, compared to the original baseline measurements, have not exceeded the accuracy range of the inclinometers. Therefore, deformation at the monitored locations since the installation of the instrumentation has not occurred.

- Results of continued survey by LRA.

  Survey data to date compared to the original baseline surveys have not exceeded the accuracy range of the surveying equipment. Therefore, deformation at the monitored locations, since the survey baseline was shot, has not occurred.

The CPFMs that could not be ruled out in Revision 0 are analyzed below based on the additional data available for Revisions 1 and 2 of this Assessment Report.

Triggering Mechanism 12 – Rapid Drawdown
CPFM 12a – River bank slope failure and undermining surrounding structures
CPFM 12b – Lateral spreading

The Triggering Mechanism and CPFMs could occur as follows: The river level drops faster than pore water pressure in the soil can dissipate. The saturated soil is elevated above the dropping river level. The sloped bank of the river provides no lateral pressure support for the saturated soil. At some point, there is insufficient support on the river side to support the saturated soils. At that point, the soils experience slope movements or even failure. Generally, slope failures associated with rapid drawdown are relatively localized and shallow in nature; however, deeper failures can occur.

Significance

Potential for Degradation/Direct Floodwater Impact

The groundwater monitoring well data and river level data indicate that excess pore pressures due to river drawdown had generally dissipated by about October 14, 2011. Field observations of the river bank on October 20, 2011, did not identify deformation of the river bank that could be attributed to slope failure or lateral spreading. Therefore, it can be concluded that neither slope failure nor lateral spreading occurred due to the 2011 flood.

Because it is believed that a potential for degradation of the structure exists but is not likely, the potential for degradation is considered low for this Triggering Mechanism and associated CPFMs 12a and 12b.

Implication

The occurrence of this potential degradation could lead to excessive movement and negatively impact the integrity or intended function of the structures and systems surrounding the Intake Structure. Therefore, the implication of the potential degradation for the Intake Structure is high.

Confidence

Field observations of the river bank and review of the groundwater data indicates that neither slope failure nor lateral spreading occurred due to the 2011 flood. Therefore, confidence in the results of this assessment for these CPFMs is high.

Summary

For CPFMs 12a and 12b, as discussed above, the potential for degradation to the river bank surrounding the Intake Structure is low because of field observations and analysis of groundwater data. In the unlikely event that these CPFMs were to occur, the implication of this degradation to the structures and systems surrounding the Intake Structure is high. The combined consideration of the potential for degradation and the implications of that degradation to this structure puts it in the "not significant" category. The data collected since Revision 0 is sufficient to rule out these CPFMs assuming the previously recommended monitoring schedule is continued. Therefore, the confidence in the above assessment is high, which means no additional data and inspections are necessary to draw a conclusion. These CPFMs are moved to the quadrant of the matrix representing "No Further Action Recommended Related to the 2011 Flood."

5.1.7.3 Revised Results

The CPFMs evaluated for the Intake Structure are presented in the following matrix, which shows the rating for the estimated significance and the level of confidence in the evaluation.

	Low Confidence (Insufficient Data)	High Confidence (Sufficient Data)
Potential for Failure **Significant**		
Potential for Failure **Not Significant**		CPFM 12a CPFM 12b

5.1.7.4 Conclusions

In the assessment of the FCS Structures, the first step was to develop a list of all Triggering Mechanisms and PFMs that could have occurred due to the prolonged inundation of the FCS site during the 2011 Missouri River flood and could have negatively impacted these structures. The next step was to use data from various investigations, including systematic observation of the structures over time, either to eliminate the Triggering Mechanisms and PFMs from the list or to recommend further investigation and/or physical modifications to remove them from the list for any particular structure. Because all CPFMs for the Intake Structure other than CPFMs 12a and 12b had been ruled out prior to Revision 1, and because CPFMs 12a and 12b have been ruled out as a result of the Revision 1 findings, no Triggering Mechanisms and their associated PFMs remain credible for the Intake Structure. Therefore, HDR has concluded that the 2011 Missouri River flood did not impact the geotechnical and structural integrity of the Intake Structure because the potential for failure of this structure due to the flood is not significant.