Ameren Corporation

Mark C. Birk
Vice President, Power Operations

One Ameren Plaza
1901 Chouteau Avenue
PO Box 66149
St. Louis, MO 63166-6149
314.554.3010
314.554.2800 fax
mbirk@ameren.com

January 27, 2006

VIA OVERNIGHT MAIL

Mr. Constantine G. Tjoumas, P.E.
Director, Division of Dam Safety and Inspections
Federal Energy Regulatory Commission
888 First Street, N.E., Room 6N-01
Washington, D.C. 20426

Re: Taum Sauk Hydroelectric Project, P-2277

Dear Mr. Tjoumas:

Enclosed please find our supplemental incident report prepared pursuant to Section 12.10(a)(2) of FERC regulations. This is in response to the additional questions set forth in Peggy Harding's December 15, 2005 letter.

If you have any questions regarding this information, please call me at (314) 554-3010.

Yours very truly,

Mark C. Birk

MCB/vww
Enclosures

cc (w/ encl): Ms. Peggy A. Harding, P.E.
Mr. Wayne B. King
Dr. Alfred J. Hendron, Jr.
Mr. Joseph L. Ehasz
Mr. Kermit Paul
Mr. Robert Powers
Mr. Warren Witt

Re: Second Supplement to Incident Report for Taum Sauk upper reservoir breach, FERC Project No. 2277, and NATDAM Nos. MO30040 and MO30041.

Union Electric Company d/b/a AmerenUE ("Ameren"), as required by 18 CFR § 12.10 and in response to the Federal Energy Regulatory Commission's December 15, 2005 information request, provides the following supplement to its December 27, 2005 and January 10, 2006 reports on the December 14, 2005 Taum Sauk upper reservoir breach. Ameren's investigation is ongoing and Ameren reserves the right to supplement these responses as additional information becomes available. Ameren will continue to provide bi-weekly updates as needed detailing its progress in assembling any outstanding information. Ameren regards the information provided in these responses as Critical Energy Infrastructure Information and requests that FERC treat this information as confidential.

Second Section 12.10(a)(2) Supplemental Response

12.10(a)(2)(vii) Any other relevant information requested by the Regional Engineer.

1. A chronology of events for the last 6 months, leading up to the uncontrolled release of the upper reservoir as noticed by on-site personnel.

Presented below is a chronology of relevant events leading up to the uncontrolled release of the upper reservoir. In this chronology, Ameren is including critical events involving off-site personnel and/or occurring outside the last six months. While Ameren was not requested to provide this additional information, it is included because Ameren believes it will facilitate the Commission's analysis. This chronology reflects Ameren's current understanding of the events. Ameren continues to gather information and will update this chronology as information is discovered.

September 10, 2004.	Ameren took the upper reservoir off-line for the liner replacement and level control upgrade project. *See* Exhibit 7. Among other things, during the outage Ameren put in new level control and protection instrumentation and logic and a new communications system. Ameren also replaced the existing staff gage, which had settled approximately one foot along with the reservoir wall. The staff gage had been used to measure the normal operating level of the upper reservoir, which was 1596 ft. Due to the settling, Ameren believes that the upper reservoir was actually operating at 1595 ft. instead of 1596 ft. before the liner replacement project. During the outage new visual level indications were painted on the liner reflecting true elevations.
October 6, 2004.	Geo-Synthetic, Inc. ("GSI"), the installation contractor, raised concerns that the March 7, 2003 gage piping design did not provide for adequate anchoring and could compromise the integrity of the liner and gage piping. In response, Emcon/OWT, Inc. ("Emcon"), an engineering firm retained to design the liner and gage piping, provided a new design drawing (8304-X-155099, Rev. 5, dated 10/5/04) proposing a new gage piping anchoring system. *See* Exhibit 8.
October 20-23, 2004.	GSI installed the gage piping. *See* Exhibit 9. During installation, Ameren determined that Emcon's design (8304-X-155099, Rev. 5, dated 10/5/04) for the gage piping could not be installed as shown due to field conditions. In consultation with Emcon and with its approval, Ameren made field changes to the anchoring system in order to adapt the design to field conditions and to make it more robust. Subsequently, on November 12, 2004, Emcon and Ameren performed a walk-through inspection of the liner and gage piping installation.
November 6, 2004.	Ameren field notes reported that the top of panel 72, the lowest known point on the upper reservoir parapet wall, was measured at elevation 1596.99 ft. *See* Exhibit 10.

November 8, 2004. Ameren field notes reflected that the level protection probes were intended to be installed at the following elevations:

- Lo-Lo probe: 1524 ft.
- Lo probe: 1524.5 ft.
- Hi probe: 1596 ft.
- Hi-Hi probe: 1596.2 ft.

See Exhibit 11.

Mid-November, 2004. The level control transducers and level protection probes were lowered into the gage pipes. Wiring from the transducers and probes to the upper reservoir gage house were marked with colored tape to distinguish one probe from another and to provide an elevation reference.

Ameren believes the colored tape reflects the as-designed and installed elevations of the level protection probes. These elevations approximate those indicated in Ameren field notes.

November 15, 2004. Ameren released the upper reservoir for operation. *See* Exhibit 12. The normal operating level remained at 1596 ft., but now was being measured by the new level control transducers and visual level indications. As a result, the actual normal operating water level was 1596 ft. and not 1595 ft. as it had been prior to the liner replacement project, as further described in the September 10 entry.

November 23, 2004. Reference comment logged into the Upper Reservoir Programmable Logic Controller ("PLC") program indicated that the Hi probe was at elevation 1596 ft. *See* Exhibit 13.

Reference comment logged into the Taum Sauk Common PLC program indicated that the Hi-Hi probe was at elevation 1596 ft. *See* Exhibit 14.

Ameren believes, but has been unable to verify, that Tony Zamberlan of Laramore, Douglass, and Popham Consulting Engineers ("LDP"), entered the comments. LDP was retained by Ameren to provide engineering services related to the new level control and protection instrumentation.

November 30, 2004. The Hi probe actuated. An Osage operator recorded a trip of unit 2 with the upper reservoir level measuring elevation 1595.0 ft. *See* Exhibits 15 and 16.

Later that day, the Lo Lo probe relay lost DC power and shut down both generators. *See* Exhibits 15 and 16.

An email from Taum Sauk's plant superintendent listed the shut down setpoints for the upper reservoir. *See* Exhibit 16. When the average of the three level control transducer readings reflects that the upper reservoir level is at the following elevations, the corresponding pump shut downs will occur:

- Elevation 1592 ft. Normal shut down for first pump.
- Elevation 1596 ft. Normal shut down for second or last pump.
- Elevation 1596.5 ft. All pumps shut down.

The superintendent also stated that the setpoint for the level protection probes is above elevation 1596.5 ft.

December 1, 2004. To prevent intermittent trips, Tony Zamberlan added a one minute time delay to the PLC logic for all level protection probe relays. *See* Exhibits 17 and 18.

According to Mr. Zamberlan's Dec. 2nd email, he also was at the upper reservoir to "pull up the Hi level Warrick probes to 1596.5." *See* Exhibit 17. Mr. Zamberlan does not recall, and has been unable to explain why he set the probes at elevation 1596.5 ft., or how he determined that elevation.

Reference comment logged into the Upper Reservoir PLC program indicated that the Hi probe was at elevation 1596.7 ft. Ameren believes, but has been unable to verify, that Mr. Zamberlan entered the comment. *See* Exhibit 18.

December 10, 2004. LDP finalized and issued the schematic drawing for the upper reservoir level relaying and shut down controls (8303-P-26648, revision 15). *See* Exhibit 19. The schematic indicated that the Hi probe was at elevation 1596.7 ft. and the Hi-Hi probe was at elevation 1596.9 ft. LDP personnel do not recall, and are unable to explain why the drawing reflects the stated elevations.

December 14, 2004. Pump shutdown levels are indicated in the Taum Sauk PLC. When the average of the three level control transducer readings reflects that the upper reservoir level is at the following elevations, the corresponding pump shut downs will occur:

- Elevation 1592 ft. Normal shut down for first pump.
- Elevation 1596 ft. Normal shut down for second or last pump.
- Elevation 1596.2 ft. Normal all pumps shut down.
- Elevation 1596.5 ft. Non-configurable all pumps trip that, if activated, requires a reset.

See Exhibit 20.

Reference comment logged into the Taum Sauk Common PLC program indicated that the Hi-Hi probe was set at elevation 1596.5 ft. Ameren believes, but has been unable to verify, that Mr. Zamberlan entered the comment. *See* Exhibit 20.

December 27, 2004. A malfunctioning Lo-Lo probe relay was replaced. *See* Exhibit 21.

The PLC historian software recorded a Hi-Hi probe alarm at 3:38 p.m. PST, or 5:38 CST, at an upper reservoir level reading of elevation 1586.4 ft.[1] *See* Exhibit 22. At the time of the alarm, the units were neither pumping nor generating. *See* Exhibit 23.

Ameren believes this alarm may have been associated with maintenance activities at Taum Sauk.

February 12, 2005. Ameren filed the final liner replacement report with gage piping drawing (8304-X-155099, Rev. 5, dated 2/7/05) with FERC. The February 7, 2005 version of revision 5 does not identify the field changes made to the gage piping anchoring system. *See* Exhibit 24.

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[1] On the date of the alarm, the PLC Historian software was programmed to Pacific time. In June 2005, the PLC Historian software was reprogrammed to Central time. Throughout this chronology, all noted alarms recorded by the PLC Historian software are expressed in Central time.

February 14, 2005.	The PLC historian software recorded a six-second Hi-Hi probe alarm at 3:57 p.m. CST, at an upper reservoir level reading of elevation 1593.5 ft. *See* Exhibit 22. At the time of the alarm, the units were neither pumping nor generating. *See* Exhibit 25. Ameren believes this alarm may have been associated with maintenance activities at Taum Sauk.
February 15, 2005.	The PLC historian software recorded multiple Hi-Hi probe alarms between 4:03 p.m. and 5:49 p.m. CST, at an upper reservoir level reading of elevation 1593.5 ft. *See* Exhibit 22. At the time of the alarms, the units were neither pumping nor generating. *See* Exhibit 25. These alarms were associated with functional checks of the Hi-Hi probe alarm that were performed by a contractor at the direction of Ameren personnel. The contractors lowered the Hi and Hi-Hi probes into the water. The generator trip logic for the Lo and Lo-Lo probes was modified from parallel logic to series logic by Tony Zamberlan. *See* Exhibits 26 and 27. In series logic, the generators would only shut off if both the Lo and Lo-Lo probes actuate. A similar change was made by Mr. Zamberlan to the pump trip logic for the Hi and Hi-Hi probes. Ameren believes the generator trip logic for the Lo and Lo-Lo probes was modified to prevent spurious actuations. Ameren has been unable to determine why the pump trip logic for the Hi and Hi-Hi probes was modified.
July 20, 2005.	The PLC historian software recorded a one-second Hi-Hi probe alarm at 5:15 p.m. CDT, at an upper reservoir level reading of elevation 1573.8 ft. *See* Exhibit 22. At the time of the alarm, the units were generating. *See* Exhibit 28. Ameren has been unable to determine why this alarm was recorded, but around the time of the alarm, a storm, likely accompanied by lightning, moved through the area of the project works. The storm may have caused momentary induced voltages on the wiring running between the Hi-Hi probe relay and the plant PLC input card resulting in the PLC Historian recording a false Hi-Hi probe alarm.

August 14, 2005. The PLC historian software recorded a one-second Hi-Hi probe alarm at 3:50 p.m. CDT, at an upper reservoir level reading of elevation 1591.6 ft. *See* Exhibit 22. At the time of the alarm, the units were generating. *See* Exhibit 29.

Ameren has been unable to determine why this alarm was recorded, but at the time of the alarm, a storm, accompanied by lightning, moved through the area of the project works. The storm may have caused momentary induced voltages on the wiring running between the Hi-Hi probe relay and the plant PLC input card resulting in the PLC Historian recording a false Hi-Hi probe alarm.

September 25, 2005 Wind-driven overtopping event. Please see Ameren's January 19, 2006 Part 12.10(a) report for details.

September 27, 2005. Ameren operators visually inspected the upper reservoir and noted that although the level control transducers indicated an elevation of 1596 ft., the normal operating level for the upper reservoir, the upper reservoir level was actually within four inches of the top of the parapet wall in the vicinity of panel 72, the lowest known point on the parapet wall. Wet walls on the west side of the reservoir also were observed. *See* Exhibit 30.

Ameren operators also discovered that one of the three level control transducers is reporting an upper reservoir level that is about one foot lower than the other two. That level control transducer was removed from the elevation averaging logic in the PLC. Based upon the visual check, a further conservative upward adjustment of 0.4 ft. was made to the logic so that the average elevation reading in the logic would approximate the actual elevation of the upper reservoir. *See* Exhibit 30.

At 10:11 a.m., an Osage operator noted in the operator log a "high upper resv. alarm [and] small gate setting changed to 7.7% by itself. HPT's are working on something @ Sauk." *See* Exhibit 31. At the time the notation was made, the units were neither pumping nor generating.

Ameren believes this alarm is related to work being done on the PLC at approximately the same time. *See* Exhibit 22. Between 10:03 and 10:05 a.m., the elevation level readings for the upper reservoir were not recorded, suggesting that the PLC was offline so that an adjustment to the logic could be made. The adjustment may have resulted in an alarm indication once the PLC came back online.

September 28, 2005.	The PLC historian software recorded a one-second Hi-Hi probe alarm at 6:18 p.m. CDT, at an upper reservoir level reading of elevation 1544.1 ft. *See* Exhibit 22. At the time of the alarm, the units were neither pumping nor generating. *See* Exhibit 31.
	Ameren has been unable to determine why this alarm was recorded, but at the time of the alarm, a storm, accompanied by lightning, moved through the area of the project works. The storm may have caused momentary induced voltages on the wiring running between the Hi-Hi probe relay and the plant PLC input card resulting in the PLC Historian recording a false Hi-Hi probe alarm.
September 30, 2005.	Ameren personnel inspected the Hi and Hi-Hi probes in the upper reservoir (this information is reported in an October 7, 2005 email). Ameren personnel found that the Hi and Hi-Hi probes in the gage piping were 7 inches and 4 inches respectively, from the top of the upper reservoir wall at the gage house. These readings were not converted to elevations in the contemporaneous notes, but correspond to elevations of 1597.4 ft. and 1597.7 ft., respectively. *See* Exhibit 32.
October 3-4, 2005.	A visual inspection of the upper reservoir revealed that portions of the gage piping support system had failed, allowing the gage piping to move. The piping was observed to be bent. Ameren operators recognized that a bend in the piping would produce an elevation reading that is lower than the actual elevation of the upper reservoir. *See* Exhibit 33.
October 7, 2005.	As a safeguard against the suspect elevation readings, the setpoint for the second or last pump shut down was lowered from elevation 1596 ft. to elevation 1594 ft., and the setpoint for the "all pumps" shut down was lowered from elevation 1596.2 ft. to elevation 1594.2 ft. *See* Exhibit 34.
	Arrangements were also made to have a diver visit the Taum Sauk project works to evaluate whether the piping could be straightened and reattached without fully draining the upper reservoir. *See* Exhibit 34.
	Plans were made to add redundancy to the upper reservoir level protection system. A wind speed measurement, transmitter and alarm, were ordered for installation at the upper reservoir. *See* Exhibit 32.

October 7, 2005 (cont.)	Ameren also planned to install an additional probe 2" below the normal last pump shut down setpoint, or at elevation 1595.83 ft., so that the level transmitters could be checked. *See* Exhibit 32.
October 11, 2005.	Following inspection, the diver informed Taum Sauk personnel that he was confident that the gage piping could be straightened out without fully draining the upper reservoir. Plans were initiated to carry out the gage piping support retrofit. *See* Exhibit 34.
October 25, 2005.	The preliminary design was completed and materials were ordered for the gage piping support retrofit. *See* Exhibit 35.
November 2, 2005.	The PLC historian software recorded a nine-second Hi-Hi probe alarm at 12:49 p.m. CST, at an upper reservoir level reading of elevation 1578.4 ft. *See* Exhibit 22. At the time of the alarm, the units were neither pumping nor generating. *See* Exhibit 36. Ameren has been unable to determine why this alarm was recorded.
November, 2005.	Materials were on hand for the gage piping support retrofit, but coordinating the diver's availability and operational demands were delaying the work. *See* Exhibit 37.
December 14, 2005.	Apparent overpumping of the upper reservoir resulted in overtopping, which led to a failure of the reservoir's rock fill dike and parapet wall in the northwest corner. The failure of the dike and wall resulted in the reservoir draining at the breach point and flowing down the side of Proffit Mountain.