Data Summary Report for Pond 3 Emergency Treatment at the Leviathan Mine 2006

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1.0 INTRODUCTION

1.1 GENERAL

The *Data Summary Report for Pond 3 Emergency Treatment at the Leviathan Mine 2006* has been prepared by TKT Consulting, LLC under contract to the Lahontan Regional Water Quality Control Board (Water Board). The goal of this work was to neutralize Acid Mine Drainage (AMD) in Pond 3 and discharge the treated water to Leviathan Creek during spring runoff to prevent overflow of untreated AMD. Because this was an emergency action, the guidelines for discharge were to neutralize the AMD to a pH between 7 and 9 and minimize the impact to Leviathan Creek.

1.2 BACKGROUND

The ponds at the Leviathan Mine have been utilized to contain water contaminated with AMD since their construction in 1985. Pond 1, Pond 2 North and Pond 2 South (the upper ponds) drain into Pond 3 during an overflow event. When full, Pond 3 overflows to Leviathan Creek in the adjacent concrete channel. All of the ponds receive direct precipitation, most of which comes in the form of snow during the winter. In addition, the upper ponds receive acidic drainage from the adit and pit under-drain (PUD). The ponds were originally designed as evaporation ponds where AMD from the adit and PUD was collected and stored. The AMD that was contained within the ponds evapo-concentrated and the strength of this AMD increased significantly over time. The majority of this evapo-concentrated AMD was treated and all of the ponds were drained down in the early 2000's. The evapo-concentrated AMD that remained in the bottom of Pond 3 eventually evaporated to near dryness and the acidic, metal containing salts remained in the sand cover. In addition, some untreated AMD was added to Pond 3 during the years that pond AMD was treated. This resulted in a reduced volume of AMD that needed to be treated because the AMD evaporated; however the acidic salts remained in the sand cover following these events. In 2000, sludge generated during system startup and optimization was added to Pond 3.

The winter of 2004-2005 was the first winter with above average rainfall since the ponds were drained down and treated in the early 2000's. This resulted in substantial increases of the flows of the adit and PUD and also increased the direct precipitation to the ponds. At the beginning of the 2005 Emergency Treatment, it was estimated that Pond 3 contained approximately 900,000 gallons of AMD at pH 2.8 s.u.. This AMD contained high concentrations of aluminum and low concentrations of iron. In 2005, the AMD in Pond 3 was neutralized and approximately 600,000 gallons was discharged, while the remainder evaporated. The sludge that was generated in 2005 was not removed and remained in the pond at the time of the emergency treatment in 2006.

In 2006, the water table at the mine site remained elevated from the previous high water year. In addition, the winter of 2006 was another high precipitation year. It was unknown at the start of treatment how much AMD would need to be treated to prevent discharge of untreated AMD to Leviathan Creek.

More than 7.5 million gallons of AMD were treated over 85 days. The AMD that was treated in 2006 varied over time and for simplicity in this report we have separated the AMD that was treated into three categories according to the chemistry of the AMD.

1. The AMD that was treated initially, was mainly ice and snow melt that was contained in pond 3 and that overflowed from the surfaces of the upper ponds. This AMD was low in metals and sulfate concentrations but contained some dissolved reduced iron. TKT was able to treat this AMD at a high rate because the acidity was low and ferrous iron concentration and oxygen consumption was relatively low. The rate at which this AMD could be treated was controlled by the ability to mix the AMD in pond 3 with the treated alkaline RCTS effluent.

2. Once the ice melted from the surface of the ponds, the stratified AMD mixed and the AMD that spilled over from the upper ponds increased in metals, sulfate and TDS concentrations and acidity. In addition, AMD was brought down from the upper ponds through a siphon hose rather than only flowing over from the surfaces of the upper ponds. This AMD was the most difficult to treat at higher flow rates. The iron in the AMD during this stage of treatment was mostly in the reduced form and the concentration was high, the acidity and oxygen consumption were also high. The ability to oxidize iron in this AMD controlled the rate at which the AMD could be treated.

3. As time went on, the pond took on oxygen prior to treatment and the iron within the ponds oxidized. Towards the end of treatment the majority of the iron was oxidized, however the acidity remained high. TKT was able to treat this AMD at a high rate due to the low oxygen consumption. The rate at which lime could be added controlled the rate at which this AMD could be treated.

Table 1.1 Characterization of the Three Types of AMD Encountered on Site

AMD Type	Dates Encountered	Description	Average Treatment Rate	Iron	Aluminum
Initial AMD (ponds stratified)	April 14 to May 8 (21 Days)	AMD was mostly rain and snow melt with low acidity and low metals concentrations	approximately 136 gpm (up to 740 gpm)	Mostly ferrous iron (1 to 21 mg/L)	2 to 310 mg/L
Mixture of surface overflow and AMD siphoned from Pond 1	May 9 to July 4 (58 Days)	AMD was high in high in acidity and high in metals concentrations	approximately 33 gpm	Mostly ferrous iron (21 to 910 mg/L)	310 to 490 mg/L
AMD siphoned from Pond 1	July 5 to July 10 (5 Days)	AMD was high in acidity and high in metals concentrations	approximately 83 gpm (up to 330 gpm)	Mostly ferric iron (up to 1000 mg/L)	Up to 490 mg/L

1.3 TREATMENT OVERVIEW

The treatment system consisted of a patented RCTS-30HS (rotating cylinder treatment system-thirty inch diameter rotor high speed) unit, two to three 500-hundred-gallon lime slurry tanks, a lime delivery pump, a 3" siphon line from pond 1 and various pumps to bring AMD to the system from the upper ponds and Pond 3. Trash pumps (3") and 3" siphon lines were used to discharge AMD from pond 3 to Leviathan Creek via the existing overflow infrastructure.

1.3.1 RCTS-HS System

Acid mine drainage typically contains sulfuric acid along with elevated concentrations of dissolved ferrous iron and other metals. The oxidation of ferrous iron to ferric iron is a commonly used process in most lime treatment systems because ferric iron is precipitated from solution at a lower pH than ferrous iron. Treating AMD at a lower pH allows for treatment of iron and aluminum in a single stage. This oxidation is typically accomplished by pumping air with compressors and mixing the air, lime and AMD with agitation mixers in large tanks. Although this method of treatment is effective, it requires significant power and a large amount of space to house the reaction tanks. The patented Rotating Cylinder Treatment System (RCTS) utilizes shallow trough-like cells or cylinders (that contain the AMD being treated) and rotating cylinders within these cells to transfer oxygen and agitate the AMD. This system has been tested on multiple sites in Nevada and California. When compared with conventional systems it requires less power, and less space and is more efficient at mixing lime. Figure 1-1 displays the RCTS-HS system utilized for the Pond 3 Emergency Treatment in 2006.

Figure 1-1
2006 RCTS-HS Treatment System

1.3.2 Treatment Concept

The treatment concept in 2006 was to treat the AMD in pond 3 and any AMD that could potentially overflow to Leviathan Creek from the upper ponds. Initially, AMD was pumped from Pond 3 (near the influent point of the overflow from the upper ponds), to the RCTS-HS where lime was added to the AMD, the dissolved ferrous iron was oxidized, and metals and sulfate were precipitated. The treated water and precipitated solids were then either gravity fed back to the pond or pumped and mixed back into the pond at strategic locations.

During the initial hours of treatment, overflow from Pond 3 to Leviathan Creek occurred at a pH less than 7 s.u.. Once the pH at the discharge end of the Pond 3 surpassed 7 s.u,, active discharge began with the use of pumps and siphon hoses. By actively discharging at a higher rate than the inflow, Pond 3 was drawn down, creating freeboard. This allowed the AMD to be treated and contained in Pond 3 until the water was suitable for a controlled discharge. Figures 1-2 and 1-3 display the discharge pumping setup.

On April 25 a siphon line was installed to gravity feed AMD from Pond 1 directly into the RCTS Treatment System. By doing this, the level in the upper ponds was drawn down which reduced the amount of AMD that overflowed from the upper ponds to Pond 3. By June 4, overflow had decreased to less than 3 gallons per minute.

Figure 1-2. Three inch trash pumps were utilized to discharge water from Pond 3 to the overflow structure where the water was released to Leviathan Creek.

Figure 1-3. The suction lines for discharge were floated near the surface of the pond to minimize the discharge of sediment to Leviathan Creek.

2.0 HEALTH AND SAFETY PERFORMANCE SUMMARY

A site-specific health and safety plan (SSHSP) was utilized as the framework for safety during the Pond 3 Emergency Treatment. Important aspects of this SSHSP are briefly described below.

The SSHSP provides site- and task-specific information unique to activities at the Site. The SSHSP provides a description of the required tasks, identifies the potential physical and chemical hazards that may be encountered, and specifies the health and safety (H&S) control measures to be followed throughout the course of the operations. The SSHSP also identifies the H&S supervisory personnel and their responsibilities, training and medical surveillance requirements, personal protective equipment (PPE) and control measures, monitoring plan, site control, decontamination protocols, and emergency response procedures. The information helped to identify potential chemical and physical hazards and to establish the controls and level of protection required to reduce the risks of exposure to these hazards. However, the SSHSP remains subject to revision as conditions change or new information becomes available. Revisions can be initiated by field team members, the H&S Coordinators, or the Project Manager. The SSHSP was kept on-site at all times during the project and was revised for sludge removal.

All RCTS field personnel were trained through the Occupational Safety and Health Administration (OSHA) 40-hour Hazardous Waste Operations and Emergency Response (HAZWOPER) program, in accordance with 29 CFR 1910.120(e).

All personnel were briefed prior to their first entry onto the site. The site briefing included reviewing the SSHSP. Site-specific training was covered with an initial site tour and review of site conditions and hazards. Elements covered in the site briefing included:

- Persons responsible for site-safety;
- Site-specific safety and health hazards;
- Proper use of personal protective equipment (PPE);
- Safe work practices;
- Engineering controls;
- Decontamination procedures; and
- Emergency response.

No incidents were recorded during the Pond 3 Emergency Treatment 2006.

3.0 OPERATIONAL SUMMARY

3.1 MOBILIZATION

In April of 2006, following a series of large spring storms it became apparent that AMD was going to overflow from the holding ponds at the Leviathan Mine to Leviathan Creek. TKT was informed to start the mobilization process on April 5, 2006. TKT was able to plow the road and mobilize the entire system in approximately one week.

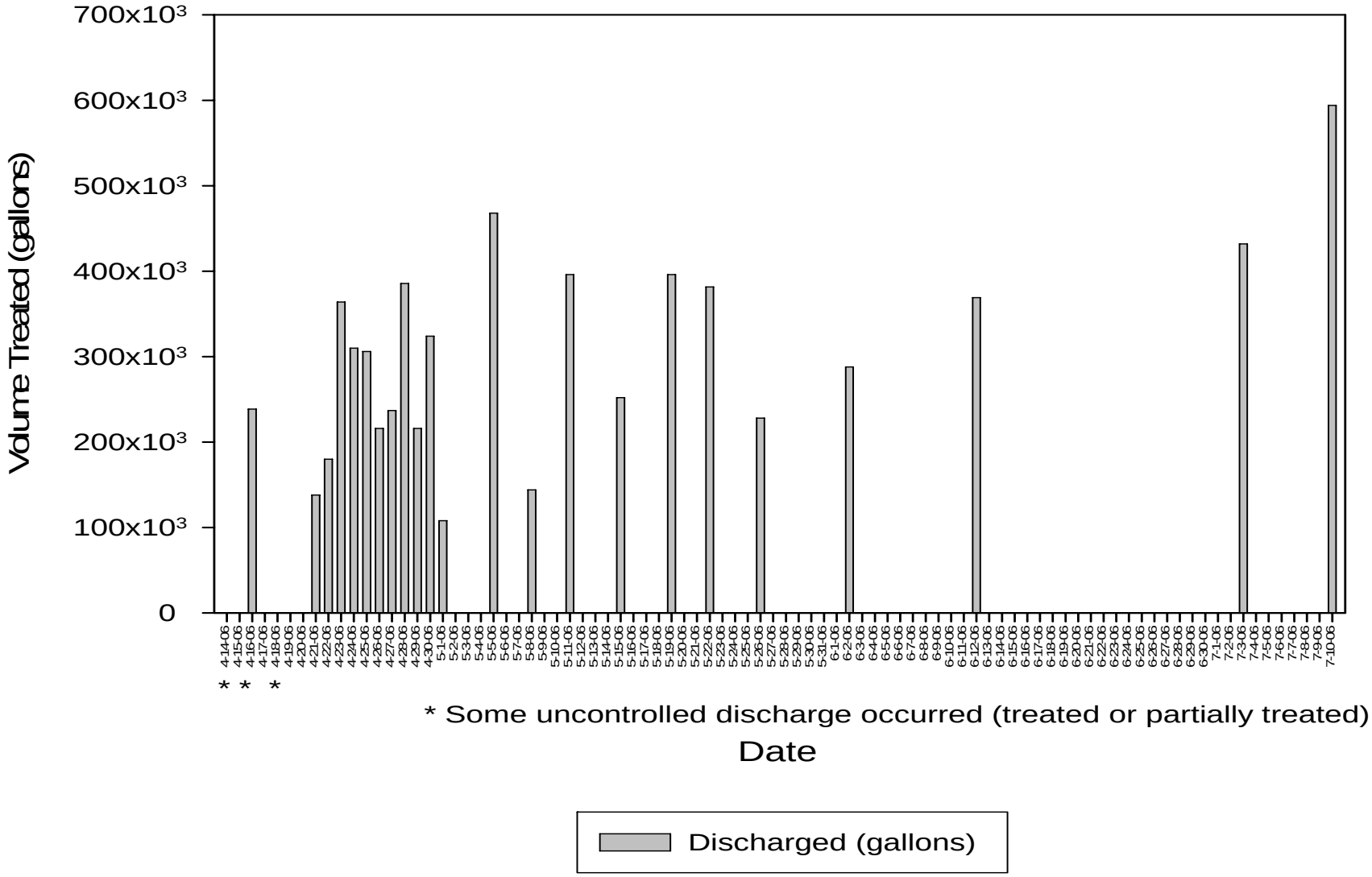
- TKT inspected the road on April 6
- The road was plowed to remove snow on April 9
- 18 pallets of lime were delivered to the Nevada/California border and were shuttled to the site via four-wheel drive equipment on April 12 and 13
- The RCTS-HS unit and lime delivery system was mobilized to the site on April 14
- Treatment began at 11:30 a.m. on April 14.
- By 10 a.m on April 15 the average pond pH was 8.3 s.u.

3.2 AMD TREATMENT

Acid mine drainage composed of mainly rain and snow-melt began to overflow from the surface of Pond 3 to Leviathan Creek sometime on April 12, 2006, due to heavy spring rain and snow. AMD treatment began on April 14, and was operated continuously through April 16. The system was shut down for approximately 33 hours between April 16 and 19. The system was

restarted on April 19 and operated continuously until July 10. Overall the treatment system was operated for 85 days. During this time approximately 7.5 million gallons of AMD was treated and discharged by actively pumping or siphoning. There was also an indefinite volume of treated water and partially treated AMD that overflowed to the creek on April 14, 15 and 18. The process of adding lime had begun on this partially treated AMD and most of the metals had precipitated from solution, however, it had not yet reached the target pH range for discharge. Figure 3-1 displays the dates of the individual discharges and the volume discharged on those dates.

Figure 3-1. Discharge Dates and Volumes



3.2.1 Initial AMD (low acidity, ferrous iron AMD)

The treatment rate in the "Spring Emergency Treatment 2006" varied with changing AMD chemistry and conditions. The AMD that was initially contained in Pond 3 was untreated low acidity AMD that consisted mainly of snow and ice melt. In addition, the upper ponds were partially stratified initially and the surface of the ponds which drained into Pond 3 was also characterized with a low acidity. AMD was pumped from Pond 3 (near the upper pond's overflow discharge point into Pond 3) and lime was added to the AMD and mixed via the RCTS unit. The high pH discharge from the RCTS unit was then mixed into Pond 3. By treating the pond in this manner TKT was able to treat the initial approximately 1 million gallons at high rate.

Lime addition began at 11:30 a.m. on April 14. The initial pH of Pond 3, measured at numerous points around the pond, was approximately 3.8 with an acidity of 134 mg/L $Ca(OH)_2$. By 10 a.m on April 15, the average pH of Pond 3 was 8.31. During this time, the RCTS effluent was added to Pond 3 at a pH value to adjust the entire pond to above 8 s.u.. This translates to an AMD treatment rate of approximately 740 gallons of AMD treated per minute. However, the pond was not thoroughly mixed. At the sampling point near the discharge the pH was approximately 6.5. At approximately 8 a.m. on April 16, the pH near the discharge point was approximately 8.6.

Once the pond pH near the discharge point reached a pH value greater than 7 the AMD began to be actively discharged by pumping or siphoning out of Pond 3 and directing the discharge through the overflow structure to Leviathan Creek. By actively discharging at a higher rate than the inflow, pond 3 could be drawn down below the overflow elevation, creating freeboard. This allowed the AMD to be treated and contained in Pond 3 until the water was suitable for a controlled discharge.

On April 25 it was apparent that a higher rate of flow could be treated. A siphon line was installed to gravity feed AMD from Pond 1 directly into the RCTS Treatment System. The acidity of the initial AMD from the surface of Pond 3 was 92 mg/L. The overflow acidity from the upper ponds was initially 41 mg/L and by April 26 the acidity increased to 136 mg/L.

3.2.2 Mixed AMD Treatment (high acidity, ferrous iron AMD)

The initial AMD contained in Pond 3 and the overflow from the upper ponds consisted of mainly ice and snow melt with a small amount of acid mine drainage mixed in. By April 30, the mixing of the stratified layers in the upper ponds was sufficient to increase the acidity of the overflow to 404 mg/L. In addition, on April 25 a siphon was placed in Pond 1 to draw AMD from Pond 1directly to the RCTS treatment system. The intake from this siphon line was placed 3 meters from the edge of Pond 1 and approximately 0.5 meters from the surface. The acidity from this siphon line was 437 mg/L initially. By May 8, the acidity increased to 1800 mg/L and by June 29, the acidity had reached 5207 mg/L.

The AMD during this period was high in acidity and also high in ferrous iron. Initially, greater than 90% of the iron was in the ferrous state. During this period the rate that the AMD could be treated was controlled by the amount of oxidation that could be achieved within the system.

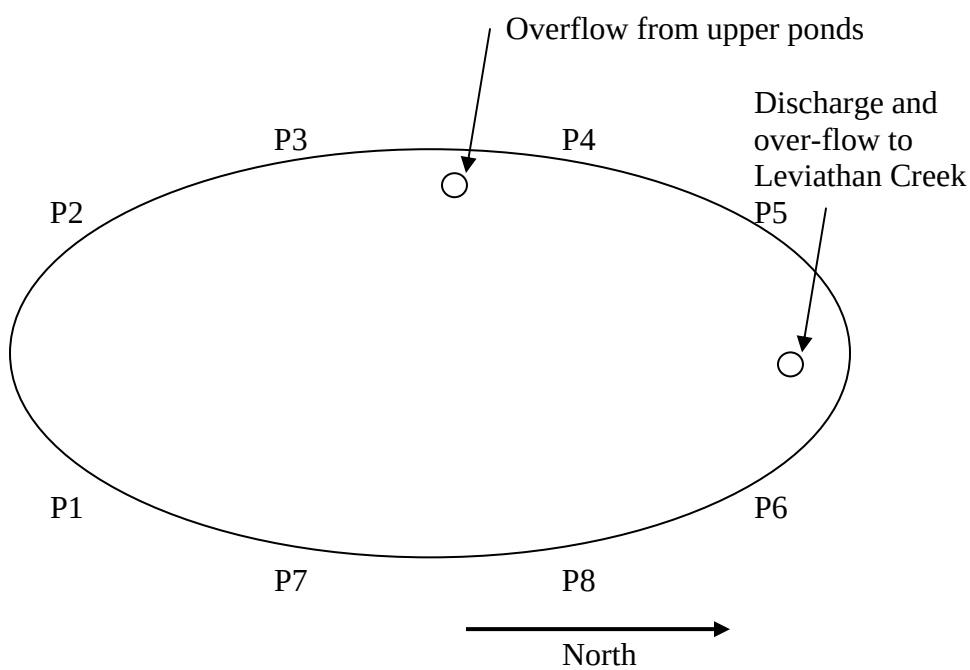
3.2.3 Mixed Oxidized AMD Treatment (high acidity, ferric iron AMD)

By July 4 the majority of the iron had oxidized within the upper ponds and the ponds were well mixed. The AMD that was treated after July 4 was high in acidity and contained iron mainly in the ferric state. On July 6 the acidity was measured at 5346 mg/L. During this period of treatment, virtually all of the AMD that was treated came from the siphon line. Because the majority of the iron was in the ferric state the AMD could be treated at a high rate during this period. The limitation of the rate of treatment during this period was the rate at which lime could be added. Because the acidity was high, the flow that could be treated continuously was limited to approximately 200 gpm without overheating the lime pump that was being used.

4.0 SAMPLING SUMMARY

Pond 3 monitoring was conducted multiple times per day on most treatment days. Pond 3 monitoring stations are displayed in Figure 4-1.

Figure 4-1. Pond 3 Monitoring Stations



Field monitoring included the determination of flow, pH, oxidation-reduction potential (ORP), conductivity, dissolved oxygen (DO), and temperature. Flow rates to the RCTS and Pond 3were

measured with a 19-liter (L) container and a stopwatch when practical. Discharge flow rates were estimated from pump and pipe manufacturer's specs. All other field measurements were measured with a Yellow Springs Instrument (YSI) 556-field meter, calibrated before each visit. Field measurements were recorded on field sampling forms and in field logbooks (See Appendix D).

Certified laboratory samples were taken by the Water Board staff at least once on discharge days following protocols defined in the Water Board's "Sampling and Analysis Plan for Surface Water Monitoring" (January 2004) and were sent to Weck Laboratories in Industry, CA for analysis. Grab samples were collected from near the discharge point in Pond 3 and the pH was monitored continuously on discharge days. Sampling stations were as follows:

- Pond 1
- Pond 2 S
- Station 15
- Pond 3

Three composite sludge samples were collected by TKT at the effluent of the RCTS. Approximately 12 gallons of RCTS effluent were collected in three 5 gallon plastic buckets. The sludge was allowed to settle overnight and the water was then decanted from the sludge. The remaining sludge was then combined into one 15 gallon container. This process was continued for several days and then was allowed to dry on site, open to the atmosphere, to obtain the first two composite samples. The third composite sample was collected in a single day and was also combined in a 15 gallon container and was allowed to dry open to the atmosphere. A sludge sample was also collected directly from Pond 3 by the Water Board on August 8.

5.0 TREATMENT RESULTS

The directives from the Environmental Protection Agency were to prevent untreated acid mine drainage from the upper ponds from overflowing to Leviathan Creek. Because this was an emergency effort and overflow appeared to be imminent, the directives were to neutralize the AMD to a pH between 7 and 9 s.u. prior to overflow or discharge to Leviathan Creek.

Despite intensive efforts to mobilize in time to treat the water prior to overflow, an untreated overflow event did occur between some time on April 12 and approximately 11:30 a.m. on April 14. Although the pH of this water was low (between 3.2 and 3.6), it was composed mainly of ice and snowmelt and was characterized with low acidity and low metals concentrations (see Appendix D). Treatment began on April 14, while uncontrolled overflow of treated or partially treated water continued between April 14 and April 20. On April 14, following treatment, the pH at the discharge point varied between 4.5 and 4.9. On April 15 the pH varied between 6.4 and 7.7. On April 16 the pH varied between 8.6 and 9.0. On April 16 Pond 3 was actively pumped down and discharged to Leviathan Creek and the system was shut down. On April 18,

Pond 3 unexpectedly began to overflow and the pH was measured at 4.6. On April 18 at approximately 11:30 p.m. the system was started back up and by 11:30 a.m on April 19 the pH was back up to 9.0. The pH on April 19 varied from 5.6 to 9.0. By April 20 the uncontrolled overflow was stopped by actively pumping treated water through the overflow structure to Leviathan Creek. The pH varied between 6.2 and 9.0 on April 20. Following April 20, all water was discharged actively at a pH between 7 and 9 with a target pH between 8.0 and 8.5.

Although only required to meet pH objectives between 7 and 9, the RCTS-HS treatment system was effective at removing metals to below the discharge objectives set forth in the Removal Action Memorandum (RAM) (See Appendix A). Once treatment began during the 2006 Spring Treatment, the maximum daily RAM discharge objectives were not exceeded, with the exception of iron which slightly exceeded the objective once. Aluminum, iron and copper exceeded the RAM discharge objectives prior to treatment. Copper and aluminum exceeded discharge objective on April 14 just following the initiation of treatment. Selenium (which is not removed effectively by lime precipitation without the presence of high concentrations of other metals which co-precipitate) exceeded the four day average RAM objective between April 14 and April 22. Figures 1-7 graphically display the data over time. Field data sets are provided in Appendix B and C.

Water was treated 24 hours per day, 7 days per week from April 19 to July 7. The controlled discharges occurred when the capacity of Pond 3 was near full and the pH of Pond 3 near the discharge point was between 7 and 9. A target discharge pH of approximately 8.3 s.u. was set, however the Pond 3 pH sometimes varied and in a few circumstances the discharge was stopped do to the pH approaching 7 or 9 s.u.. Samples were taken during discharge whenever practical however on April 27 and April 28 the samples were taken after the discharge had been stopped and on May 5 the samples were taken prior to discharge.

The RCTS-HS mobile unit was mobilized very quickly and under harsh conditions and the treatment system was effective at discharging water between pH 7 and 9 s.u. and only one sample exceeded the Maximum RAM discharge criteria once all discharges were controlled. In 2006 approximately 28.4 million L (7.5 million gal) of AMD was treated compared to approximately 2.27 million L (600,000 gal) in 2005. Forty two and one half tons of dry lime were consumed and two and one half tons of dry lime remain on site for future operations, if needed.

Table 5.1 Removal Action Memorandum Discharge Criteria

Target Metals	Maximum (a) (µg/L)	Average (b) (µg/L)	Target Metals	Maximum (a) (µg/L)	Average (b) (µg/L)
Primary Target Metals			**Secondary Water Quality Indicator Metals**		
Aluminum	4,000	2,000	Cadmium	9.0	4.0
Arsenic	340	150	Chromium	970	310
Copper	26	16	Lead	136	5.0
Iron	2,000	1,000	Selenium	No Standard	5.0
Nickel	840	94	Zinc	210	210

(a) Based on a daily composite of three grab samples
(b) Based on the average of four consecutive daily composite samples

6.0 SLUDGE REMOVAL

The treatment process in 2005 and 2006 resulted in sludge being settled out in Pond 3. Multiple options were considered to remove the sludge from Pond 3 and dispose of it, in order to regain the lost volume within the pond. The decision was made to pump and drain Pond 3 to the extent possible and let the remaining water evaporate over the summer.

Following evaporation, Pond 3 contained an average of 10-14 inches of sludge or approximately 1,200 m^3. This sludge was generated and/or stored in Pond 3 during treatment of the approximately 7.5 million gallons of AMD in 2006, approximately 800,000 gallons of AMD in 2005 and an un-quantified volume existed from previous treatment years. To determine the characteristics of the sludge being generated, grab samples were collected from the effluent of the RCTS by TKT on a daily basis from June 13 through June 16 and were mixed. Grab samples were also collected by TKT on a daily basis from June 30 through July 3 and were mixed. A third sample was taken on 7-7-06 by TKT. A composite sample of the sludge contained in Pond 3 was also collected by the Water Board on August 8. All samples were sent to Weck Laboratories, Inc for analysis. The "Total Threshold Limit Concentration" TTLC and "Soluble Threshold Limit Concentration" STLC analysis were performed to characterize the sludge for disposal. (See results in Tables 6.1, 6.2 and 6.3) Results from these tests classified the sludge as "non-RCRA Hazardous Waste" which necessitated the disposal in a hazardous waste facility according to California regulations.

Funding for sludge removal was secured on October 24. TKT visited the site on October 25 to inspect the site and determine the appropriate means of sludge removal. Although an agreement between TKT and the traditional sludge removal contractor was in place, the contractor pulled out of the project on October 26 stating concerns for weather and a shortage of staff.

TKT, also concerned about the weather, then quickly proceeded to contract John DeLaHunt Equipment Services (Sparks, NV) for sludge removal and also proceeded to secure the appropriate sludge profiles with U.S. Ecology (Beatty, NV) for sludge disposal.

On November 8, an excavator was mobilized to the site. On November 9, staging of the sludge began within the pond and a front end loader was mobilized to the site to load the end dump trucks that would haul the sludge to U.S. Ecology. On November 10, TKT received notice from U.S. Ecology that the sludge profiles were approved and the sludge could be transferred to U.S. Ecology. The stockpiled sludge was transferred from Pond 3 to nine 20 yd^3 end-dump trucks, also on November 10. The pre-loaded trucks (unable to unload at U.S. Ecology over the weekend) and one empty truck then returned to the contractor's yard. On November 13 the sludge was transferred to U.S Ecology.

TKT estimates that approximately 60-70% of the sludge contained in Pond 3 was removed. The remainder (wet sludge) was stockpiled within Pond 3 for removal at a later time. It was estimated that approximately 1,200 m^3 of sludge was contained in Pond 3 prior to excavation. However,

the top approximately 80 % of this sludge contained a considerable volume of air. When the sludge was moved, it compacted and continued to dry, both of which resulted in a smaller final volume of sludge. In total 162 to 180 yd^3 (159 tons) of sludge were transferred to U.S. Ecology.

Figure 6-1 Pond 3 Sludge Removal

Table 6.1 Sludge Characterization (6-13-06 to 6-16-06 combined grab samples)				
Parameter	**Total Metals[1] (mg/kg)**	**Exceed TTLC?**	**STLC (mg/L)**	**Exceed STLC?**
Antimony	7.4	No	0.14	No
Arsenic	1100	***Yes***	4.0	No
Barium	9.2	No	0.14	No
Beryllium	1.5	No	<0.10	No
Cadmium	18	No	0.24	No
Chromium	150	No	3.9	No
Cobalt	250	No	1.8	No
Copper	490	No	12	No
Lead	<1.3	No	<0.10	No
Mercury	<0.013	No	<0.005	No
Molybdenum	<6.6	No	<0.10	No
Nickel	610	No	6.1	No
Selenium	<1.3	No	<0.30	No
Silver	<0.66	No	<0.05	No
Thallium	41	No	<0.50	No
Vanadium	96	No	0.26	No
Zinc	130	No	0.55	No

[1] Metals data reported as dry weight

mg/kg = Milligram per kilogram
mg/L = Milligram per liter

STLC = Soluble threshold limit concentration
TTLC = Total threshold limit concentration

Table 6.2 Sludge Characterization (6-30-06 through 7-3-06 combined grab samples)				
Parameter	**Total Metals[1] (mg/kg)**	**Exceed TTLC?**	**STLC (mg/L)**	**Exceed STLC?**
Antimony	7.8	No	<0.10	No
Arsenic	1300	***Yes***	0.62	No
Barium	7.7	No	<0.10	No
Beryllium	1.5	No	<0.10	No
Cadmium	18	No	0.16	No
Chromium	150	No	2.2	No
Cobalt	250	No	1.3	No
Copper	450	No	9.8	No
Lead	<1.2	No	<0.10	No
Mercury	<0.012	No	<0.0050	No
Molybdenum	<6.0	No	<0.10	No
Nickel	620	No	5.1	No
Selenium	<1.2	No	<0.30	No
Silver	<0.6	No	<0.050	No
Thallium	24	No	0.21	No
Vanadium	89	No	<0.050	No
Zinc	130	No	<0.50	No

[1] Metals data reported as dry weight

mg/kg = Milligram per kilogram
mg/L = Milligram per liter

STLC = Soluble threshold limit concentration
TTLC = Total threshold limit concentration

Table 6.3 Sludge Characterization (7-7-06 combined grab samples)				
Parameter	**Total Metals[1] (mg/kg)**	**Exceed TTLC?**	**STLC (mg/L)**	**Exceed STLC?**
Antimony	8.0	No	<0.10	No
Arsenic	1400	***Yes***	0.31	No
Barium	8.6	No	<0.10	No
Beryllium	1.6	No	<0.10	No
Cadmium	19	No	0.15	No
Chromium	160	No	1.7	No
Cobalt	260	No	1.8	No
Copper	430	No	9.5	No
Lead	<1.2	No	<0.10	No
Mercury	0.0083	No	<0.0050	No
Molybdenum	<6.0	No	<0.10	No
Nickel	650	No	5.3	No
Selenium	<1.2	No	<0.30	No
Silver	<0.6	No	<0.050	No
Thallium	19	No	<0.50	No
Vanadium	94	No	<0.050	No
Zinc	140	No	<0.50	No

[1] Metals data reported as dry weight

mg/kg = Milligram per kilogram
mg/L = Milligram per liter

STLC = Soluble threshold limit concentration
TTLC = Total threshold limit concentration

Table 6.4 Sludge Characterization (Composite Sample taken from Pond 3 8-8-06)				
Parameter	**Total Metals[1] (mg/kg)**	**Exceed TTLC?**	**STLC (mg/L)**	**Exceed STLC?**
Antimony	9.7	No	0.19	No
Arsenic	1000	***Yes***	8.7	Yes
Barium	40	No	0.22	No
Beryllium	1.5	No	0.015	No
Cadmium	14	No	0.17	No
Chromium	150	No	1.6	No
Cobalt	240	No	2.6	No
Copper	380	No	4.0	No
Lead	<0.84	No	<0.032	No
Mercury	0.39	No	<0.0036	No
Molybdenum	<6.3	No	<0.022	No
Nickel	610	No	6.5	No
Selenium	<2.2	No	<0.13	No
Silver	2.4	No	<0.013	No
Thallium	29	No	0.23	No
Vanadium	91	No	0.87	No
Zinc	120	No	1.6	No

[1] Metals data reported as dry weight

mg/kg = Milligram per kilogram
mg/L = Milligram per liter

STLC = Soluble threshold limit concentration
TTLC = Total threshold limit concentration

7.0 RECOMENDATIONS

TKT makes the following recommendations for future emergency treatment efforts.

1. Notification to proceed at least three weeks prior to overflow. It may be necessary to mobilize the treatment system through several feet of snow. This effort can be streamlined if more time is provided.

2. Keep at least two pallets of lime on site. The local availability of lime (particularly type N) is limited at times and must be transported from several hundred miles away. Because acquisition takes time, and it is difficult to transport to the site under 4 wheel drive conditions, it is import to keep a supply of lime stored at the site.

3. Based on the data from 2006, when possible operate the system at a target pH of 8.3 to 8.9. Some metals like nickel are precipitated more effectively from solution at a higher pH, however aluminum re-dissolves back into solution as the pH is raised above 6. During 2006, the aluminum Maximum RAM Discharge criteria was not exceeded but the iron criteria was exceeded. Because of the emergency nature of the treatment it was not always practical to discharge at the optimum pH, but targets should be set that are between pH 8.3 and 8.9 to optimize nickel and iron removal.

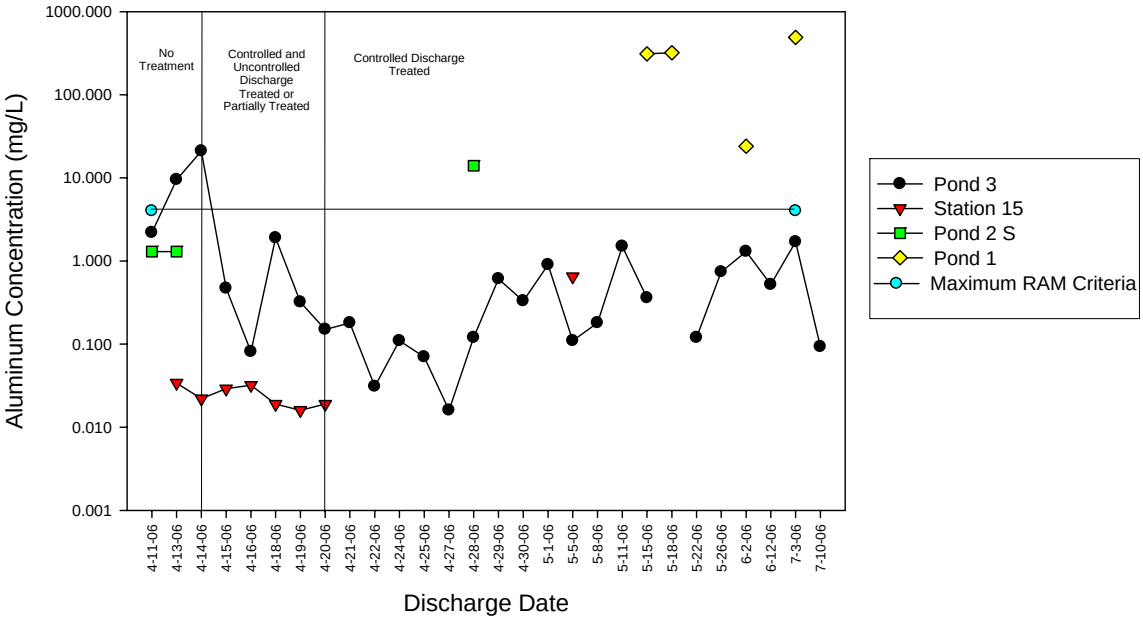
4. In order to be able to treat at a higher rate of flow, a larger lime pump should be utilized to prevent overheating. In addition, a larger RCTS unit/lime tanks or multiple RCTS units and additional lime tanks can be added to the system.

5. The use of a silt curtain, confinement dam or similar device to contain the sludge that is generated on the south side of Pond 3, should be investigated. This may aid in dewatering and make sludge removal easier.

APPENDIX A

Figures and Laboratory Data Sets
(Water Board Data)

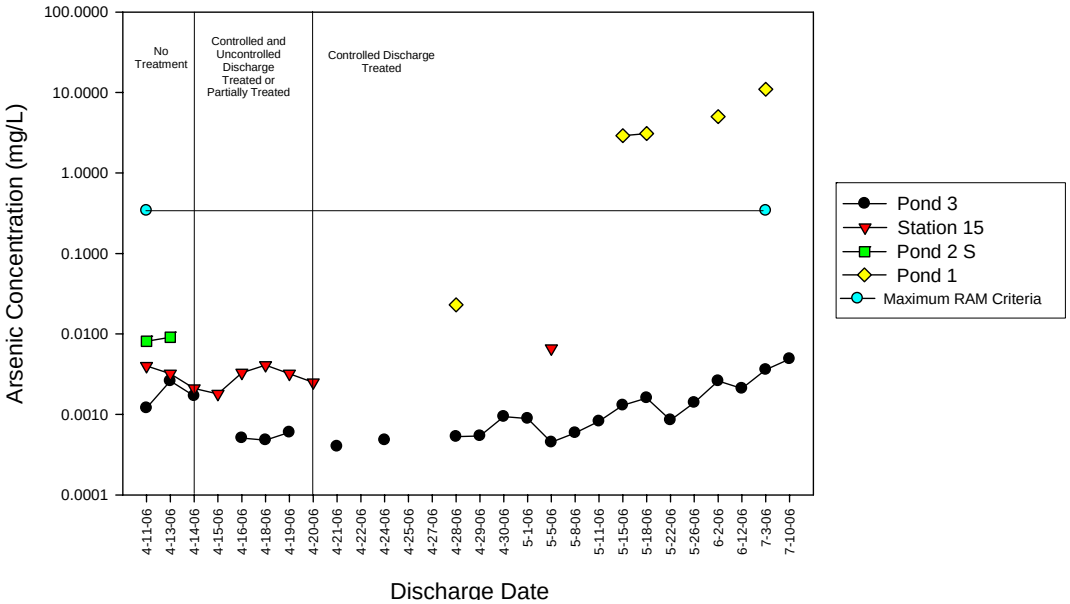
Figure 1. Leviathan Pond 3 Emergency Water Treatment 2006
Aluminum Concentrations (mg/L)



Spring 2006 Emergency Pond AMD Treatment Dissolved Aluminum Data (mg/L)

Date	Pond 3	Station 15	Pond 2 S	Pond 1	Maximum RAM Criteria	Comments
4-11-06	2.2	<0.02	1.3		4	No treatment
4-13-06	**9.5**	0.034	1.3		4	No treatment
4-14-06	**21**	0.022			4	Partial treatment at time of sampling
4-15-06	0.47	0.029			4	Partially treated some uncontrolled discharge
4-16-06	0.081	0.032			4	
4-18-06	1.9	0.019			4	Partially Treated some uncontrolled discharge
4-19-06	0.320	0.016			4	Some uncontrolled discharge
4-20-06	0.150	0.019			4	Some uncontrolled discharge
4-21-06	0.180				4	Controlled discharge
4-22-06	0.031				4	Controlled discharge
4-24-06	0.110				4	Controlled discharge
4-25-06	0.070				4	Controlled discharge
4-27-06	0.016				4	Controlled discharge
4-28-06	0.120		**14**		4	Controlled discharge
4-29-06	0.610				4	Controlled discharge
4-30-06	0.330				4	Controlled discharge
5-1-06	0.900				4	Controlled discharge
5-5-06	0.110	0.650			4	Controlled discharge
5-8-06	0.180				4	Controlled discharge
5-11-06	1.5				4	Controlled discharge
5-15-06	0.360			**310**	4	Controlled discharge
5-18-06	<0.020			**320**	4	Controlled discharge
5-22-06	0.120				4	Controlled discharge
5-26-06	0.740				4	Controlled discharge
6-2-06	1.3			**24**	4	Controlled discharge
6-12-06	0.520				4	Controlled discharge
7-3-06	1.7			**490**	4	Controlled discharge
7-10-06	0.093				4	Controlled discharge

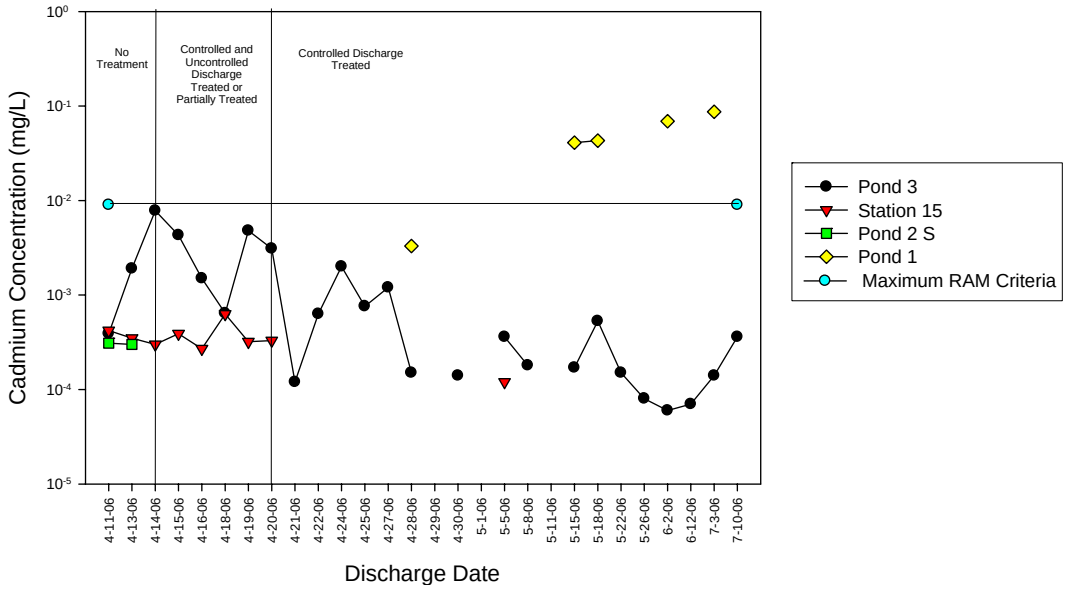
Figure 2. Pond 3 Emergency Water Treatment 2006
Arsenic Concentrations (mg/L)



Spring 2006 Emergency Pond AMD Treatment Dissolved Arsenic Data (mg/L)

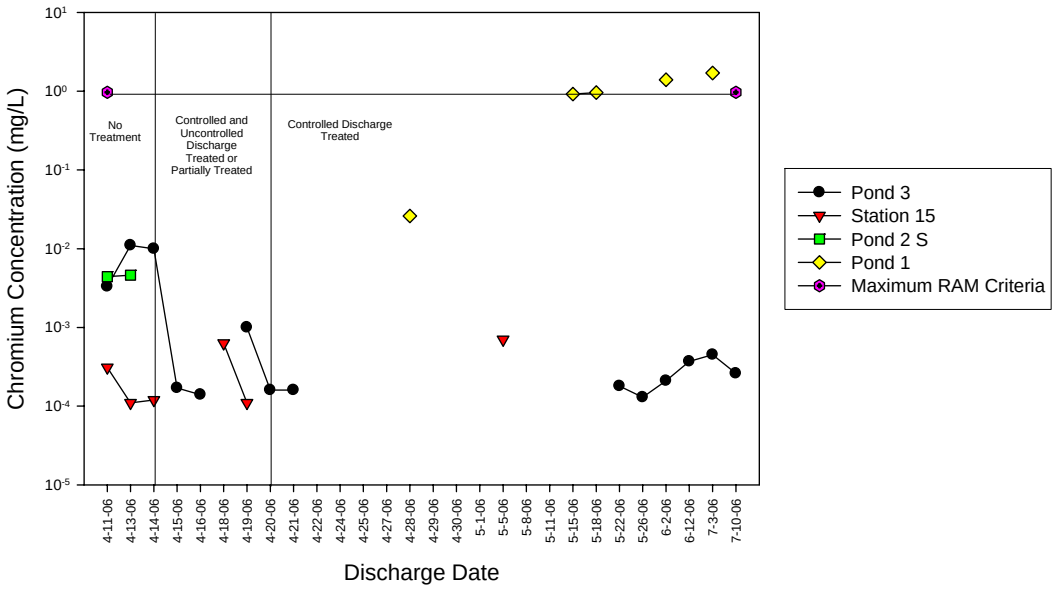
Date	Pond 3	Station 15	Pond 2 S	Pond 1	Maximum RAM Criteria	Comments
4-11-06	0.0012	0.004	0.0081		0.34	No treatment
4-13-06	0.0026	0.0032	0.0091		0.34	No treatment
4-14-06	0.0017	0.0021			0.34	Partial treatment at time of sampling
4-15-06	<0.0004	0.0018			0.34	Partially treated some uncontrolled discharge
4-16-06	0.00051	0.0033			0.34	
4-18-06	0.00048	0.0041			0.34	Partially Treated some uncontrolled discharge
4-19-06	0.0006	0.0032			0.34	Some uncontrolled discharge
4-20-06	<0.00040	0.0025			0.34	Some uncontrolled discharge
4-21-06	0.0004				0.34	Controlled discharge
4-22-06	<0.0004				0.34	Controlled discharge
4-24-06	0.00048				0.34	Controlled discharge
4-25-06	<0.00040				0.34	Controlled discharge
4-27-06	<0.00040				0.34	Controlled discharge
4-28-06	0.00053			0.023	0.34	Controlled discharge
4-29-06	0.00054				0.34	Controlled discharge
4-30-06	0.00094				0.34	Controlled discharge
5-1-06	0.00089				0.34	Controlled discharge
5-5-06	0.00045	0.0066			0.34	Controlled discharge
5-8-06	0.00059				0.34	Controlled discharge
5-11-06	0.00082				0.34	Controlled discharge
5-15-06	0.0013			**2.9**	0.34	Controlled discharge
5-18-06	0.0016			**3.1**	0.34	Controlled discharge
5-22-06	0.00085				0.34	Controlled discharge
5-26-06	0.0014				0.34	Controlled discharge
6-2-06	0.0026			**5**	0.34	Controlled discharge
6-12-06	0.0021				0.34	Controlled discharge
7-3-06	0.0036			**11**	0.34	Controlled discharge
7-10-06	0.0049				0.34	Controlled discharge

Figure 3. Pond 3 Emergency Water Treatment 2006
Cadmium Concentrations (mg/L)



Spring 2006 Emergency Pond AMD Treatment Dissolved Cadmium Data (mg/L)						
Date	**Pond 3**	**Station 15**	**Pond 2 S**	**Pond 1**	**Maximum RAM Criteria**	**Comments**
4-11-06	0.00039	0.00042	0.00031		0.009	No treatment
4-13-06	0.0019	0.00035	0.0003		0.009	No treatment
4-14-06	0.0078	0.0003			0.009	Partial treatment at time of sampling
4-15-06	0.0043	0.00039			0.009	Partially treated some uncontrolled discharge
4-16-06	0.0015	0.00027			0.009	
4-18-06	0.00064	0.00063			0.009	Partially Treated some uncontrolled discharge
4-19-06	0.0048	0.00032			0.009	Some uncontrolled discharge
4-20-06	0.0031	0.00033			0.009	Some uncontrolled discharge
4-21-06	0.00012				0.009	Controlled discharge
4-22-06	0.00063				0.009	Controlled discharge
4-24-06	0.002				0.009	Controlled discharge
4-25-06	0.00076				0.009	Controlled discharge
4-27-06	0.0012				0.009	Controlled discharge
4-28-06	0.00015			0.0033	0.009	Controlled discharge
4-29-06	<0.0001				0.009	Controlled discharge
4-30-06	0.00014				0.009	Controlled discharge
5-1-06	<0.0001				0.009	Controlled discharge
5-5-06	0.00036	0.00012			0.009	Controlled discharge
5-8-06	0.00018				0.009	Controlled discharge
5-11-06	<0.0001				0.009	Controlled discharge
5-15-06	0.00017			**0.041**	0.009	Controlled discharge
5-18-06	0.00053			**0.043**	0.009	Controlled discharge
5-22-06	0.00015				0.009	Controlled discharge
5-26-06	0.00008				0.009	Controlled discharge
6-2-06	0.00006			**0.069**	0.009	Controlled discharge
6-12-06	0.00007				0.009	Controlled discharge
7-3-06	0.00014			**0.087**	0.009	Controlled discharge
7-10-06	0.00036				0.009	Controlled discharge

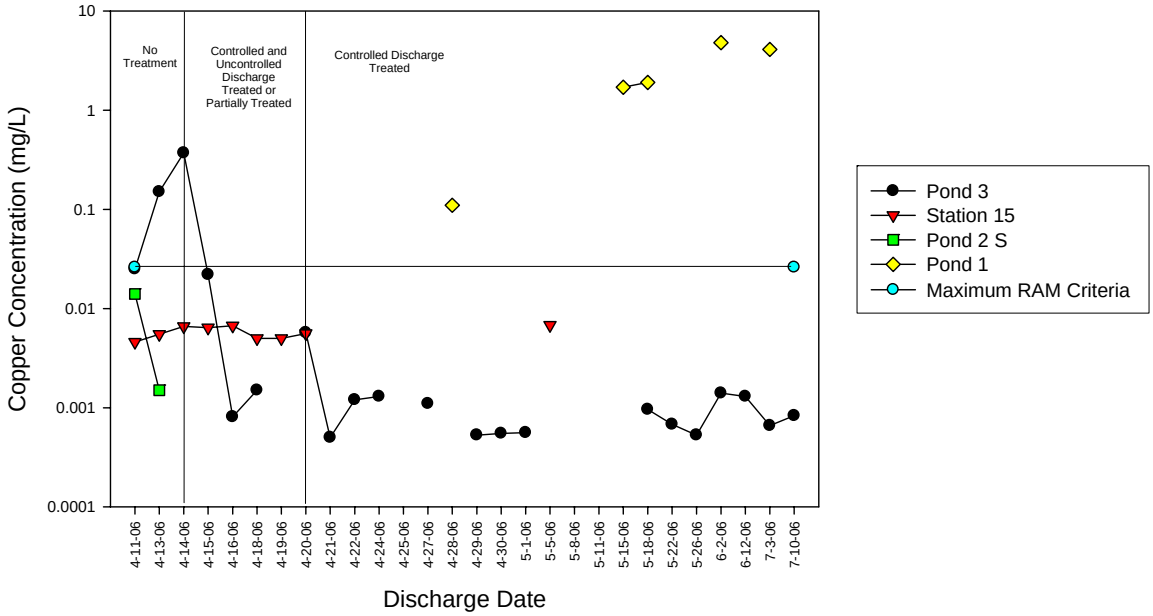
Figure 4. Pond 3 Emergency Water Treatment 2006
Chromium Concentrations (mg/L)



Spring 2006 Emergency Pond AMD Treatment Dissolved Chromium Data (mg/L)

Date	Pond 3	Station 15	Pond 2 S	Pond 1	Maximum RAM Criteria	Comments
4-11-06	0.0033	0.00031	0.0044		0.970	No treatment
4-13-06	0.011	0.00011	0.0046		0.970	No treatment
4-14-06	0.010	0.00012			0.970	Partial treatment at time of sampling
4-15-06	0.00017	<0.00010			0.970	Partially treated some uncontrolled discharge
4-16-06	0.00014	<0.00010			0.970	
4-18-06	<0.00010	0.00063			0.970	Partially Treated some uncontrolled discharge
4-19-06	0.001	0.00011			0.970	Some uncontrolled discharge
4-20-06	0.00016	<0.00010			0.970	Some uncontrolled discharge
4-21-06	0.00016				0.970	Controlled discharge
4-22-06	<0.0001				0.970	Controlled discharge
4-24-06	<0.0001				0.970	Controlled discharge
4-25-06	<0.0001				0.970	Controlled discharge
4-27-06	<0.0001				0.970	Controlled discharge
4-28-06	<0.0001			0.026	0.970	Controlled discharge
4-29-06	<0.0001				0.970	Controlled discharge
4-30-06	<0.0001				0.970	Controlled discharge
5-1-06	<0.0001				0.970	Controlled discharge
5-5-06	<0.0001	0.0007			0.970	Controlled discharge
5-8-06	<0.0001				0.970	Controlled discharge
5-11-06	<0.0001				0.970	Controlled discharge
5-15-06	<0.0001			**0.920**	0.970	Controlled discharge
5-18-06	<0.0001			**0.960**	0.970	Controlled discharge
5-22-06	0.00018				0.970	Controlled discharge
5-26-06	0.00013				0.970	Controlled discharge
6-2-06	0.00021			**1.4**	0.970	Controlled discharge
6-12-06	0.00037				0.970	Controlled discharge
7-3-06	0.00045			**1.7**	0.970	Controlled discharge
7-10-06	0.00026				0.970	Controlled discharge

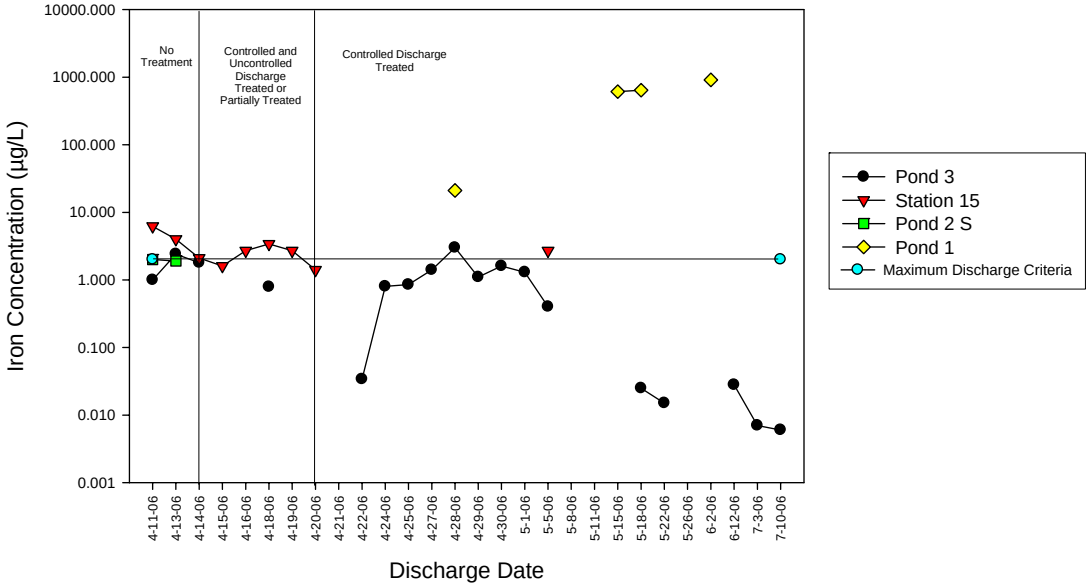
Figure 5. Pond 3 Emergency Water Treatment 2006
Copper Concentrations (mg/L)



Spring 2006 Emergency Pond AMD Treatment Dissolved Copper Data (mg/L)

Date	Pond 3	Station 15	Pond 2 S	Pond 1	Maximum RAM Criteria	Comments
4-11-06	0.025	0.0046	0.014		0.026	No treatment
4-13-06	**0.150**	0.0055	0.0015		0.026	No treatment
4-14-06	**0.370**	0.0066			0.026	Partial treatment at time of sampling
4-15-06	0.022	0.0064			0.026	Partially treated some uncontrolled discharge
4-16-06	0.00081	0.0067			0.026	
4-18-06	0.0015	0.005			0.026	Partially Treated some uncontrolled discharge
4-19-06	<0.0005	0.005			0.026	Some uncontrolled discharge
4-20-06	0.0057	0.0056			0.026	Some uncontrolled discharge
4-21-06	0.0005				0.026	Controlled discharge
4-22-06	0.0012				0.026	Controlled discharge
4-24-06	0.0013				0.026	Controlled discharge
4-25-06	<0.0005				0.026	Controlled discharge
4-27-06	0.0011				0.026	Controlled discharge
4-28-06	<0.0005			**0.110**	0.026	Controlled discharge
4-29-06	0.00053				0.026	Controlled discharge
4-30-06	0.00055				0.026	Controlled discharge
5-1-06	0.00056				0.026	Controlled discharge
5-5-06	<0.0005	0.0068			0.026	Controlled discharge
5-8-06	<0.0005				0.026	Controlled discharge
5-11-06	<0.0005				0.026	Controlled discharge
5-15-06	<0.0005			**1.7**	0.026	Controlled discharge
5-18-06	0.00096			**1.9**	0.026	Controlled discharge
5-22-06	0.00068				0.026	Controlled discharge
5-26-06	0.00053				0.026	Controlled discharge
6-2-06	0.0014			**4.8**	0.026	Controlled discharge
6-12-06	0.0013				0.026	Controlled discharge
7-3-06	0.00066			**4.1**	0.026	Controlled discharge
7-10-06	0.00083				0.026	

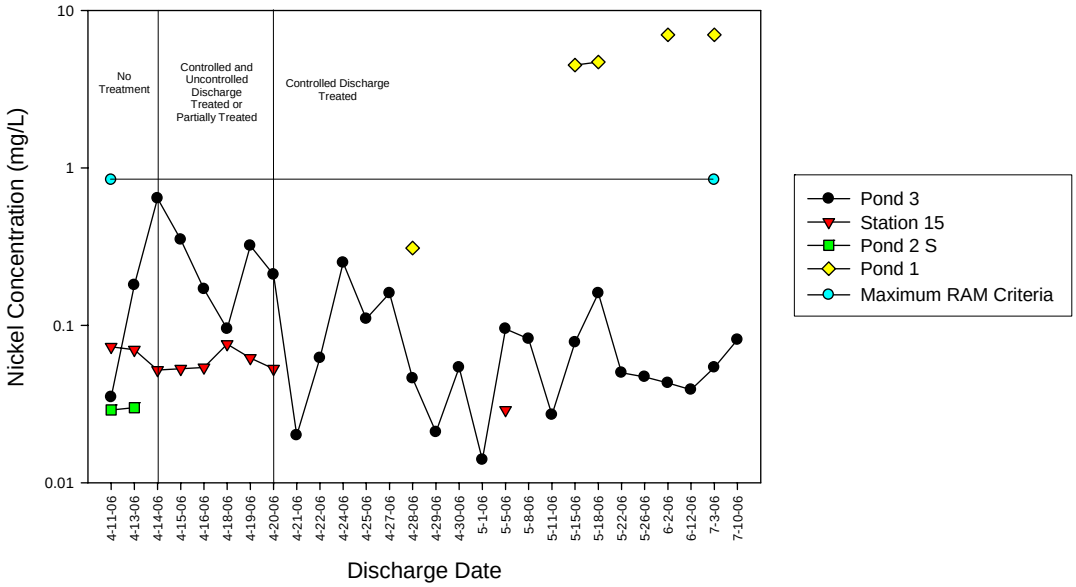
Figure 6. Pond 3 Emergency Water Treatment 2006
Iron Concentrations



Spring 2006 Emergency Pond AMD Treatment Dissolved Iron Data (mg/L)

Date	Pond 3	Station 15	Pond 2 S	Pond 1	Maximum RAM Criteria	Comments
4-11-06	1	**6.2**	**2**		2	No treatment
4-13-06	**2.4**	**4**	1.9		2	No treatment
4-14-06	1.8	**2.1**			2	Partial treatment at time of sampling
4-15-06	<0.002	1.6			2	Partially treated some uncontrolled discharge
4-16-06	<0.002	**2.7**			2	
4-18-06	0.790	**3.4**			2	Partially Treated some uncontrolled discharge
4-19-06	<0.002	**2.7**			2	Some uncontrolled discharge
4-20-06	<0.002	1.4			2	Some uncontrolled discharge
4-21-06	<0.002				2	Controlled discharge
4-22-06	0.034				2	Controlled discharge
4-24-06	0.800				2	Controlled discharge
4-25-06	0.850				2	Controlled discharge
4-27-06	1.4				2	Controlled discharge
4-28-06	**3**			**21**	2	Controlled discharge
4-29-06	1.1				2	Controlled discharge
4-30-06	1.6				2	Controlled discharge
5-1-06	1.3				2	Controlled discharge
5-5-06	0.400	**2.7**			2	Controlled discharge
5-8-06	<0.002				2	Controlled discharge
5-11-06	<0.002				2	Controlled discharge
5-15-06	<0.002			**610**	2	Controlled discharge
5-18-06	0.025			**640**	2	Controlled discharge
5-22-06	0.015				2	Controlled discharge
5-26-06	<0.002				2	Controlled discharge
6-2-06	<0.002			**910**	2	Controlled discharge
6-12-06	0.028				2	Controlled discharge
7-3-06	0.007			**1,000**	2	Controlled discharge
7-10-06	0.006				2	

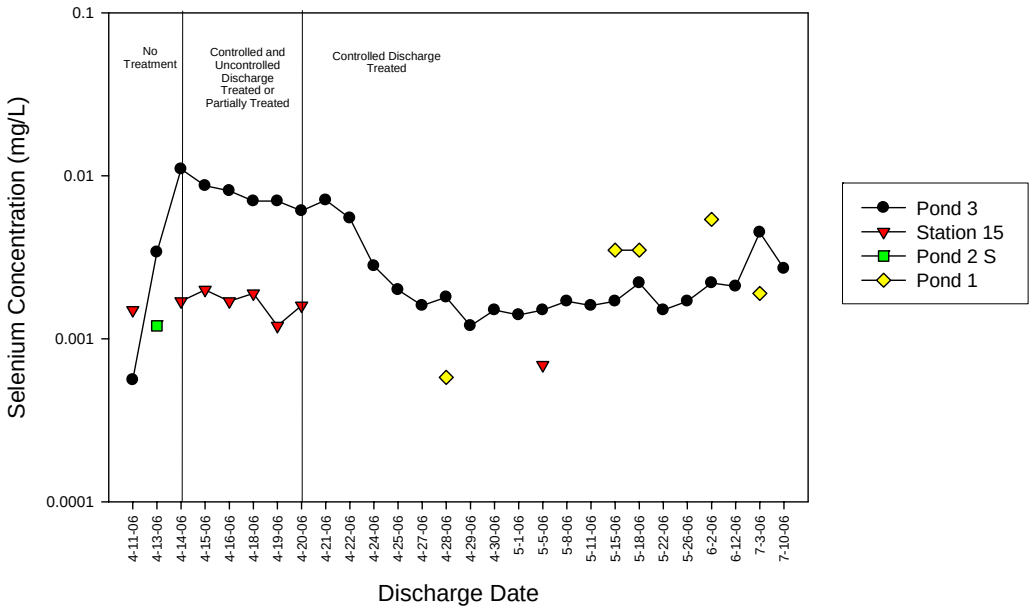
Figure 7. Pond 3 Emergency Water Treatment 2006
Nickel Concentrations (mg/L)



Spring 2006 Emergency Pond AMD Treatment Dissolved Nickel Data (mg/L)

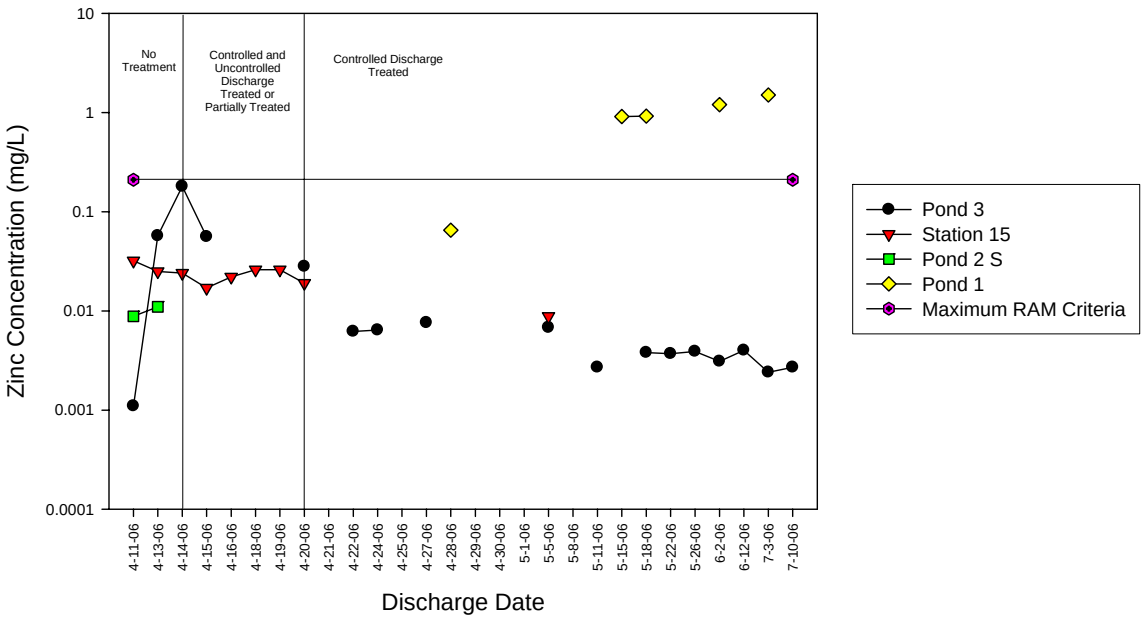
Date	Pond 3	Station 15	Pond 2 S	Pond 1	Maximum RAM Criteria	Comments
4-11-06	0.035	0.073	0.029		0.84	No treatment
4-13-06	0.180	0.070	0.030		0.84	No treatment
4-14-06	0.640	0.052			0.84	Partial treatment at time of sampling
4-15-06	0.350	0.053			0.84	Partially treated some uncontrolled discharge
4-16-06	0.170	0.054			0.84	
4-18-06	0.095	0.076			0.84	Partially Treated some uncontrolled discharge
4-19-06	0.320	0.062			0.84	Some uncontrolled discharge
4-20-06	0.210	0.053			0.84	Some uncontrolled discharge
4-21-06	0.020				0.84	Controlled discharge
4-22-06	0.062				0.84	Controlled discharge
4-24-06	0.250				0.84	Controlled discharge
4-25-06	0.110				0.84	Controlled discharge
4-27-06	0.160				0.84	Controlled discharge
4-28-06	0.046			0.310	0.84	Controlled discharge
4-29-06	0.021				0.84	Controlled discharge
4-30-06	0.054				0.84	Controlled discharge
5-1-06	0.014				0.84	Controlled discharge
5-5-06	0.095	0.029			0.84	Controlled discharge
5-8-06	0.082				0.84	Controlled discharge
5-11-06	0.027				0.84	Controlled discharge
5-15-06	0.078			**4.5**	0.84	Controlled discharge
5-18-06	0.160			**4.7**	0.84	Controlled discharge
5-22-06	0.050				0.84	Controlled discharge
5-26-06	0.047				0.84	Controlled discharge
6-2-06	0.043			**7**	0.84	Controlled discharge
6-12-06	0.039				0.84	Controlled discharge
7-3-06	0.054			**7**	0.84	Controlled discharge
7-10-06	0.081				0.84	Controlled discharge

Figure 8. Pond 3 Emergency Water Treatment 2006
Selenium Concentrations (mg/L)



Spring 2006 Emergency Pond AMD Treatment Dissolved Selenium Data (µg/L)					
Date	**Pond 3**	**Station 15**	**Pond 2 S**	**Pond 1**	**Comments**
4-11-06	0.00056	0.0015	<0.0004		No treatment
4-13-06	0.0034	<0.0004	0.0012		No treatment
4-14-06	0.011	0.0017			Partial treatment at time of sampling
4-15-06	0.0087	0.002			Partially treated some uncontrolled discharge
4-16-06	0.0081	0.0017			
4-18-06	0.007	0.0019			Partially Treated some uncontrolled discharge
4-19-06	0.007	0.0012			Some uncontrolled discharge
4-20-06	0.0061	0.0016			Some uncontrolled discharge
4-21-06	0.0071				Controlled discharge
4-22-06	0.0055				Controlled discharge
4-24-06	0.0028				Controlled discharge
4-25-06	0.002				Controlled discharge
4-27-06	0.0016				Controlled discharge
4-28-06	0.0018			0.00058	Controlled discharge
4-29-06	0.0012				Controlled discharge
4-30-06	0.0015				Controlled discharge
5-1-06	0.0014				Controlled discharge
5-5-06	0.0015	0.00069			Controlled discharge
5-8-06	0.0017				Controlled discharge
5-11-06	0.0016				Controlled discharge
5-15-06	0.0017			0.0035	Controlled discharge
5-18-06	0.0022			0.0035	Controlled discharge
5-22-06	0.0015				Controlled discharge
5-26-06	0.0017				Controlled discharge
6-2-06	0.0022			0.0054	Controlled discharge
6-12-06	0.0021				Controlled discharge
7-3-06	0.0045			0.0019	Controlled discharge
7-10-06	0.0027				Controlled discharge

Figure 9. Pond 3 Emergency Water Treatment 2006
Zinc Concentrations (mg/L)



Spring 2006 Emergency Pond AMD Treatment Dissolved Zinc Data (m/L)

Date	Pond 3	Station 15	Pond 2 S	Pond 1	Maximum RAM Criteria	Comments
4-11-06	0.0011	0.032	0.0088		0.21	No treatment
4-13-06	0.057	0.025	0.011		0.21	No treatment
4-14-06	0.180	0.024			0.21	Partial treatment at time of sampling
4-15-06	0.056	0.017			0.21	Partially treated some uncontrolled discharge
4-16-06	<0.005	0.022			0.21	
4-18-06	<0.005	0.026			0.21	Partially Treated some uncontrolled discharge
4-19-06	<0.005	0.026			0.21	Some uncontrolled discharge
4-20-06	0.028	0.019			0.21	Some uncontrolled discharge
4-21-06	<0.0050				0.21	Controlled discharge
4-22-06	0.0062				0.21	Controlled discharge
4-24-06	0.0064				0.21	Controlled discharge
4-25-06	<0.005				0.21	Controlled discharge
4-27-06	0.0076				0.21	Controlled discharge
4-28-06	<0.005			0.065	0.21	Controlled discharge
4-29-06	<0.005				0.21	Controlled discharge
4-30-06	<0.005				0.21	Controlled discharge
5-1-06	<0.005				0.21	Controlled discharge
5-5-06	0.0068	0.0088			0.21	Controlled discharge
5-8-06	<0.005				0.21	Controlled discharge
5-11-06	0.0027				0.21	Controlled discharge
5-15-06	<0.005			**0.910**	0.21	Controlled discharge
5-18-06	0.0038			**0.920**	0.21	Controlled discharge
5-22-06	0.0037				0.21	Controlled discharge
5-26-06	0.0039				0.21	Controlled discharge
6-2-06	0.0031			**1.2**	0.21	Controlled discharge
6-12-06	0.004				0.21	Controlled discharge
7-3-06	0.0024			**1.5**	0.21	Controlled discharge
7-10-06	0.0027				0.21	Controlled discharge

APPENDIX B

Field Data (WATER BOARD)

Spring 2006 Emergency Pond AMD Treatment Field Data WATER BOARD Data								
Date	**Sample ID**	**Station**	**Time**	**pH**	**Temp (oC)**	**EC (uS)**	**SC (uS)**	**Comments**
4/11/2006	056LM134	Sta 15	9:50	6.7	3.0	230.3	397.1	
4/11/2006	056LM131	Pond 3	10:25	3.8	2.5	91	160	
4/11/2006	056LM132	Pond 3 Dup	10:30	3.8	2.5	91	160	
4/11/2006	056LM035	Pond 2 S	11:00	2.9	3.6	123.4	210.2	
4/11/2006	056LM133	FMB	11:15					
4/13/2006	056LM138	Pond 3	9:35	3.6	3.5	313	531	
4/13/2006	056LM139	Pond 2 S	10:00	3.1	1.8	106	LErr	LErr - temperature is below instruments capability to calculate SC
4/13/2006	056LM137	Sta 15	11:15	6.6	5.3	222	356	
4/14/2006	056LM140	Pond 3	14:45	4.2	5.2	709	1142	
4/14/2006	056LM141	Sta 15	15:10	6.3	5.6	193	306	
4/15/2006	056LM142	Pond 3	16:30	5.9	3.6	720	1218	
4/15/2006	056LM143	Sta 15	17:10	6.7	3.9	179	299	
4/16/2006	056LM144	Pond 3	9:15	7.6	1.0	663	LErr	LErr - temperature is below instruments capability to calculate SC
4/16/2006	056LM145	Sta 15	9:40	6.8	2.1	188	335	
4/18/2006	056LM146	Pond 3	11:30	4.6	3.8	679	1141	
4/18/2006	056LM147	Sta 15	12:30	6.4	5.6	216	343	
4/19/2006	056LM148	Pond 3	13:45	8.9	6.3	723	1126	
4/19/2006	056LM136	Pond 3 Dup	13:55	8.9	6.3	723	1126	
4/19/2006	056LM149	Sta 15	14:30	6.6	9.0	291	420	
4/19/2006	056LM150	FMB	14:45					
4/20/2006	056LM151	Pond 3	13:45	5.0	9.3	787	1125	
4/20/2006	056LM152	Sta 15	14:45	6.3	8.7	231	335	
4/21/2006	056LM153	Pond 3	12:40	9.9	7.5	721	1083	
4/22/2006	056LM154	Pond 3	10:15	8.2	9.1	703	99.7	
4/24/2006	056LM155	Pond 3	15:15	7.8	8.6	526	767	
4/27/2006	056LM170	Pond 3	15:15	7.5	12.7	554	722	
4/28/2006	056LM171	Pond 1	11:40	2.9	13.5	560	715	
4/28/2006	056LM172	Pond 3	12:40	9.0	12.7	566	740	
4/29/2006	056LM173	Pond 3	10:30	7.1	11.6	544	731	
4/30/2006	056LM174	Pond 3	17:45	7.4	17.0	776	916	
4/30/2006	056LM175	FMB	17:55					
5/1/2006	056LM176	Pond 3	11:20	8.9	12.9	618	805	
5/5/2006	056LM177	Sta 15	10:25	7.1	5.1	110	179	
5/5/2006	056LM178	Pond 3	11:00	7.7	11.5	866	1166	
5/5/2006	056LM179	Pond 3 Dup	11:05	7.7	11.5	866	1166	
5/8/2006	056LM180	Pond 3	14:50	8.4	16.4	1235	1476	
5/11/2006	056LM181	Pond 3	12:15	8.2	14.7	1440	1794	
5/15/2006	056LM182	Pond 3	14:40	8.5	15.9	1887	2284	
5/15/2006	056LM183	Pond 1	13:45	2.6	18.0	3724	4297	
5/18/2006	056LM184	Pond 3	12:30	8.5	17.3	2222	2605	
5/18/2006	056LM185	Pond 1	12:45	2.4	20.3	4091	4493	
5/22/2006	056LM186	Pond 3	11:40	7.8	12.9	2078	2704	
5/22/2006	056LM187	FMB	11:50					
5/26/2006	056LM188	Pond 3	13:00	8.4	15.6	2607	3170	
6/2/2006	056LM189	Pond 3	11:10	8.7	16.1	3230	3892	
6/2/2006	056LM208	Pond 1	11:20	2.3	19.0	5320	6020	
6/12/2006	056LM209	Pond 3	12:00	8.5	16.0	3494	4228	
7/3/2006	067LM001	Pond 1	11:45	2.7				used field lab probe, no conductivity
7/3/2006	067LM002	Pond 3	11:35	8.2				“ “
7/10/2006	067LM003	Pond 3	11:50	7.0				“ “

APPENDIX C

Field Data (TKT)

Spring 2006 Emergency Pond AMD Treatment Field Data TKT Data									
Date	**Location**	**Time**	**pH**	**Temp (^oC)**	**EC (uS)**	**DO**	**ORP**	**Acidity (mg/L $Ca(OH)_2$)**	**Comments**
4/14/2006	Pond 3(Prior to treatment)	11:40	3.8		802			92	
4/14/2006	DIS (Overflow)	16:55	4.9	4.6	1039	11.78	278		
4/14/2006	Pond 3	17:20	5.0					81	
4/15/2006	DIS (Overflow)	8:25	5.7	2.8	1110	12.23	225		
4/15/2006	DIS (Overflow)	9:49	6.4	3.1	1116	12.48	196		Measurement taken after circulating water for 40 seconds
4/15/2006	DIS (Overflow)	10:52	6.6	3.0	1120	11.63	203		
4/15/2006	DIS (Overflow)	11:52	6.8	3.7	1146	12.41	282		
4/15/2006	INF (Overflow)	12:08	3.5					41	
4/15/2006	DIS (Overflow)	12:22	6.7	4.4	1152	12.29	237		
4/15/2006	DIS (Overflow)	12:55	6.9	4.0	1142	12.7	203		
4/15/2006	DIS (Overflow+active)	15:05	7.1						Started active discharge
4/15/2006	DIS (Overflow + active)	16:00	6.3						
4/15/2006	DIS (Overflow + active)	17:20	7.1	3.4	1200	11.33	278		
4/15/2006	DIS (Overflow + active)	17:47	6.0	3.2	1222	11.08	223		Active discharge stopped
4/15/2006	DIS (Overflow)	18:10	7.7	3.1	1246	12.3	272		Active discharge started
4/15/2006	DIS (Overflow + active)	18:30	6.8	3.1	12.37	11.99	293		
4/15/2006	DIS (Overflow + active)	19:35							Discharge stopped
4/16/2006	Pond 3	7:56	8.6	1.8	1031	12.42	217		
4/16/2006	DIS (active)	8:12							Active discharge started
4/16/2006	DIS (active)	8:52	8.8		1036				
4/16/2006	DIS (active)	9:23	8.8		1032				
4/16/2006	DIS (active)	10:15	8.9		1028				
4/16/2006	DIS (active)	11:15	9.0		1030				
4/16/2006	DIS (active)	12:05	8.8		1022				
4/16/2006		13:23							Shut down system
4/18/2006		23:30							System turned on
4/19/2006	DIS (Overflow)	10:03	5.6	3.7			213		
4/19/2006	DIS (Overflow)	10:44	6.0	4.2			178		
4/19/2006	DIS (Overflow)	11:33	9.1						
4/19/2006	DIS (Overflow)	11:51	8.4						Discharge started
4/19/2006	DIS (Overflow + Active)	12:44	8.1	5.5			61		
4/19/2006	DIS (Overflow + Active)	14:26	9.4						Discharge stopped
4/20/2006	DIS (Overflow)	8:54	6.2	5.3			192		
4/20/2006	DIS (Overflow)	10:03	8.9	6.2			103		Discharge started
4/20/2006	DIS (Overflow + Active)	10:37	8.0	6.6			136		
4/20/2006	DIS (Overflow + Active)	11:28	7.2	6.7			162		
4/20/2006	DIS (Overflow + Active)	12:32	7.7	7.7			165		
4/20/2006	DIS (Active)	13:32	6.5	7.9			280		
4/20/2006	DIS (Active)	14:15	9.0						
4/20/2006	DIS (Active)	14:50	8.5	8.3			186		
4/20/2006	DIS (Active)	15:30	7.9	8.8			192		
4/21/2006	DIS (Active)	11:23	9.8	7.7			129		
4/21/2006	DIS (Active)	12:20	9.7	7.4			125		
4/21/2006	DIS (Active)	14:18	8.7	7.7			150		
4/21/2006	DIS (Active)	14:39	8.4	7.9			169		
4/21/2006	DIS (Active)	15:43	8.9	8.7			121		
4/21/2006	DIS (Active)	17:26	9.2	8.3			146		Discharge stopped
4/22/2006	DIS (Active)	8:04	8.3	6.1			40		Discharge started
4/22/2006	DIS (Active)	9:00	8.9	7.3			117		
4/22/2006	DIS (Active)	10:40	8.1	7.5			26		
4/22/2006	DIS (Active)	11:16	7.9	8.5			51		
4/22/2006	DIS (Active)	11:46	7.9	8.1			66		
4/22/2006	DIS (Active)	12:30	7.8	9.3			72		
4/22/2006	DIS (Active)	12:58	7.9	8.8			98		Discharge stopped

Spring 2006 Emergency Pond Water Treatment Field Data									
Date	Location	Time	pH	Temp (^oC)	EC (uS)	DO	ORP	Acidity (mg/L $Ca(OH)_2$)	Comments
4/23/2006	DIS (Active)	12:13	7.2	5.3			74		Discharge started
4/23/2006	DIS (Active)	12:46	8.3	5.8			101		
4/23/2006	DIS (Active)	13:22	8.0	4.4			157		
4/23/2006	DIS (Active)	13:58	8.0	5.6			165		
4/23/2006	DIS (Active)	15:39	7.7	7.4			81		Discharge stopped
4/24/2006	DIS (Active)	9:14	7.3						Discharge started
4/24/2006	DIS (Active)	9:30	7.5						
4/24/2006	DIS (Active)	9:48	7.9						
4/24/2006	DIS (Active)	10:07	7.9	5.3			66		
4/24/2006	DIS (Active)	10:35	7.9	6.0			-8		
4/24/2006	DIS (Active)	11:08	8.4	6.5			58		
4/24/2006	DIS (Active)	11:30	8.6	6.4			97		
4/24/2006	DIS (Active)	11:58	8.2	6.9			156		
4/24/2006	DIS (Active)	12:33	7.9	7.2			163		
4/24/2006	DIS (Active)	13:02	7.8	7.4			152		
4/24/2006	DIS (Active)	13:32	7.6	8.0			155		
4/24/2006	DIS (Active)	14:00	7.5	7.6			164		
4/24/2006	DIS (Active)	15:04	7.9	8.6			184		
4/24/2006	DIS (Active)	15:15							Stopped Discharge
4/25/2006	DIS (Active)	7:42	7.8	3.8			20		Started Discharge
4/25/2006	DIS (Active)	8:22	7.5	4.5			49		
4/25/2006	DIS (Active)	9:28	7.3	5.0			101		
4/25/2006	DIS (Active)	10:00	7.3	5.3			161		
4/25/2006		12:10							Started siphon line from Pond1
4/25/2006	DIS (Active)	13:11	8.9	7.5			105		
4/25/2006	DIS (Active)	14:19	7.3	8.4			151		
4/25/2006	DIS (Active)	15:17	7.0	9.2			126		
4/25/2006	DIS (Active)	16:09	8.6	8.9			117		Stopped discharge
4/26/2006	Inf (Siphon)	9:58						437	
4/26/2006	Inf (overflow)	10:20						136	
4/26/2006	DIS (Active)	13:53	7.8	9.8			153		Started Discharge
4/26/2006	DIS (Active)	14:52	9.0	10.1			139		
4/26/2006	DIS (Active)	15:11	8.7	10.3			154		
4/26/2006	DIS (Active)	15:45	8.4	10.6			190		
4/26/2006	DIS (Active)	16:23	8.1	10.3			210		Discharge stopped
2/27/2006	DIS (Active)	7:23	8.7	6.1			183		Discharge started
2/27/2006	DIS (Active)	8:32	8.6	7.3			181		
2/27/2006	DIS (Active)	9:20	8.3	7.7			192		
2/27/2006	DIS (Active)	9:50	8.1	8.4			185		
2/27/2006	DIS (Active)	10:30	8.1	9.6			241		
2/27/2006	DIS (Active)	12:07	8.1	9.9			221		Discharge stopped
4/28/2006	DIS (Active)	7:32	8.3	7.9			125		Discharge started
4/28/2006	DIS (Active)	9:47	6.9	10.9			110		Discharge stopped
4/28/2006	DIS (Active)	12:33	7.7	14.7			114		Discharge started
4/28/2006	DIS (Active)	13:27	9.0	13.6			42		
4/28/2006	DIS (Active)	14:17	9.0	13.8			79		
4/28/2006	DIS (Active)	14:41	8.9	14.5			115		Discharge stopped
4/29/2006	DIS (Active)	9:22	7.6	11.1			28		Discharge started
4/29/2006	DIS (Active)	9:49	7.8	10.7			39		
4/29/2006	DIS (Active)	10:17	7.8	11.7			84		
4/29/2006	DIS (Active)	10:58	7.9	11.9			82		
4/29/2006	DIS (Active)	11:32	7.0	12.7			75		
4/29/2006	DIS (Active)	11:36	7.1	12.1			68		
4/29/2006	DIS (Active)	12:11	7.3	12.5			0		Discharge stopped

Spring 2006 Emergency Pond AMD Treatment Field Data									
Date	Location	Time	pH	Temp (^oC)	EC (uS)	DO	ORP	Acidity (mg/L $Ca(OH)_2$)	Comments
4/30/2006	Inf (overflow)	10:00	3.3					404	
4/30/2006	DIS (Active)	10:47	7.7	13.0	10.57	868	-36		Discharge started
4/30/2006	DIS (Active)	11:03	7.5	12.8	11.19	870	-30		
4/30/2006	DIS (Active)	11:16	7.3	13.0	10.8	871	-18		
4/30/2006	DIS (Active)	11:28	7.3	13.0	10.57	871	0.6		
4/30/2006	DIS (Active)	11:44	7.1	13.4	10.9	874	-23		
4/30/2006	DIS (Active)	12:06	6.8	13.7	10.77	875	-8		Discharge stopped
4/30/2006	DIS (Active)	14:22	7.2	15.2	10.84	888	71		Discharge started
4/30/2006	DIS (Active)	15:41	7.9	16.1	9.7	895	119		
4/30/2006	DIS (Active)	16:19	8.0	16.4	9.96	894	149		
4/30/2006	DIS (Active)	16:58	8.2	16.5	10.09	899	152		
4/30/2006	DIS (Active)	17:41	8.3	16.7	9.78	902	150		Discharge stopped
5/1/2006	DIS (Active)	8:20	8.5	10.0	11.35	899	194		Discharge started
5/1/2006	DIS (Active)	9:08	8.9	10.9	11.92	901	89		
5/1/2006	DIS (Active)	9:46	9.1	11.1	11.85	899	100		Discharge stopped
5/5/2006	DIS (Active)	11:50	7.6	12.0	9.25	1029	76		Discharge started
5/5/2006	DIS (Active)	12:10	7.8	12.2	9.36	1039	81		
5/5/2006	DIS (Active)	12:22	7.9	12.5	9.59	1031	77		
5/5/2006	DIS (Active)	13:06	7.5	14.0	9.14	1034	83		
5/5/2006	DIS (Active)	13:35	7.8	14.5	9.58	1035	107		
5/5/2006	DIS (Active)	14:01	8.0	13.9	9.22	1038	63		
5/5/2006	DIS (Active)	15:20	7.5	15.5	8.7	1040	57		
5/5/2006	DIS (Active)	15:26	7.4	14.9	8.84	1039	39		
5/5/2006	DIS (Active)	16:10	7.5	15.2	8.59	1044	39		
5/5/2006	DIS (Active)	16:29	7.5	15.3	8.55	1041	33		Discharge stopped
5/8/2006	Inf (Siphon)	13:46	2.8					1800	
5/8/2006	Inf (overflow)	14:21	3.1					426	
5/8/2006	DIS (Active)	15:04	8.2	16.2	7.68	1429	79		Discharge started
5/8/2006	DIS (Active)	15:38	8.0	16.2	7.32	1442	120		
5/8/2006	DIS (Active)	16:00	8.0	16.4	7.09	1437	133		
5/8/2006	DIS (Active)	16:45	8.0	16.9	6.79	1440	139		Discharge Stopped
5/10/2006	Inf (Siphon)	10:00	2.8					2238	
5/10/2006	Inf (overflow)	10:14	3.0					491	
5/11/2006	DIS (Active)	10:29	8.7	12.5	8.72	1736	151		Discharge started
5/11/2006	DIS (Active)	10:40	8.7	12.9	9.34	1738	139		
5/11/2006	DIS (Active)	11:09	8.6	13.5	9.47	1740	137		
5/11/2006	DIS (Active)	11:51	8.5	14.5	9.14	1744	132		
5/11/2006	DIS (Active)	11:59	8.4	17.0		1756	129		
5/11/2006	DIS (Active)	13:37	7.9	16.5	8.62	1760	49		
5/11/2006	DIS (Active)	14:18	7.6	15.9	8.51	1791	26		
5/11/2006	DIS (Active)	14:50	7.7	16.6	8.84	1774	66		
5/11/2006	DIS (Active)	15:38	7.6	17.8	8.27	1792	155		
5/11/2006	DIS (Active)	16:06	7.9	17.4	8.27	1791	165		Discharge stopped
5/15/2006	Inf (overflow)	9:40	2.9	16.3	8	1502	442	600	
5/15/2006	Inf (Siphon)	10:00	2.7					2401	
5/15/2006	DIS (Active)	14:46	8.7	15.7	7.77	2129	-10		Discharge started
5/15/2006	DIS (Active)	15:18	8.6	16.5	8.32	2168	31		
5/15/2006	DIS (Active)	15:57	8.2	17.1	8.54	2180	18		
5/15/2006	DIS (Active)	16:23	8.3	16.6	8.64	2157	50		
5/15/2006	DIS (Active)	17:29	7.8	17.2	8.15	2157	50		
5/15/2006	DIS (Active)	17:55	8.0	17.0	7.83	2169	71		Discharge stopped
5/18/2006	Inf (overflow)	8:38	2.9					840	
5/18/2006	Inf (Siphon)	8:56	2.7					2401	

Spring 2006 Emergency Pond AMD Treatment Field Data									
Date	Location	Time	pH	Temp (^oC)	EC (uS)	DO	ORP	Acidity (mg/L $Ca(OH)_2$)	Comments
5/18/2006	DIS (Active)	13:00	7.6	18.5	7.82	2301	60		Discharge started
5/18/2006	DIS (Active)	13:37	7.6	18.1	7.56	2294	57		
5/18/2006	DIS (Active)	14:27	7.5	18.1	7.56	2306	11		
5/18/2006	DIS (Active)	15:00	7.7	17.9	7.54	2303	34		
5/18/2006	DIS (Active)	15:37	8.8	18.7	7.39	2301	34		
5/18/2006	DIS (Active)	16:05	9.0	18.8	7.45	2301	46		Discharge stopped
5/22/2006	DIS (Active)	11:57	8.4	13.9	8.69	2469	60		Discharge started
5/22/2006	DIS (Active)	12:17	8.3	13.5	9.12	2484	71		
5/22/2006	DIS (Active)	12:49	8.4	13.9	8.77	2489	74		
5/22/2006	DIS (Active)	13:34	8.4	14.3	8.9	2489	86		
5/22/2006	DIS (Active)	14:05	8.5	14.8	8.57	2491	76		
5/22/2006	DIS (Active)	14:36	8.6	15.0	9.2	2492	29		
5/22/2006	DIS (Active)	15:17	8.7	15.6	8.9	2492	59		Discharge stopped
5/26/2006	Inf (Siphon)	11:46	2.5	17.3	9.55	4799	387	3711	
5/26/2006	Inf (overflow)	12:27	2.8	14.8	5.19	2017	414	1309	
5/26/2006	DIS (Active)	13:14	8.3	15.7	10.04	2751	48		Discharge started
5/26/2006	DIS (Active)	14:07	8.1	15.7	9.17	2761	51		
5/26/2006	DIS (Active)	14:56	8.1	16.7	8.57	2769	53		
5/26/2006	DIS (Active)	15:33	8.0	16.9	8.9	2765	32		
5/26/2006	DIS (Active)	16:07	8.2	16.8	8.63	2777	40		Discharge stopped
6/2/2006	DIS (Active)	9:24	8.6	14.2	8.65	3692	121		Discharge started
6/2/2006	DIS (Active)	10:08	8.6	14.9	8.4	3693	88		
6/2/2006	DIS (Active)	11:25	8.6	15.7	8.73	3599			
6/2/2006	DIS (Active)	11:54	8.5	17.1	7.92	3700	51		
6/2/2006	Inf (Siphon)	12:01	2.6	19.0	8.1	5754	393	4366	
6/2/2006	Inf (overflow)	12:22	2.9	15.6	7.73	2460	403	1583	
6/2/2006	DIS (Active)	12:46	8.3	17.5	7.55	3709	25		
6/2/2006	DIS (Active)	13:20	8.4	18.0	7.65	3704	45		
6/2/2006	DIS (Active)	13:40	8.4	18.0	7.9	3703	47		Discharge stopped
6/12/2006	DIS (Active)	12:20	8.5	17.3	8	3989	-4		Discharge started
6/12/2006	DIS (Active)	12:31	8.4	16.8	8.54	3972	24		
6/12/2006	DIS (Active)	12:57	8.3	18.4	8.32	3967	18		
6/12/2006	DIS (Active)	13:29	8.3	18.5	7.56	3954	36		
6/12/2006	Inf (Siphon)	13:37	2.6	22.7	3.58	5678	415	5260	
6/12/2006	DIS (Active)	14:11	8.7	18.8	7.09	3946	24		
6/12/2006	DIS (Active)	14:28	8.3	18.6	7.63	3933	29		
6/12/2006	DIS (Active)	15:02	8.3	20.1	6.91	3938	33		Discharge stopped
6/20/2006	Inf (Siphon)	8:13	2.7	16.4	2.45	5071	426	3998	
6/22/2006	Inf (Siphon)	8:23	2.6	16.6	4.13	4813	430	4405	
6/29/2006	Inf (Siphon)	11:55	2.6	18.6	2.13	3884	441	5207	
7/3/2006	Inf (Siphon)	8:21	2.6	16.7	6.15	4066	442	4734	
7/3/2006	DIS (Active)	9:14	8.4	15.2	8.21	2555	93		Discharge started
7/3/2006	DIS (Active)	9:49	8.4	15.4	10.2	2560	59		
7/3/2006	DIS (Active)	10:47	8.1	16.6	10.96	2558	55		
7/3/2006	DIS (Active)	11:25	8.3	17.4	10.41	2560	28		
7/3/2006	DIS (Active)	12:23	8.3	18.3	10.44	2557	45		
7/3/2006	DIS (Active)	13:30	8.1	19.5	9.45	2559	23		
7/3/2006	DIS (Active)	14:47	8.2	21.3	8.65	2556	33		
7/3/2006	DIS (Active)	15:41	8.1	22.2	8.41	2558	35		
7/3/2006	DIS (Active)	16:47	8.0	23.1	8.01	2529	58		Discharge stopped
7/6/2006	Inf (Siphon)	9:55	2.6	21.6	7.75	3133	444	5346	
7/10/2006	DIS (Active)	8:40	7.8	13.2	9.35	2926	89		Discharge started
7/10/2006	DIS (Active)	10:07	8.6	14.3	9.51	2920	34		

Spring 2006 Emergency Pond AMD Treatment Field Data									
Date	**Location**	**Time**	**pH**	**Temp (^oC)**	**EC (uS)**	**DO**	**ORP**	**Acidity (mg/L $Ca(OH)_2$)**	**Comments**
7/10/2006	DIS (Active)	10:54	8.3	14.9	8.6	2892	64		
7/10/2006	DIS (Active)	11:52	8.1	16.3	8.55	2854	60		
7/10/2006	DIS (Active)	13:02	8.3	17.6	8.66	2846	74		
7/10/2006	DIS (Active)	13:53	8.0	18.7	7.85	2774	75		
7/10/2006	DIS (Active)	14:54	8.8	19.1	7.65	2830	48		
7/10/2006	DIS (Active)	15:53	8.5	21.2	7.12	2772	68		
7/10/2006	DIS (Active)	16:50	8.3	21.6	7.44	2779	27		
7/10/2006	DIS (Active)	17:51	8.3	20.8	7	2709	110		Discharge stopped

APPENDIX D

Discharge Data and pH

Discharge Data and pH

	Sample Date	Sample Time	pH (water board data)	pH (TKT data)	Comment	Al	Q	As	Q	Ca	Q	Cd	Q	Co	Q	Cr	Q	Cu	Q	Fe	Q	Pb	Q	Mg	Q	Mn	Q	Ni	Q	Zn	Q	Se	Q	TDS	Q	Sulfate	Q
Daily Max Discharge Criteria:			**6 - 9 SU**	**6-9 SU**		**4.00**		**0.34**		**n/a**		**0.009**		**n/a**		**0.97**		**0.026**		**2.0**		**0.136**		**n/a**		**n/a**		**0.84**		**0.21**		**n/a**		**n/a**		**n/a**	
Pond 3	4/13/2006	9:35	**3.6**			**9.500**		0.00260				0.00190				0.01100		**0.15000**		**2.400**								0.180		0.0570		0.00340					
Pond 3	4/14/2006	14:45	**4.2**	**4.80**	treatment began	**21.000**		0.00170				0.00780				0.01000		**0.37000**		1.800								0.640		0.1800		0.01100					
Pond 3	4/15/2006	16:30	**5.9**	6.30		0.470		<0.0004	U			0.00430				0.00017		0.02200		<0.002	U							0.350		0.0560		0.00870					
Pond 3	4/16/2006	9:15	7.6	8.77		0.081		0.00051				0.00150				0.00014		0.00081		<0.002	U							0.170		<0.005	U	0.00810					
Pond 3	4/18/2006	11:30	**4.6**			1.900		0.00048				0.00064				<0.0001	U	0.00150		0.790		<0.0002	U					0.095		<0.005	U	0.00700					
Pond 3	4/19/2006	13:45	8.9	8.89		0.320		0.00060		0.15000		0.00480				0.00100		<0.0005	U	<0.002	U			0.0570		0.6200		0.320		<0.005	U	0.00700		880		570	
Pond 3 Duplicate	4/19/2006	13:55	8.9			0.200		<0.0004	U	0.15000		0.00059				0.00023		0.00150		<0.002	U			0.0540		0.5600		0.088		<0.005	U	0.00670		850		570	
Pond 3	4/20/2006	13:45	**5.0**	6.40	overflow stopped	0.150		<0.0004	U			0.00310				0.00016		0.00570		<0.002	U	<0.0002	U					0.210		0.0280		0.00610					
Pond 3	4/21/2006	12:40	9.9	9.74		0.180		0.00040				0.00012				0.00016		0.00050		<0.002	U							0.020		<0.005	U	0.00710					
Pond 3	4/22/2006	10:15	8.2	8.06		0.031		<0.0004	U			0.00063				<0.0001	U	0.00120		0.034								0.062		0.0062		0.00550					
Pond 3	4/24/2006	15:15	7.8	7.57		0.110		0.00048				0.00200				<0.0001	U	0.00130		0.800								0.250		0.0064		0.00280					
Pond 3	4/25/2006					0.070		<0.0004	U			0.00076				<0.0001	U	<0.0005	U	0.850								0.110		<0.005	U	0.00200					
Pond 3	4/27/2006	15:15	7.5		sample taken after discharge had stopped	0.016		<0.0004	U			0.00120				<0.0001	U	0.00110		1.400								0.160		0.0076		0.00160					
Pond 3	4/28/2006	12:40	9.0		sample taken after discharge had stopped	0.120		0.00053				0.00015				<0.0001	U	<0.0005	U	**3.000**								0.046		<0.005	U	0.00180					
Pond 3	4/29/2006	10:30	7.1	7.77		0.610		0.00054				<0.0001	U			<0.0001	U	0.00053		1.100								0.021		<0.005	U	0.00120					
Pond 3	4/30/2006	17:45	7.4	8.30		0.330		0.00094		0.17		0.00014		0.011		<0.0002	U	0.00055		1.600		<0.0002	U	0.0240		0.4300		0.054		<0.005	U	0.00150		690		470	
Pond 3	5/1/2006	11:20	8.9	8.18		0.900		0.00089				<0.0001	U			<0.0001	U	0.00056		1.300		<0.0002	U					0.014		<0.005	U	0.00140					
Pond 3	5/5/2006	11:00	7.7	6.61	sample taken prior to discharge	<0.005	U	0.00041				0.00035				<0.0002	U	<0.0005	U	0.400		<0.0002	U					0.095		0.0031		0.00150					
Pond 3 Duplicate	5/5/2006	11:05	7.7			0.110		0.00045				0.00036				<0.0002	U	<0.0005	U	0.330		<0.0002	U					0.095		0.0068		0.00140					
Pond 3	5/8/2006	14:50	8.4	8.21		0.180		0.00059				0.00018				<0.0001	U	<0.0005	U	<0.002	U							0.082		<0.005	U	0.00170					
Pond 3	5/11/2006	12:15	8.2	8.30		1.500		0.00082				<0.0001	U			<0.0001	U	<0.0005	U	<0.002	U							0.027		0.0027		0.00160					
Pond 3	5/15/2006	14:40	8.5	8.57		0.360		0.00130				0.00017				<0.0001	U	<0.0005	U	<0.002	U							0.078		<0.005	U	0.00170					
Pond 3	5/18/2006	12:30	8.5	7.84		<0.020	U	0.00160				0.00053				<0.0001	U	0.00096		0.025								0.160		0.0038		0.00220					
Pond 3	5/22/2006	11:40	7.8	8.38		0.120		0.00085				0.00015				0.00018	B	0.00068		0.015	B	<0.0002	U					0.050		0.0037		0.00150					
Pond 3	5/26/2006	13:00	8.4	8.26		0.740		0.00140				0.00008	B			0.00013	B	0.00053		<0.002	U	<0.0002	U					0.047		0.0039		0.00170					
Pond 3	6/2/2006	11:10	8.7	8.60		1.300		0.00260				0.00006	B			0.00021		0.00140		<0.002	U	0.000077	B					0.043		0.0031		0.00220					
Pond 3	6/12/2006	12:00	8.5	8.54		0.520		0.00210				0.00007	B			0.00037		0.00130		0.028		0.0012	B					0.039		0.0040		0.00210					
Pond 3	7/3/2006	11:45	**2.7**			1.700		0.00360	B			0.00014	B			0.00045	B	0.00066	B	0.007	B	0.0045						0.054	B	0.0024	B	0.00450					
Pond 3	7/10/2006	11:50	7.0	8.14		0.093		0.00490	B			0.00036	B			0.00026	B	0.00083	B	0.006	B	<0.0002	U					0.081	B	0.0027	B	0.00270	B				

All values reported in milligrams/liter, except pH.
All parameters reported as dissolved, except Selenium reported as total recoverable.
n/a - not applicable, no discharge criteria exists for this parameter.
Bold values excede the the daily maximum discharge value
Rows highlighted in blue indicate discharge samples
Qualifiers:
U - Analyte not detected at the given Method Detection Limit.
B - Analyte detected between the Method Detection Limit and the Practical Quantitation Limit.
* - Relative Percent Difference outside of control limits

APPENDIX D

Other Sampling Data and pH

Other Sampling Data and pH

	Sample Date	Sample Time	pH (water board data)	pH (TKT data)	Comment	Al	Q	As	Q	Ca	Q	Cd	Q	Co	Q	Cr	Q	Cu	Q	Fe	Q	Pb	Q	Mg	Q	Mn	Q	Ni	Q	Zn	Q	Se	Q	TDS	Q	Sulfate	Q
Daily Max Discharge Criteria:			**6 - 9 SU**	**6-9 SU**		**4.00**		**0.34**		**n/a**		**0.009**		**n/a**		**0.97**		**0.026**		**2.0**		**0.136**		**n/a**		**n/a**		**0.84**		**0.21**		**n/a**		**n/a**		**n/a**	
Pond 3	4/11/2006	10:25	**3.8**			2.200		0.00120		0.01200		0.00039		0.014		0.00330		0.02500		1.000				0.0012		0.1200		0.035		0.0110		0.00056		81		49	
Pond 3 Duplicate	4/11/2006	10:30	**3.8**			2.200		0.00120		0.01200		0.00039		0.014		0.00310		0.02500		1.000				0.0012		0.1200		0.033		0.0110				77		50	
Station 15	4/11/2006	9:50	6.7			<0.02	U	0.00400		0.04400		0.00042		0.03		0.00031		0.00460		**6.200**				0.0110		1.2000		0.073		0.0320		0.00150		270		150	
FMB	4/11/2006	11:15				<0.02	U	<0.0004	U	<0.0001	U	<0.0001	U	<0.0001	U	<0.0002	U	<0.0005	U	<0.002	U			<0.0001	U	<0.010	U	<0.0008	U	<0.0005	U			<10	U	<0.5	U
Pond 2 S	4/11/2006	11:00	**2.9**			1.300		0.00810				0.00031				0.00440		0.01400		2.000								0.029		0.0088		<0.0004	U				
Station 15	4/13/2006	11:15	6.6			0.034		0.00320				0.00035				0.00011		0.00550		**4.000**								0.070		0.0250		<0.0004	U				
Pond 2 S	4/13/2006	10:00	**3.1**			1.300		0.00910				0.00030				0.00460		0.01500		1.900								0.030		0.0110		0.00120					
Station 15	4/14/2006	15:10	6.3			0.022		0.00210				0.00030				0.00012		0.00660		**2.100**								0.052		0.0240		0.00170					
Station 15	4/15/2006	17:10	6.7			0.029		0.00180				0.00039				<0.0001	U	0.00640		1.600								0.053		0.0170		0.00200					
Station 15	4/16/2006	9:40	6.8			0.032		0.00330				0.00027				<0.0001	U	0.00670		**2.700**								0.054		0.0220		0.00170					
Station 15	4/18/2006	12:30	6.4			0.019		0.00410				0.00063				0.00063		0.00500		**3.400**		<0.0002	U					0.076		0.0260		0.00190					
Station 15	4/19/2006	14:30	6.6			0.016		0.00320		0.04900		0.00032				0.00011		0.00500		**2.700**				0.0140		1.1000		0.062		0.0260		0.00120		290		170	
FMB	4/19/2006	14:45				0.005		<0.0004	U	0.00017		<0.0001	U			<0.0001	U	<0.0005	U	<0.002	U			<0.0001	U	<0.0002	U	<0.0008	U	<0.005	U	<0.0004	U	<10	U	<10	U
Station 15	4/20/2006	14:45	6.3			0.019		0.00250				0.00033				<0.00010	U	0.00560		1.400		<0.0002	U					0.053		0.0190		0.00160					
Pond 1	4/28/2006	11:40	**2.9**			**14.000**		0.02300				0.00330				0.02600		**0.11000**		**21.000**								0.310		0.0650		0.00058					
FMB	4/30/2006	17:55				<0.005	U	<0.0004	U	<0.0001	U	<0.0001	U	<0.0001	U	<0.0002	U	<0.0005	U	<0.002	U	0.0002		<0.0001	U	<0.0002	U	0.025		<0.005	U	<0.0004	U	<10	U	<0.5	
Station 15	5/5/2006	10:25	7.1			0.650		0.00660				0.00012				0.00070		0.00680		**2.700**		<0.0002	U					0.029		0.0088		0.00069					
Pond 1	5/15/2006	13:45	**2.6**			**310.000**		**2.90000**				**0.04100**				0.92000		**1.70000**		**610.000**								**4.500**		**0.9100**		0.00350					
Pond 1	5/18/2006	12:45	**2.4**			**320.000**		**3.10000**				**0.04300**				0.96000		**1.90000**		**640.000**								**4.700**		**0.9200**		0.00350					
FMB	5/22/2006	11:50				<0.005	U	<0.0004	U			<0.0001	U			0.00010	B	<0.0005	U	<0.002	U	<0.0002	U					<0.0008	U	<0.002	U	<0.0004	U				
Pond 1	6/2/2006	11:20	**2.3**			**24.000**		**5.00000**				**0.06900**				**1.40000**		**4.80000**		**910.000**		0.0066						**7.000**		**1.2000**		0.00540					
Pond 1	7/3/2006	11:35	8.2	8.25		**490.000**		**11.00000**				**0.08700**				**1.70000**		**4.10000**		**1000.000**		<0.0002	U					**7.000**		**1.5000**		0.00190	B				

All values reported in milligrams/liter, except pH.
All parameters reported as dissolved, except Selenium reported as total recoverable.
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Bold values excede the the daily maximum discharge value
Rows highlighted in blue indicate discharge samples
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B - Analyte detected between the Method Detection Limit and the Practical Quantitation Limit.
* - Relative Percent Difference outside of control limits