Supporting Document No. 4.d

Required Technical Report

April 5, 2005

CITY OF ESCONDIDO

Hale Avenue Resource Recovery Facility

Order Number R9-2005-0077

Reference CA:01-0031.02:stewr

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Mary Ann Mann,
Utilities Manager

Hale Avenue Resource Recovery Facility

Required Technical Investigation
Order No. R9-2005-0077

The City of Escondido (the "City") hereby submits this report pursuant to San Diego Regional Water Quality Control Board ("SDRWQCB") Required Technical Investigation Order No. R9-2005-0077 regarding daily maximum effluent limitation exceedances that may have occurred between May 3 and June 27, 2004, from the Hale Avenue Resource Recovery Facility ("HARRF").

I. INTRODUCTION

On November 30, 2004, SDRWQCB issued Order No. R9-2004-0421 to the City based on 399 alleged violations of effluent limitations contained in the City's National Pollution Discharge Elimination System ("NPDES") Permit No. CA0107981. These alleged violations were based on 51 exceedances of the City's daily maximum effluent limitations between May 3 and June 27, 2004, and 348 alleged exceedances of weekly and monthly average limitations through August 17, 2004. On January 11, 2005, the City informed SDRWQCB that it suspected that the exceedances were caused by illegal discharges from third party sources, and that the United States Environmental Protection Agency ("USEPA") was undertaking an ongoing criminal investigation of potential illegal discharges into the collection system. On February 15, 2005, under Order No. R9-2005-0077, SDRWQCB withdrew Order No. R9-2004-0421 pending USEPA's ongoing investigation. In the meantime, SDRWQCB asked the City to prepare and submit this Technical Report describing the suspected cause of the upset resulting in the exceedances, and any data supporting the City's position that the exceedances were caused by third party discharges.

As set forth below, the City suspects that the exceedances described in withdrawn Order R9-2004-0421 might have been the result of illegal discharges to the sewer system that resulted in an upset of the biological processes at the HARRF. On several consecutive Saturdays in April 2004, the City experienced cyclic upsets to the treatment process that became cumulatively worse until the first exceedance of a daily effluent limitation on May 3. Oxygen monitoring at the facility confirms that there were periodic disturbances in dissolved oxygen demand levels that coincided with these weekly upsets. These impacts are consistent with intermittent discharges of toxic materials into the collection system upstream of the facility. Further, based on the results of an enhanced monitoring program established by the City after the initial exceedances, the City found evidence of unusually high levels of several toxic pollutants in the influent. Additionally, based on inspections of third party facilities conducted as part of the City's investigation of the upset, the City also discovered evidence of an illegal connection and dumping into the collection system. USEPA currently is conducting an investigation of this suspected discharger.

Together, the City believes these facts provide significant evidence that the upset was caused by third party sources. However, due to the nature of the upset and the treatment process, it is very difficult to prove *a posteriori* that chemical constituents attacked the biological process in sufficient quantities to cause the upset. For example, it is impossible to now know the character of the April 2004 influent immediately prior to the initial disturbances and the establishment of the City's enhanced monitoring program. Moreover, although the City moved quickly to establish an enhanced monitoring program as part of its investigation of the upset, the scope of the monitoring program was based on the City's learning curve associated with its investigation, which informed the collection system line coverage and the scope of constituents that were monitored. Thus, although the enhanced monitoring did uncover evidence of significant levels of pollutants in the influent that likely affected the duration of the upset, there could have been additional pollutants that were not detected under the program. Finally, it is very difficult to prove criminal discharges by third parties without admissions by the third party. The City has not been privy to the specific progress of USEPA's ongoing criminal investigation, but understands that USEPA has obtained some evidence of illegal discharges of toxic materials. If fact, on April 1, 2005, the owner of The Iron Factory, James Kronus, was indicted by the Grand Jury on one count of felony illegal discharge of industrial wastes. In order not to impede the progress of the federal government's investigation, the City has been asked to put its own inquiry on hold until USEPA's investigation is complete.

The City continues its investigation of the causes of the 2004 upset at HARRF and looks forward to cooperating fully with SDRWQCB as its investigation of the upset proceeds. The City will supplement this Technical Report if and when additional relevant information comes to its attention.

II. SUMMARY OF UPSET

HARRF receives residential and industrial sewage from the Rancho Bernardo area of San Diego as well as from the City of Escondido. The secondary treatment processes include five aeration basins, secondary clarifiers and activated sludge.

On Saturday, April 17, 2004, the secondary treatment process experienced an upset affecting the microorganisms used in the activated sludge process. "Activated Sludge" refers to a biological process consisting of 95% bacteria and 5% higher organisms (protozoa, rotifers, and higher forms of invertebrates). The health and abundance of the higher organisms serve as a biomonitoring test for toxicants and other stresses affecting the plant. A decrease in higher organisms in the activated sludge, along with unusually low oxygen use are usually the first noticeable signs of toxicity. Although the City did not experience any violations of its effluent limitations relating to this upset, a sudden decrease in dissolved oxygen demand was noted in all five aeration basins, indicating the weakening of the higher organisms in the treatment process. This sudden decrease in dissolved oxygen demand was indicated by a decrease in the higher organisms, as determined by microscopic examination of the activated sludge, and a spike in the dissolved oxygen residual observed by the operations staff. These observations are consistent with conditions that would be expected to result from the introduction of a toxin to the treatment process. The microorganism population began to recover throughout the following week until the dissolved oxygen demand suddenly dropped again on Saturday, April 24, resulting in the decrease of population of higher organism. On Saturday, May 1, the dissolved oxygen demand dropped once again. Due to the sudden decrease of dissolved oxygen demand, it is likely that one or more toxic constituents was introduced into the facility by means of an illegal sewer discharge on these three consecutive Saturdays.

The cumulative effect of these attacks on the treatment process resulted in the upset to the facility described in withdrawn Order No. R9-2004-0421. After the dissolved oxygen demand dropped on May 1, 2004, the process was unable to recover. The suspected influx of toxic constituents severely impacted the treatment process by overwhelming the aerobic microorganisms, allowing the anaerobic and facultative microorganisms to dominate the aeration basins. On May 3, the cumulative effect of these toxic discharges resulted in the exceedances of the daily effluent violations described in withdrawn Order No. R9-2004-0421.

The system was repopulated with healthy organisms from Fallbrook Public Utility District on May 12, 2004. However, the 30,000 gallons of "seed" sludge did not improve the plant's performance. Dissolved oxygen was increased on May 14, and an additional 30,000 gallons of sludge was added on May 20, 2004. The processes began to improve and continued to improve through June 2004. By June 27, the daily effluent limits were again meeting daily maximum discharge permit requirements.

III. NATURE OF EXCEEDANCES

As a result of the upset, effluent concentration limitations for carbonaceous biochemical oxygen demand ("CBOD") and total suspended solids ("TSS") were exceeded a total of 51 times over a 56 day period beginning May 3, 2004 and ending June 27, 2004. The maximum CBOD limit was exceeded on 25 days between May 3 and June 27. The mass emission rate ("MER") for CBOD was also exceeded on 12 days between May 3 and June 13. The maximum TSS exceeded permitted values 10 days from May 5 and June 4. The MER for TSS was exceeded on four days between May 26 and June 3.

The remaining 348 alleged violations cited in withdrawn Complaint No. R9-2004-0421 were related to rolling averages of daily concentrations for TSS and CBOD over seven and thirty day periods and were not related to any exceedances of a daily limit. The City met its daily effluent limits for TSS and CBOD as of June 4 and June 27, respectively, and continuously met the daily limits thereafter.

IV. SUSPECTED CAUSE OF THE UPSET

As described above, it is probable that the upset was caused by illegal discharges of toxic materials from one or more third parties. The City's suspicion is based on unusual cyclic treatment performance, constituents found in the treatment process and irregularities noted during inspections of third party dischargers. In addition, the upset may have been exacerbated and prolonged by an apparent design defect in a hand-held dissolved oxygen meter used by the City to calibrate in-tank oxygen probes and blower adjustment.

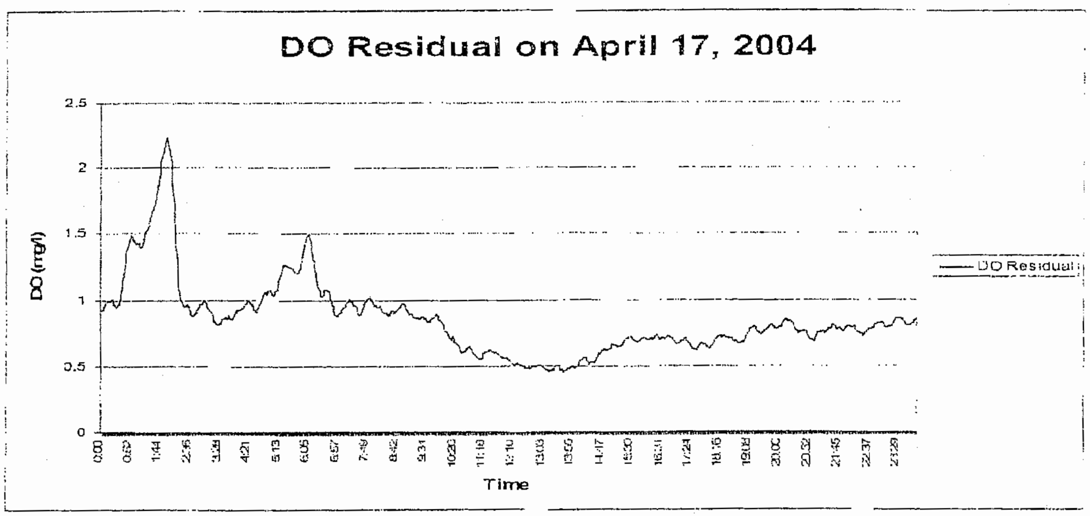
A. TREATMENT PERFORMANCE DECLINED ON AT LEAST THREE CONSECUTIVE SATURDAYS

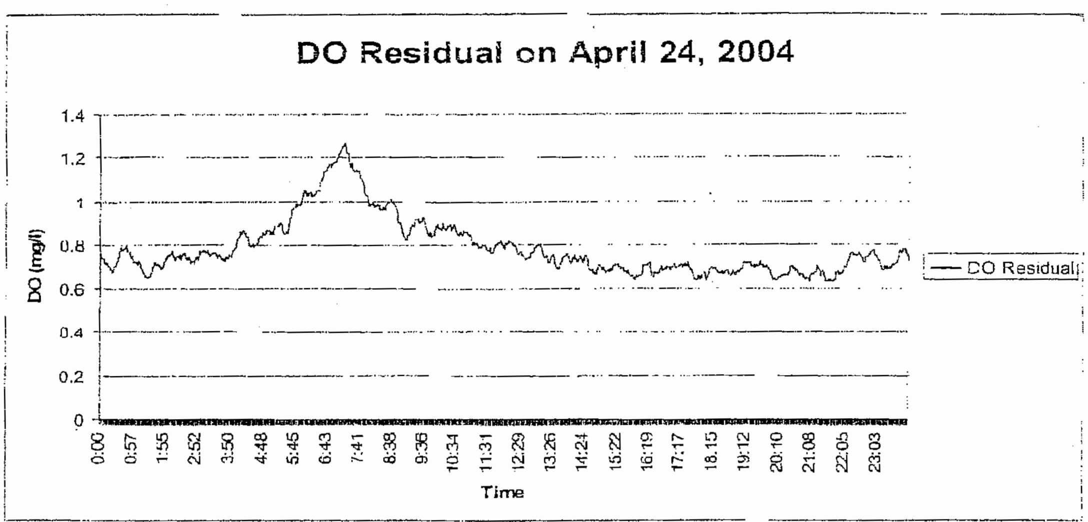
Beginning the weekend of April 10, 2004, the wastewater treatment operators noted a slight decrease in the plant process performance associated with the biological treatment. For example, plant operators noticed a sudden decrease in important higher life form microorganisms (ciliates and rotifers) in the aeration basins, which is usually one of the first physical manifestations of toxicity or stress within the basins. The decrease of these microorganisms resulted in the increase of secondary effluent turbidity. The impact on the treatment process was consistent with a short-term but intense influx of toxic constituents into the facility. The processes returned to normal during the following week.

The treatment performance declined notably and in a similar fashion during the next three consecutive Saturdays. Specifically, sudden decreases in dissolved oxygen demand were noted in all five aeration basins beginning April 17, 2004 and continuing on each Saturday through May 1, 2004. Although the microorganism population began to recover after each weekend, the cumulative effect of these weekly disturbances was significant, and eventually the treatment process transitioned from aerobic to facultative and anaerobic. As a result of the change in microorganism population, secondary settling, turbidity and odors worsened.

This cyclic change in influent quality is not normal and indicates that something was being introduced into the collection system upstream from HARRF on a weekly basis, for example, as a result of a cleaning schedule for an industrial or commercial facility. The introduction of a toxin to the wastewater system can be seen by numerous indicators, including elevated levels of CBOD, TSS, odors, increased turbidity, acute toxicity in the secondary effluent and less activity noted in the microscopic examination of the activated sludge. These indicators were noted in the activated treatment process during the April 2004 disturbances. Toxic impacts on the biological treatment process can also be seen by increased levels of residual dissolved oxygen in the activated sludge (as described above) and poor CBOD removal in the secondary effluent. Indeed, as shown in Figures 1-3, there were unusually high spikes in the dissolved oxygen residual levels on April 17, 24, and May 1, consistent with short-term and intense hits by toxic materials from upstream of the facility. In addition, as shown in Figure 4, the cumulative effects of these impacts can be seen by the increasing average daily dissolved oxygen residual levels at the end of April 2004. This pattern is in marked contrast to the normal average daily dissolved oxygen level in any given month, as can be seen from the February 2004 average set forth in Figure 5. There were no changes in HAARF's operational procedures, staffing, maintenance or equipment that would otherwise explain these treatment performance abnormalities.

Figures 1-3. Daily Dissolved Oxygen Levels (Average of All Five Aeration Basins)





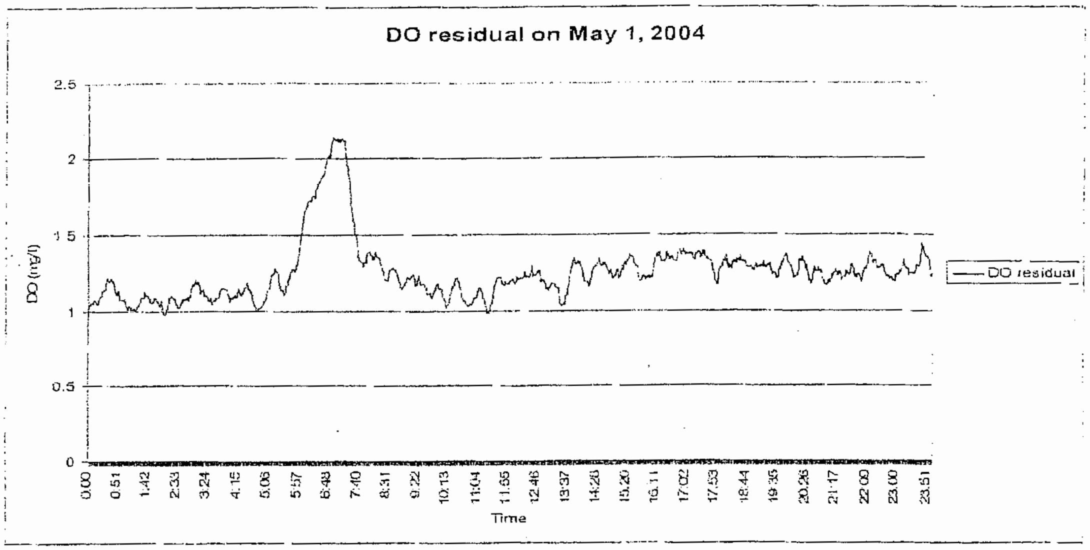


Figure 4. Dissolved Oxygen Levels (Average Daily, All Five Basins)

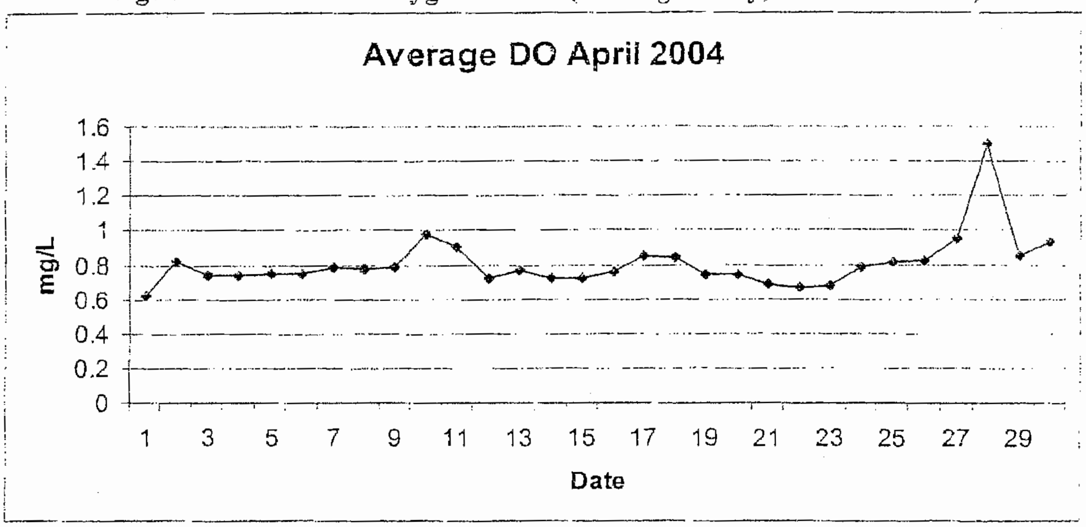
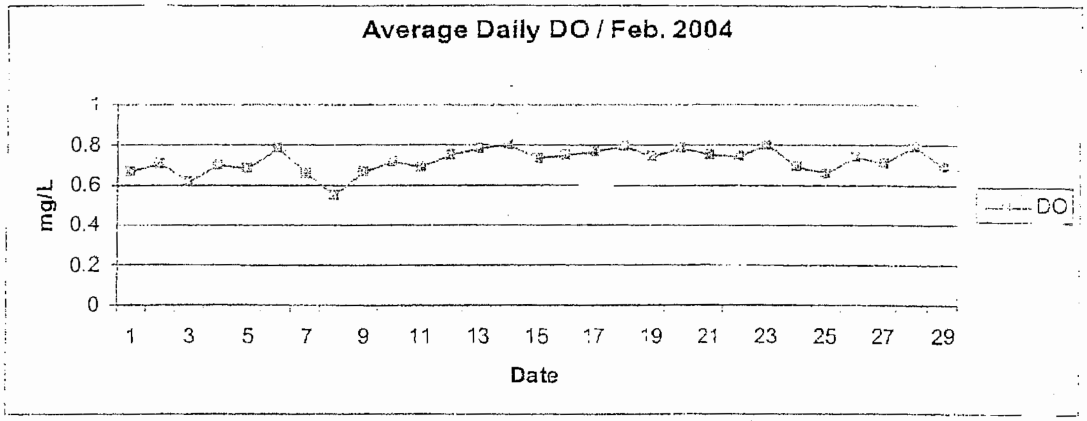


Figure 5. Dissolved Oxygen Levels (Average Daily, All Five Basins)



B. TOXIC CONSTITUENTS FOUND DURING MONITORING

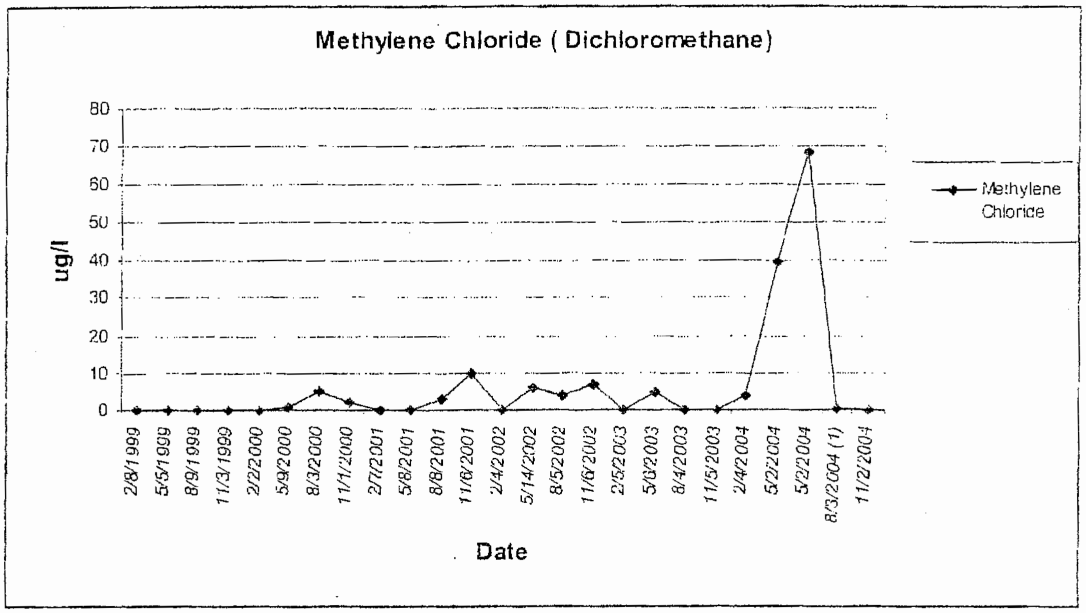
Based on the upset in treatment process performance discussed above, the City established an enhanced program to monitor HARRF influent and centrifuge sludge cake. Shortly after the initial signs of plant upset, and prior to the first exceedances, the City began sample monitoring for the Rancho Bernardo and Escondido main lines on April 30 and May 1-6, 2004. The samples collected during this period were analyzed for heavy metals and volatile organics.

As part of this monitoring program, the City identified high concentrations of acetone and total recoverable petroleum hydrocarbon ("TRPH"), and the presence of methylene chloride (dichloromethane) and methyl ethyl ketone ("MEK"). Acetone, methylene chloride and MEK are widely used commercially as solvents. The Material Safety Data Sheet ("MSDS") for each of these chemicals does not list a specific danger to aquatic life. However, they do indicate toxicological data for animals. Microorganisms, such as those used in the biological treatment process at HARRF, are generally more susceptible to toxins than the animals and fish used in laboratory studies to determine carcinogenic, mutagenic and teratogenic effects. The introduction of these types of toxic constituents into the biological treatment process would overwhelm the aerobic microorganisms and allow anaerobic microorganisms to dominate causing septic conditions in the aeration basins. Septic conditions prolong processing time of organic and inorganic degradation, resulting in elevated TSS and CBOD levels.

Results summarizing the significant pollutants found during the enhanced monitoring program are described below and shown in tables at the end of this Technical Report.

On May 2, 2004, an unusual and suspicious spike of methylene chloride (dichloromethane) was identified in the Escondido main sewer line. Monitoring results for this constituent from 1999 to 2004 are shown in Figure 6. The May 2004 sample is considerably higher than other recorded levels of methylene chloride (dichloromethane). Although the amount of methylene chloride (dichloromethane) that was found may not have been responsible for the entire upset, it likely played a role in the disturbance of the previously weakened activated sludge process described above and prolonged the upset.

Figure 6. Methylene Chloride Levels in HARRF Influent 1999 to 2004

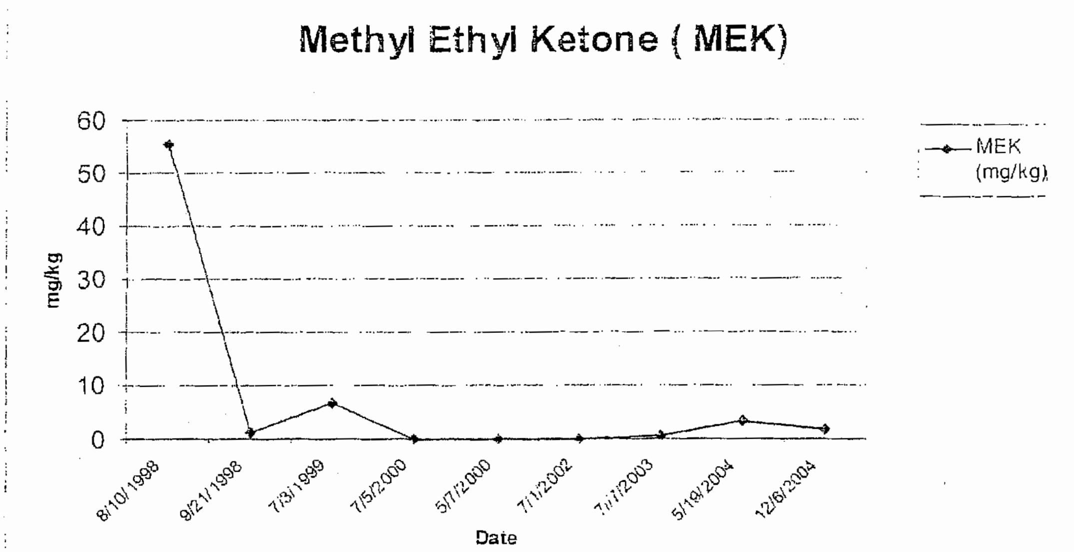


On or about May 17, 2004, City staff expanded the enhanced monitoring to four main trunk lines (4102, 4018, 4104 and 11449) entering HARRF. These particular lines were chosen because they are all high flow and deliver significant industrial discharge. The City also began to analyze the centrifuge sludge cake. The sludge cake would contain traces of potential contaminants that had entered the plant within the past 25 days.

On May 18, 2004, trunk line monitoring began and continued for seven consecutive days. Microtox and metal analyses were performed on all trunk line samples collected during this sampling. Based on these analyses, samples with the highest levels of toxicity were sent for further testing, including testing for volatile organic compounds ("VOCs"). Based on this data, additional trunk lines (4070, 4086, 4094) were added to the monitoring program on June 4-6 to locate the source of potentially toxic pollutants. Results from these trunk lines, however, showed no significant contaminant levels.

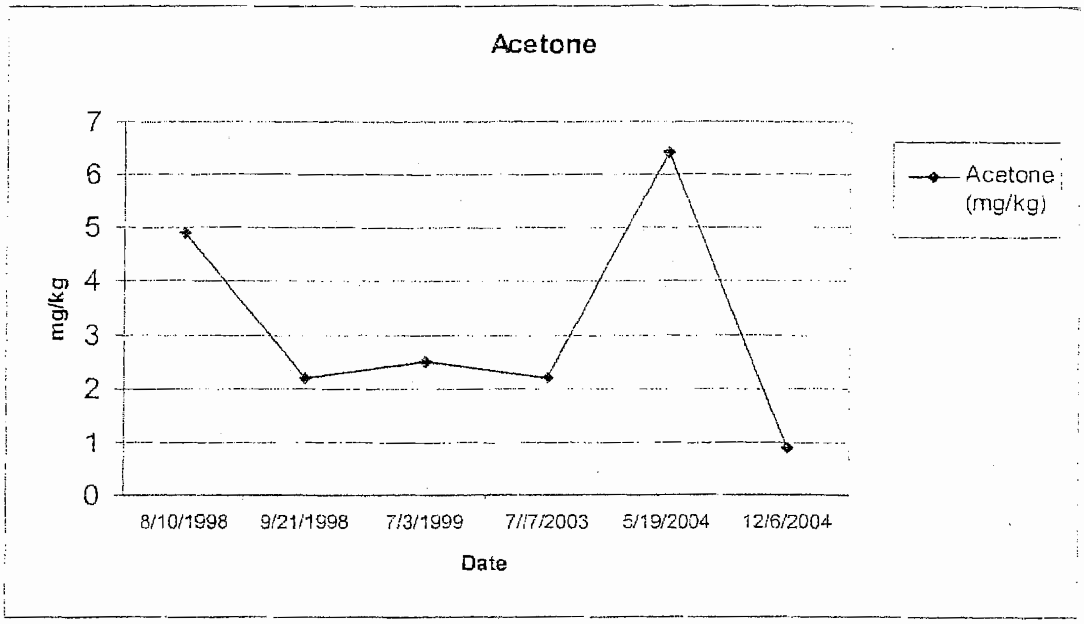
On June 21-23, 2004, the sampling was expanded again to include another three lines (4937, 5105, and 4936). Results from these trunk lines showed high levels of toxic metals, TRPH and VOCs, including acetone. Results for the centrifuge sludge cake showed high levels of acetone and MEK. The levels of these constituents were higher than had been noted anytime within the past six years. MEK in the centrifugal sludge cake was 3200 micrograms per kilogram. In fact, the last time the MEK levels were found to be this high was during two previous plant upsets in 1998 and 1999. As noted in Figure 7, the spike in MEK in the influent was also higher than normal (although not as high as in the sludge cake). Over the past six years, the spikes of MEK noted in the centrifuge sludge cake show a correlation with the treatment plant upsets in 1998, 1999 and 2004. MEK was identified as the cause of the 1998 incident, as well as the 1999 incident when similar levels of MEK were at issue.

Figure 7. Methyl Ethyl Ketone Levels in HARRF Centrifuge Sludge Cake 1998 to 2004



Acetone may also have had a role in negatively impacting the plant process because it was found at extremely high levels in the centrifuge sludge sample. These high levels are anomalous compared to sludge analyses in previous years as shown in Figure 8. The high acetone level in the sludge is also suspicious since the holding time for the sludge is approximately 25 days and much of the original levels in the influent would have been expected to degrade while traveling through the system.

Figure 8. Acetone Levels in HARRF Centrifuge Sludge Cake 1998 to 2004



Since pollutants that may have caused the overall failure of the plant were found in the trunk line samples and the centrifuge sludge cake, the monitoring program was effective in demonstrating that outside materials were being introduced from an upstream third party source, detrimentally impacting the treatment process and prolonging the duration of the upset. However, it is important to note that it is not possible to know what pollutants may have been delivered to the plant before the enhanced monitoring system was established. This point is crucial because, as discussed above, it appears that toxic constituents introduced at high levels caused the initial disturbance of the aerobic microorganisms and may have migrated through the entire system completely undetected. Furthermore, it is also not possible to know exactly what toxic constituents caused the initial upset. An unknown, unfamiliar or uncommon toxic constituent may have been continuously delivered to the system and may have been present in the trunk line samples but not included in the scope of the enhanced monitoring program.

C. INVESTIGATION OF THIRD PARTY DISCHARGERS FOUND ILLEGAL SEWER DISCHARGES

As part of its investigation of the causes of the upset, and based on the cyclic disturbances in the treatment process and the toxic constituents uncovered during the enhanced monitoring program, the City conducted investigations of facilities that may have been the source of any toxic discharges. As a part of this investigation, the City inspected The Iron Factory, a "zero permitted discharger," on August 24, 2004. "Zero permitted dischargers" are required to have a pretreatment permit but are not allowed to discharge any process wastes into the municipal sewer. During inspection of The Iron

Factory, City staff discovered that there was an illegal sewer connection (a hole had been punched into the wall of their facility creating direct access to the sewer pipe) (**see Attachment 5**). The owner of the facility claimed that only the waste stream from their reverse osmosis process (brine water) had been discharged through this illegal connection.

In the course of the City's investigation, it determined from The Iron Factory's Industrial User Discharge Permit (**see Attachment 2**) that several toxic materials are used at the facility, including, among others, cyanide, chromium, nickel, naphthalene, and notably, methylene chloride. In addition, a number of cleaners and acids containing toxic materials were apparently utilized at the facility, including sulfuric acid, potassium chloride, cyanide and muriatic acid. City inspectors noted that the hazardous materials present at The Iron Factory did not have appropriate Hazardous Material Manifests, which are required to document "cradle to grave" custody of these types of chemicals (**see Attachment** 3 - narrative by DHS). Thus, the ultimate fate of these materials is not documented and is unknown. Moreover, the enhanced monitoring program revealed that The Iron Factory is located on a sewer line (4104) in which elevated levels of Methylene Chloride were detected.

USEPA was immediately informed of the illegal connection on August 24, 2004. During USEPA's subsequent investigation, The Iron Factory's owner admitted that there had been approximately five gallons of chrome plating waste and an unknown amount of caustic solution discharged through the illegal connection several months before the inspection. The timeframe for this illegal discharge would have been consistent with the first indications of treatment plant upset in April, as described above. According to USEPA's "Guidance Manual on the Development and Implementation of Local Discharge Limitations Under the Pretreatment Program", it would take as little as 30 pounds of chromium, 30 pounds of nickel, or 13.7 pounds of cyanide (materials that have reportedly been present unmanifested at The Iron Factory) entering the HARRF within a 24 hour period to inhibit the activated sludge process. Under USEPA's guidelines, these amounts assume a healthy microbial population that are exposed to the constituents during nitrification (**see Attachment 4**). Once weakened, it would take less of a dose on subsequent discharges to inhibit the bacterial growth.

On April 1, 2005, the owner of The Iron Factory, James Kronus, was indicted by the Grand Jury on one count of felony illegal discharge of industrial wastes. Moreover, based on the City's own investigation, it is unlikely that The Iron Factory would punch a hole into their building in order to only occasionally discharge small amounts of brine water. There are far easier ways of illegally disposing of this type of waste stream, such as onsite sinks or storm drains. The Iron Factory's inability to produce the Hazardous Materials Manifests also leads to suspicion that unknown quantities of toxic chemicals may have been discharged into the sewer.

D. DEFECTIVE DISSOLVED OXYGEN METER MAY HAVE PROLONGED THE UPSET

As described above, the City believes that the sudden drop in oxygen noted in the aeration basins at the beginning of the upset was the result of the introduction of one or more toxic chemicals into the plant's influent from a third party source. The subsequent discharges of other toxins may have negatively impacted the already weakened processes resulting in the plant upset. It is possible that the duration of the upset may have been prolonged by a defective dissolved oxygen meter.

At the time of the upset, plant operators used a handheld dissolved oxygen meter (YSI Model 55) to calibrate the probes and meters in each of the five aeration basins on a daily basis. If the basin probe did not read the same as the handheld unit, adjustments were made to the basin probe based on readings of the handheld instrument. The handheld unit was calibrated weekly using a bench dissolved oxygen meter in the laboratory in accordance with YSI's operation manual (**see Attachment 1**). Blowers are operated to adjust oxygen levels, as necessary, in the basins based on the in-tank probe readings.

In July 2004, the City determined that the YSI Model 55 handheld unit was inaccurate at lower readings (zero saturation). Specifically, the handheld meter was registering levels of dissolved oxygen adequate for the treatment processes even though very little, if any, oxygen may have been present (see Figure 9). Thus, the City's weekly calibration of the handheld probe was inadequate because lower level readings can not be accurately determined in the YSI Model 55. If calibration inaccuracies had been occurring during the plant upset at the lower levels, the operators would have assumed that the dissolved oxygen levels in the basins at the lower levels were higher than the basin probes were indicating and adjusted the basin probes accordingly. Based on such inaccurate readings, the blower output would have been lowered. Such actions may inadvertently have resulted in further depriving the aerobic microbes of oxygen and prolonged the upset.

Figure 9

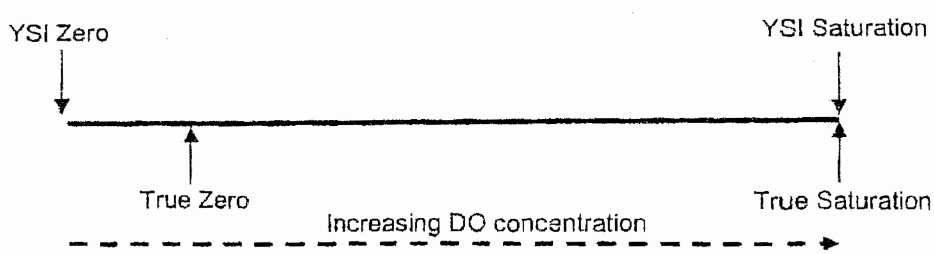


Figure 1 Relationship of YSI Model 55 DO probe readings to true DO readings

The YSI Model 55 handheld unit was replaced with HACH Model HQ10 LDO in July 2004, promptly after the YSI calibration problems were discovered. The replacement meter has demonstrated accuracy at a wider range of dissolved oxygen levels than the original, including at the lower levels up to and including zero oxygen levels. All the basin probes were replaced between April 29, 2004 and July 27, 2004. The replacement of the basin probes had been planned before the plant upset because the manufacturer no longer supports the equipment and it was difficult to obtain replacement parts.

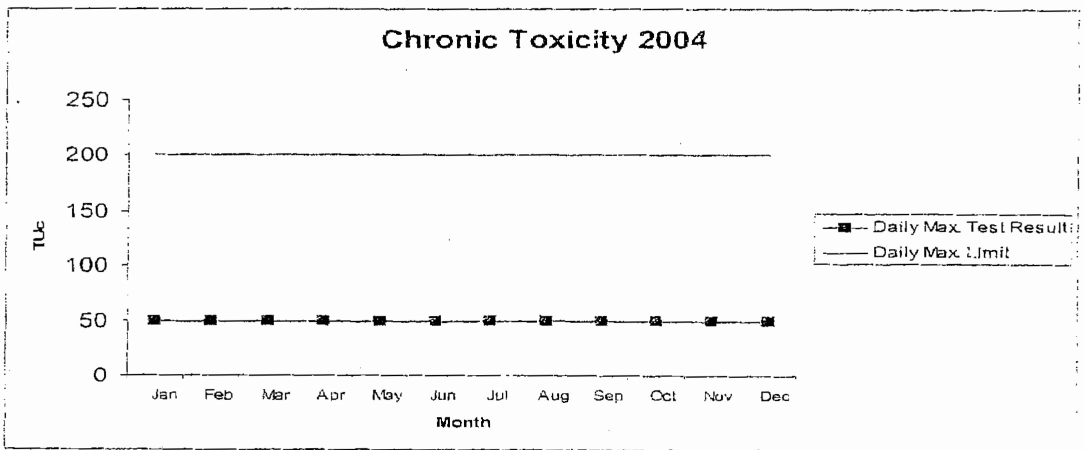
Additionally, quality control procedures have been revised and implemented to include the laboratory checking the bench and handheld meters weekly using a titration method for dissolved oxygen. The laboratory will also run titrations on aeration basin samples weekly to verify the accuracy of the handheld unit and basin probes.

V. NO EFFECTS ON THE RECEIVING WATER

There is no indication that the exceedances associated with CBOD and TSS in the secondary effluent had any significant impact on the receiving water. This conclusion is based on the results of the effluent monitoring for the HARRF Monthly and Quarterly Reports to SDRWQCB, along with the amount of dilution that occurs at the San Elijo Outfall.

In the monthly testing of secondary effluent, chronic toxicity was performed to evaluate the long term effects on the germination and growth of the most sensitive species of Macrocystis pyrifera (commonly known as Kelp). The May through August test results showed no effects on this species from HARRF discharges. Quarterly testing is also required to analyze toxic material for the protection of marine aquatic life. None of the toxic constituents were in violation of the daily maximum during May or August testing. Chronic toxicity testing results are shown in Figure 10. Tables showing the effluent limitations for toxic materials are located at the end of this Technical Report.

Figure 10. Chronic Toxicity in HARRF Effluent During 2004



The City's NPDES Permit requirement for TSS and CBOD are 85% removal. While the TSS removal was not in violation during the upset period, the CBOD removal in May and June of 2004 had a monthly average of 80.5% and 84.2% respectively. These levels are only slightly below (4.5% and 0.8%, respectively) the required limit. With the dilution from San Elijo Joint Powers Authority water at the outfall, it is unlikely that the effluent had any negative effects on the receiving water.

VI. TIMELINE OF EVENTS

The following timeline of events indicates the steps taken to identify the cause of the treatment process disturbance, minimize the treatment and compliance issues, and bring the plant back to operational standards and regulatory compliance.

Date 2004	Event or Action Taken
April/May	The Iron Factory owner stated to USEPA that there had been an illegal discharge to the sewer from their facility sometime in April or May.
April 10	Plant operators noted a slight decrease in plant process performance. The processes appeared to have returned to normal after the weekend.
April 17	Secondary treatment process was upset affecting the microorganisms used in the activated sludge process. A sudden decrease in dissolved oxygen demand was noted in all five aeration basins.
April 22 to May 19	Acetone, total recoverable petroleum hydrocarbon, methylene chloride, and methyl ethyl ketone were discovered in the HARRF influent and in the centrifuge sludge. The levels of these constituents were higher than had been noted anytime within the past six years.
April and May	Notified Bryan Ott, SDRWQCB, of the plant upset both before and after the effluent limits were exceeded. The City also updated Mr. Ott regarding the status of the upset on several occasions. Communication of the upset was also included in the monthly report for April 2004.
April 24	Dissolved oxygen demand again dropped further indicating an impacted treatment process and inhibiting the recovery of the microorganism population.
April 24	Activated sludge wasting was increased to remove toxin from the system.
April 25	The same process indicators and results as the week prior were noted.

April 27	Wasting returned to normal plant WAS rate. Daily addition of Vermatek enzyme product to aeration basin began (50 lbs/day).
April 29 to July 27	All dissolved oxygen probes in the aeration basins were replaced because the manufacturer no longer supported the equipment.
April 30	Sample monitoring for the Rancho Bernardo and Escondido main lines began and continued through May 6. The samples collected during this monitoring were analyzed for heavy metals and volatile organics.
May thru August	Chronic toxicity was performed during monthly testing of secondary effluent to evaluate the long term effects of on the germination and growth of the most sensitive species of Macrocystis pyrifera (commonly known as Kelp). The test results showed no effects on this species.
May and August	Quarterly toxicity testing performed. None of the constituents were in violation of the daily maximum limits during testing.
May 1	The plant again experienced an impact on the treatment process and an increase in dissolved oxygen levels. The weakened processes were unable to recover. The aeration tanks turned black and septic. Secondary settling was poor, turbidity and odors increased.
May 1	Enhanced monitoring program was established by the Industrial Waste Inspectors to find possible sources of pollutants that caused the upset. A spike was noted in methylene chloride, chloroform, chromium, copper and lead entering the plant.
May 2	An unusual spike of methylene chloride (dichloromethane) was identified in the Escondido main sewer line.
May 3	The maximum CBOD limit was exceeded. This continued on 25 days with the last incident on June 27. The MER for CBOD was also exceeded on 12 days between May 3 and June 13.
May 5	First day that maximum TSS exceeded permitted values. Exceedances occurred on 10 days through June 4.
May 5	HARRF imported healthy organisms from another wastewater treatment plant (Fallbrook). Atlas pumping was unable to make the delivery until May 12.
May 10	Wasting of activated sludge was ceased in order to build biomass.
May 11	Wasting resumed due to high presence of septic sludge.

May 12	The system was repopulated with 30,000 gallons of "seed" sludge from Fallbrook.
May 13	No improvement noted. "Seed" sludge appears dead. Increased wasting. Began adding 100 lbs per day of Vermatek enzyme product into collection system for 7 days.
May 14	Increased dissolved oxygen residual to 2.0 mg/L.
May 15	HARRF staff met to review the monitoring data and discuss a possible strategy.
May 15	Educational article published in local paper regarding HARRF upset and effect of toxic dumping into collection system.
May 17	HARRF staff and industrial waste inspectors met and decided to expand the monitoring to four main trunk lines (4102, 4018, 4104 and 11449) entering HARRF and to test the centrifuge sludge cake sample.
May 18	Trunk line monitoring began and continued for seven consecutive days. Microtox and metal analyses were performed on all trunk line samples collected during the seven days. Based on these analyses, samples with the highest levels of toxicity were sent for further testing.
May 19	Centrifuge sludge sample was sent to identify toxic passing through during past 25 days. Acetone, MEK, Carbondisulfide, 1, 4-Dichlorobenze, p-Isopropyltoluene and methylene chloride were found in the sludge.
May 20	An additional 30,000 gallons of "seed" sludge was added from Fallbook was added.
May 20	Ferric chloride resumed in influent pump station to control sulfides in the influent.
May 20	Additional 30,000 of "seed" sludge from Fallbrook
May 24	Curtailed decanting of storm drain vactor water into collection system as a precautionary measure. This procedure had been conducted for several days previously as part of a routine maintenance program. This procedure may have introduced Beggiatoa Bactria (anaerobic) into the treatment process. Previous additions of storm drain cleaning residues have been handled at HARRF without problems.
May 24	Resumed addition of Sodium Hypochlorite to RAS.

May 25	Ceased ferric chloride addition - changed to sodium hypochlorite to improve oxidation of hydrogen sulfides in the wastewater.
May 26	The MER for TSS was exceeded on 4 days between May 26 and June 3.
May 27	Began addition of ferric chloride to mixed liquor effluent as secondary settling aid instead of polymer.
May 28	Changed application point of sodium hypochlorite from IPS to primary influent to oxidize hydrogen sulfides.
June 4	Last recorded exceedance of maximum TSS.
June 4	Began four day trunk line monitoring sampling on additional areas of collection system (4102, 4094, 4086, 4070).
June 4 to June 6	Additional trunk lines (4070, 4086, 4094) were added to the enhanced monitoring program to locate the source of the water showing higher levels of potentially toxic pollutants. Results from these trunk lines showed no significant pollutant levels.
June 8	Operational control of plant solids (MLSS) occurred and indicated that the plant was recovering. More indicator organisms present in the MLSS samples. Odor decreased noticeably.
June 11	Activated sludge wasting rate was decreased in order increase the biomass. This resulted in the process neither improving nor degrading.
June 13	Last recorded exceedance of MER for CBOD.
June 17	Noticeable increase in the number and type of microbes. More cilia and possible some stalk cilia were found. The process is showing signs of nitrification. Nitrates are present in the secondary effluent.
June 18	Testing sulfides at the primary effluent, aeration basin and effluent in an attempt to control sulfides with sodium hypochlorite applied to the primary influent. Dosage rates were determined from these tests and control of sulfides was increased.
June 21	Plant aeration basins are still dark and septic. Staff is maintaining solids inventory at 950 mg/l MLSS, wasting at 380 GPM. Additional trunk line monitoring sampling beings and continues for 3 days (4936, 4937, 5105, 4104)
June 23	Increased wasting to maintain target of 950 mg/l MLSS.
June 21 to	Enhanced monitoring was expanded again to include another three lines

June 23	(4937, 5105, and 4936). Results from these trunk lines showed high results of toxic metals, TRPH and VOC's including acetone. Results for the centrifuge sludge cake showed high levels of acetone and MEK.
June 24	Grease and oil appearing in micro, source unknown.
June 26	Micro slide shows increase in filamentous growth. Increased NaOCl to RAS to control the growth.
June 27	Last recorded exceedance of maximum CBOD concentration.
June 27	First day City began meeting all daily maximum effluent limitations.
June 30	Adjusted RAS valves at aeration basins to balance solids loading. Air demand and solids inventory is easier to control if the solids loading is balanced.
July 2	Moved NaOCl application point from primary influent to headworks to improve mixing.
July 5	Increase in foam noted on aeration tanks with brown color returning to normal.
July 8	Increase in micro activity noted with decrease in filamentous organism.
July 11	Decreased NaOCl to RAS.
July 14	Decreased WAS last three days to try and maintain solids inventory. Reduced NaOCl to the headworks.
July 28	DO meter malfunction discovered.
August	Handheld dissolved oxygen unit (YSI Model 55) was noted to be inaccurate at lower readings (zero saturation) and had no ability to be calibrated at these levels. The meter was promptly replaced with a different unit that has not had these problems.
August 17	Quality of effluent discharge from the HARRF is excellent and in full compliance with all NPDES Permit discharge limits.
August 24	City inspectors found an illegal connection to sewer at The Iron Factory (a "permitted zero discharger"). They also noted hazardous materials at The Iron Factory without appropriate Hazardous Waste Manifests. San Diego County Hazardous Materials staff were called to assist. Violation reported to USEPA.
August 26	USEPA's investigation of The Iron Factory began.

April 1, 2005 The Iron Factory owner, James Kronus, was indicted by the Grand Jury on one count of felony illegal discharge of industrial wastes.

VII. WATER CODE SECTION 13385 ISSUES

California Water Code Section 13385(f)(2)(A), pertaining to mandatory minimum penalties for effluent violations, allows for the collapse of mandatory penalties resulting from a "single operational upset" under certain circumstances described below. According to the State Water Resources Control Board's Water Quality Enforcement Policy, dated February 19, 2002 ("SWRCB Policy"), the Regional Boards must apply USEPA guidance in determining if a single operational upset has occurred. See SWRCB Policy at 30. USEPA defines a single operational upset as "an exceptional incident which causes simultaneous, unintentional, unknowing (not the result of a knowing act or omission), temporary noncompliance with more than one CWA effluent discharge pollutant parameter." Id. at 29. An "exceptional" incident is described as a "'non-routine malfunctioning of an otherwise generally compliant facility.'" Id. at 30. The SWRCB Policy indicates that "[s]ingle operational upsets include such things as upset caused by a sudden violent storm, a bursting tank, or other exceptional event and may result in violations of multiple pollutant parameters." Id. Furthermore, Water Code Section 13385(j)(1)(C) provides an affirmative defense against mandatory minimum penalties when the violations were caused by acts of third parties.

The City suspects that the effects of cyclic illegal toxic discharges resulted in a single operational upset at HAARF, which eventually resulted in the exceedances of the discharges limits noted herein. The upset continued for a prolonged time due to additional intermittent discharges which continued to weaken the biological treatment process. The upset was not due to operator error, changes in procedures, or negligence on the behalf of the City. Staff reported all potential and suspected problems in a timely manner to SDRWQCB. Action plans for monitoring and sampling were implemented and atypical levels of several chemicals which could have had a detrimental effect on the treatment process were identified. Pretreatment inspectors identified an illegal sewer connection at an industrial facility which was not permitted to discharge any industrial waste into the sewer. Additionally, the handheld oxygen meter used by the City malfunctioned and was incapable of being calibrated at lower levels. Based on these defects, the City may have further deprived the aeration tanks of oxygen, an action that may have prolonged the upset.

The City has an approved pretreatment program which was submitted to the Regional Board in 1990. The City has been submitting reports to SDRWQCB since that time in accordance with this program. An inspection of the program was performed by Tetra Tech following the upset. No significant problems were noted. As HARRF is a generally compliant facility, the incident described above meets the definition of a single operational upset.

VIII. CONCLUSION

The City looks forward to discussing these issues with SDRWQCB and fully cooperating with the Board to resolve these matters. Because of the extraordinary nature of these events, the City believes the exceedances are subject to either collapse of mandatory minimum penalties under Water Code Section 13385(f)(1), or not subject to mandatory penalties under Section 13385(j)(1)(C). The City's investigation of these events is continuing (as is USEPA's investigation of the suspected illegal discharger). The City will update and supplement this Technical Report if and when additional relevant material comes to its attention.

Table 1. Atypical Findings in HARRF Monitoring Program

Location	Date (Time)	Constituent	Concentration (µg/L)
HARRF Influent	5/2/04 (0800-0800)	Methylene chloride	39.6
Manhole #4104	5/2/04 (1400-1900)	Methylene chloride	68.6
Manhole #4104	5/18/04 (1020-1520)	Methylene chloride	22.2
Manhole #4104	5/19/04 (0420-0920)	Methylene chloride	31.2
Manhole #4104	5/19/04 (1545-2045)	Methylene chloride	42.6
Manhole #4104	5/20/04 (0950-1450)	Methylene chloride	11.4
Manhole #4104	5/21/04 (1000-1500)	Methylene chloride	16.9
Manhole #4104	5/23/04 (0430-0930)	Methylene chloride	11.3
Manhole #4102	5/18/04 (1043-1543)	Copper	3220
Manhole #4102	5/18/04 (1643-2143)	Copper	1230
Manhole #4102	5/19/04 (0443-0943)	Copper	1300
Manhole #4936	6/21/04 (1000-1200)	TRPH	25.000
Centrifuge Sludge Cake	5/19/04	Acetone	6410
Centrifuge Sludge Cake	5/19/04	MEK	3200

Table 2. HARRF Influent Methylene Chloride From 1999-2004

Date	ug/l
2/8/1999	ND
5/5/1999	ND
8/9/1999	ND
11/3/1999	ND
2/2/2000	ND
5/9/2000	1
8/3/2000	5
11/1/2000	2
2/7/2001	ND
5/8/2001	ND
8/8/2001	3
11/6/2001	10
2/4/2002	ND
5/14/2002	6
8/5/2002	3.7
11/6/2002	7
2/5/2003	ND
5/6/2003	4.9
8/4/2003	ND
11/5/2003	ND
2/4/2004	4
5/2/2004	68.6
8/3/2004	0.4

Table 3. Centrifuge Sludge Cake from 1999-2004

Date	Acetone (mg/kg)	MEK(mg/kg)
8/10/1998	4.9	55.5
9/21/1998	2.2	1.3
7/3/1999	2.5.	6.6
7/5/2000	Not Analyzed	Not detected
5/7/2000	Not Analyzed	Not detected
7/1/2002	Not Analyzed	0.112
7//7/2003	2.2	0.57
5/19/2004	6.41	3.20
12/6/2004	0.9	1.8

Table 4. Effluent Limits on Toxic Materials for Protection of Marine Aquatic Life

Constituent/ Property	Units	6-Month Median	Daily Maximum	Instantaneous Maximum	1st QTR	2nd QTR	3rd QTR	4th QTR
Sample Date					2-Feb-04	26-May-04	3-Aug-04	2-Nov-04
Flow Rate	MGD				14.20	13.50	14.60	14.50
Arsenic	ug/l	1100	6400	17000	< 5 ND	4.2 J	2.5 J	3.8 J
	lbs/day	150	880	2300	< 0.592	0.473	0.30	0.46
Cadmium	ug/l	220	880	2200	< 2 ND	0.42 J	0.28 J	< 2
	lbs/day	30	120	300	< 0.237	0.047	0.034	< 0.242
Chromium (Hexavalent)	ug/l	440	1800	4400	≤ 3.00 J	≤ 5.50	< 5.0 ND	≤ 2.4 J
	lbs/day	61	240	610	≤ 0.355	≤ 0.619	< 0.61 ND	≤ 0.29
Copper	ug/l	220	2200	6200	14.20	56.22	20.2	15.4
	lbs/day	31	300	850	1.682	6.328	2.46	1.86
Lead	ug/l	440	1800	4400	< 5.00 ND	4.10 J	1.1 J	< 5.0 ND
	lbs/day	61	240	610	< 0.592	0.462	0.13	< 0.60
Mercury	ug/l	8.7	35	88	0.18 J	0.18 J	0.18 J	0.48 J
	lbs/day	1.2	4.9	12	0.021	0.020	0.022	0.058
Nickel	ug/l	1100	4400	11000	14	14.3	10.3	8.4
	lbs/day	150	610	1500	1.655	1.610	1.25	1.02
Selenium	ug/l	3300	13000	33000	< 10.00 ND	< 10.00 ND	< 10 ND	< 10 ND
	lbs/day	460	1800	4600	< 1.184	< 1.126	< 1.22	< 1.21
Silver	ug/l	64	360	930	< 10 ND	1.9 J	< 10 ND	< 10 ND
	lbs/day	8.8	50	130	< 1.184	0.214	< 1.22	< 1.21
Zinc	ug/l	2700	16000	42000	79.6	172	71.6	95.3
	lbs/day	370	2200	5800	9.427	19.365	8.72	11.52
Cyanide	mg/l	0.22	0.88	2.2	< 0.05 ND	< 0.05 ND	< 0.05 ND	< 0.05 ND
	lbs/day	30	120	300	< 5.92	< 5.63	< 6.09	< 6.05
Phenolic compd	mg/l	6.6	27	66	< 0.1 ND	0.16	0.11	0.061 J
(non-chlorinated	lbs/day	910	3600	9100	< 11.84	18.01	13.4	6.2
Chlorinated Phe	mg/l	0.22	0.88	2.2	< 0.05 ND	< 0.05 ND	< 0.05 ND	< 0.05 ND
	lbs/day	30	120	300	< 5.92	< 5.63	< 6.09	< 6.05
Endosulfan	ug/l	1.9	4	6	< 0.1 ND	< 0.1 ND	< 0.1 ND	< 0.1 ND
	lbs/day	0.27	0.55	0.82	< 0.012	< 0.011	< 0.012	< 0.012
Endrin	ug/l	0.44	0.88	1.3	< 0.1 ND	< 0.1 ND	< 0.48 ND	< 0.1 ND
	lbs/day	0.061	0.12	0.18	< 0.012	< 0.011	< 0.058	< 0.012
HCH	ug/l	0.88	1.8	2.7	< 0.05 ND	< 0.05 ND	< 0.05 ND	< 0.05 ND
	lbs/day	0.12	0.24	0.36	< 0.006	< 0.006	< 0.006	< 0.006
Radioactivity	Not to exceed limits specified			Alpha	4.3+/-2.2	3.4+/-2.8	3.1+/-1.0	< 3+/-1.9
	in Title 17, Div 1, Chapter 5,			Beta	9.4+/-2.6	9.0+/-3.9	12+/-1.9	9.4+/-2.1
	Grp 3, Article 1, Sect 30253							
	of the Calif. Code of Reg.							

Table 5. Effluent Limitations for Toxic, Noncarcinogenic Materials for Protection of Human Health

Constituent /Property	Units	Monthly Average (30-Day)	Method		1st Quarter 2004			2nd Quarter 2004			3rd Quarter 2004			4th Quarter 2004	
Sample Date					4-Feb-04			26-May-04			Aug-3-2004			Nov-2-2004	
Flow Rate	MGD				14.20			13.50			13.80			14.50	
acrolein	ug/l	49000	624	<	50	ND	<	50	ND	<	50	ND	<	50	ND
	lbs/day	6700		<	5.921		<	5.630		<	5.755		<	6.047	
antimony*	ug/l	270000	200.7	<	10.00	ND	<	10	ND	<	10	ND	<	10	ND
	lbs/day	36000		<	1.184		<	1.126		<	1.151		<	1.209	
bis(2-chloroethoxy) methane	ug/l	970	625	<	10	ND	<	10	ND	<	10	ND	<	10	ND
	lbs/day	130		<	1.184		<	1.126		<	1.151		<	1.209	
bis(2-chloroisopropyl) ether	ug/l	270000	625	<	10	ND	<	10	ND	<	10	ND	<	10	ND
	lbs/day	36000		<	1.184		<	1.126		<	1.151		<	1.209	
chlorobenzene	ug/l	130000	624	<	1	ND	<	1	ND	<	1	ND	<	1	ND
	lbs/day	17000		<	0.116		<	0.113		<	0.115		<	0.121	
chromium (III)*	ug/l	42000000	200.7	≤	3.00	J	≤	5.5		≤	5.0	ND	≤	2	J
	lbs/day	5800000		≤	0.355		≤	0.619		≤	0.575		≤	0.290	
di-n-butyl phthalate	ug/l	770000	625	<	10	ND		5	J	<	10	ND	<	10	ND
	lbs/day	100000		<	1.184			0.563		<	1.151		<	1.209	
dichlorobenzenes	ug/l	1100000	624		0.9	J		1			1			1	
	lbs/day	160000			0.107			0.113			0.115			0.085	
1,1-dichloroethylene	ug/l	1600000	624	<	1	ND	<	1	ND	<	1	ND	<	1	ND
	lbs/day	220000		<	0.118		<	0.113		<	0.115		<	0.121	
diethyl phthalate	ug/l	7300000	625	<	10	ND		13			3	J	<	10	ND
	lbs/day	1000000		<	1.184			1.464			0.345		<	1.209	
dimethyl phthalate	ug/l	180000000	625	<	10	ND	<	10	ND	<	10	ND	<	10	ND
	lbs/day	25000000		<	1.184		<	1.126		<	1.151		<	1.209	
4,6-dinitro-2-methylphenol	ug/l	49000	625	<	50	ND	<	50	ND	<	48	ND	<	50	ND
	lbs/day	6700		<	5.921		<	5.630		<	5.524		<	6.047	
2,4-dinitrophenol	ug/l	380	625	<	50	ND	<	50	ND	<	48	ND	<	50	ND
	lbs/day	120		<	5.921		<	5.630		<	5.524		<	6.047	
ethylbenzene	ug/l	910000	624	<	1	ND	<	1	ND	<	1	ND	<	1	ND
	lbs/day	120000		<	0.118		<	0.113		<	0.115		<	0.121	
fluoranthene	ug/l	3300	625	<	10	ND	<	10	ND	<	10	ND	<	10	ND
	lbs/day	460		<	1.184		<	1.126		<	1.151		<	1.209	
hexachlorocyclopentadiene	ug/l	13000	625	<	50	ND	<	50	ND	<	50	ND	<	50	ND
	lbs/day	1800		<	5.921		<	5.630		<	5.755		<	6.047	
isophorone	ug/l	33000000	625	<	10	ND	<	10	ND	<	10	ND	<	10	ND
	lbs/day	4500000		<	1.184		<	1.126		<	1.151		<	1.209	
nitrobenzene	ug/l	1100	625	<	10	ND	<	10	ND	<	10	ND	<	10	ND
	lbs/day	150		<	1.184		<	1.126		<	1.151		<	1.209	
thallium*	ug/l	3100	200.7		9.1	J	<	10.00	ND		7	J	<	10.0	ND
	lbs/day	430			1.073		<	1.126			0.806		<	1.209	
toluene	ug/l	19000000	624		0.7	J		0.7	J		1	J	<	1	
	lbs/day	2600000			0.083			0.079			0.058		<	0.121	
1,1,2,2,-tetrachloroethane	ug/l	270000	624	<	1	ND	<	1	ND	<	1	ND	<	1	ND
	lbs/day	36000		<	0.118		<	0.113		<	0.115		<	0.121	
tributyltin	ug/l	0.31	Organotin	<	0.1	ND		n/a	ND	<	0.10	ND		n/a	ND
	lbs/day	0.043	WCAA	<	0.012					<	0.012				
1,1,1-trichloroethane	ug/l	120000000	624	<	1	ND	<	1	ND	<	1	ND	<	1	ND
	lbs/day	16000000		<	0.118		<	0.113		<	0.115		<	0.121	
1,1,2-trichloroethane	ug/l	9500000	624	<	1	ND	<	1	ND	<	1	ND	<	1	ND
	lbs/day	1300000		<	0.118		<	0.113		<	0.115		<	0.121	

Notes: 1) J: Reported between PQL (or ML) and MDL
2) ND: None Detected

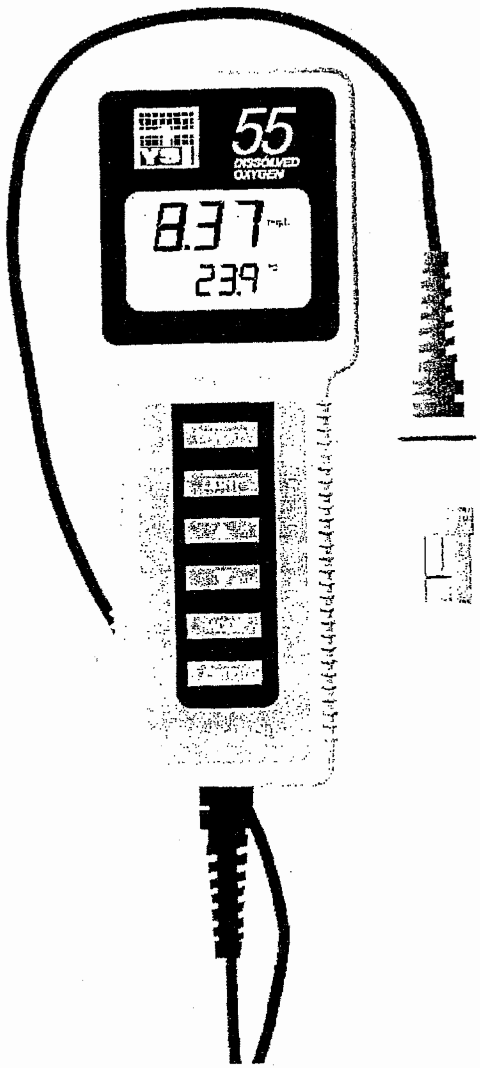
Table 6. Effluent Limits for Toxic, Carcinogenic Mat'ls to Protect Human Health

Constituent /Property	Units	Monthly Average (30-Day)	Method	1st Quarter 2004	2nd Quarter 2004	3rd Quarter 2004	4th Quarter 2004
Sample Date				4-Feb-04	26-May-04	Aug-3-2004	Nov-2-2004
Flow Rate	MGD			14.20	13.50	13.80	14.50
acrylonitrile	ug/l	22	624	< 50 ND	< 50 ND	< 50 ND	< 50 ND
	lbs/day	3		< 5.921	< 5.630	< 5.755	< 6.047
aldrin	ug/l	0.0049	608	< 0.05 ND	< 0.05 ND	< 0.05 ND	< 0.05 ND
	lbs/day	0.00067		< 0.006	< 0.006	< 0.006	< 0.006
benzene	ug/l	1300	624	< 1 ND	< 1 ND	< 1 ND	< 1 ND
	lbs/day	180		< 0.118	< 0.113	< 0.115	< 0.121
benzidine	ug/l	0.015	625	< 50 ND	< 50 ND	< 50 ND	< 50 ND
	lbs/day	0.0021		< 5.921	< 5.630	< 5.755	< 6.047
beryllium*	ug/l	7.3	200.7	< 2 ND	0.07 J	0 J	< 2.000 ND
	lbs/day	1		< 0.237	0.0079	0.018	< 0.242
bis(2-chloroethyl) ether	ug/l	10	625	< 10 ND	9 J	< 10 ND	< 10 ND
	lbs/day	1.4		< 1.184	1.013	< 1.151	< 1.209
bis(2-ethylhexyl) phthalate	ug/l	770	625	1 J	< 10 ND	3 J	3 J
	lbs/day	100		0.118	< 1.126	0.346	0.363
carbon tetrachloride	ug/l	200	624	< 1 ND	< 1 ND	< 1 ND	< 1 ND
	lbs/day	27		< 0.118	< 0.113	< 0.115	< 0.121
chlordane	ug/l	0.0051	608	< 2 ND	< 2 ND	< 2 ND	< 2 ND
	lbs/day	0.0007		< 0.237	< 0.225	< 0.230	< 0.242
chloroform	ug/l	29000	624	14	3	1.0	1
	lbs/day	4000		1.658	0.338	0.115	0.085
DDT	ug/l	0.038	608	< 0.1 ND	< 0.1 ND	< 0.1 ND	< 0.1 ND
	lbs/day	0.0052		< 0.012	< 0.011	< 0.012	< 0.012
1,4-dichlorobenzene	ug/l	4000	624	1 J	2	1	1 J
	lbs/day	550		0.118	0.225	0.115	0.085
3,3-dichlorobenzidine	ug/l	1.8	625	< 20 ND	< 20 ND	< 20 ND	< 20 ND
	lbs/day	0.25		< 2.369	< 2.252	< 2.302	< 2.419
1,2-dichloroethane	ug/l	29000	624	< 1 ND	< 1 ND	< 1 ND	< 1 ND
	lbs/day	4000		< 0.118	< 0.113	< 0.115	< 0.121
dichloromethane	ug/l	99000	624	< 1 ND	< 5 ND	1 J	< 5 ND
	lbs/day	14000		< 0.118	< 0.563	0.092	< 0.605
1,3-dichloropropene	ug/l	2000	624	< 1 ND	< 1 ND	< 1 ND	< 1 ND
	lbs/day	270		< 0.116	< 0.113	< 0.115	< 0.121
dieldrin	ug/l	0.0088	608	< 0.1 ND	< 0.1 ND	< 0.1 ND	< 0.1 ND
	lbs/day	0.0012		< 0.012	< 0.011	< 0.012	< 0.012
2,4-dinitrotoluene	ug/l	570	625	< 10 ND	< 10 ND	< 10 ND	< 10 ND
	lbs/day	79		< 1.184	< 1.126	< 1.151	< 1.209
1,2-diphenylhydrazine	ug/l	35	625	< 10 ND	< 10 ND	< 10 ND	< 10 ND
	lbs/day	4.9		< 1.184	< 1.126	< 1.151	< 1.209
halomethanes	ug/l	29000	624	< 1 ND	< 1 ND	< 1.0 ND	< 1 ND
	lbs/day	4000		< 0.118	< 0.113	< 0.115	< 0.121
heptachlor	ug/l	0.16	608	< 0.05 ND	< 0.05 ND	< 0.05 ND	< 0.05 ND
	lbs/day	0.022		< 0.006	< 0.006	< 0.006	< 0.006
hexachlorobenzene	ug/l	0.046	625	< 10 ND	< 10 ND	< 10 ND	< 10 ND
	lbs/day	0.0064		< 1.184	< 1.126	< 1.151	< 1.209
hexachlorobutadiene	ug/l	3100	625	< 10 ND	< 10 ND	< 10 ND	< 10 ND
	lbs/day	430		< 1.184	< 1.126	< 1.151	< 1.209
hexachloroethane	ug/l	550	625	< 10 ND	< 10 ND	< 10 ND	< 10 ND
	lbs/day	76		< 1.134	< 1.126	< 1.151	< 1.209
N-nitrosodimethylamine	ug/l	1600	625	< 10 ND	< 10 ND	< 10 ND	< 10 ND
	lbs/day	220		< 1.184	< 1.126	< 1.151	< 1.209
N-nitrosodiphenylamine	ug/l	550	625	< 10 ND	< 10 ND	< 50 ND	< 50 ND
	lbs/day	76		< 1.184	< 1.126	< 5.755	< 6.047
PAHs	ug/l	1.9	625	< 10 ND	< 10 ND	< 10 ND	< 10 ND
	lbs/day	0.27		< 1.184	< 1.126	< 1.151	< 1.209
PCBs	ug/l	0.0042	608	< 2 ND	< 2 ND	< 2.0 ND	< 2.0 ND
	lbs/day	0.00058		< 0.237	< 0.225	< 0.230	< 0.242
TCDD equivalents	pg/L	0.86	8280	< 70 ND	n/a	0.16	n/a
	lbs/day	0.00000012		< [illegible]		[illegible]	
tetrachloroethylene	ug/l	22000	624	< 1 ND	< 1 ND	1 J	0 J
	lbs/day	3000		< 0.118	< 0.113	0.056	0.048
toxaphene	ug/l	0.046	608	< 5 ND	< 5 ND	< 5 ND	< 5 ND
	lbs/day	0.0064		< 0.592	< 0.563	< 0.575	< 0.605
trichloroethylene	ug/l	6000	624	< 1 ND	< 1 ND	< 1 ND	< 1 ND
	lbs/day	820		< 0.118	< 0.113	< 0.115	< 0.121

Attachment 1

YSI

Y S I *incorporated*



YSI Model 55

Handheld Dissolved Oxygen and Temperature System

Operations Manual

Order No. R9-2005-0077

5. Calibration

Dissolved oxygen calibration must be done in an environment with a known oxygen content. Since the amount of oxygen in the atmosphere is known, it makes an excellent environment for calibration (at 100% relative humidity). The calibration/storage chamber contains a moist sponge to create a 100% water saturated air environment.

5.1. Before You Calibrate

Before you calibrate the YSI Model 55, complete the procedures discussed in the Preparing the Meter and Preparing the Probe chapters of this manual. To accurately calibrate the YSI Model 55, you will need to know the following information:

- The approximate altitude of the region in which you are located.
- The approximate salinity of the water you will be analyzing. Fresh water has a salinity of approximately zero. Sea water has a salinity of approximately 35 parts per thousand (ppt). If you are not certain what the salinity of the sample water is, use a YSI Model 30 Salinity-Conductivity-Temperature meter to determine it.

5.2. The Calibration Process

1. Ensure that the sponge inside the instrument's calibration chamber is wet. Insert the probe into the calibration chamber.

2. Turn the instrument on by pressing the ON/OFF button on the front of the instrument. Wait for the dissolved oxygen and temperature readings to stabilize (usually 15 minutes is required after turning the instrument on).

3. To enter the calibration menu, use two fingers to press and release both the UP ARROW and DOWN ARROW keys at the same time.

4. The LCD will prompt you to enter the local altitude in hundreds of feet. Use the arrow keys to increase or decrease the altitude.

   EXAMPLE: Entering the number 12 here indicates 1200 feet.

Attachment 2

Order No. R9-2005-0077

CITY OF ESCONDIDO
INDUSTRIAL WASTE PROGRAM

475 North Spruce Street
Escondido, CA 92025-2525
PHONE (760) 839-6282
FAX (760) 739-7040

INDUSTRIAL USER DISCHARGE PERMIT APPLICATION

QUESTIONNAIRE NUMBER:	INDUSTRY NUMBER:
BUS. LICENSE NUMBER:	CLASSIFICATION:
PARCEL NUMBER:	PERMIT ISSUED: YES OR NO
LAND USE CODE:	PERMIT ISSUED:
SIC CODE: ___, ___, ___, ___	PERMIT NUMBER:
WATER ACCOUNT NUMBER:	PERMIT DATE:
WATER DISTRICT: City of Escondido ___	PERMIT EXPIRATION DATE:
Rincon MWD ___	AGENCY: CITY OF ESCONDIDO
REVIEWED BY:	DATE:

SECTION A. GENERAL INFORMATION

1. COMPANY NAME: THE IRON FACTORY
2. SITE ADDRESS: STREET 639 No. AERO WAY
   CITY: ESCONDIDO STATE: CA ZIP CODE: : 92029
3. MAILING ADDRESS: STREET 639 No AERO WAY
   CITY: ESCONDIDO STATE: CA ZIP CODE: 92029
4. LANDLORD/ PROPERTY OWNER JAMES A. KRONUS
   STREET 11126 PALA LOMA DR.
   CITY: Valley Center STATE: CA ZIP CODE: 92082
5. PERSONS TO CONTACT CONCERNING THIS APPLICATION:

Administration Contact:	Title:	Area Code:	Phone Number:
Jim KRONUS	owner	(760)	480-2377

Inspection Contact:

___	___	( )	___

6. CHECK ONE: ✓ EXISTING DISCHARGE ___ PROPOSED DISCHARGE
   IF PROPOSED DISCHARGE, ANTICIPATED DATE OF DISCHARGE INITIATION: ___
7. GIVE A BRIEF DESCRIPTION OF THE MAIN PRODUCTS OR SERVICES:
   PLATING OF GOLF CLUBS & METAL STAMPINGS

SECTION B. PLANT OPERATIONAL CHARACTERISTICS

1. CHECK ALL ACTIVITIES THAT ARE PRESENT AT YOUR FACILITY: (NA if not applicable)

___ Assembly	___ Groundwater Remediation	___ Photo Finishing
___ Auto Repair Shop	___ Hospital	___ Plant Wash Down
___ Bulk Chemical Storage	___ Laboratory	___ Printing
___ Car Wash	___ Laundry	___ Radiator Repair Shop
___ Chemical Waste Storage	___ Machining/Milling	___ Restaurant/Food prep
___ Dry Cleaning	___ Manufacturing	___ Retail/Wholesale
✓ Electroplating/Metal Finishing	___ Military	___ Steam Cleaning/Degreasing
___ Flammable/Explosives	___ Office Unit	___ TSDF
___ Food Processing	___ One-Pass Cooling Water	___ Warehousing
___ Fume Scrubbers	___ Painting/Finishing	___ Other ___________

2. SHIFT INFORMATION

A. Number of Shifts Per Work Day: ___ 1 ✓ 2 ___ 3

B. Work Days Per Week: ___ 4 ✓ 5 ___ 6 ___ 7

C. Average Number of On-Site Employees Per Shift: 1st 2 2nd 2 3rd ___ Total 4

3. IS OPERATION SUBJECT TO SEASONAL VARIATIONS ? ✓ Yes ___ No

If yes, indicate months of peak operation: FEB & MAR

4. ARE MAJOR PROCESSES: ✓ Batch ___ Continuous ___ Both

SECTION C. WATER USE

1. WATER SOURCE: ___ City of Escondido ✓ Rincon MWD Other (specify) ___________

2. IS WATER SUPPLIED BY A LANDLORD ? ___ Yes ✓ No

3. WHAT NAME APPEARS ON THE WATER BILL ? THE IRON FACTORY

4. WATER SERVICE ACCOUNT NUMBER(S):

2307602

5. WHAT IS YOUR ESTIMATED AVERAGE DAILY WATER CONSUMPTION ?

500 gpd

SECTION D. CHEMICAL INFORMATION

1. LIST THE CHEMICALS AND OTHER MATERIALS (BOTH LIQUID AND SOLID) WHICH ARE USED OR STORED: (ATTACH ADDITIONAL SHEETS IF NECESSARY)

Material	Estimate Maximum Quantity Stored on premise (Indicate Units)	Estimate Quantity Used per year (Indicate Units)
Potassium Cloride	800 lbs	5200 lbs
Zinc Anodes	1000 lbs	5200 lbs
Nickle Cloride	50 gal	100 gal
Chromic Acid	100 lbs	300 lbs
Sulfuric Acid	200 gal	400 gal
Caustic Soda	100 lbs	400 lbs

2. IS A WRITTEN SPILL PREVENTION CONTROL AND COUNTERMEASURE PLAN PREPARED FOR THE FACILITY ? ____ Yes ____ No

3. DOES THE FACILITY HAVE AN EPA GENERATOR NUMBER ? ✓ Yes ____ No

If yes, EPA generator number(s) CAD 981977216

SECTION E. WASTE DISCHARGE

1. DOES THIS FACILITY USE WATER FOR PURPOSES OTHER THAN IN RESTROOMS ? ✓ Yes ____ No

2. IS THERE ANY DISCHARGE TO STORM DRAINS ? ____ Yes ✓ No

If yes, NPDES permit number(s): ____________________

IF THE ANSWER TO QUESTION E-1 OR E-2 IS YES, COMPLETE ENTIRE APPLICATION. IF NOT, PROCEED TO AND COMPLETE LAST PAGE AND SIGN.

SECTION F. WASTE WATER INFORMATION

1. BRIEFLY DESCRIBE EACH INDUSTRIAL PROCESS GENERATING WASTE WATER:

A. TIN PLATING
B. ZINC PLATING
C. Nickle Plating
D. Silver Plating
E. COPPER + BRASS Plating

All waste water is Reused

2. PLEASE ESTIMATE THE SOURCES AND QUANTITIES OF WASTEWATER GENERATED OR LOST AT THE FACILITY IN GALLONS PER DAY. INDICATE THE DISCHARGE LOCATION BY PLACING THE QUANTITY GENERATED UNDER THE APPROPRIATE SEWER CONNECTION NUMBER BELOW.

(NA if not applicable)

Discharge Source	Quantity of Sewer Conn. No.	Wastewater Sewer Conn. No.	Discharged Sewer Conn. No.	Surface/ Storm Drn	Total Discharged or Lost
1. Sanitary	125				
2. Industrial Processes A. 300					
B. 300					
C. <5	Not	Discharged		Reused	
D. <5	Not	Discharged		Reused	
E.					
3. Plant/Equip Washdown					
4. Other Discharges					
5. Lost to cooling Evap					
6. Lost to Irrigation				75	
7. Lost to Product					
8. Other Losses					
Total Water Lost					
Total Industrial Waste					
Total Wastewater					

* FROM SECTION F-1 WATER BALANCE

3. LIST PLANT LATERALS AND THEIR ASSOCIATED FLOWS BELOW. DO NOT INCLUDE STORM DRAIN INFORMATION UNLESS YOU FEEL IT IS PERTINENT. IF MORE THAN 2, ATTACH ADDITIONAL CONNECTION INFORMATION ON ANOTHER SHEET OF 8 1/2 X 11 INCH PAPER.

(NA if not applicable)

CONNECTION No.	DESCRIPTIVE LOCATION OF LATERAL CONNECTION TO CITY SEWER	ESTIMATED AVG. FLOW (GPD)
1	Domestic Only	125

TOTAL WASTEWATER DISCHARGED... (GPD – AVG.) 125

SECTION G. PLANT LAYOUT

IN THIS SPACE BELOW, SKETCH THE LAYOUT OF THE INDUSTRIAL COMPLEX. IF KNOWN, SHOW THE LOCATION OF THE SEWER LATERALS AND POSSIBLE SAMPLE POINTS. INCLUDE BUILDING WALLS, STREETS, ALLEYS PROCESS AREAS, EQUIPMENT, AND ANY OTHER PERTINENT PHYSICAL STRUCTURES. IF AVAILABLE, A SCALED DRAWING OF THE FACILITY CAN BE ATTACHED INSTEAD.

ATTACHED

SECTION H. CHARACTERISTICS OF DISCHARGES

1. INDICATE THE CONSTITUENTS THAT ARE OR COULD BE PRESENT IN THE WASTEWATER DISCHARGE AS A RESULT OF YOUR OPERATIONS BY PLACING AN (X) IN THE COLUMN NEXT TO THE CONSTITUENTS. ALSO INDICATE THE CONNECTIONS TO WHICH THOSE MATERIALS ARE DISCHARGED BY ENTERING THE SEWER REFERENCE NUMBER FROM SECTION F-3 (if applicable)

Constituents	X	Sewer Connections (SECTION F-3)	Constituents	X	Sewer Connections (SECTION F-3)
1. Acids (Low pH)			13. PCB's		
2. Alcohol's/Ketones			14. Pesticides		
3. Caustics (high pH)			15. Radioactive Wastes		
4. Chlorinated Solvents			16. R. O. and Other Brines		
5. Cyanides	X	N/A	17. Sulfates		
6. Dissolved Metals*	X	N/A	18. Sulfides		
7. Fibrous Wastes			19. Toxic Organics		
8. Flammable Solvents			20. Uncontaminated Water		
9. Fuels			21. Viscous Water/Solids		
10. Grease and Oils			22.		
11. Highly Odorous Wastes			23.		
12. High Temperature Waste			24.		

*DISSOLVED METALS INCLUDE: ANTIMONY, ARSENIC, BERYLLIUM, CADMIUM, CHROMIUM, COPPER, GOLD, LEAD, MERCURY, NICKEL, SELENIUM, SILVER, THALLIUM, AND ZINC.

SECTION I. WASTEWATER PRETREATMENT

1. IS ANY FORM OF PRETREATMENT (SEE LIST BELOW) PRACTICED AT THIS FACILITY? ✓ Yes __ No
IF NO, SKIP QUESTION 2 AND GO TO SECTION J.

2. FOR EACH WASTE STREAM TREATED BEFORE DISCHARGE CHECK THE APPROPRIATE BOXES FOR TYPES OF TREATMENT USED AT THIS FACILITY.

(NA if not applicable)

Pretreatment Type	X	Sewer Conn. or Location	Pretreatment Type	X	Sewer Conn. or Location
1. Chemical Addition			11. pH Neutralize/Batch		
2. Chromium Reduction	X		12. pH Neutralize/Continuous	X	
3. Cyanide Destruction	X		13. Precipitation		
4. Equalization	X		14. Rinse - Counterflow	X	
5. Filtration	X		15. Rinse - Dead		
6. Grease Interceptor			16. Rinse - Spray		
7. Grease Trap			17. Sedimentation		
8. Marble Chip Neutralize			18. Silver Recovery		
9. Oil/Water Separator			19. Solid Screening		
10. Oxidation/Ozone			20. Other WATER REUSED - RO SYSTEM		

SECTION J. PRIORITY POLLUTANT INFORMATION

PLEASE INDICATE BY PLACING AN "X" IN THE BOX BY EACH LISTED CHEMICAL USED IN YOUR MANUFACTURING OR SERVICE ACTIVITY OR GENERATED AS A BY-PRODUCT. SOME COMPOUNDS ARE KNOWN BY OTHER NAMES.

(NA if not applicable)

Present	
	asbestos (fibrous)
X	cyanide (total)
	antimony (total)
	arsenic (total)
	beryllium (total)
	cadmium (total)
X	chromium (total)
X	copper (total)
X	lead (total)
	mercury (total)
X	nickel (total)
	selenium (total)
X	silver (total)
	thallium (total)
X	zinc (total)
	acenaphthene
	acenaphthylene
	acrolein
	acrylonitrile
	aldrin
	anthracene
	benzene
	benzidine
	benzo (a) anthracene
	benzo (a) pyrene
	3,4-benzofluoroanthene
	benzo (g, h, I) perylene
	benzo (b) fluoroanthene
	a-BHC (alpha)
	b-BHC (beta)
	d-BHC (delta)
	g-BHC (gamma)
	bis (2-chloroethyl) ether
	bis (2-chloroethoxy) methane
	bis (2-chloroisopropyl) ether
	bis (chloromethyl) ether
	bis (2-ethylhexyl) phthalate
	bromodichloromethane
	bromoform
	bromomethane
	4-bromophenyl phenyl ether
	butylbenzyl phthalate

Present	
	carbon tetrachloride
	chlordane
	4-chloro-3-methylphenol
	chlorobenzene
	chloroethane
	2-chloroethyl vinyl ether
	chloroform
	chloromethane
	2-chloronaphthalene
	2-chlorophenol
	4-chlorophenyl phenyl ether
	chrysene
	4,4'-DDD
	4,4'-DDE
	4,4'-DDT
	dibenzo (a,h) anthracene
	dibromochloromethane
	1,2-dichlorobenzene
	1,3-dichlorobenzene
	1,4-dichlorobenzene
	3,3-dichlorobenzene
	1,1-dichlorobenzene
	1,2-dichlorobenzene
	1,1-dichlorobenzene
	1,2-trans-dichloroethylene
	2,4-dichlorophenol
	1,2-dichloropropane
	1,2-dichloropropylene
	dieldrin
	diethyl phthalate
	2,4-dimethyl phenol
	di-n-butyl phthalate
	di-n-octyl phthalate
	4,6-dinitro-o-cresol
	2,4-dinitrophenol
	2,4-dinitrotoluene
	2,6-dinitrotoluene
	1,2-diphenylhydrazine
	a-endosulfan (alpha)
	b-endosulfan (beta)
	endosulfane sulfate
	endrin

Present	
	endrin aldehyde
	ethylbezene
	fluoranthene
	fluorene
	heptachlor
	heptachlor epoxide
	hexachlorobenzene
	hexachlorobutadiene
	hexachlorocyclopentadiene
	hexachloroethane
	indeno (1, 2, 3-cd) pyrene
	isophorone
X	methylene chloride
X	naphthalene
	nitrobenzene
	2-nitrophenol
	4-nitrophenol
	n-nitrosodimethylamine
	n-nitrosodi-n-propylamine
	n-nitrosodiphenylamine
	PCB-1016
	PCB-1221
	PCB-1232
	PCB-1242
	PCB-1248
	PCB-1254
	PCB-1260
	pentachlorophenol
	phenanthrene
	phenol
	pyrene
	2,3,7,8--tetrachlorodibenzo-pdioxin
	1,1,2,2-tetrachloroethane
	tetrachloroethylene
	toluene
	toxaphene
	1,2, 4-trichlorobenzene
	1,1, 1-trichloroethane
	1,1 2-trichloroethane
	trichloroethylene
	2,,4, 6-trichlorophenol
	vinyl chloride

SECTION K. NON-DISCHARGED WASTE

1. AT THIS SITE ARE THERE ANY WASTE LIQUIDS OR SLUDGES THAT ARE NOT DISCHARGED TO THE SEWER? ✓ Yes ___ No

IF NO, SKIP THE BALANCE OF SECTION K AND GO TO SECTION L. IF YES, CHECK THOSE THAT APPLY AND INDICATE WHETHER THE WASTE IS RECYCLED. (NA if not applicable)

	Estimated Gal/Yr.	Recycled?		Estimated Gal/Yr.	Recycled?
Acids and Alkalis		___ Yes ___ No	Sump Wastes		___ Yes ___ No
Grease		___ Yes ___ No	Waste Oil		___ Yes ___ No
Paints		___ Yes ___ No	Waste Product		___ Yes ___ No
Pesticides		___ Yes ___ No	Waste Solvent		___ Yes ___ No
Plating Wastes	400	___ Yes ✓ No	Other (Specify)		___ Yes ___ No
Pretreatment Sludge		___ Yes ✓ No			___ Yes ___ No

2. ARE ANY OF THE ABOVE CHECKED WASTES PLACED WITH TRASH FOR DISPOSAL? ___ Yes X No

3. DOES YOUR COMPANY PRACTICE ON-SITE DISPOSAL OF THE CHECKED WASTE? ___ Yes X No

4. IF AN OUTSIDE FIRM REMOVES ANY OF THE ABOVE CHECKED WASTE, STATE THE NAME(S) AND ADDRESS OF ALL WASTE HAULERS.

a. Company Name: Alternative Disposal Hauler
Street/P. O. Box: 2674 Via Alicia
City: Fallbrook State: CA Zip Code: 92028

b. Company Name: ______
Street/P. O. Box: ______
City: ______ State: ______ Zip Code: ______

c. Company Name: Nordic Ind.
Street/P. O. Box: 5215 S. Boyle Ave.
City: Los Angeles State: CA Zip Code: 90058

d. Company Name: ______
Street/P. O. Box: ______
City: ______ State: ______ Zip Code: ______

SECTION L. CERTIFICATION

NOTE TO SIGNING OFFICIAL: *INFORMATION AND DATA IDENTIFYING THE NATURE AND FREQUENCY OF A DISCHARGE SHALL BE AVAILABLE TO THE PUBLIC. REQUESTS FOR CONFIDENTIAL TREATMENT OF ALL OTHER INFORMATION SHALL BE GOVERNED BY PROCEDURES SPECIFIED IN 40 CFR PART 2.*

"I HEREBY CERTIFY UNDER PENALTY OF PERJURY, THAT THE INFORMATION CONTAINED IN THIS APPLICATION IS FAMILIAR TO ME, AND REPRESENTS AN ACCURATE AND COMPLETE STATEMENT OF FACT TO THE BEST OF MY KNOWLEDGE."

Print Name: James A. Krooks Title: Owner
Signature: [signature] Date: 3/15/00

Inspectors' Name: Ralph Harbel
Signature: ______ Date: ______

Attachment 3

NARRATIVE OF SITE VIST TO THE IRON FACTORY
ON AUGUST 30, 2004

I visited the Iron Factory located at 639 Aero Way in Escondido as a follow-up to the inspection made on August 24th by HMD and the Escondido Public Works Wastewater/Industrial Collection Division inspection on August 24th.

I arrived at about 2:40 PM and spoke to the plating shop's owner, Mr. Jim Kronos. I told Mr. Kronos to be certain to write out and save the receipts for all usable chemicals and equipment that was being sold or transferred to other plating businesses. Mr. Kronos stated that "Mario" from North County Polishing and Plating had already transported several containers of plating chemicals from 639 Aero Way to his shop (located at 1175 Industrial Avenue, Escondido).

I cautioned Mr. Kronos that no hazardous waste could be removed from the site without using a registered hazardous waste transporter and proper uniform hazardous waste manifests. Mr. Kronos stated that he was using Alternative Disposal Inc. (California State Registration # 2570) as his hazardous waste hauler.

As I spoke to Mr. Kronos he stated that since the August 24th inspection he had to tell one of his customers that he could no longer do any nickel plating. When I asked why Mr. Kronos stated, "The city water has 600 ppm TDS (total dissolved solids). I have to run this water through my water treatment system (reverse osmosis or deionizer) and I can only use about one third of it. Since the wastewater people were here I don't have a place to dump the excess water so I can't treat water for nickel plating. Where can I put it, down the sink?" As he answered me Mr. Kronos pointed in the direction of the hole in the cinder block wall that gave access to the sewer even though the original discharge point was closed with concrete. Mr. Kronos appeared to be referring to HMD's joint August 24th inspection with the City of Escondido Industrial Waste Division.

On August 24th after Ms. Cindy Esparso discovered the illegal sewer connection I asked Mr. Kronos if he knew who had created the (illegal) sewer access point. He stated that one of his employees might have done it. I asked Mr. Kronos if he knew why his records showing water usage of about 14,000 gallons for June and July were so different from his water supplier's billing statement, which showed that 44,000 gallons of water were used in the same time period. Mr. Kronos replied, "I don't know". When I asked Mr. Kronos why he paid for approximately three times more water (~30,000 gallons) than his own records reported being used he replied, "I just pay the bill". I told Mr. Kronos that he should call the water supplier to request a test/re-calibration of his water meter. Mr. Kronos said it would not be worth the trouble. Mr. Kronos did not explain where the unaccounted 330,00 gallons of water may have gone.

Narrative prepared by;

Edward Slater · September 7, 2004

Edward Slater, Supervising Environmental Health Specialist, Hazardous Materials Division, Department of Environmental Health

Attachment 4

TABLE 9.2 REPORTED VALUES FOR BIOLOGICAL PROCESS TOLERANCE LIMITS OF INORGANIC PRIORITY POLLUTANTS

POLLUTANT	THRESHOLD OF INHIBITORY EFFECT, mg/L					
	ACTIVATED SLUDGE		ANAEROBIC DIGESTION		NITRIFICATION	
	Russell[a]	EPA[b]	Russell[a]	EPA[b]	Russell[a]	EPA[b]
Arsenic	0.1	0.04-0.4	1.5			0.1-1
Cadmium	1.0	0.5-10	0.02	0.02-1	5.2	5-9
Chromium (VI)	1		5		0.25	
Chromium (III)	10		50			
Chromium (Total)		1-20		1.5-50		0.25-1
Copper	1.0	0.1-1	0.5	0.5-100	0.48	0.05-0.5
Cyanide	0.1	0.05-20	4	0.1-4	0.34	0.3-20
Lead	0.1	0.1-10		50-250	0.5	0.5-1.7
Mercury	0.1	0.1-5.0	1365	1400		2-12.5
Nickel	1	1-5	10	2-200	0.25	0.25-5
Silver	5	0.03-5				0.25
Zinc	0.08	0.3-20	1.5	1-10	0.08	0.01-1

[a] Russell, L. C. Cain, C. B., and Jenkins, D. J. "Impact of Priority Pollutants on Publicly Owned Treatment Works and Processes: A Literature Review. Purdue Industrial Waste Conference," 37(1982), 871-882. *CAUTION:* The published Purdue paper has the values in the Anaerobic Digestion and Nitrification columns interchanged and is incorrect.

[b] *GUIDANCE MANUAL FOR PREVENTING INTERFERENCE AT POTWs.* References: US EPA (1981a), Russell, et al (1983), Geating (1981) and US EPA (1986a).

NOTE: Values reported in literature can be in error and reference to original papers is very important. Values reported in literature may refer to soluble fraction or to total amount of a pollutant.

ACKNOWLEDGMENT. Many thanks to Chris Cain for his assistance in sorting out the conflicts in the literature

Attachment 5 Pictures of Iron Factory Illegal Connection