UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IX
75 Hawthorne Street
San Francisco, CA 94105

October 26, 2005

In Reply Refer To: WTR-7

Doug Scrimes
Director of Process & Product Improvement
Pioneer Circuits, Incorporated
3000 South Shannon Street
Santa Ana, California 92704

Re: June 21, 2005 Clean Water Act Inspection

Dear Mr. Scrimes:

Enclosed is the October 26, 2005 report for our June 21 inspection of Pioneer Circuits. Please submit a short response to the findings in Sections 2 through 5 of this report, to EPA, Orange County, and the Regional Water Quality Control Board, by **December 30, 2005**.

The primary finding concerns the intermittent copper violations documented in the sample record even though the on-site treatment was found to exceed in design and performance the model best-available-technology treatment used in originally setting the Federal standards. This means the violations are not the result of partial or compromised treatment but rather are likely related to the operation and maintenance of the on-site treatment or possibly to the water quality of the untreated wash waters.

The secondary finding concerns new source Federal standards. Pioneer Circuits no longer is subject solely to the Federal electroplating standards for existing sources but also is subject to the more stringent Federal metal finishing standards for new sources. This means the Federal standards as they are applied in the Orange County permit are no longer correct. The copper violations and the compliance for other pollutants were identified against these corrected Federal standards.

Under the definitions in 40 CFR 403.3(k), a process constructed at an existing source metal finisher after August 31, 1982 is a new source (1) if it entirely replaces a process which caused a discharge from an existing source or (2) if it is substantially independent of the existing sources on-site. This means the new source standards apply to the original installation of printed circuit board manufacturing lines, rebuilt or moved lines, or existing lines converted to do entirely new operations. This also means the new source standards generally do not apply to the piecemeal replacement of tanks for maintenance in otherwise intact printed circuit board manufacturing lines. The new source standards essentially apply when a change in configuration provides the opportunity to install the best-available-technology ("BAT") treatment for new sources. Qualifying changes at Pioneer Circuits include the addition the new cupric etch line in 2001, the new ammonium etching line in 1993, and the installation of the new plating room in the early 1990's.

I certainly appreciate your helpfulness extended to me during this inspection. I remain available to Orange County and to you to assist in any way. Once again, thank you for your cooperation during this inspection. Please do not hesitate to call me at (415) 972-3504 or e-mail at arthur.greg@epa.gov.

Sincerely,

Original signed by:
Greg V. Arthur

Greg V. Arthur
CWA Compliance Office

Enclosure

cc: Chris Pelletier, OCSD
Julio Lara, RWQCB-Santa Ana

U.S. ENVIRONMENTAL PROTECTION AGENCY

REGION 9

CLEAN WATER ACT COMPLIANCE OFFICE

NPDES COMPLIANCE EVALUATION INSPECTION REPORT

Industrial User:	Pioneer Circuits, Incorporated 3010 South Shannon St, Santa Ana, California 92704 40 CFR 413 Subpart H – Job-Shop Printed Circuit Board Mfg 40 CFR 433 Subpart A – Metal Finishing
Treatment Works:	Orange County Sanitation District Fountain Valley Wastewater Reclamation Plant No.1 and Huntington Beach Wastewater Treatment Plant No.2 (NPDES Permit CA0110604)
Date of Inspection:	June 21, 2005

Inspection Participants:

US EPA:	Greg V. Arthur, Region 9, CWA Compliance Office, (415) 972-3504
RWQCB-Santa Ana:	Julio Lara, Water Resources Control Engineer, (951) 782-4901 Najah Amin, Water Resources Control Engineer, (951) 320-6362
Orange County SD:	Chris Pelletier, Source Control Engineer, (714) 962-2411
Pioneer Circuits	Brian Park, Process Engineer, (714) 641-3132 Michelle Nerona, Environmental Technician, (714) 641-3132 Doug Scrimes, Director, Prcss/Product Improvement, (714) 641-3132

Report Prepared By:	Greg V. Arthur, Environmental Engineer October 26, 2005

1.0 Scope and Purpose

On June 20, 2005, EPA, the California Regional Water Quality Control Board Santa Ana Region ("RWQCB"), and the Orange County Sanitation District ("OCSD") conducted a compliance evaluation inspection of Pioneer Circuits, Inc. ("Pioneer Circuits") in Santa Ana, California. The purpose was to ensure compliance with the Federal regulations covering the discharge of non-domestic wastewaters into the sewers. In particular, it was to ensure:

- Classification in the proper Federal categories;
- Application of the correct standards at the correct sampling points;
- Consistent compliance with the standards; and
- Fulfillment of Federal self-monitoring requirements.

Pioneer Circuits is a significant industrial user ("SIU") within the OCSD sewer service area whose compliance was assessed as part of a 2005 evaluation of the OCSD pretreatment program by the RWQCB, its contractor, Tetra Tech, and EPA. The inspection participants are listed on the title page. Arthur conducted the inspection of Pioneer Circuits on June 21.

1.1 Process Description

Pioneer Circuits is a job-shop manufacturer of multilayer printed circuit boards made to customer specifications for aerospace, avionics, missiles, and medical applications at 3010 South Shannon Street in Santa Ana, California. The manufacturing steps include template photo development, board scrubbing, photo resist, inner layer etching, photo resist strip, board lay-up, hole drilling and electroless-copper plating, copper plating, ammonium etching, and solder reflow, leveling, mask and strip. Nickel and gold tab plating are done off-site.

Surface Prep	• film template – photo development • copper clad laminate board scrub – acid clean, mechanical scrub • photo resist – K_2CO_3 -carbonate developer • inner layer etching – $CuCl_2$-etch, KOH-photo resist strip, HCl-acid activate • multilayer board lay-up – (Cobra-)bonding, dry punching, insulation layer cutting, vacuum lamination
E-less Plating	• hole drilling • hole plating – solvent clean, $KMnO_4$-hole desmear, H_2SO_4-acid activation, caustic polyamide clean, $NaHF_2$-glass etching, HCl-acid etch, alkaline surfactant clean, $Na_2S_2O_8$ (persulfate)/H_2SO_4-acid microetch, palladium catalyst, electroless-copper plating
Plating	• copper plating line – H_2SO_4-acid clean, persulfate/H_2SO_4-acid microetch, acid copper plating, HBF_4-acid pre-dip • acid tin/lead solder plating
Etching	• ammonium oxidation etching line
Solder	• solder line – HNO_3-acid solder strip, ethylamine/K_2CO_3-solder mask developing, hot-air solder leveling, hot-oil solder reflow

Pioneer Circuits began operations before 1983. Air quality permits posted on the facility walls indicated that Pioneer Circuits installed the new cupric etch line in 2001 and the new ammonium etch line in 1993. Pioneer Circuits also indicated that the plating room was newly installed 12 to 14 years ago in the early 1990's.

Pioneer Circuits discharges its non-domestic and domestic wastewaters to the City of Santa Ana domestic sewers to the Orange County wastewater treatment plants. There is a single sewer connection into the domestic sewers designated in this report by permit number as IWD-11262. See Appendix 1.

1.2 Facility SIC Code

Pioneer Circuits is assigned the SIC code for printed circuit board manufacturing (SIC 3672).

1.3 Facility Wastewater Sources

The printed circuit board manufacturing lines generate spents, rinses, and wash waters from the image developers and metal finishing steps, as well as blowdowns and reverse osmosis reject brine. The 2003 Orange County pre-permit inspection report provides a detailed list of the solution and rinse tanks on-site identified by tank number. See Appendix 1.

Spent Solutions – The imparted contamination from the processing of parts and the progressive drop in solution strength results in the generation of spent solutions. Pioneer Circuits hauls off-site for reclaim ammonium etchant spents, cupric etchant spents, and template film photo fixant spents. Pioneer Circuits batch treats for discharge to the sewers spent acids, alkaline cleaners, strippers, electroless copper, and developers. The remaining solutions lose enough through drag-out for regeneration strictly through additions.

Hauled Off-site	On-site Batch Treatment	Regenerated By Additions
ammonium etchant cupric etchant template film fixant	H_2SO_4-acid activation HCl-acid cleaning $KMnO_4$-desmear HBF_4-acid pre-dip $NaHF_2$-glass etch polyamide caustic clean alk surfactant cleaning persulfate-acid microetch electroless copper plate photo resist developer solder mask developer KOH photo resist strip HNO_3-acid solder strip	acid copper plating tin/lead plating solvent clean palladium catalyst
No Sewer Discharge	Discharged @ IWD-11262	No Sewer Discharge

Static Rinses – Pioneer Circuits follows many but not all of its metal finishing and image developer steps with static rinses often in 2-stage or 3-stage countercurrent series. Nearly all static rinses are treated and discharged through either ion exchange or batch chemical treatment. The exceptions are the first-stage drag-out rinses for tin/lead plating and hole desmear.

Ion Exchange	On-site Batch Treatment	Solution Make-Up Returns
HCl-acid clean 2-stage microetch 2-stage palladium catalyst H_2SO_4-acid clean tin/lead plate final-stage alk surfactant clean 2-stage cobrabond 2-stage solder mask spray solvent clean 2-stage $KMnO_4$-desmear 2-stage H_2SO_4-activation 2-stage	cobrabond DI 1°-stage microetch 1°-stage	tin/lead plate drag-out $KMnO_4$-desmear drag-out
Untreated		
solder reflow		
Discharged @ IWD-11262	Discharged @ IWD-11262	No Sewer Discharge

Running Rinses – Pioneer Circuits employs a number of second stage overflow and spray rinses. Nearly all overflow and spray rinses are treated and discharged through either ion exchange or batch treatment. The exceptions are a few untreated rinses related to soldering, board preparation, and photo resist. The 2003 Orange County pre-permit inspection report identifies the use of on-demand flow controls on a limited number of overflowing rinses but none of these were observed during this inspection.

Ion Exchange	On-site Batch Treatment	Untreated
NaHF2 glass etch overflow HCl-acid activate overflow Pd-catalyst DI-overflow e-less copper overflow H_2SO_4-acid clean spray tin/lead plate 2°-spray solder brightener overflow ammonium etch cascade cupric etch cascade	cobrabond DI-overflow solder strip low-overflow	board scrubbing washdown board cleaning cascade board cleaning DI-spray photo resist strip cascade photo resist develop cascade solder mask develop spray
Discharged @ IWD-11262	Discharged @ IWD-11262	Discharged @ IWD-11262

Blowdowns – Reverse osmosis reject brine, fume scrubber blowdown, and cooling tower blowdown also are generated on-site. The ion exchange columns used to treat low-copper rinses are regenerated on-site and produce a concentrated regenerant blowdown.

Ion Exchange	On-Site Batch Treatment	Untreated
none	ion exchange regenerant	cooling tower blowdown fume scrubber blowdown reverse osmosis reject
n/a	Discharged @ IWD-11262	Discharged @ IWD-11262

Domestic Sewage – Domestic sewage discharges into the City of Santa Ana sewer lateral through separate connections downstream of the industrial wastewater connection.

1.4 Facility Process Wastewater Composition

The following determinations of the composition of the wastewaters listed above in section 1.3 were determined strictly by interview, observation, and literature search. There were no sample results in the sample record for Pioneer Circuits specific to these wastewaters.

Ion Exchange Sources	Batch Treatment Sources	Untreated Sources
copper, nickel, tin, zinc, complexed metals, ammonia, other chelating agents, dissolved solids, low pH, high pH, surfactants	copper, lead, nickel, tin, zinc, chromium, palladium, complexed metals, ammonia, other chelating agents, stannic oxide, dissolved solids, low pH, high pH, surfactants	minerals, copper, abrasives, board dust, low pH, high pH, biocide
Ion Exchange Chemicals	Batch Treatment Chemicals	
caustic, salts, low pH, high pH	caustic, sulfuric acid, sodium sulfide, polymer, ferrous sulfate	

The fume scrubber blowdown would be expected to contain entrained metals from acidic mists. The cooling tower blowdown would be expected to be alkaline and contain an introduced biocide. The reverse osmosis brines would be expected to contain entrained minerals concentrated from the water supply. The chemical make-up of the introduced conditioning chemicals in the blowdowns was not determined during this inspection.

1.5 Facility Process Wastewater Treatment

Pioneer Circuits operates a flow-through ion exchange wastewater treatment unit and a batch chemical wastewater treatment unit to treat most spent solutions, and most static, spray and running rinses. The other wastewaters, comprising a few selected rinses, the blowdowns and reject waters bypass around both the flow-through ion exchange and the batch treatment for discharge through one or both of the final clarifiers to the sewers, without treatment for toxic metals, cyanide, or pH. The 2004 Orange County annual report lists Pioneer Circuits as discharging an average of 35,000 gallons per day ("gpd") to the sewers. See the table on the next page. See Appendix 1.

Flow Estimates	Ion Exchange	Batch Treat	Inside Clarifier	Final Clarifier
Treated Flows	20,000 gpd	2,500 gpd	22,000 gpd	22,000 gpd
Total Flows	20,000 gpd	2,500 gpd	28,000 gpd	35,000 gpd
Untreated %	0%	0%	20%	40%

Delivery – All treated wastewaters are hard plumbed to the treatment units. All untreated wastewaters are hard plumbed through the one or both of the final clarifiers.

Ion Exchange – Pioneer treats an estimated 20,000 gpd of low-copper rinse waters through two ion exchange columns. The ion exchange columns are preceded by an 800 gallon pH adjustment tank in which the incoming wastewaters are preconditioned with caustic to an influent pH between 5.0 and 7.0 s.u. Pioneer Circuits regenerates the ion exchange columns on-site, thereby producing a salty regenerant waste stream, expected to have a high pH. The ion exchange effluent is discharged through both of the final two clarifiers to the sewers.

Batch Treatment – Pioneer Circuits treats an estimated 2,500 gpd (~seven batches per day) of concentrated wastewaters and copper-bearing rinses through chemical batch treatment for discharge to the sewers. The batch treatment unit consists of four 2,000 gallon equalization tanks for concentrated alkalines, concentrated acids, ion exchange regenerant, and filter press filtrate, followed by two 350 gallon batch reactor tanks, and two 1,200 gallon settling tanks. The contents impounded in the four equalization tanks are fed sequentially into the batch reactor tanks for segregated treatment. The batch treatment involves metals hydroxide precipitation, metals sulfides precipitation, polymer flocculation, and coagulation. The batch treated wastewaters are discharged through both of the final two clarifiers to the sewers.

Final Clarifiers – Pioneer Circuits discharges an estimated 13,000 gpd of untreated wastewaters along with the estimated 22,000 gpd of treated wastewaters through one or both of the final two clarifiers. The untreated wastewaters comprise an estimated 6,000 gpd of developer rinses and board preparation wash waters, 5,000 gpd of reverse osmosis reject (~20% reject rate), and 2,000 gpd of solder-related rinses. The final clarifiers provide no treatment for metals, cyanide, or final pH. See the photos on the next page.

Residuals Handling – The batch treatment filter press sludges are hauled off-site as hazardous by Univar. Spent etchants are hauled off-site for reclaim by LA Chemical.

Sewer Discharge and Compliance Sampling – Treated and untreated wastewaters combine for discharge through the underground final clarifier. The final clarifier serves as the permitted compliance sampling point, IWD-11262.

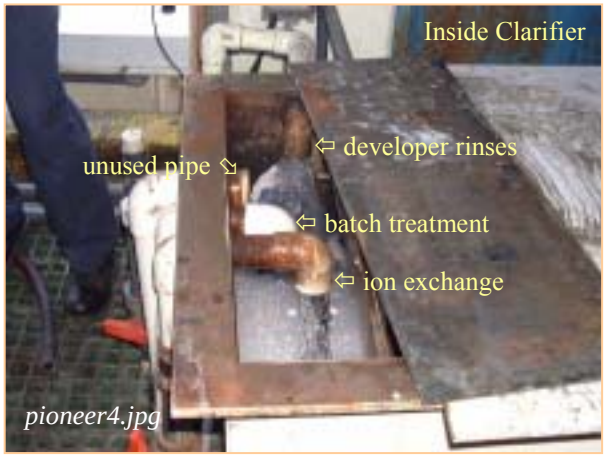
Operational Controls – Pioneer Circuits incorporates a number of good operational controls that improve the reliability and performance of the on-site wastewater treatment. In particular, batch treatment benefits from operating in batch mode, and from the sequenced treatment of waste streams delivered and segregate by type from dedicated equalization tanks. Pioneer Circuits also implements a number of operational controls that influence water quality including the extensive but not universal use of multiple-staged static rinses, over-tank spray rinses, and deactivation rinses between processing steps of differing surface chemistry.

1.6 POTW Legal Authorities

Orange County Sanitation Districts – OCSD operates an EPA-approved pretreatment program as required by the State of California in the Santa Ana RWQCB's Waste Discharge Requirements, No. R8-2004-0062, reissued to OCSD in 2004, and serving as NPDES Permit No. CA0110604. As part of this, OCSD has established sewer use Ordinance No.1 that applies to all industrial users of its sewer system. Under this authority, Orange County issued an industrial user permit to Pioneer Circuits, No. 1-1-262 covering the sewer discharge from IWD-11262.

1.7 Photo Documentation

Arthur took four digital photographs during this inspection. The file names are *pioneer3.jpg, pioneer4.jpg, pioneer5.jpg, and pioneer6.jpg*. Three of the photographs are depicted below. The fourth is a duplicate of *pioneer4.jpg*.



Top left shows the inlets into the inside clarifier, with ion exchange contributing approximately three times the flow of the developer rinses (*pioneer4.jpg*). Top right shows a small sewer vault with the solder mask rinse inlets (*pioneer6.jpg*). Left shows the underground final clarifier and final discharge point (*pioneer5.jpg*).

Photos Taken by: Greg V. Arthur
Date: June 21, 2005

2.0 Sewer Discharge Standards and Limits

Federal categorical pretreatment standards (where they exist), national prohibitions, and the local limits (where they exist) must be applied to the sewered discharges from industrial users. (40 CFR 403.5 and 403.6).

The Federal categorical pretreatment standards for job-shop electroplating in 40 CFR 413 for existing sources and for metal finishing in 40 CFR 433 for new sources apply to the process wastewater discharges from Pioneer Circuits through IWD-11262. The OCSD permit only applied local limits and the Federal standards for existing sources in 40 CFR 413. As a result, the permit does not accurately state the discharge requirements for Pioneer Circuits. The application of Federal categorical standards, national prohibitions, and local limits was determined through visual inspection. See Appendix 2 for the sewer discharge standards and limits.

Requirements

- The Federal standards for existing source job-shop electroplating and new source metal finishing must be applied to the discharge through IWD-11262 using the combined wastestream formula.

- The permit must prohibit dilution as a substitute for any treatment that is necessary to comply with Federal standards.

Recommendations

- Pioneer Circuits should determine the percentage of wastewaters generated by the new sources and by the non-contact dilution water sources for the permitted compliance sampling point, IWD-11262.

2.1 Classification by Federal Point Source Category

Pioneer Circuits qualifies as a printed circuit board manufacturer subject to the Federal job-shop electroplating standards for existing sources in 40 CFR 413 (>10,000 gallons per day) and to the Federal metal finishing standards for new sources in 40 CFR 433. OCSD classified Pioneer Circuits as subject to just the job-shop electroplating standards. Federal standards are self-implementing which means they apply to regulated waste streams whether or not they are implemented in a local permit. The Federal rules in 40 CFR 403.6 define domestic sewage and non-contact wastewaters to be dilution waters.

New or Existing Sources – Pioneer Circuits no longer is subject solely to the Federal standards for existing sources. Under the definitions in 40 CFR 403.3(k), a process constructed at an existing source printed circuit board manufacturer after August 31, 1982 is a new source (1) if it entirely replaces a process which caused a discharge from an existing source or (2) if it is substantially independent of the existing sources on-site. This means the new source standards apply to the original installation of printed circuit board manufacturing

lines, rebuilt or moved lines, or existing lines converted to do new operations. This also means the new source standards generally do not apply to the piecemeal replacement of tanks for maintenance in otherwise intact printed circuit board manufacturing lines. The new source standards apply when a change in configuration provides the opportunity to install the best-available-technology ("BAT") treatment for new sources.

The non-domestic wastewater discharges delineated by Federal category classification follow below. The rough flow estimates by category were based solely on proportions of the number of solution and rinse tanks by category.

Metal Finishing New Sources 40 CFR 433.17	Job-Shop Electroplating Existing Sources 40 CFR 413.84(c)(g)	Unregulated or Dilution Waters 40 CFR 403.6
cupric etch line ammonium etch line copper plating line tin/lead plating line electroless copper line fume scrubber blowdown • 24 spent solutions • 15 static rinses • 17 running rinses	surface prep line photo resist/strip line solder mask/strip line • 26 solution tanks • 26 static rinses • 18 running rinses	reverse osmosis reject cooling tower blowdown
estimated flow ~ 40%	estimated flow ~ 45%	estimated flow ~ 15%

2.2 Local Limits and National Prohibitions

Local limits and the national prohibitions are meant to express the limitations on non-domestic discharges necessary to protect the sewers, treatment plants and their receiving waters from adverse impacts. In particular, they prohibit discharges that can cause the pass-through of pollutants into the receiving waters or into reuse, the operational interference of the sewage treatment works, the contamination of the sewage sludge, sewer worker health and safety risks, fire or explosive risks, and corrosive damage to the sewers. The national prohibitions apply nationwide to all non-domestic sewer discharges. The OCSD local limits apply to non-domestic discharges in the OCSD service area.

2.3 Federal Categorical Pretreatment Standards
Existing Source Job-Shop Electroplating >10,000 gpd - 40 CFR 413.84(c)(g)

40 CFR 413 >10kgpd	Cd	Cr	Cu	Pb	Ni	Ag	Zn	CNt	TTO	TM
daily-maximum (mg/l)	1.2	7.0	4.5	0.6	4.1	1.2	4.2	1.9	2.13	10.5
four-day average (mg/l)	0.7	4.0	2.7	0.4	2.6	0.7	2.6	1.0	-	6.8
stat conversion to mo-avgs	0.5	2.5	1.8	0.3	1.8	0.5	1.8	0.55	-	5.0

Applicability - The Federal job-shop electroplating standards apply to printed circuit board manufacturers that were in operation in their present configuration before the August 31,

1982 proposal date of the Federal metal finishing rule. This means the job-shop electroplating standards in 40 CFR 413.84(c)(g) apply to the process wastewater discharges at Pioneer Circuits from the printed circuit board manufacturing operations continuing unchanged in operation since August 31, 1982. The Federal job-shop electroplating standards in 40 CFR 413 do not apply at Pioneer Circuits to any new printed circuit board manufacturing lines, rebuilt or moved lines, or existing lines converted to do entirely new operations, if these changes in configuration occurred after August 31, 1982. See section 2.1 of this report for the list of wastewater discharges subject to the existing source standards in 40 CFR 413 and to the new source standards in 40 CFR 433. As a result, the job-shop electroplating standards apply to some of the process wastewater discharges to IWD-11262.

Basis of the Standards – The job-shop electroplating standards were based on a model pretreatment unit that comprises metals precipitation, settling, sludge removal, source control of toxic organics, and if necessary, cyanide destruction and chromium reduction. The best-available-technology standards were set where printed circuit board manufacturers and other job-shop metal finishers with model treatment operated at a long-term average and variability that achieved a compliance rate of 99% (1 in 100 chance of violation).

Adjustments – The Federal categorical pretreatment standards at IWD-11262 must be adjusted to account for dilution and for dual Federal categories because the wastewaters through this compliance sampling point qualify as Federally-regulated under 40 CFR 413 and 40 CFR 433, and as dilution waters under 40 CFR 403.6. The Federal standards in 40 CFR 413 for existing sources and 40 CFR 433 for new sources would have to be adjusted using the combined wastestream formula as specified in 40 CFR 403.6(e). The Federal job-shop electroplating standards include a provision to statistically convert the four-day average standards in 40 CFR 413 to monthly-averages which can be mathematically combined with the monthly-average standards in 40 CFR 433. See Appendix 2 for the adjusted Federal categorical pretreatment standards as applied to IWD-11262.

Compliance Deadline - Existing source printed circuit board manufacturers were required to comply with all Federal job-shop electroplating standards by the final compliance deadline of July 31, 1986.

2.4 Federal Categorical Pretreatment Standards New Source Metal Finishing - 40 CFR 433.17

40 CFR 433.17	Cd	Cr	Cu	Pb	Ni	Ag	Zn	CNt	CNa	TTO
daily-maximum (mg/l)	0.11	2.77	3.38	0.69	3.98	0.43	2.61	1.20	0.86	2.13
month-average (mg/l)	0.07	1.71	2.07	0.43	2.38	0.24	1.48	0.65	0.32	-

Applicability - Under 40 CFR 433.10(a), the metal finishing standards apply to the process wastewaters from the new source printed circuit board manufacturing operations. The metal finishing standards "... apply to plants that perform ..." the core operations of electroplating, electroless plating, etching, anodizing, chemical coating, or printed circuit board manufacturing and they extend to other on-site operations, such as cleaning, associated with metal finishing and specifically listed in 40 CFR 433.10(a). If any of the core operations are performed, the new source metal finishing standards apply to discharges from any of the new

source core or associated operations. As a result, the metal finishing standards apply to some of the process wastewater discharges to IWD-11262.

Basis of the Standards - The new source metal finishing standards were based on a model pretreatment unit that comprises metals precipitation, settling, sludge removal, source control of toxic organics, no discharge of cadmium-bearing wastewaters, and if necessary, cyanide destruction and chromium reduction. The best-available-technology standards were set where printed circuit board manufacturers and other metal finishers with model treatment operated at a long-term average and variability that achieved a compliance rate of 99% (1 in 100 chance of violation).

Adjustments – See section 2.3, Adjustments, on page 10 above. In addition, under 40 CFR 433.12(c), the cyanide standards as applied to metal finishing wastewater discharges must be adjusted to account for dilution from non-cyanide bearing waste streams (Federally-regulated and unregulated). Since the new sources at Pioneer Circuits do not generate any cyanide-bearing wastewaters, they are unregulated for total cyanide and amenable cyanide.

Compliance Deadline - New sources were required to comply on the first day of discharge.

2.5 Point(s) of Compliance

Local limits and the national prohibitions apply end-of-pipe to all non-domestic flows from Pioneer Circuits. The sample point designated in this report as IWD-11262 is a suitable end-of-pipe sample point representative of the day-to-day non-domestic wastewater discharges. Federal categorical pretreatment standards apply end-of-process-after-treatment to all Federally-regulated discharges to the sewers. The sample point IWD-11262 is also a suitable sample point representative of the day-to-day discharge of Federally-regulated wastewaters.

2.6 Compliance Sampling

Local limits and the national prohibitions are instantaneous-maximums and are comparable to samples of any length including single grab samples. Federal categorical pretreatment standards are daily-maximums comparable to 24-hour composite samples. The 24-hour composite samples can be supplanted with single grabs or manually-composited grabs that are representative of the sampling day's discharge.

3.0 Compliance with Federal Standards

Industrial users must comply with the Federal categorical pretreatment standards that apply to their process wastewater discharges. 40 CFR 403.6(b).

Categorical industrial users must comply with the prohibition against dilution of the Federally-regulated waste streams as a substitute for treatment. 40 CFR 403.6(d).

Industrial users must comply with the provision restricting the bypass of treatment necessary to comply with any pretreatment standard or requirement. 40 CFR 403.17(d).

Wastewater treatment at Pioneer Circuits exceeds in design the best-available-technology model treatment used in originally setting the Federal standards. Nevertheless, Pioneer Circuits has not achieved the consistent compliance expected from model treatment, with its sampling results at times exceeding the Federal standards for copper. The likely cause is operational and not treatment related resulting from incomplete or overloaded batch treatment or from an unexpected breakthrough of ion exchange, although the untreated discharges from board preparation may also prove to be copper-bearing. Finally, the Federal standards are more stringent than advanced in the OCSD permit. There is no evidence of dilution as a substitute for treatment or of bypassing of treatment necessary to comply. See Appendix 3.

Requirements

- Pioneer Circuits must achieve consistent compliance with its Federal standards for copper.

Recommendations

- Batch treated wastewaters should be discharged only after verifying compliance through water quality testing.
- Batch treated wastewaters found in compliance through testing should be metered for discharge, or if found to be in non-compliance, hauled off-site.
- The ion exchange should be retrofitted with automatic alarms indicating the pending breakthrough of contaminants and with automated switching and regeneration.
- Board preparation rinses should be tested and batch treated if found to be copper-bearing.
- Pioneer Circuits should consider installation of equalization either before ion exchange or after that would allows the return of off-spec wastewaters for re-treatment.

3.1 Sampling Records

The 2003-2005 sample records for Pioneer Circuits at IWD-11262 consists of quarterly self-monitoring 24-hour composite samples collected by Pioneer Circuits and quarterly samples

collected by OCSD. These samples indicate that Pioneer Circuits, as currently designed and operated, complies with its Federal standards most of the time. However, Pioneer Circuits has not achieved consistent compliance with its Federal daily-maximum and monthly-average standards for copper of 3.38 and 1.64 mg/l, with average and calculated 99th% peak copper concentrations of 1.22 and 5.37 mg/l.

The sample results are usable for determining compliance with the Federal standards. However, while the 24-hour composite samples are representative over the sampling day, they are not representative over the Federally-required six month reporting period. Four of the five main wastewater contributions that report to the clarifiers would be expected to exhibit little day-to-day variability (*ion exchange effluent, solder mask rinses, non-contact blowdowns, and wash waters from board preparation and photo resist*). The fifth (*batch treatment effluent*) would be expected to vary depending on which spent solutions or static rinses are treated per batch, however that variability would be mitigated by the control over the discharge quality inherent in batch treatment. As a result, the variability in the effluent quality evident in the sample record for copper indicates that there may be other potential sources of variability, conceivably from the faulty operation of the ion exchange columns, or from the contact cleaning and scrubbing of copper clad boards. The variability from undefined sources points to the need to increase the frequency of sampling for copper and possibly for lead as well. See section 5.0 on page 17.

3.2 Best-Available-Technology Treatment

Pioneer Circuits discharges dilute low-copper bearing rinses treated through ion exchange, copper-bearing concentrates and rinses through batch chemical treatment, and certain other non-contact blowdowns, wash waters, and rinses without treatment.

Ion Exchange – Pioneer Circuits provides ion exchange treatment for nearly 60% of the total wastewater volume discharged to the sewers through IWD-11262. In many applications, ion exchange is considered to exceed in performance and to be equivalent in design to the BAT model treatment used in setting the Federal standards for metal finishing and existing source job-shop electroplating. The ion exchange at Pioneer Circuits would be expected to produce a consistent low-copper slightly mineralized effluent as long as the incoming wastewaters do not overload or compromise the ion exchange resins. Nevertheless, the occasional instances of elevated copper in the sample record for IWD-11262 indicates the possibility of unsteady ion exchange operations.

Batch Chemical Treatment – Pioneer Circuits batch treats approximately 7% of the total wastewater volume as well as the majority of the contaminant loadings discharged to the sewers through IWD-11262. Batch treatment also further produces all of the residual metals precipitates removed through treatment since the high-strength ion exchange regenerants are also batch treated. The batch treatment involves both hydroxide and sulfide precipitation, coagulation, flocculation, and settling and thus is equivalent in design to the BAT model treatment used in setting the Federal standards that apply to Pioneer Circuits. Batch treatment would be expected to produce mineralized effluents that could greatly vary by batch depending on the quality of the wastewaters undergoing treatment.

Untreated Through Final Clarifiers – The untreated discharges consist of non-contact blowdowns, board preparation wash waters, and photo resist and solder mask developer rinses. The non-contact reverse osmosis reject and cooling tower blowdowns would not be expected to entrain contaminants beyond the mineralization present in the city water supply and the conditioning additives in trace levels such as chlorinated-organic biocides, descalants, and corrosion inhibitors. The fume scrubber blowdown would be expected to acidic and potentially metals-bearing in trace amounts. Photo resist and solder mask developer rinses would be expected to be alkaline but not metals-bearing. However, the board preparation wash waters from acid cleaning and scrubbing of the copper clad boards could entrain both dissolved copper and copper-bearing abrasion slurry. The blowdowns and the developer rinses would not be expected to vary in quality day-to-day, however the variability in the water quality from board preparation is unknown.

3.3 Dilution as a Substitute for Treatment

The Federal standards in 40 CFR 403.6(d) prohibit "dilution as a substitute for treatment" in order to prevent compromising BAT model treatment with dilute waste streams. In particular, this prohibition applies when sample results for a diluted waste stream are below the Federal standards and the apparent compliance is used to justify discharge without treatment. There are two conditions that need to be established in order to make a determination of non-compliance with this prohibition. First, some or all of the Federally-regulated wastewaters must discharge without undergoing BAT model treatment or its equivalent. Second, there must be some form of excess water usage within a Federally-regulated process.

Pioneer Circuits meets the first condition of non-compliance since a portion of the Federally-regulated waters discharge untreated for metals although it is not certain that these wastewaters carry enough copper to require treatment. However, there is no evidence that Pioneer Circuits does not meet the second condition since nearly all process wastewaters including all rinses discharge through treatment equivalent to or exceeding BAT model treatment.

3.4 Bypass Provision

The Federal standards in 40 CFR 403.17 prohibit the bypassing of any on-site treatment necessary to comply with standards unless the bypass was unavoidable to prevent the loss of life, injury, or property damage, and there were no feasible alternatives. This provision explicitly prohibits bypasses that are the result of a short-sighted lack of back-up equipment for normal downtimes or preventive maintenance. It also explicitly prohibits bypasses that could be prevented through wastewater retention or the procurement of auxiliary equipment. It specifically allows bypasses that do not result in violations of the standards as long as there is prior notice and approval from the sewerage agency or State.

For the most part, there cannot be bypassing at Pioneer Circuits since the majority of the Federally-regulated wastewater undergoes treatment that exceeds or is equivalent to the BAT model treatment. However, the board preparation wash waters would be considered to bypass treatment necessary to comply with standards if they are found to be the source of the copper violations.

4.0 Compliance with Local Limits and National Prohibitions

All non-domestic wastewater discharges to the sewers must comply with local limits and the national prohibitions. 40 CFR 403.5(a,b,d).

Industrial users must comply with the provision restricting the bypass of treatment necessary to comply with any pretreatment standard or requirement. 40 CFR 403.17(d).

Compliance with the Federal requirements would be expected to also result in compliance with the local limits for copper, lead and zinc. No controls are necessary for the other metals, pesticides, cyanide, sulfides, flammability, or PCBs because Pioneer Circuits is not expected to discharge wastewaters containing significant levels of these locally-limited pollutants. However, the acidic and alkaline nature of the printed circuit board wastewaters and the pH adjustment inherent in operating treatment supports the need to install continuous final pH metering. Acidic wastewaters in particular pose a risk to worker health and safety through exposure and the release of toxic fumes, as well as acidic degradation of the sewers themselves. See Appendix 3. Also see Section 3.0 of this report.

Requirements

- Pioneer Circuits must ensure that grab samples comply with the local limit for copper.

Recommendations

- None.

4.1 National Objectives

The general pretreatment regulations were promulgated in order to fulfill the national objectives to prevent the introduction of pollutants that:

(1) cause operational interference with sewage treatment or sludge disposal,
(2) pass-through sewage treatment into the receiving waters or sludge,
(3) are in any way incompatible with the sewerage works, or
(4) do not improve the opportunities to recycle municipal wastewaters and sludge.

This inspection did not include an evaluation of whether achievement of the national objectives in 40 CFR 403.2 have been demonstrated by the OCSD wastewater treatment plants through consistent compliance with their sludge and discharge limits.

4.2 Local Limits for Oxygen Demanding Pollutants and The National Prohibition Against Interference

The wastewaters discharged to the sewers are not high enough in organics strength to pose a risk of interference, with average and statistical maximums for BOD of 46 and 77 mg/l.

4.3 Local Limits for Toxic Metals, Cyanide, and Other Pollutants and The National Prohibition Against Pass-Through

Federally-Regulated Metals – Corrective actions necessary to achieve consistent compliance with the Federal standards for copper would be expected to also result in compliance with the local limit. The Federal monthly-average standards are more stringent than local limits for all of the Federally-regulated metals (*cadmium, chromium, copper, nickel, lead, silver, and zinc*).

Mercury and Arsenic – Although mercury and arsenic are regulated solely by local limits and not by Federal standards neither pollutant would be expected in the discharges in concentrations requiring treatment beyond the model BAT treatment for Federal standards, if at all.

Total or Amenable Cyanide – The wastewaters discharged through IWD-11262 are not expected to contain any cyanide-bearing wastewaters.

Toxic Organics – OCSD reviewed and approved a toxic organics management plan with self-certifications in lieu of self-monitoring. As a result, toxic organics are not expected in significant amounts. The OCSD sample maximum is above detection but orders of magnitude below the Federal standards and local limits at 96.6 μg/l total toxic organics.

Oil and Grease – Petroleum oil and grease is unlikely to be entrained in the wastewater discharge to the sewers.

Pesticides and PCBs – These pollutants are not expected in the discharge to the sewers.

4.4 Flammability

Flammability would not be expected because the toxic organics management plans prevent the discharge of volatile organics to the sewers.

4.5 Local Limits for pH and Sulfides, and The National Prohibitions Against Safety Hazards and Corrosive Structural Damage

Sewer collection system interferences related to the formation of hydrogen sulfide and the resulting acidic disintegration of the sewers are not expected because the wastewaters discharged to the sewers are not high-strength in biodegradable organics. However, uncontrolled acidic and alkaline discharges can result in safety hazards related to the release of toxic fumes, worker exposure risks, and acidic disintegration of the sewers. The overall discharge to the sewers does not undergo final pH adjustment to ensure neutral conditions in the sewers.

5.0 Compliance with Federal Monitoring Requirements

Significant industrial users must self-monitor for all regulated parameters at least twice per year unless the sewerage agency monitors in place of self-monitoring. 40 CFR 403.12(e) & 403.12(g).

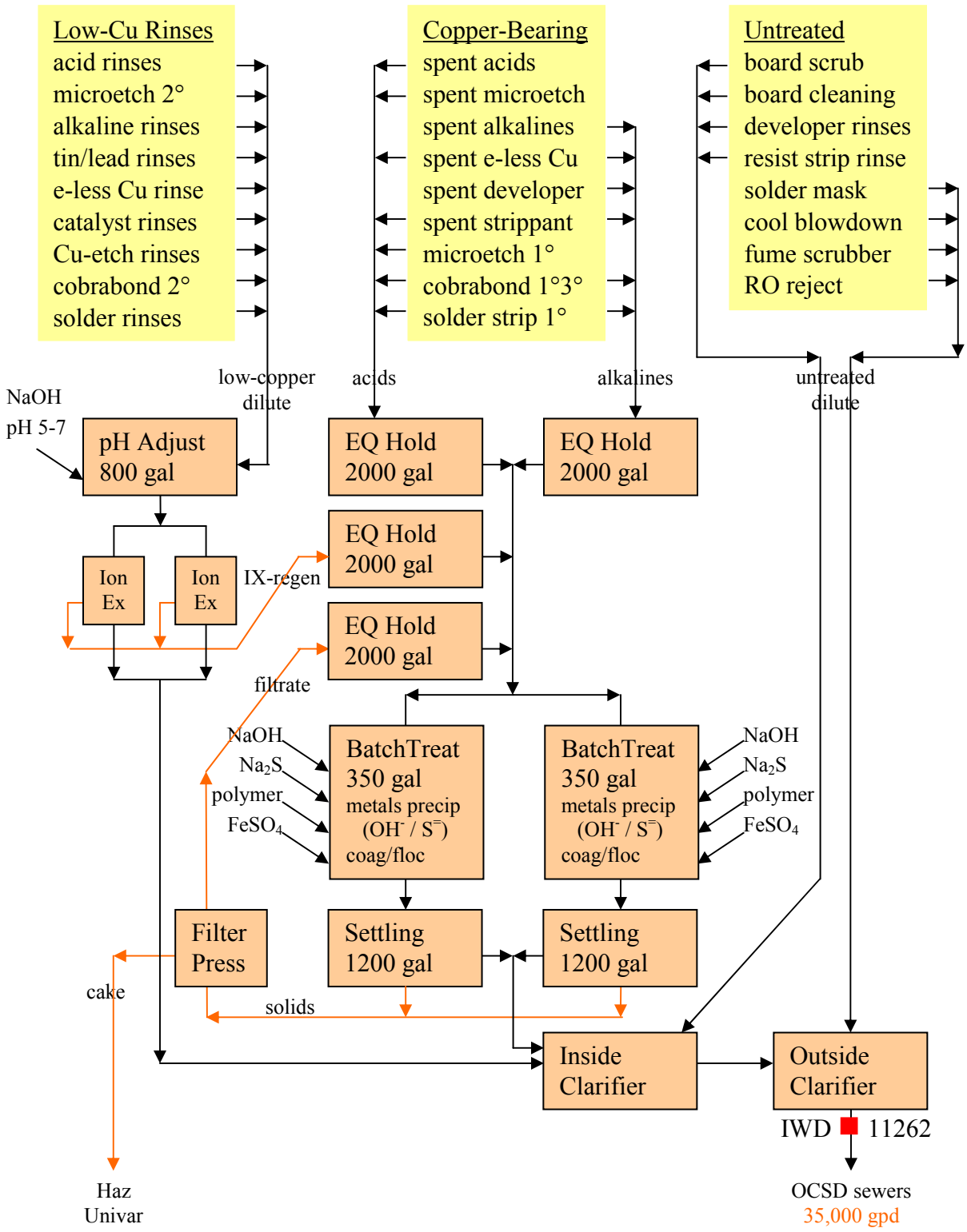
Each sample must be representative of the sampling day's operations. Sampling must be representative of the conditions occurring during the reporting period. 40 CFR 403.12(g) and 403.12(h).

The sample record for Pioneer Circuits is representative of the sampling day's operations. However, the sample record is not representative over the six-month reporting period because of the variability from undefined sources that resulted in violations of the Federal standards and local limits for copper. Once the cause of the violations is identified and addressed, a sample record that results in more than 10 samples per year would be considered statistically representative over the reporting period, as long as the contributing discharges are proven to be essentially random. Otherwise, if there is a statistical bias from any of the significant discharges occurring on schedules, then the minimum number of samples has to increase to account for the scheduled bias. The final pHs need to be continuously monitored as long as most flows discharge without final pH adjustment. See section 3.1 on page 13.

Requirements

- See Appendix 2 for the expected self-monitoring requirements for IWD-11262.

Appendix 1
Pioneer Circuits, Incorporated
Schematic of the Wastewater Collection and Treatment



Appendix 2
Sewer Discharge Standards and Limits
Pioneer Circuits @ IWD-11262

pollutants of concern (mg/l)	Expected upon revision of the OCSD industrial users permit				
	① Federal standards (daily-max)	① Federal standards (month-avg)	national prohibitions (inst-max)	OCSD local limits (daily-max)	Projected monitoring frequency
arsenic	-	-	-	2.0	④
cadmium	0.58	0.25	-	1.0	2/year
chromium	4.26	1.81	-	2.0	2/year
copper	3.38	1.64	-	3.0	1/month
lead	0.55	0.31	-	2.0	1/month
mercury	-	-	-	0.03	④
nickel	3.44	1.76	-	10.0	2/year
silver	0.71	0.32	-	5.0	2/year
zinc	2.93	1.40	-	10.0	2/year
total cyanide	1.62	0.47	-	5.0	2/year
amenable cyanide	-	-	-	1.0	-
total toxic organics	1.81	-	-	0.58	⑤
total metals	8.93	4.68	-	-	2/year
pesticides	-	-	-	0.01	④
PCBs	-	-	-	0.01	④
total sulfides	-	-	-	5.0	④
dissolved sulfides	-	-	-	0.5	④
oil and grease - petroleum	-	-	-	100.0	④
flow (gpd)	-	-	-	-	continuous
pH (s.u.)	-	-	<5.0	6.0 to 12.0	continuous
explosivity	-	-	<140°F ②	10% LEL ③	④

① From the Combined Wastestream Formula, 40 CFR 403.6(e)

$$C_{11262} = \frac{(C_{433} \times Q_{433}) + (C_{413} \times Q_{413})}{(Q_{433} + Q_{413})} \times \frac{(Q_{total} - Q_{dilution})}{Q_{total}}$$

C_{11262} = Limit @ IWD-11262
C_{433} = 40 CFR 433.17
C_{413} = 40 CFR 413.84cg
Q_{total} = Flow @ IWD-11262
Q_{433} ≈ 40% of Q_{total}
Q_{413} ≈ 45% of Q_{total}
$Q_{dilution}$ = 15% of Q_{total}

② Closed-cup flashpoint
③ 10% of the Lower Explosivity Limit
④ As part of periodic priority pollutant scans in order to identify changes in discharge quality
⑤ Toxic organics management plans allow certifications in lieu of twice-per-year self-monitoring.

Appendix 3
Pioneer Circuits Wastewater Discharge Quality @ IWD-11262
January 2003 – June 2005

pollutants ② (µg/l)	Effluent sampling results			violation rate ①		sample count	loading (lbs/yr)
	Mean	99th%	max	sample	month ④		
arsenic	-	-	-	-	-	0	-
cadmium	<7.0	<7.0	<7.0	0/22	0/17	22	<0.5
chromium	<40.0	<40.0	<40.0	0/22	0/17	22	<2.9
copper	1215.0	5369.0	8130	**2/22**	**3/17**	22	88.53
lead	60.3	194.7	200	0/22	0/17	22	4.39
mercury	-	-	-	-	-	0	-
nickel	7.4	45.3	80	0/22	0/17	22	0.53
silver	<40.0	<40.0	-	0/2	-	2	-
zinc	36.5	117.0	150	0/22	0/17	22	2.66
total cyanide	<25.0	<25.0	<25.0	0/10	0/10	10	<1.8
amenable cyanide	-	-	-	-	-	0	-
total toxic organics	27.8	121.2	96.6	0/5	0/5	5	2.03
total metals ③	1246.4	5421.5	8130	0/22	0/17	22	90.81
pesticides	-	-	-	-	-	-	-
PCBs	-	-	-	-	-	-	-
total sulfides	-	-	-	-	-	-	-
dissolved sulfides	-	-	-	-	-	-	-
oil and grease - petroleum	-	-	-	-	-	-	-
flow (gpd)	-	-	-	-	-	-	-
pH (s.u.)	-	-	-	-	-	-	-
explosivity	-	-	-	-	-	-	-

① List of violations, indicating the days of violation under the Clean Water Act, follows below
② No sample results for the following pollutants of concern: flow, and pH
③ Total metals defined as the summation of chromium, copper, nickel, and zinc, 40 CFR 413.02(e)
④ Monthly-averages calculated by averaging all samples in a calendar month, even if just one

Sample Date	Type	Sampler	Standards and Limits @ IWD-11262		Violation	Days Viol
Mar 2005	24-h	OCSD	Fed	Cu month-avg 1.64 mg/l	1.83 mg/l	31
08/16/04	grab	OCSD	local	Cu instant-max 3.0 mg/l	3.79 mg/l	1
Dec 2003	24-h	OCSD	Fed	Cu month-avg 1.64 mg/l	2.56 mg/l	31
Jan 2003	24-h	OCSD	Fed	Cu month-avg 1.64 mg/l	8.13 mg/l	31
01/22/03	24-h	OCSD	Fed	Cu daily-max 3.38 mg/l	8.13 mg/l	
			local	Cu instant-max 3.0 mg/l		
Total Days of Violation (January 2003 June 2005)						94