1057 Added 23.25 g $NaClO_4$ to R-3

1130 collect samples for R-1,2,3 effluent for pH analysis.

Checking pH
R1 eff - ~~7.68~~ 7.69
R2 eff - 7.18
R3 eff - 7.83

1145 Added 20 mL HCl to R-1,3,
20 mL NaOH to R-2

1155 Depart site for lunch

1225 Rtrn to site.

1245 Collect samples for R-1,2,3 effluent for pH analysis.

1250 Checking pH:
R1 eff - 7.63
R2 eff - 7.37
R3 eff - 7.93

1300 Add 20 mL ~~[illegible]~~ 6 M HCl to R3

1305 Work on securing tank lids for w/e

1315 Clean up & depart site.

[signature]

4/9/01

1035 D. Tietje onsite. Stopped at CEM to pick 2 bottles LSA solution.

Equipment check
- standing water on asphalt around bioreactors - also on Poly Tanks - probably from wet rain

1050 Collect samples from R1 eff, R2 eff, R3 eff for ClO_4^- readings + parameter check

1100 set samples out w/ standards to equilibrate

On second equipment check, noticed water level is v. low in I-1 (relative to I-2, I-3) + water is dripping from base of pump, possibly indicating leaking gaskets.

— Working on tightening pump seals for P-2 → 4 —

Pump P-2 (for I-1) OK

Pump P-3 (for I-2) still leaks

1115 Checking parameters (first calibrating pH probe w/ 7, 10 standards)

R-1
- T - 15.1°C
- pH - ~~8.80~~ 8.78
- cond - 2.30

R-2
- T - 15.2°C
- pH - 6.82
- cond - 1.98

R-3
- T - 16.1°C
- pH - 8.64
- cond - 2.51

Need to pH adjust in all 3 reactors

1145 Shut off pump P-3 (I-2 R-2 circulation)

1150 Add 30 mL 6M HCl to I-1, I-3

1205 Begin checking ClO_4^- standards (pretty well equilibrated w/ samples)

1210 – Std. # 6 – 157 mV ✓

1215 – Std. # 1 – 267 mV ✓

1220 Pipet 2 ml 2M $(NH_4)_2SO_4$ into each of 3 reactor effluent samples.

1223 – Reading R-1 eff –
– reading is 179 mV, or ~ 39 ppm ClO_4^- indicating ClO_4^- reduction was minimal Fri.-Mon. (and possibly expected given ~ 1/3 of the process water in the system leaked out).

1229 Reading R-3 eff –
– reading is 175 mV, or ~ 46 ppm; indicating minimal/no ClO_4^- reduction since Fri. (not known since [ClO_4^-] was ~~added~~ not measured after being added Fri.)

1235 Reading R-2 eff
– reading is 288+ mV, indication < 1 ppm ClO_4^-

1250 Consult w/ Mike Goh on how to resolve leak in P-3
– he suggested shutting off pump, loosening + retightening ~~face, moving around/tapping gasket if necessary~~ bolts, then re-testing; and if that doesn't work, take apart the face + possibly reposition the gasket.

1300 – 1330 Break for lunch.

1330 ~~Collect~~ Collect samples to take pH readings (R1, R3 only)

Checking pH readings –
R1 eff – 8.40
R3 eff – 8.40

1345 Begin working on fixing leak in P-3 seal

1400 Pump seal still leaks after loosening bolts + retightening — will attempt to take apart face plate to reposition gasket

1440 Depart site for hardware store to pick PVC fittings

1540 Return to site.

1550 Begined piping on inlet/discharge of P-3

Collect samples to check pH in I-1/R-1, I-3/R-3

Checking pH of R-1 eff sample — 8.29

" pH of R-3 eff sample — 8.32

1600 Add 40 mL 6M HCl each to I-1, I-3.

1600 Spoke w/ Losi

(1) - told me to add filtered water to Tank 1 (to approx. same level as I-2, I-3)

(2) - told me to add 131 g NaAc to R1 + R3

(3) - told me to add Nutrients to R-2 once I get the pump up + running

(4) - tomorrow we may pump down the inocula tanks + introduce groundwater

1615 Begin work on Task #(1)

Complete Task #1

1630 + Work on Task #(2)

1642 Complete work on Task #2

1650 Prepare to test P-3 (for reactor 2)

Pump still leaks — though now it appears leak is @ impeller — shut off pump + lv. I-2/R-2 system offline.

1700 Offsite —

[illegible]

4-10-01

745 Arrive onsite, D. Tietje

800 Equipment check — R1, R3 running OK — no leaks.
R2 offline — will replace pump today.

805 Collected samples from R1 eff, R3 eff

810 Check calibration of pH probe
- pH 7 standard — 9.13 → 7.00
- pH 10 standard — 9.91 → 10.00

813 Set out CrO_4^- standards to equilibrate w/ samples

815 Checking parameters:

(1) R1 effl. —
(2) R3 effl. —
(1) T — 14.3 °C
pH — 8.18
cond — 1.75

(2) T — 12.6 °C
pH — 8.23
cond — 2.58

820 Begin working on changing out pump P-3 — will replace it w/ P-7

820 Add 30 mL 6M HCl ea to I-1, I-3

915 Begin checking calibration of CrO_4^- probe

922 Checking std. # 6 — reading is 158 mV

928 Checking Std. # 1 — reading is 267 mV — this is about 6 mV low; will check remaining stds. also

#2 — 210 mV @ 940
#3 — 190 mV @ 945
#4 — 174 mV @ 935
#5 — 163 mV @ 948

DID NOT USE

950 Add 2 mL $(NH_4)_2SO_4$ to R-1, R-3 samples

958 Reading R1 effl. sample w/ ClO_4^- probe: 191 mV (~24 ppm) indicating a slight reduction in ClO_4^- since yesterday's reading (remembering ~20-30 gal fresh tap water was added)

959 Reading R3 eff sample – 208 mV (~110 ppm) indicating a reduction in $[ClO_4^-]$ since yesterday's reading

1010 Spoke to Mark Losi, informing him of the ClO_4^- readings – told me to turn on the tank heaters for I-1, I-3, and measure the $[ClO_4^-]$ at the end of the day

1015 – Turn on heat tape for I-1, I-3

1020 Resume work on Pump Installation

1145 Complete installation of pump for R-2

1150 Collect samples from R1 effl., R3 effl. to check pH, Temp.

R1 sample: pH – 7.83
T – 17.3°C

R3 sample: pH – 8.02 – .05
T – 18.3°C

1200 N Add 20 mL HCl to R-1
30 mL HCl to R-3

1210 Depart site for lunch.

1300 Return to site.

1315 Spoke w/ Mike Goh – says I should wait a few additional hours b/f I test the new pump plumbing.

1325 Spoke w/ Charlie @ Yardley Pump regd leaking gasketts. He said I can drop off at their facility @ my convenience so they can inspect it – they will repair/replace as needed

1345 Collect samples to check parameters –

R3 eff – pH – 7.96-7
T – 21.6 °C

R2 eff pH – 7.78
T – 20.3 °C

1355 Add 30 mL 6 M HCl each to R-1, R-3

1400 Spoke w/ Lori – told me my plan to sample @ 3 pm was OK, and if possible to try to test / re-start R-2 today. Also said to make sure the heaters are off at days end.

1425 Set out standards to allow to warm b/f equilibrating w/ samples.

1500 Collect samples R1 eff, R3 eff

1505 Continue working on sand bags for secondary containment

1535 Complete work on secondary containment berm

1540 Collect samples from R-1, R-3 effluents to check parameters

R1 eff – pH – 7.70 T – 23.5°C
R3 eff – pH – 7.92 T – 24.0 °C

1550 Add 20 mL HCl to I-1
30 mL HCl to I-2

1555 Turn off heat trace
Affix lids in place for I-1, I-3

1600 Testing Std. #6
reading 157 mV

1605 Prepare to test samples
Add ~ 2 mL ISA to each sample

(Note – Added ~ 2.2 mL ISA to R-1 sample)

1611 Reading R1 eff sample — 195 mV, indicating a slight reduction from this AM

DID NOT RECORD

1616 Reading R3 eff sample — 213 mV, indicating a slight reduction from this AM

1620 Ready to test Pump P-3 (replaced) piping

Pump ~~[illegible]~~ runs OK w/ no apparent leaks; unfortunately drum is bulging at lid due to Pressure buildup — concerned it could burst. Shut off pump

1630 Spoke to M. Cole Witthal — they agreed we ~~may~~ need to keep I-2 IR-2 off line, + to hold off on replacing the drum/media right away.

1700 Depart site.

David Tietje

4/11/01

810 D. Tietje onsite.

822 Equipment check — OK
Pumps for R-1, R-3 running OK, no leaks; water circulation OK
R2 offline

825 Collect samples for R1 eff, R3 eff CrO_4^- readings + parameter check.

830 Set out CrO_4^- probe standards to equilibrate w/ samples

Calibrate pH probe

835 pH 7 standard — reading is 7.00 — OK
pH 10 standard — reading is 10.01 — OK

837 Reading R1 eff1 sample
pH — 8.36
T — 17.1°C (162.6°F)
cond — 2.11

840 Checking R3 effluent sample parameters-
T- 18.3 °C (64.9 °F)
pH- 8.47
cond- 3.03

845 Prepare to add 30 mL 6M HCl on to R-1, 3

935 Begin checking standards w/ ClO_4- probe, starting w/ std. # 6
937 - std #6 - rdg. is 155 mV
943 - Std #1 - rdg. is 264 mV

945 Prepare to add 2 mL 2M $(NH_4)_2SO_4$ on to R-1 eff, R-3 eff samples

950 Testing samples w/ ClO_4- probe R-1 -

955 Reading on R-1 is 193 mV, indicating basically no reduction from yesterday

1000 Reading on R-3 is 210 mV, indicating no change from yesterday

1000 - 1015 Mr. Cutler stopped by. Gave him a tour of the PBR System.

1025 Spoke w/ Lad - told me to keep maintaining the system until we hear from the Navy on start-up. He told me to hold off on chemical addition for now.

1045 Collect samples to check parameters for R1, R3

1050 Checking R1 eff. parameters:
pH - 8.09
T- 17.9 °C

Checking R3 eff. parameters:
pH - 8.30
T- 18.3 °C

1055 Prepare to add 30 mL 6M HCl on to R-1, R-3 (I-1, I-3)

1105 Site Need List

- Distilled water (2 1/2 gal)
- Kim wipes
- Lab:
  - HCl
  - ~~Disposal of~~ Sample waste containers
- ✓ Repair Price pump – take to vendor
- Eyewash station / saline solution
- 1" hose; hose clamps (small)

1130 Depart site for lunch, ~~pick supplies for site~~ (DT)

1230 Return to site.

Spoke to Lori on drive to lunch. Told me that I should proceed as follows:

1. Pump contents of I-1, I-3 into EQ tank 1 (upstream of secondary treatments)
2. Add Groundwater to I-1, I-3 to approx. the same level as now, + continue circulation
3. Measure the CrO_4^- concentration in both streams
4. Adjust the $[CrO_4^-]$ as needed to correct it to ~ 10 ppm ~~Add CrO_4~~ (DT)
5. Add NaAc – less than previous amount ½ (caution at time of addition)

1240 EQ tank 1 has ~75 gal top ~~water~~ in it – pump tank down (transfer water into EQ tank 2)

1310 EQ Tank 1 – Level is at ~35 gal

40 gal 150 min ≅ 4.13 gpm

1320 Water level currently in incinerator tank is ≅ 18.5" or 32 gal

water currently in Incinerator Tank # 2 ≅ 16" or 27.8 gal

To add ~50 gal to each reactor depth to water level from base of manway should be 29.9".

1327 Stopped pumping from EQ Tank 1 to 2. Approx. 29 gal water remains in EQ Tank 1

1330 Begin withdrawing water from I-1, I-3 + transferring into EQ Tank 1

Approx. 60 gal total should be pumped out of the I-1/R-1 & I-3/R-3 systems into EQ Tank I, raising the water level to ~ 87 gal.

1340 Stopped pumping down I-1, I-3 Insufficient water remaining in each); < 10 gal remaining, and ~73 gal in EQ Tank #1

1400 Finished adding ~ ground water to I-1. DTW ~ 24" ∴ (added ~ 31 gal to tank)

1407 Finished adding GW to I-3 DTW ~ 24" also.

1410 Turn on P-2, P-4 to resume circulation

Throttle back valve to incr. backpressure, reduce flow for P-2

— 1415 P-4 pressure / flow low
— (open Mixing Tank to flood intake) — only did this for few min

1425 P-4 pressure OK —
~28 psi on pump discharge
water flow into I-3 increased slightly also

1500 spoke to Losi —
if $[ClO_4^-]$ <10 ppm based on readings
→ Add 46.4/10 = 5 g $NaClO_4$ to I-1, I-3
→ Add 131.3 g Nitrate to each reactor [no matter what]
→ If I have to add ClO_4^-, wait 1/2 hr + measure again (only need to wait 1/2 hr to allow samples to equilibrate)

1505 Collect samples from R-1 eff, R-3 effl; set out to equilibrate w/ standards
Also collect water to check parameters.
Note: needed to close valve to I-3 to collect sample due to insufficient pressure

1515 Checking parameters for R1, R3 eff samples

• R1 eff — pH — 7.98
cond — 1.65
T — 17.5 °C

• R3 eff — pH — 8.15
cond — 2.23
T — 18.6 °C

★ check w/ Losi to see if I should pH adjust still.

1535 Testing Std. #6 w/ ClO_4^- probe → 1539 reading is 156 mV (ok)

1540 Pipet 2 mL ISA into each sample

1545 Measure [ClO_4^-] in R-1 eff sample w/ ClO_4^- probe
Reading is 201 mV (1.57 ppm)

DID NOT RECORD

1552 Reading [ClO_4^-] in R-3 eff sample — reading is 220 mV or 7.2 ppm.

Need to add [illegible] to R-3
[illegible] R-1 and R-3

1601 [illegible]

1606 [illegible]

1610 Spoke to Charlie Galloway to confirm I will be bringing in pump for inspection @ 0730 tomorrow.

1625 Spoke to Losi — told me that today's work is complete once I collect the final sample from R-3. He said to [illegible]

1632 Collected R3 eff sample. Set out to equilibrate w/ standards.

1637 [illegible] g NaAc to I-3

1700 Add 2 mL ISA to R-3 effl sample

1704 Reading w/ ClO_4^- probe - 202 mV or ~ 15.1 ppm.

1710 Depart site.

[signature]

[illegible]

945 D. Thetje onsite.

Stopped at Yardley Pump in Fountain Valley on way to site. Vendor replaced gasket & mech. (shaft) seal for pump (that was leaking previously)

1000 Equipment check - OK

1005 Collect samples for parameter check & ClO_4^- readings

Note: - water pressure @ R3 sample port better today (able to sample w/o closing recirculation line valve)

- water cloudy from R3 effl sample port, clear from R1 effl sample port

[illegible]

- Calibrate pH probe

pH 7 standard - rdg. 6.91 (adjust)
10 standard - rdg. 10.05 (adjust to 10.00)

- set out ClO_4^- standards to allow to equilibrate w/ samples

1018 Checking R-1 eff sample -
pH - 8.38
T - 16.8 °C
cond - 1.78

1020 Checking R-3 eff sample -
pH - 8.46
T - 17.9 °C
cond - 2.42

1030 Add 30 mL 10 M HCl ea to I-1, I-3 to lower pH

1035 work on installing repaired pump in P-7 position (final discharge)

1115 Finished installation of final discharge pump.

waiting for samples to equilibrate w/ standards . . . .

1130 Begin testing standards w/ ClO_4^- probe

First, testing std. #6 - reading is 159 mV (@ 1132)

Std. #1 - reading is 267 mV @ 1137

Std. #4 - reading is 170 mV @ 1142

DID NOT RECORD

Std. #2 - reading is 210 mV @ 1147

Std. #3 - reading is 190 mV @ 1152
(note: spilled about 2/3 of std. in bottle before rdg.)

Std. #5 - reading is 1623 mV @ 1159

12:00 N Add 2.0 mL 2 M $(NH_4)_2SO_4$ to ea sample (R1 eff, R3 eff)

1205 Reading $[ClO_4^-]$ in R-1 eff sample, reading is 202 mV (-15 mV), indicating $[ClO_4^-]$ is essentially unchanged from yesterday's reading

1210-2 Reading $[ClO_4^-]$ in R-3 eff sample, reading is 218 mV (+32 mV), indicating a reduction in $[ClO_4^-]$ since the last reading taken after adding ClO_4^-.

1300 Collect samples to check pH / T.

- Checking R-1 effl. (1304)
  pH - 8.10 - 12
  T - 22.7°C

- checking R-3 effl.
  pH - 8.19
  T - 23.5°C

1315 Depart site for lunch.

1400 Return to site. Spoke to Losi while @ lunch, and informed him of the results. Based on this he instructed me to do the following:

✓ ① install pipes to direct incoming water below surface

✓ ② close lids, turn off heat (when leaving site)

③ Check (pH), T and ClO_4^- concentrations b/f leaving site

✓ ④ Check ClO_4^- concentrations again tomorrow AM

✓ ⑤ Note: Do not need to adjust (lower) flow

✓ ⑥ Add 1/4 of total amount of NaAc to both reactors

1805 Shut off P-1, P-3. Prepare to install inlet pipes.

1850 Complete installation of inlet piping. Waiting for glue to dry (~ 1 hour)

1910 Cut heaters. Concerned about overheating since water is not circulating.

1915 Measuring pH / T in I-1 —
T - 25°C
pH - 8.05

1920 Measuring pH / T in I-3 —
T - 27.6 °C
pH - 7.96

1950 Re-start circulation through R-1 / I-1, R-3, I-3.
- Recirculation - OK
- Pump discharge pressure - OK
- leaks in inlet piping - none

Noticed leak in R-1 @ ring
– tighten ring w/ socket wrench

1600 Shut off P1; observed pressure "cracking" of drum; tighten ring + re-start pump

1605 pump discharge P is ~ 10 psi
" " pump discharge P is ~ 20 psi (after a few minutes)

1615 Add 65.7 g NaAc to I-1

1618 Add 65.7 g NaAc to I-3

Continue monitoring R-1 for signs of leakage

1628 shut off P-1, tighten ring again (ring still leaking); re-start pump & continue monitoring

Pump dischg. P ~ 13 psi

1645 Spoke w/ Vitthal
Agreed that we ~~should~~ can keep the reactors both running overnight, despite the possibility of leakage, since any possible runoff would be contained.

Items to think about for future:
- Return Celite to vendor
- Pressure relief valve on discharge of reactor drums – consider & can use tee + flex hose + direct relief line into tank.

1700 Departed site.

[signature]

4/13/01

835 Tietje onsite.

Equipment check - OK.
No leaking in R-1 drum.
Flow OK into I-1, 3
Press. on P1 discharge
= 20 psi.
Press. on P2, 3 discharge
= 26 psi
in-line temps.: R1 inf. - 68°F;
R3 inf. - 70°F

845 Collect samples for
parameter check,
ClO_4^- readings

850 Set out ClO_4^- standards
to equilibrate w/ samples

855 Check pH probe calibration

pH 7 standard: reading is
6.99 - OK
pH 10 standard: reading is
10.03 - adjust to 10.00

903 Checking R1 eff parameters:
pH - 7.92
T - 17.6°C (63.7°F)
Cond - 1.96

907 Checking R3 eff parameters:
pH - 8.07
T - 18.9°C (66.0°F)
cond - 2.57

910 Add 30 mL 6M HCl ea
to R-1, R-3 to lower pH.
★ Need to obtain more HCl -
only ~ 100 mL remaining

950 Prepare to test ClO_4^- standards,
beginning w/ std. #6 -
- reading for std. #6 - 156 mV
(@ 950)
- reading for std. #1 - 266 mV
(@ 1003)

1005 Prepare to pipet 2 mL $(NH_4)_2SO_4$
each into R-1, R3 effl. samples

1010 - Reading R1 eff1 sample
Reading is 288+ mV, indicating <1 ppm ClO_4^- (and representing a reduction since yesterday's test).

1015 Reading R3 eff1 sample.
Reading is 289+ mV, indicating <1 ppm ClO_4^- (and representing a reduction since yesterday's test)

1050 Spoke w/ Losi and confirmed the results. He said he + Vitthal will decide today if they want to keep the system running (try to talk to the Navy)

1100 Collect R1 eff, R3 eff samples to check parameters

1104 Reading R1 eff pH - 7.49 - .53
T - 21.8

1107 Reading R3 eff
pH - 7.65
T - 22.7°C

1150 Depart site for lunch / PU supplies.

1240 Return to site.

Continue work on organizing fittings.

1315 Spoke to Mark Losi / Vitthal - told me to keep the system running over the weekend, to add 131.35 g NaAc to each reactor, and cut the inlet pipes / crack lids to return to aerobic mode.

1335 Finished cutting / removing inlet pipes to 1-1, 1-3.

1340 Add 131.3 g NaAc ea to 1-1, 1-3

1345 Set lids for 1-1, 1-3 partially open.

1355 Clean up / depart site.

David Tietz

4/17/01

810 D. Tietje onsite. Mike Goh already onsite.
Plan for day's activities — preparation for startup.
— Test repaired pump in "P7" (recycle/discharge) position
— Work on making down nutrient and NaAc solutions (NaAc in feed is 50 mg/L)

820 Confirmed need to add ~4000 g NaAc to make up NaAc feed stock.

830 Begin measuring/adding NaAc to Ac addition tank for R-1

1005 Finished adding 4003.7 g NaAc to R-1 substrate feed tank

1015 Begin adding NaAc to substrate feed tank for R-3

1145 Finished adding NaAc, 4003.7 g, to substrate feed tank for R-3

1205 – 1255 offsite for lunch

1255 Evaluate ammonium phosphate addition

1310 Add 244.2 g $(NH_4)_2PO_4$ to Nutrient Feed Tank

Begin pumping ~~[illegible]~~ into T-1.

1320 Spoke w/ Mark Lasl
Agreed we should add 244.2 g of nutrient salt as a starting point.
Check ΔT btwn influent feed water + outlet from T-1, once the system is going (but not to worry about heating up water in T-1 or pumping through the downstream units).

1345 Turned on heater for EQ tank 1, set thermostat to 80°F.

?

1355 Isolate inocula tanks.

Begin pumping down Mixing Tanks 1,3 through bioreactors, into EQ Tank 1.

1400 Mixing tanks pumped down ok
Begin pumping from EQ Tank 1, through aerobic bioreactor into EQ Tank 2.

T-1 still filling - has not reached low level.

1405 Discuss question of venting for EQ Tank 2 - VOCs may still be present. May need to plumb 2-in vent to join vent for EQ Tank 1.
[Need 2-in Tee]

1445 EQ Tank 1 still pumping down; still filling T-1 to low pump level

1455 Water level in EQ Tank 2 almost @ high level. Inflow rate v. low (< 1 gpm); may need to change-out pump when working at higher flows.

~1520 High-high level shut down P-5
Begin pumping down EQ 2 - through GAC/UX into Baker Tank

1535 Begin pumping groundwater into mixing tanks

1555 (A) Return system to recycle mode.
Spoke w/ Mark Losi
Add 1/2 x 269.2 g ≅ 500 mg/l Na Ac to each inocula tank
Leave in aerobic mode.
(B) Leave system running w/o substrate addition

1600 P-1 shutoff

~~Volume of tank - [illegible] gal~~
~~50 ppm Na Ac in EQ-1~~
~~0.5 lb - in few gallons~~