BY MS. WITKOWSKI:

Q In the scenario that you just responded to, would that allocation be a load allocation or a waste-load allocation?

MR. CARRIGAN: Same objections.

THE WITNESS: That's dependent upon whether it's from point source or not. I don't know if there's any policy or guidance that helps us determine that.

For example, if the historic discharge came from a large open area, then initially it would be considered a waste-load allocation.

But I don't know if that would carry further because once it's in a specific location, it may be considered a point discharge.

So it gets cloudy there, and I'm not sure that I can offer any opinion on guidance or policy as to how to determine that specifically.

BY MS. WITKOWSKI:

Q Have you ever worked on a TMDL that dealt with historic discharges in this way that we've discussed?

A No.

Q Are you aware of any that have done this?

A No.

Q If you were working on a TMDL, hypothetically, if you were working on a TMDL to address these past historic discharges, how would you go about determining who was responsible for those discharges?

MR. LEDGER: Vague and ambiguous.

THE WITNESS: I'm not necessarily sure that we would. According to water laws I understand it, water quality laws I understand it, and regulations as I understand them, if the pollutant is on your property for any current owner of that property, it's their problem.

So I'm not sure that we would necessarily address historic discharges unless we were specifically directed by other board members or the executive officer.

BY MS. WITKOWSKI:

Q So it's possible that if you weren't directed to specifically address historic discharges that they could be left unaddressed?

A They would be the responsibility of the current property owner.

Q In that situation would the current property owner be responsible for bearing the costs of any cleanup or reduction in pollution?

MR. CARRIGAN: I just renew my objection --

MS. NICHOLS: Calls for a legal conclusion.

MR. CARRIGAN: -- to this incomplete con- --

and hypothetical and these abstract questions that seem to call for an expert opinion.

MS. NICHOLS: Did you get my objection?

MR. CARRIGAN: Go ahead.

THE WITNESS: Can you repeat the question?

MS. WITKOWSKI: Can you read it back, please.

(The pending question was read.)

MS. NICHOLS: Calls for a legal conclusion.

THE WITNESS: As I understand water law, water quality law and regulations, it would be up to them to recoup whatever cost through whatever means legally they can.

BY MS. WITKOWSKI:

Q Your testimony earlier you characterize yourself as an expert in regulatory requirements for TMDLs; is that correct?

A Sure.

Q I'd like to -- I just have a few more questions for you regarding your testimony earlier about metals in Chollas Creek and the TMDL work you've done.

If I heard your testimony correctly, you talked about how difficult it is to remove dissolved metals from water once those metals are in the water; is that correct?

A That's right.

Q Isn't it also possible to achieve pollution reduction by directly addressing the sources of those pollution?

A Yes, it is.

Q Are you aware of any current source reduction measures regarding copper?

A Yes. There is a brake-pad partnership that I'm aware of, a group of brake-pad manufacturers, and a large number of other interested stakeholders, including Cities and the County, that are working to replace the copper component in brakes with other components.

Q Are you aware of recently passed legislation in California regarding copper in brake pads?

A I'm not aware of it, no.

Q Thank you. That's all the questions that I have today. Thank you very much.

A Okay.

MR. DART: I have a few follow-ups. Everybody had their first turn? Just have a few questions, Mr. Tobler.

THE WITNESS: Sure.

FURTHER EXAMINATION

BY MR. DART:

Q Do you have Master Exhibit 2 in front of you, the DTR?

A I do.

Q Would you turn to Page 3-9 within the BAE section?

A Okay.

Q I believe you testified earlier today that you drafted this section?

A I didn't give it a complete review, but the short review that I did give it made me feel that I authored all of it, if not most of it.

Q Okay. Do you see the second paragraph under Section 3.4?

A Yes.

Q Could you read the first sentence to yourself.

MS. TRACY: Counsel, what page were you on?

MR. DART: 3-9, Section 3.4, the second paragraph.

MS. TRACY: Beginning "Pollutants"?

MR. DART: Yes.

BY MR. DART:

Q That sentence reads, "Pollutants generated at the BAE Systems facility as a result of shipyard activities include" -- and then it goes on to list a number of pollutants.

Do you see that sentence?

A Yes, I do.

Q What shipyard activities are included within that reference of shipyard activities within that sentence?

A The building, construction, and maintenance of ships.

Q With respect to the pollutant PCB referenced in that sentence, are there any other shipyard activities that you were including in that reference of shipyard activities?

MS. TRACY: Objection; vague and ambiguous. Calls for expert opinion.

THE WITNESS: PCBs are frequently associated with transformers. And transformers are frequently found on shipyards.

BY MR. DART:

Q So was it your assumption there were transformers on BAE's facilities that led to the generation of PCBs?

A Yes.

Q What documents, if any, was that assumption based upon?

A Our tour. I didn't see transformers -- or I don't recall seeing transformers particularly noted in any of the files or reports, but it was four or five years ago. I may have seen it in reports also. But it was the tour.

Q The tour where you -- maybe I didn't understand your testimony. You did or you didn't see transformers on your tour of the BAE facility?

A I don't recall.

Q So going back again, were there any documents that you reviewed?

A I may have. I don't recall specifically. I'm assuming you were going to ask about transformers. Maybe you should ask that question; I will answer it.

MR. CARRIGAN: He'll get at it.

THE WITNESS: Okay.

BY MR. DART:

Q Did you talk to anyone at BAE Systems about transformers on their property?

A No.

Q So is it safe to assume that you did not ask them whether their transformers contained dielectric fluid or something else?

A That is a safe assumption.

Q If you turn to Page 3-10, the next page --

A Okay.

Q -- the second bullet point, would you please read that and let me know if you drafted that as well?

A I believe I did.

Q Does that statement in the second bullet point, does that relate to the sentence we were talking about on Page 3-9 regarding PCBs generated at the BAE Systems facility as a result of shipyard activities?

A Yeah, it's certainly associated.

Q How so?

A Well, in the paragraph immediately preceding it, I note PCBs as some of the pollutants generated in shipyard activities. And then immediately following it, I noted the location of where the elevated PCB concentrations are.

So assuming just a normal read of documents, they would be associated with each other.

Q From the allegation in that second bullet point that there are certain elevated concentrations of PCBs within the boundary of BAE Systems' leasehold, did you use that as support for your statement that PCBs are generated from the BAE Systems as a result of shipyard activities?

A Yes.

Q Are you familiar with when PCBs were outlawed?

A No.

Q So as part of your investigation as reflected here in Section 3.4, did you not consider the time frames in which PCBs were outlawed?

A I didn't.

MS. TRACY: Objection; lacks foundation.

THE WITNESS: I didn't consider that, no.

BY MR. DART:

Q We talked earlier or another counsel asked you earlier about the Water Board Notice of Violations -- no, I'm sorry. I think that was City of San Diego Notice of Violation.

Are you familiar with the Water Board Notice of Violations?

A Yeah, it's a tool that we use.

Q Is the discharger provided a copy of that Notice of Violation when it's issued by the Water Board?

A Yes.

Q I have no further questions. Thank you, Mr. Tobler, for your time.

A Thank you.

MR. CARLIN: I have no further questions either.

MR. LEDGER: I have just a couple, Mr. Tobler.

FURTHER EXAMINATION

BY MR. LEDGER:

Q Go to --

MR. CARRIGAN: Do you want to ask from there? Just a couple? Okay. Go ahead.

MR. LEDGER: I -- yeah, I think so.

BY MR. LEDGER:

Q Go to 305, which is from -- the report from the tour force.

A 305?

Q Yes.

A Yes.

Q Go to the third page, please.

A Okay.

Q Do you see the SWM heading?

A Yes.

Q Now, on the third paragraph down, it states, "Trash and sheen has been observed many times at SW4 discharges into Bay. Shaun Halvax has video footage of the discharge from SW4 with report."

My question is, is it true that the information in that first sentence in that third paragraph was something told to you and not something you personally observed?

MR. DART: Objection; lacks foundation. Calls for speculation and --

MS. TRACY: Objection. The witness has already testified he did not prepare this, so he has no knowledge.

MR. LEDGER: Okay. Let me rephrase it.

BY MR. LEDGER:

Q You were present during the two tours, correct?

A Yes.

Q And did you observe any trash or sheen at the SW4 outlet from the BAE System leasehold?

A I don't know which one the SW4 is, but -- so I'm looking here. And I did find it actually a couple of pages later on the first map. Looks like it's Picture No. 5. So I'm going to take a look at that and see if that jogs my memory.

And I honestly can't recall any trash or oil sheen or really anything much about that specific outfall.

MR. LEDGER: Okay. That's all the questions that I have. Thanks.

MS. NICHOLS: I have a few follow-up questions. If you don't mind, I will ask from here as well.

THE WITNESS: Please.

FURTHER EXAMINATION

BY MS. NICHOLS:

Q With respect to that same Exhibit 305, in the list of tour participants on SAR156648, at the bottom it says "City of San Diego-Port."

Do you recall for certain, Mr. Tobler, whether there was any representative of the Port present for this tour?

A I don't recall.

Q Do you recall specifically whether the Port ever received notice of this tour?

A No. In fact, I don't believe they did at that point. The Port wasn't included.

Q And how is it that you recall that?

A Just -- I just recall it because I know that that at that point, the Port wasn't included, and it would be odd to ask them to the tour. But it's not outside of possibilities, I suppose. They may have been interested. They may have heard about it.

Q So the Port typically was not notified by the Regional Board when its enforcement inspections of this sort were occurring, correct?

MS. TRACY: Objection; lacks foundation. Calls for speculation.

THE WITNESS: It's too broad a general statement.

BY MS. NICHOLS:

Q In your experience?

A An inspection on NASSCO's site, for example, or

BAE's site, for example?

Q Yes, with respect to this site.

A Yeah. I don't believe that the Port would necessarily be called to an inspection. We wouldn't -- we would certainly ask for a site representative to join us, but we wouldn't typically ask the governing entity that's leasing the facilities to the inspection.

Q Okay. And do you recall who was present from ARCO during this inspection?

A I know there was someone from ARCO, BP, correct, but I don't recall the name.

Q Do you recall who was present on behalf of NASSCO for the inspection?

A I don't recall any of the names specifically.

Q Okay. Up at the top of the first page of Exhibit 305, the right -- top right-hand corner, your handwriting that appears to say, incompletely, "enforcement" and then a 03-0137 -- is that .05?

A That's right.

Q And what does that refer to, if you know?

A Yes, that's my handwriting. I recognize it because I make my sevens with the little thing in them.

That's a file number, and that's a file that we would put it in the general to-file basket, and then the people that file would put it in the appropriate folder.

Q So at the Regional Board, is there currently a file identified as 03-0137.05?
A There may be. I don't know if they changed it since the electronic documents were all made available. They may have a new file number or just -- just eliminated this one. Or it may still be in existence. I don't know.
Q And with respect to Brennen Ott, you mentioned previously, what was his role at the Regional Board?
A He was a Water Resource Control Engineer that came to work for the Board for only a couple of years. I took over responsibilities that he had for the -- this shipyard enforcement order.
He only had it for a short time prior to me. And he left abruptly. He gave two weeks' notice and didn't quite make that -- his mother unfortunately passed away during that time. And so it was something of an abrupt handoff.
Q So he left of his own accord?
A Yes.
Q You mentioned that he currently is in Bakersfield?
A That's the last I know of it. But that's as of probably three years ago that I had heard.
Q If you were to attempt to locate him now, how

would you go about doing that?

A I know his brother. I could probably -- I loosely know his brother. I believe he still works at Caltrans. He also worked at the Regional Board. His name is Brian Ott.

He also moved from the Regional Board probably a year or two after Brennen did and went to Caltrans, and we kept in e-mail correspondence, just typical kind of, you know, send a silly e-mail now and again.

But that's fallen off in the last three years and I haven't really talked to him since then. But I could probably get ahold of him.

MS. NICHOLS: Thank you very much. I have no further questions at this time, subject to my prior reservation of rights.

MS. TRACY: I have no further questions.

MS. WITKOWSKI: No further questions.

MR. CARLIN: No further questions.

MR. DART: I actually do have one quick, very quick.

MR. CARRIGAN: You do this every time.

MR. DART: I know.

MR. CARRIGAN: That's all right.

MS. TRACY: We're not going to invite you to the party anymore.

FURTHER EXAMINATION

BY MR. DART:

Q Very quickly.

A Please.

Q Mr. Tobler, if you would turn to 3-22, it's again within the BAE Systems section, the portion of the table at the top.

A Okay.

Q Do you see in the Source column some references to RWQCB inspection?

A Yes.

Q Are you familiar with that source?

A Yes. That's the Regional Water Quality Control Board Inspection. So that would come from an inspection report.

Q And is that inspection report or a document related to it sent to the alleged discharger?

A Not necessarily, if it's accompanied and -- let me start over.

If the inspection reveals that there are significant enough violations in order to warrant a Notice of Violation or any other type of enforcement action, then, yes, a copy of the inspection report would go to the discharger, including the enforcement order, but a copy of an inspection report does not always necessarily go to -- go out to the discharger. It -- in that case it would just go into our files.

Q If it doesn't meet the criteria that you laid out?

A If it's not -- yeah. Right.

MR. DART: No further questions.

MR. CARRIGAN: Same stipulation as yesterday --

MS. NICHOLS: Yes.

MR. CARRIGAN: -- for the transcript?

MR. DART: Yes.

MR. CARLIN: Agreed.

MR. LEDGER: Yes.

MR. DART: Stipulated.

(Whereupon, the deposition was adjourned at 4:18 p.m.)

(Whereupon, the following stipulation was previously agreed to by counsel:

"MR. DART: I propose that we relieve the court reporter of the duty to maintain custody of the original;

"Instead, when it's completed, I propose that the transcript is sent to counsel for the deponent, Mr. Carrigan, who shall immediately send it to the witness for review;

"The witness shall have 30 days to review the transcript, make any changes that she deems necessary, and sign the transcript, after which Mr. Carrigan will promptly notify all counsel when the transcript has been signed and provide an errata or a copy of the transcript that reflects the changes;

"And, if the witness fails to sign the transcript within 30 days, the unsigned deposition shall be used in lieu of that and be available for use for all purposes.

"Anything else?

"MR. CARRIGAN: So stipulated.

"MR. CARLIN: So stipulated.)"

I, BENJAMIN TOBLER, declare under penalty of perjury under the laws of the State of California that the foregoing is true and correct; that I have read my deposition and have made the necessary corrections, additions or changes to my answers I deem necessary.

Executed on this________day of____________________, 2010.

____

BENJAMIN TOBLER

C E R T I F I C A T E

I, BRIDGET L. MASTROBATTISTA, Certified Shorthand Reporter for the State of California, do hereby certify:

That the witness in the foregoing deposition was by me first duly sworn to testify to the truth, the whole truth and nothing but the truth in the foregoing cause; that the deposition was taken by me in machine shorthand and later transcribed into typewriting, under my direction, and that the foregoing contains a true record of the testimony of the witness.

Dated: This 20th day of May, 2011 at San Diego, California.

BRIDGET L. MASTROBATTISTA
C.S.R. NO. 7715, RPR, RMR

WORD INDEX

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Q

R

S

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EXHIBIT 179
300
Tobler
PENGAD 800-631-6989

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD

SAN DIEGO REGION

IN THE MATTER OF: TENTATIVE CLEANUP AND ABATEMENT ORDER NO. R9-2010-0002	**BAE SYSTEM'S FIRST AMENDED NOTICE OF DEPOSITION OF BENJAMIN TOBLER** Date: September 29, 2010 Time: 10:00 a.m. Dept: DLA Piper LLP (US) 401 B Street, Suite 1700 San Diego, CA 92101-4297

TO ALL PARTIES AND THEIR COUNSEL OF RECORD:

NOTICE IS HEREBY GIVEN that, pursuant to the Final Discovery Plan for Tentative Cleanup and Abatement Order No. R9-2010-0002 and Associated Draft Technical Report dated February 18, 2010, the Order of Presiding Officer King dated July 16, 2010, and the Stipulation Regarding Discovery, that on September 29, 2010 at 10:00 a.m., BAE Systems San Diego Ship Repair Inc. ("BAE Systems") will take the deposition of Benjamin Tobler ("Deponent"). This deposition will take place at the law offices of DLA Piper LLP (US), 401 B Street, Suite 1700, San Diego, California 92101-4297, upon oral examination before a Certified Shorthand Reporter duly authorized to administer oaths, and will continue from day to day, Saturdays, Sundays and holidays excepted, until completed.

PLEASE TAKE FURTHER NOTICE that the deposition may also be videotaped, stenographically recorded, and recorded through such means as to provide the instant display of the testimony. BAE Systems reserves the right to use any videotaped portion of the deposition testimony at a hearing in this matter.

PLEASE TAKE FURTHER NOTICE that Deponent shall produce and permit inspection and copying of the documents identified in Attachment A to this Notice at the place, date, and time specified above.

Dated: September 14, 2010

DLA PIPER LLP (US)

By: ______________________

Michael S. Tracy
Amy G. Nefouse
Matthew B. Dart
Erin O. Doyle
Attorneys for Designated Party
BAE Systems San Diego Ship Repair Inc.

ATTACHMENT A TO THE NOTICE OF DEPOSITION FOR

BENJAMIN TOBLER

I. INSTRUCTIONS

1. Please produce DOCUMENTS as they are kept in the usual course of business or organize and label them to correspond with the categories in these requests.

2. In the event any requested DOCUMENT has been destroyed, lost, discarded or otherwise disposed of, please identify such DOCUMENT as completely as possible, including without limitation the following information: (a) date of disposal; (b) manner of disposal; and (c) person approving of the disposal.

II. DEFINITIONS

The following definitions shall apply to each category of documents set forth below:

1. "ADVOCACY TEAM" shall mean and refer to the Advocacy Team of the California Regional Water Quality Control Board, San Diego Region ("Regional Board"), specially formed in response to and for purposes of advising the Regional Board in connection with its consideration of the TENTATIVE ORDER, and its agents, employees, attorneys, investigators, consultants, affiliates, or anyone acting on its behalf.

2. "COMMUNICATIONS" shall mean and refer to the written or verbal exchange of information by any means, including, without limitation, telephone, telecopy, facsimile, or other electronic medium (including e-mail), letter, memorandum, notes or other writing method, meeting, discussion, conversation or other form of verbal expression.

3. "DOCUMENT(S)" shall mean and refer to any and all written, printed, typewritten, photographic, graphic, or recorded materials (by tape, video or otherwise), however produced or reproduced, including data stored in a computer, data stored on removable magnetic and optical media (e.g., magnetic tape, floppy disks, and recordable optical disks), e-mail, and voice mail, which relate or pertain in any way to the subject matter to which the Interrogatory refers. "DOCUMENT(S)" shall further include, without limitation, all preliminary, intermediate and final drafts or versions of any DOCUMENT, as well as any notes, comments, and marginalia appearing on any DOCUMENT, and shall not be limited in any way with respect to the process

by which any DOCUMENT was created, generated, or reproduced, or with respect to the medium in which the document is embodied. DOCUMENT(S) shall include all "writing" and tangible forms of expression falling within the scope of California Evidence Code § 250, within YOUR custody, possession or control.

4. "ENVIRONMENTAL GROUPS" shall mean and refer to any and all non-profit and/or advocacy organizations focused on environmental causes and issues, including but not limited to members of the San Diego Bay Council, including but not limited to Designated Parties San Diego Coastkeeper (formerly San Diego Baykeeper) and Environmental Health Coalition.

5. "PERSON(S)" shall mean and refer to any natural person, proprietorship, public or private corporation, limited or general partnership, trust, joint venture, firm, association, organization, board, authority, governmental entity, or any other entity, including a representative of such PERSON(S).

6. "RELATING TO" shall mean and refer to relating to, pertaining to, referring to, evidencing, in connection with, reflecting, respecting, concerning, based upon, stating, showing, establishing, supporting, bolstering, contradicting, refuting, diminishing, constituting, describing, recording, noting, embodying, memorializing, containing, mentioning, studying, analyzing, discussing, specifying, identifying, or in any other way bearing on the matter addressed in the request, in whole or in part.

7. "SITE" shall mean and refer to the Shipyard Sediment Site, as described in the TENTATIVE ORDER and TECHNICAL REPORT.

8. "TECHNICAL REPORT" shall mean and refer to the Draft Technical Report for the TENTATIVE ORDER, publicly released on December 22, 2009, including but not limited to the prior drafts released publicly on August 24, 2007, and April 4, 2008, and any other versions released prior to the date of deposition.

9. "TENTATIVE ORDER" shall mean and refer to Tentative Cleanup and Abatement Order R9-2010-0002, publically released on December 22, 2009, including but not limited to the prior drafts released publicly on April 29, 2005, August 24, 2007, and April 4, 2008, and any other versions released prior to the date of deposition.

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10. "YOU" or "YOUR" shall mean the Deponent, including without limitation YOUR employer or prior employer and its agents, employees, representatives, attorneys, accountants, investigators, and insurance companies, and their employees, and anyone else acting on your behalf). With respect to YOUR DOCUMENTS, it includes any DOCUMENTS in YOUR possession, custody or control.

11. "PERSON" shall mean any entity or natural person.

DOCUMENT REQUESTS

1. All DOCUMENTS RELATING TO any work YOU performed regarding the human health risk assessment utilized in connection with the proposed cleanup levels and/or remediation of the SITE.

2. All DOCUMENTS RELATING TO any work YOU performed regarding the ecological risk assessment utilized in connection with the proposed cleanup levels and/or remediation of the SITE.

3. All DOCUMENTS RELATING TO any work YOU performed regarding the economic feasibility analysis utilized in connection with the proposed cleanup levels and/or remediation of the SITE.

4. All DOCUMENTS RELATING TO any work YOU performed regarding the technological feasibility analysis utilized in connection with the proposed cleanup levels and/or remediation of the SITE.

5. All DOCUMENTS RELATING TO any work YOU performed regarding the cost analysis utilized in connection with the proposed cleanup levels and remediation of the SITE.

6. All DOCUMENTS RELATING TO any work YOU performed regarding the remedy selection alternatives analysis utilized in connection with the proposed cleanup levels and/or remediation of the SITE.

7. All DOCUMENTS RELATING TO any work YOU performed regarding the aquatic life impairment analysis utilized in connection with the proposed cleanup levels and/or remediation of the SITE.

/////

8. All DOCUMENTS RELATING TO any work YOU performed regarding the aquatic-dependent wildlife impairment analysis utilized in connection with the proposed cleanup levels and/or remediation of the SITE.

9. All DOCUMENTS RELATING TO any work YOU performed regarding the bioavailability analysis utilized in connection with proposed cleanup levels and/or remediation of the SITE.

10. All DOCUMENTS RELATING TO any work YOU performed regarding any alternative sediment cleanup levels analysis utilized in connection with the proposed cleanup levels and/or remediation of the SITE.

11. All DOCUMENTS RELATING TO any work YOU performed regarding any remedial monitoring analysis utilized in connection with the proposed cleanup levels and/or remediation of the SITE.

12. All DOCUMENTS RELATING TO any work YOU performed regarding the analysis of the contribution of stormwater to sediment contamination in the San Diego Bay, utilized in connection with the proposed cleanup levels and/or remediation of the SITE.

13. All DOCUMENTS RELATING TO any COMMUNICATIONS between YOU and ENVIRONMENTAL GROUPS RELATING TO the TENTATIVE ORDER and/or TECHNICAL REPORT.

14. All DOCUMENTS RELATING TO any COMMUNICATIONS between YOU and any local, state or federal agency RELATING TO the TENTATIVE ORDER and/or TECHNICAL REPORT.

15. All DOCUMENTS RELATING TO any COMMUNICATIONS between YOU and the ADVISORY TEAM RELATING TO the TENTATIVE ORDER and/or TECHNICAL REPORT.

16. All DOCUMENTS RELATING TO any COMMUNICATIONS between YOU and any PERSON, other than a member of the CLEANUP TEAM, RELATING TO the TENTATIVE ORDER and/or TECHNICAL REPORT.

PROOF OF SERVICE

I am a resident of the State of California, over the age of eighteen years, and not a party to the within action. My business address is DLA Piper LLP (US), 401 B Street, Suite 1700, San Diego, California 92101-4297. On September 14, 2010, I served the within documents:

BAE SYSTEMS' FIRST AMENDED NOTICE OF DEPOSITION OF BENJAMIN TOBLER

☒ by transmitting via e-mail the document(s) listed above to the recipient(s) set forth below on this date

SEE ATTACHED SERVICE LIST

I am readily familiar with the firm's practice of collection and processing correspondence for mailing. Under that practice it would be deposited with the U.S. Postal Service on that same day with postage thereon fully prepaid in the ordinary course of business. I am aware that on motion of the party served, service is presumed invalid if postal cancellation date or postage meter date is more than one day after date of deposit for mailing in affidavit.

I declare under penalty of perjury under the laws of the State of California that the above is true and correct.

Executed on September 14, 2010, at San Diego, California.

NATHINE NELSON

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In re Shipyard Sediment Site Cleanup Project and
Tentative Cleanup & Abatement Order No. R9-2010-0002

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Tentative Cleanup & Abatement Order No. R9-2010-0002

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CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
SAN DIEGO REGION

In the matter of Tentative Cleanup and Abatement Order No. R9-2010-0002 (Shipyard Sediment Cleanup)	San Diego Water Board Cleanup Team's Witness Designations

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TO ALL PARTIES AND TO THEIR ATTORNEYS OF RECORD HEREIN;

PLEASE TAKE NOTICE that, pursuant to the Presiding Officer's February 18, 2010 Order Issuing Final Discovery Plan Etc., Designated Party the California Regional Water Quality Control Board, San Diego Region Cleanup Team ("Cleanup Team") hereby designates the following witnesses who may testify in the above-referenced proceeding.

- David Gibson – Executive Officer, Former Branch Chief of the Water Quality Restoration Standards Branch and an Environmental Program Manager 1.
- David Barker – Branch Chief of the Surface Waters Basins Branch and a Supervising Water Resource Control Engineer.
- Julie Chan – Branch Chief of the Ground Water Basins Branch and a Supervising Engineering Geologist.
- Craig Carlisle – Senior Engineering Geologist.
- Tom Alo – Water Resource Control Engineer.
- Alan Monji – Environmental Scientist.

Dated: July 19, 2010

Respectfully submitted,

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD, SAN DIEGO REGION CLEANUP TEAM

By: /s/

Christian Carrigan

3

Watershed Monitoring and Modeling in Switzer, Chollas, and Paleta Creek Watersheds

Kenneth Schiff

Southern California Coastal Water Research Project

www.sccwrp.org

By The End Of Today

- Overview from previous meetings
- Review wet season empirical results
- Demonstrate success at building watershed models
- Assessment guidance so SCCWRP can write final report

At Our Previous Meetings

- **Sediments at the mouth of several urban creeks draining to SD Bay are listed as impaired**
  - chemistry, toxicity, benthic community

- **Two questions for this study**
  - What are the loads of COPC to the creek mouth?
  - How much of the total load deposits in the creek mouth?

- **Several COPC**
  - Chlordane, PAHs, PCBs, Cu, Pb, Zn,
  - As, Hg

Sources of COPC

- **Chollas Creek watershed**
  - Paleta and Switzer Creek watersheds
- **Runoff directly to the Chollas Creek mouth**
  - Navy, NASSCO
- **Atmospheric deposition to the creek mouth**
- **San Diego Bay**
  - tidal inputs

Watershed Inputs

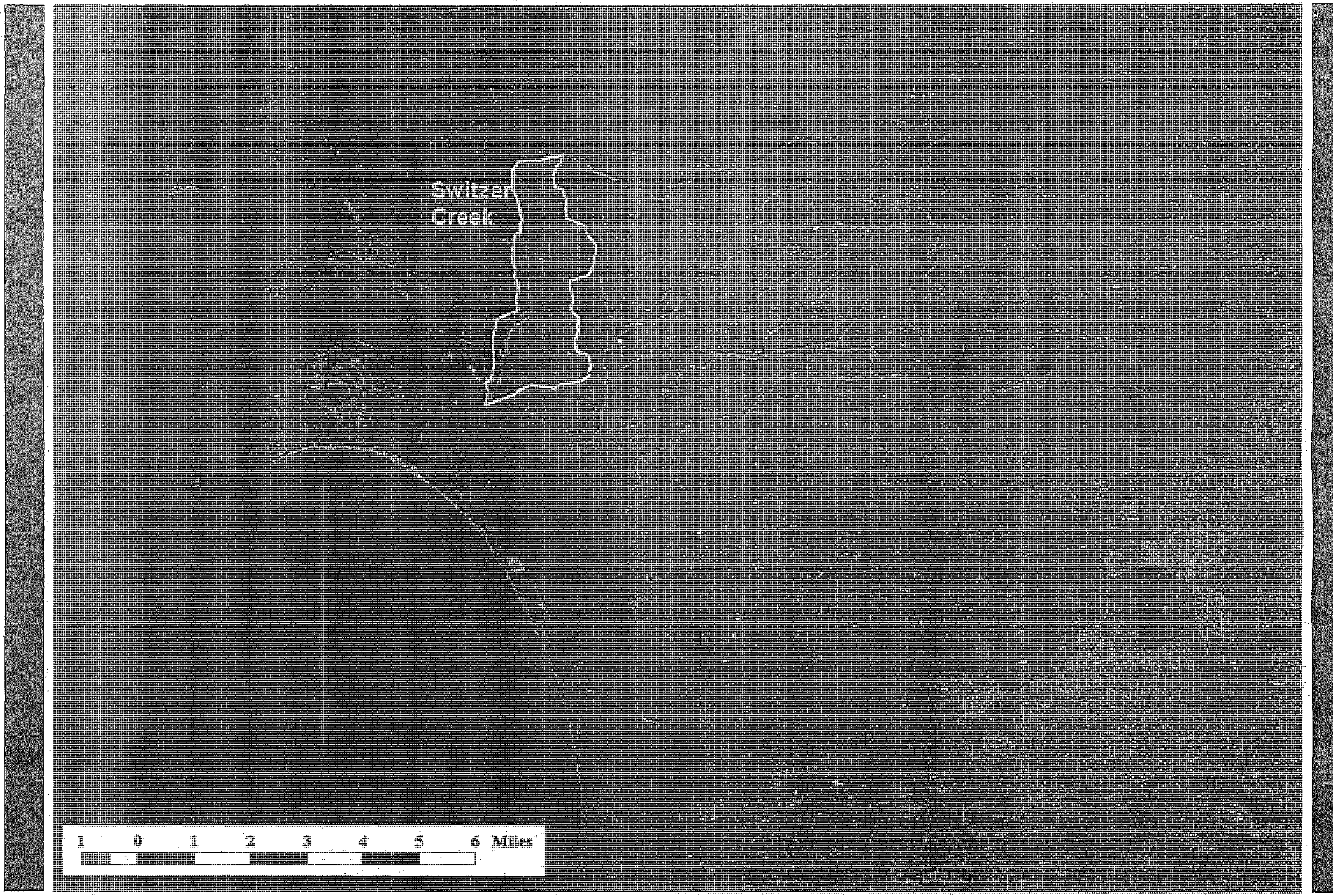
- **Break into two parts**
- **Use combination of empirical data and wet weather modeling**
  - TSS, metals, PAHs
  - Can we predict changes in loads and concentrations?
- **Use empirical data**
  - Chlorinated hydrocarbons
  - Can we detect loads or concentrations?

5

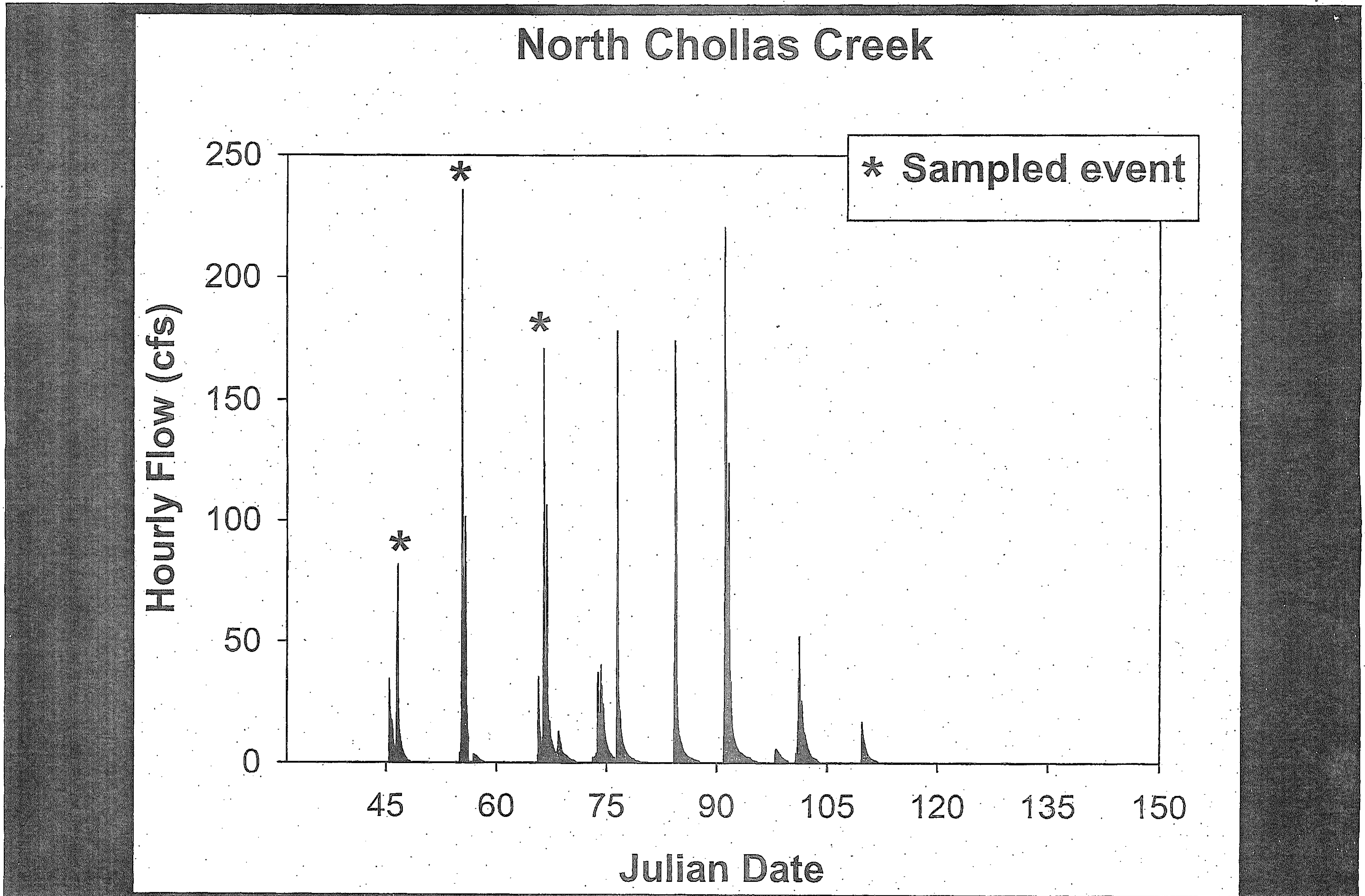
Sampling Design for Wet Weather

- **Four sites**
  - North and South Fork Chollas, Switzer, Paleta
- **Three storms each**
  - continuous flow data
- **Pollutograph for model validation**
  - 10 to 12 samples per site event
  - TSS, metals, and PAH
- **Flow weighted composites for non-modeled components**
  - large volume samples for low detection limits

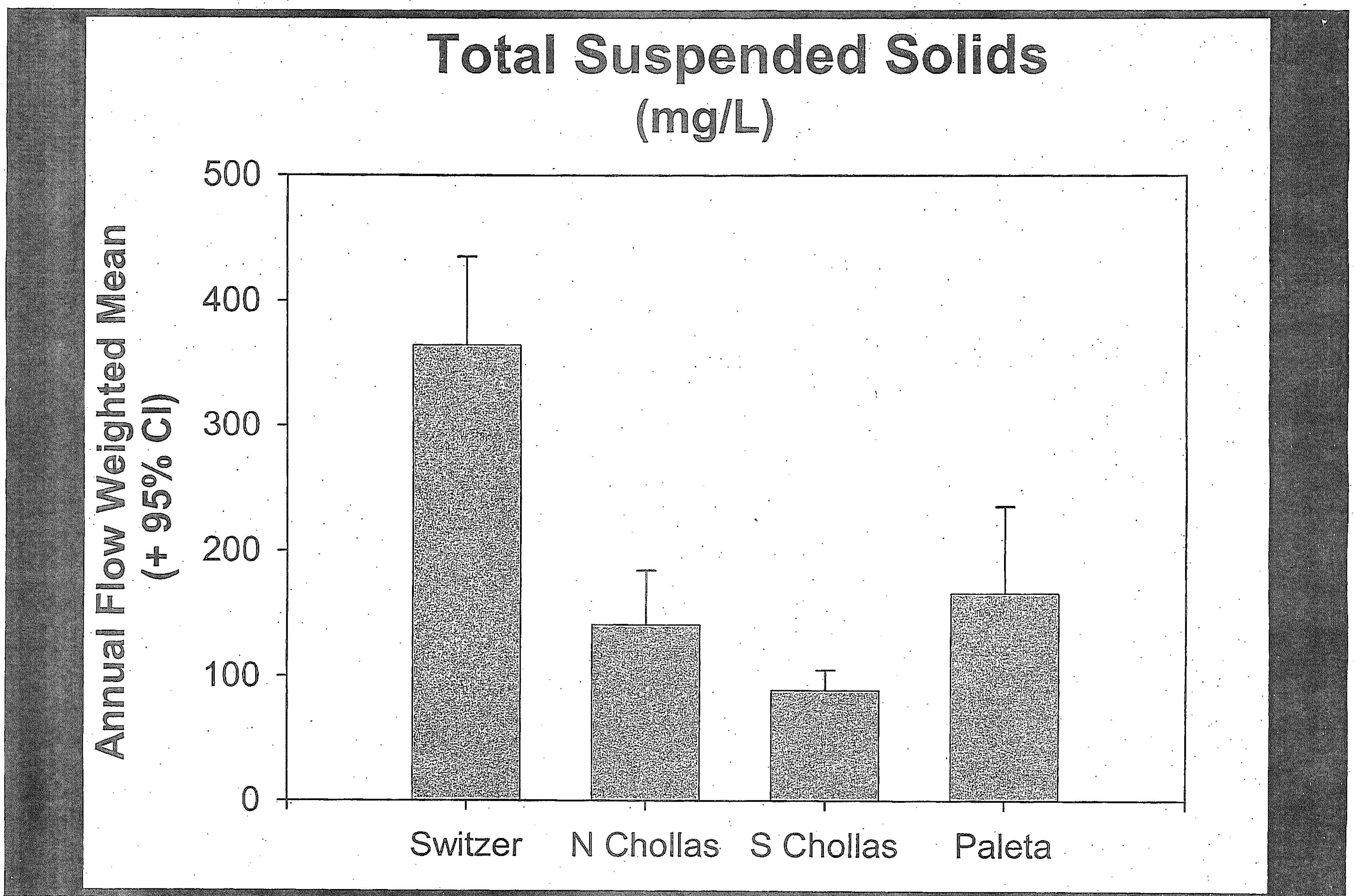
6



7


North Chollas Creek
* Sampled event
Hourly Flow (cfs)
250
200
150
100
50
0
45
60
75
90
105
120
135
150
Julian Date

8


Total Suspended Solids
(mg/L)
Annual Flow Weighted Mean
(+ 95% CI)
500
400
300
200
100
0
Switzer
N Chollas
S Chollas
Paleta

9

Annual Flow Weighted Mean

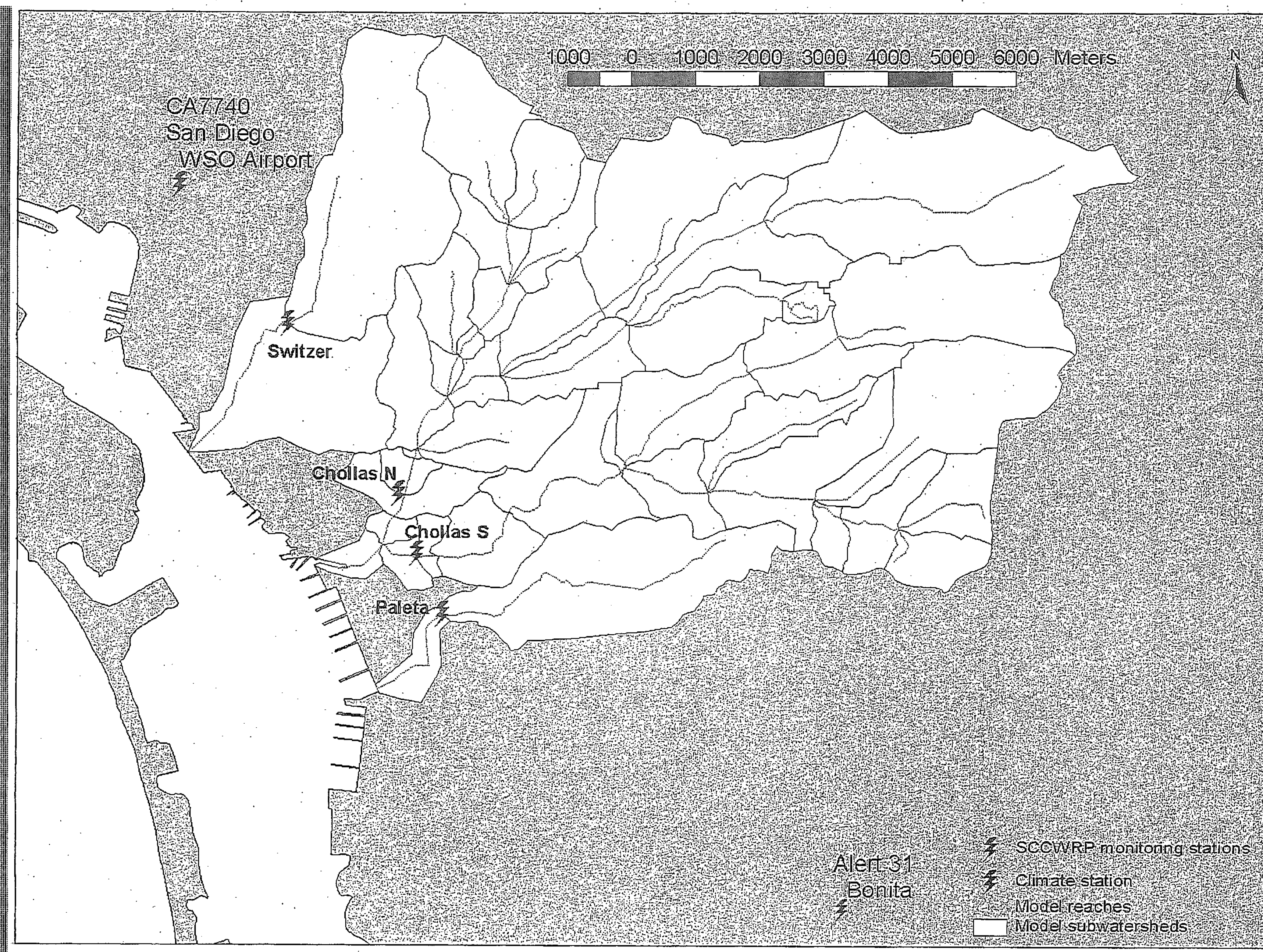
	Switzer	North Chollas	South Chollas	Paleta
TSS (mg/L)	365	141	89	166
Copper (ug/L)	58	25	15	24
Lead (ug/L)	37	24	12	30
Zinc (ug/L)	408	201	105	191
Total PAH (ng/L)	558	1,273	388	810
Tot Chlordane (ng/L)	66	20	26	34
Total PCB (ng/L)	ND	ND	ND	ND

By The End Of Today

- Overview from previous meetings
- Review wet season empirical results
- Demonstrate success at building watershed models
- Assessment guidance so SCCWRP can write final report

Approach to Building a Watershed Model

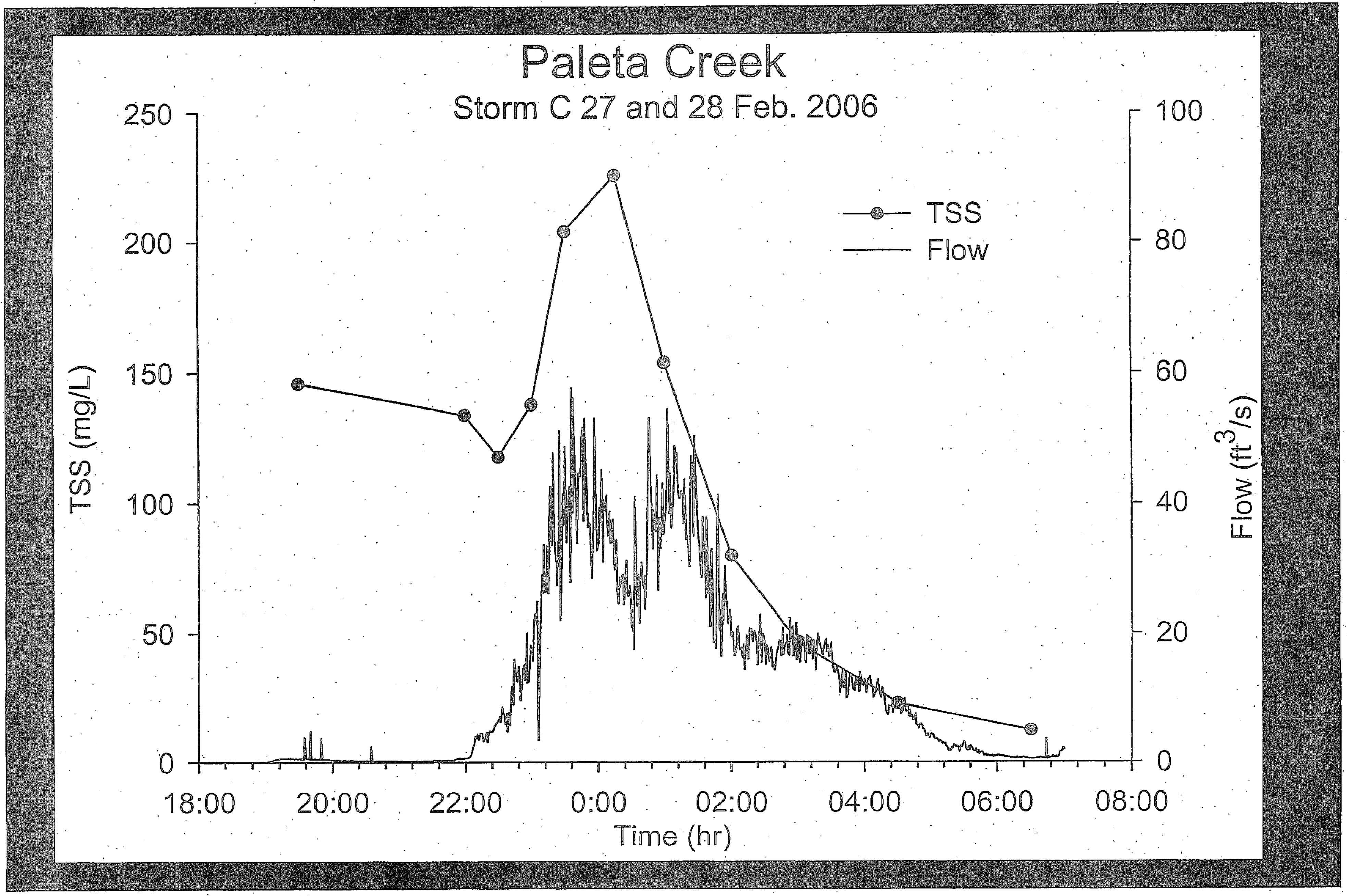
- **Physical data for the model domain**
  - watershed delineation, stream properties, land use, etc.
- **Calibrate flow and water quality at small homogeneous land uses**
  - utilize land use data from Los Angeles
- **Validate flow and water quality at the end of the watershed**
  - cumulative of all land uses


1000 0 1000 2000 3000 4000 5000 6000 Meters
N
CA7740
San Diego
WSO Airport
Switzer
Chollas N
Chollas S
Paleta
Alert 31
Bonita
SCCWRP monitoring stations
Climate station
Model reaches
Model subwatersheds

Land Use Assignment forModeling Parameters	Land Uses in Model
Commercial	Commercial/ Institutional
	Automobile Dealerships
	Parking Lots
High density residential	High density residential
Industrial	Light Industry; Heavy Industry
	Communications and Utilities
	Freeways
	Junkyard/Dump/ Landfill
	Marine Terminal
	Rail Station/Transit Centers
	Military
Low density residential	Low density residential
Mixed urban	Other Transportation
	Transitional
Open	Open Space
	Parks/Recreation
	Open Recreation

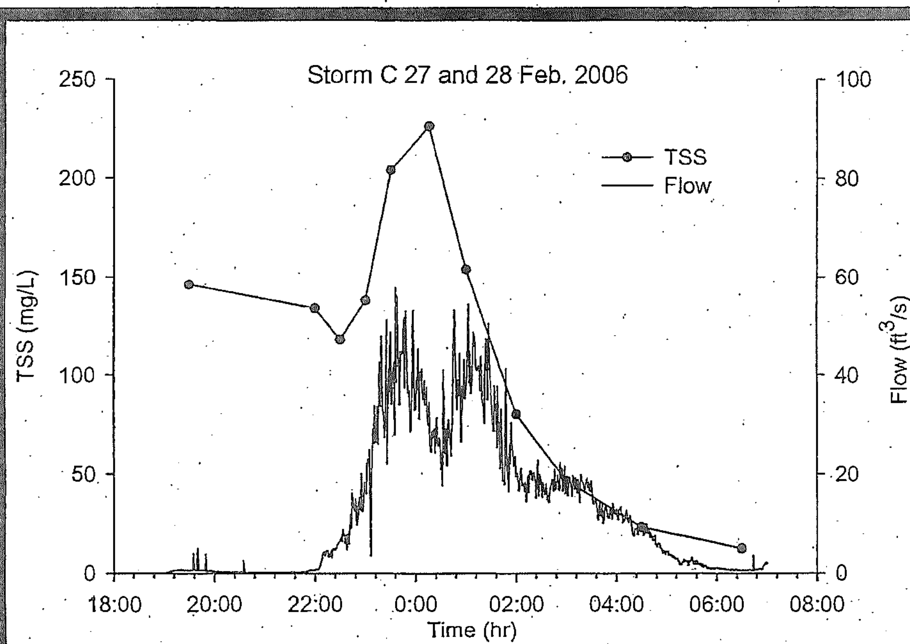
Sampling Design for Wet Weather

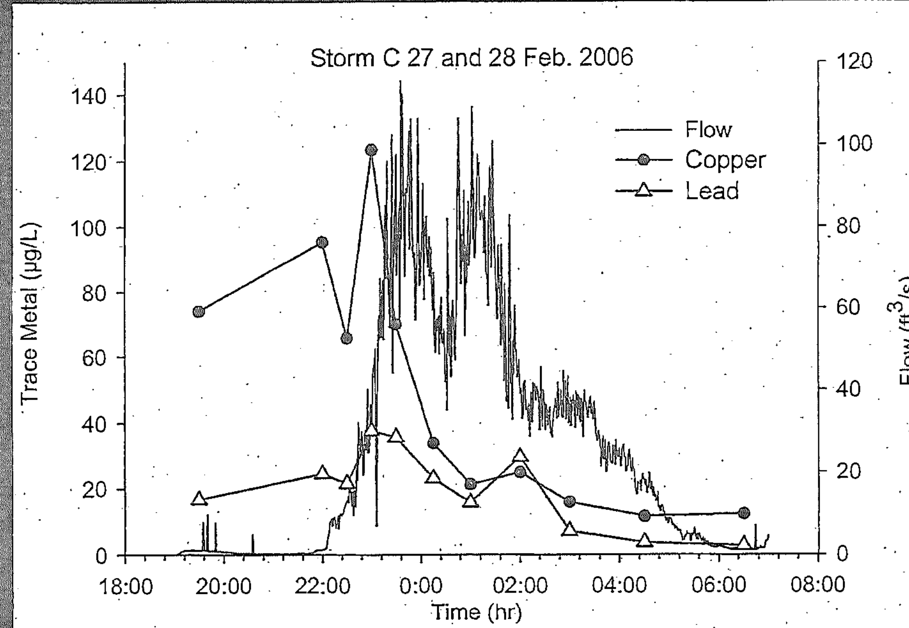
- **Four sites**
  - North and South Fork Chollas, Switzer, Paleta
- **Three storms each**
  - continuous flow data
- **Pollutograph for model validation**
  - 10 to 12 samples per site event
  - TSS, metals, and PAH
- **Flow weighted composites for non-modeled components**
  - large volume samples for low detection limits

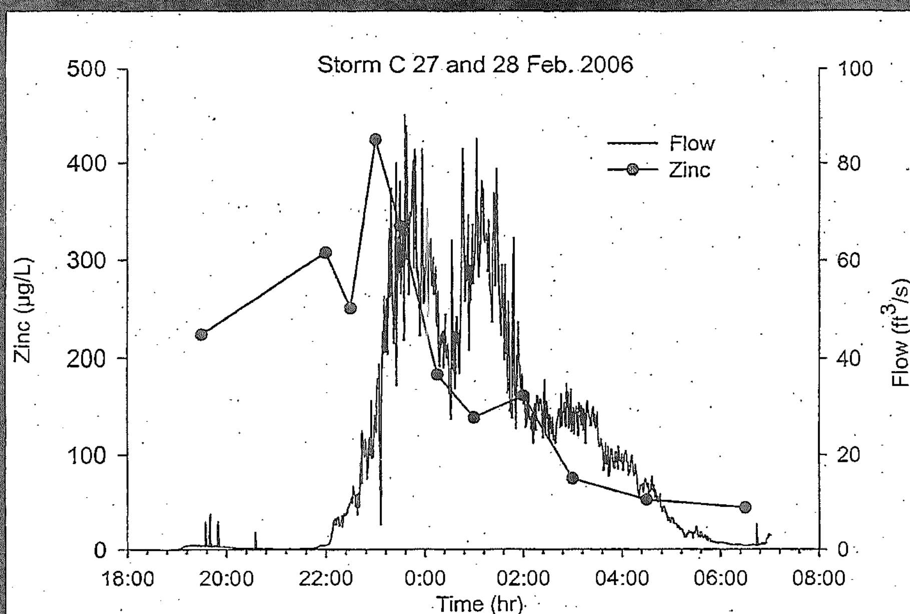


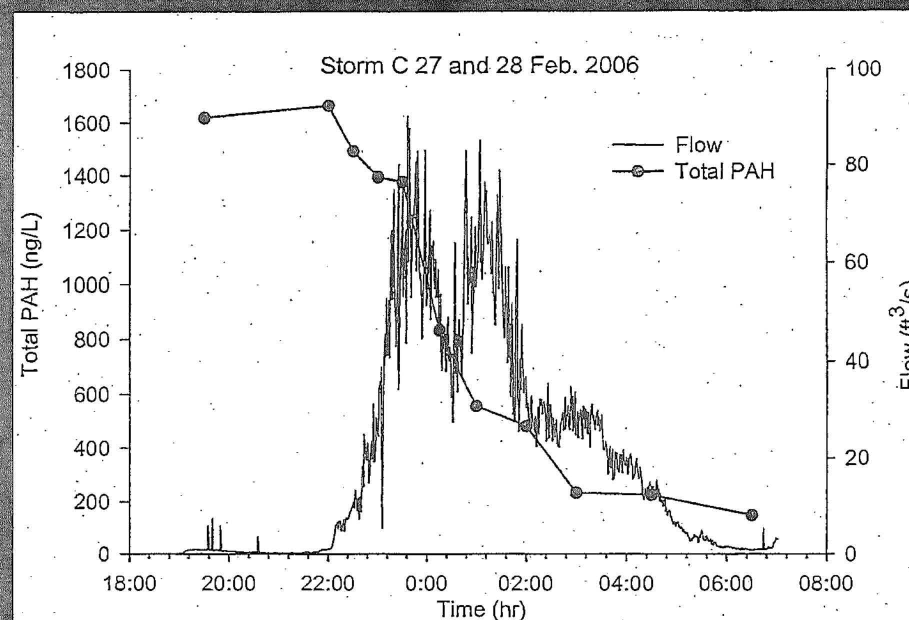
Paleta Creek
Storm C 27 and 28 Feb. 2006
TSS
Flow
TSS (mg/L)
Flow (ft³/s)
Time (hr)
250
200
150
100
50
0
100
80
60
40
20
0
18:00
20:00
22:00
0:00
02:00
04:00
06:00
08:00

.16


Storm C 27 and 28 Feb. 2006
TSS
Flow
TSS (mg/L)
Flow (ft³/s)
Time (hr)
250
200
150
100
50
0
100
80
60
40
20
18:00
20:00
22:00
0:00
02:00
04:00
06:00
08:00


Storm C 27 and 28 Feb. 2006
Flow
Copper
Lead
Trace Metal (µg/L)
Flow (ft³/s)
Time (hr)
140
120
100
80
60
40
20
0
18:00
20:00
22:00
0:00
02:00
04:00
06:00
08:00


Storm C 27 and 28 Feb. 2006
Flow
Zinc
Zinc (µg/L)
Flow (ft³/s)
Time (hr)
500
400
300
200
100
0
80
60
40
20
18:00
20:00
22:00
0:00
02:00
04:00
06:00
08:00


Storm C 27 and 28 Feb. 2006
Flow
Total PAH
Total PAH (ng/L)
Flow (ft³/s)
Time (hr)
1800
1600
1400
1200
1000
800
600
400
200
0
100
80
60
40
20
18:00
20:00
22:00
0:00
02:00
04:00
06:00
08:00

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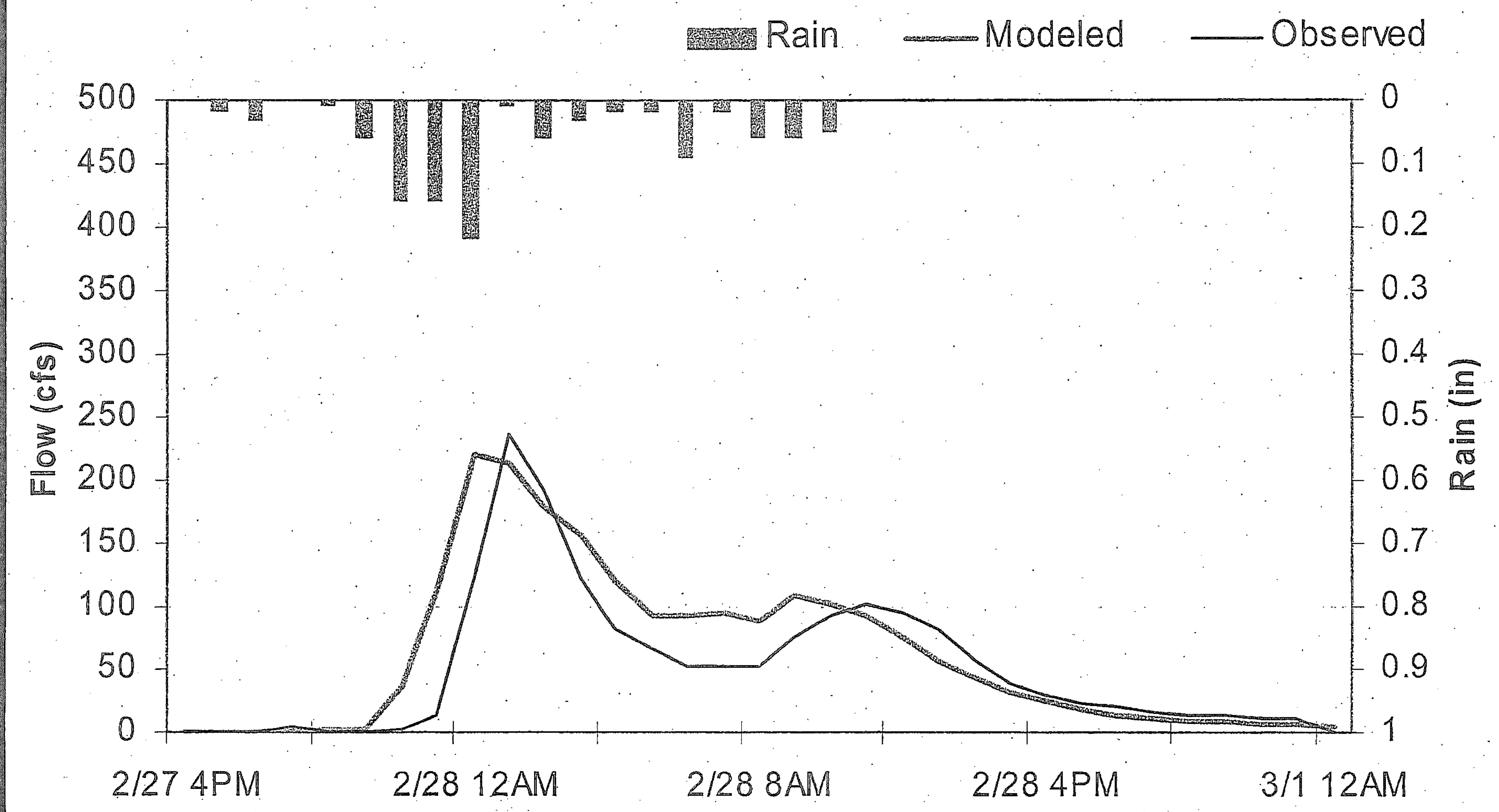
Hydrologic Calibration and Validation

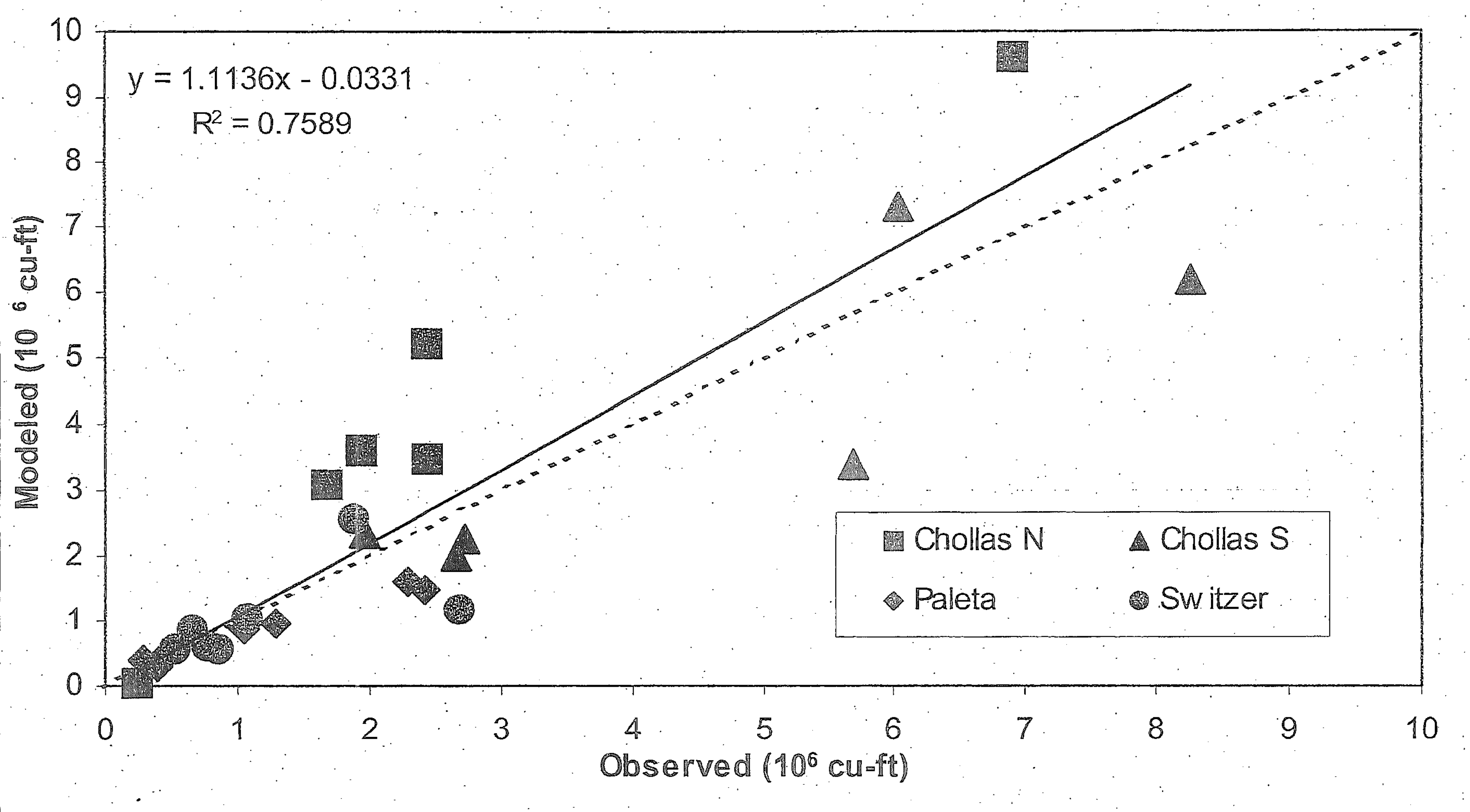
- Modeled at hourly time steps
  - Hourly averages
- Hydrographs
- Hydrograph simulations
- Assess accuracy, bias, precision

South Chollas Creek



15

Runoff Volume



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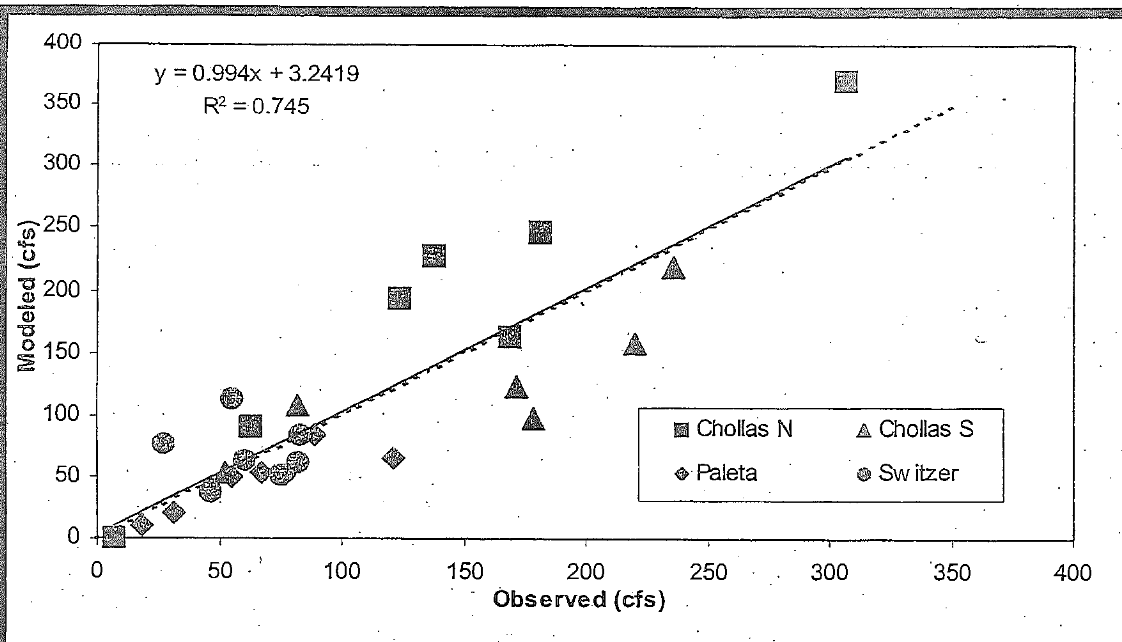
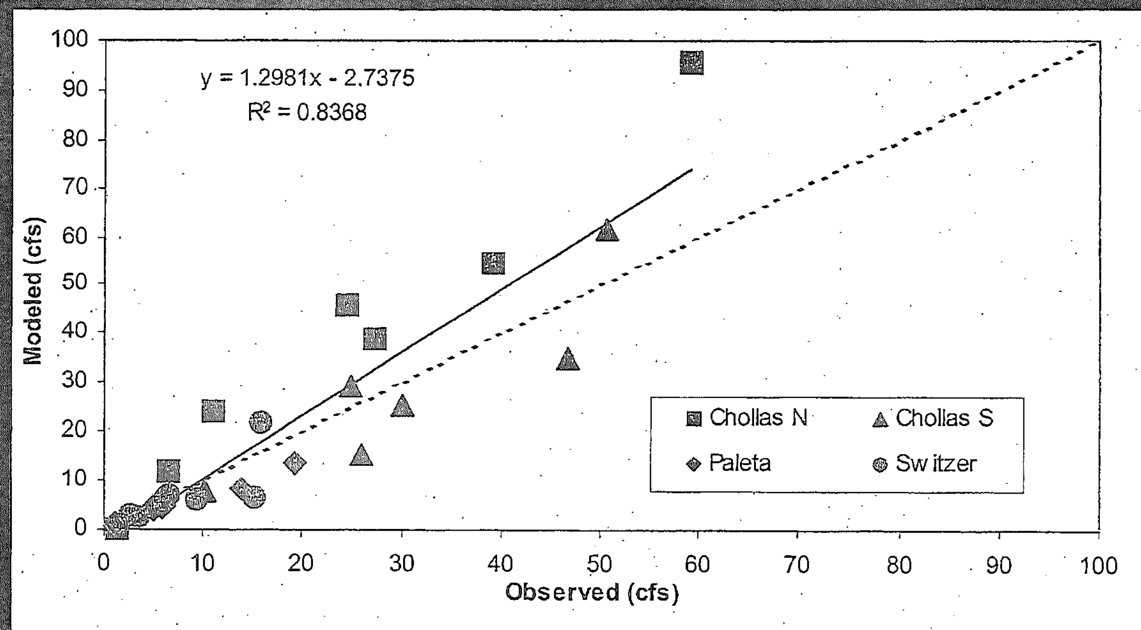


Peak Flow



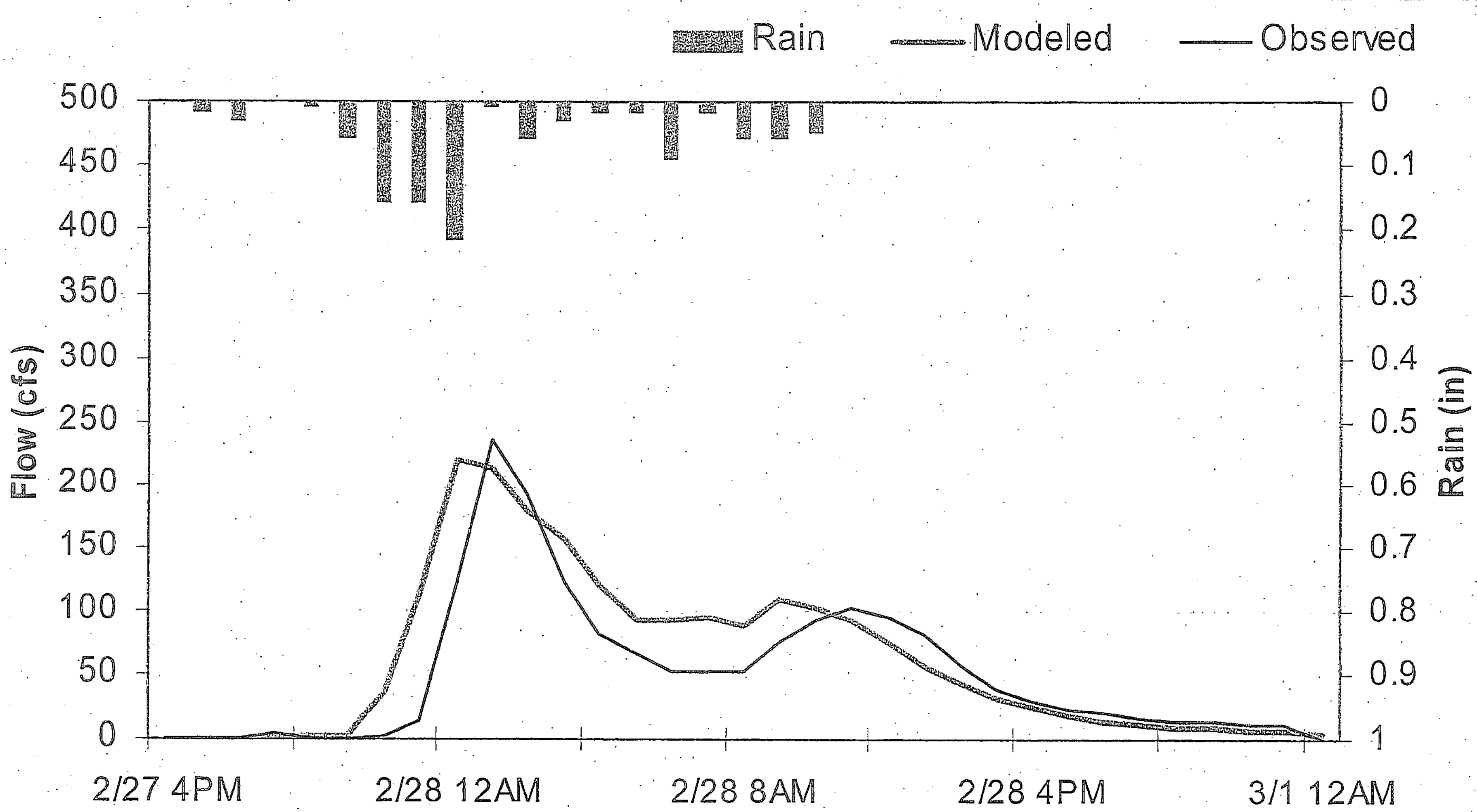
Mean Flow

21

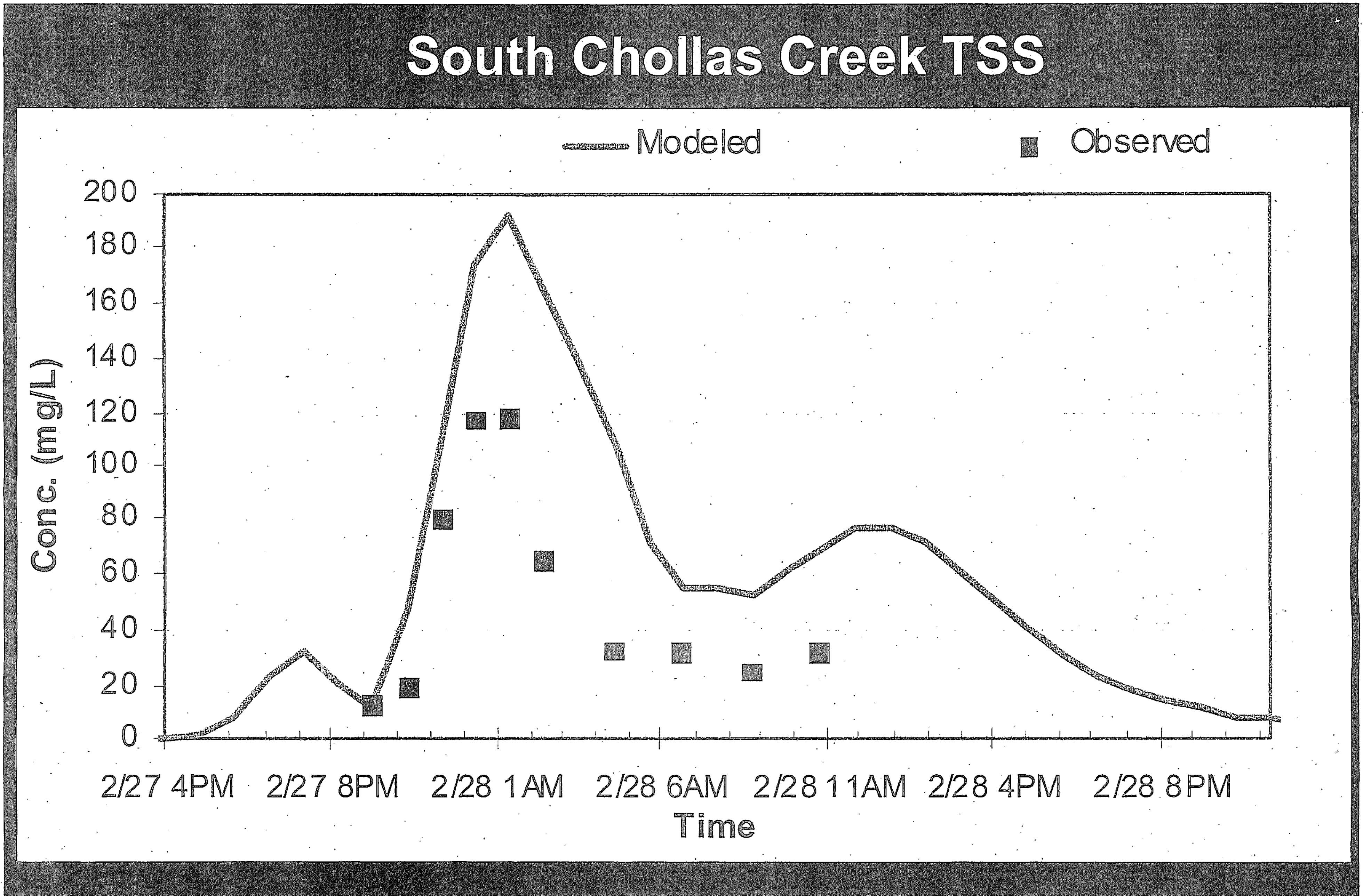
Water Quality Calibration and Validation

- Modeled at hourly time steps
  - Hourly averages
- Pollutographs
  - simulations
- Event mean concentrations
- Accuracy, bias, precision

South Chollas Creek

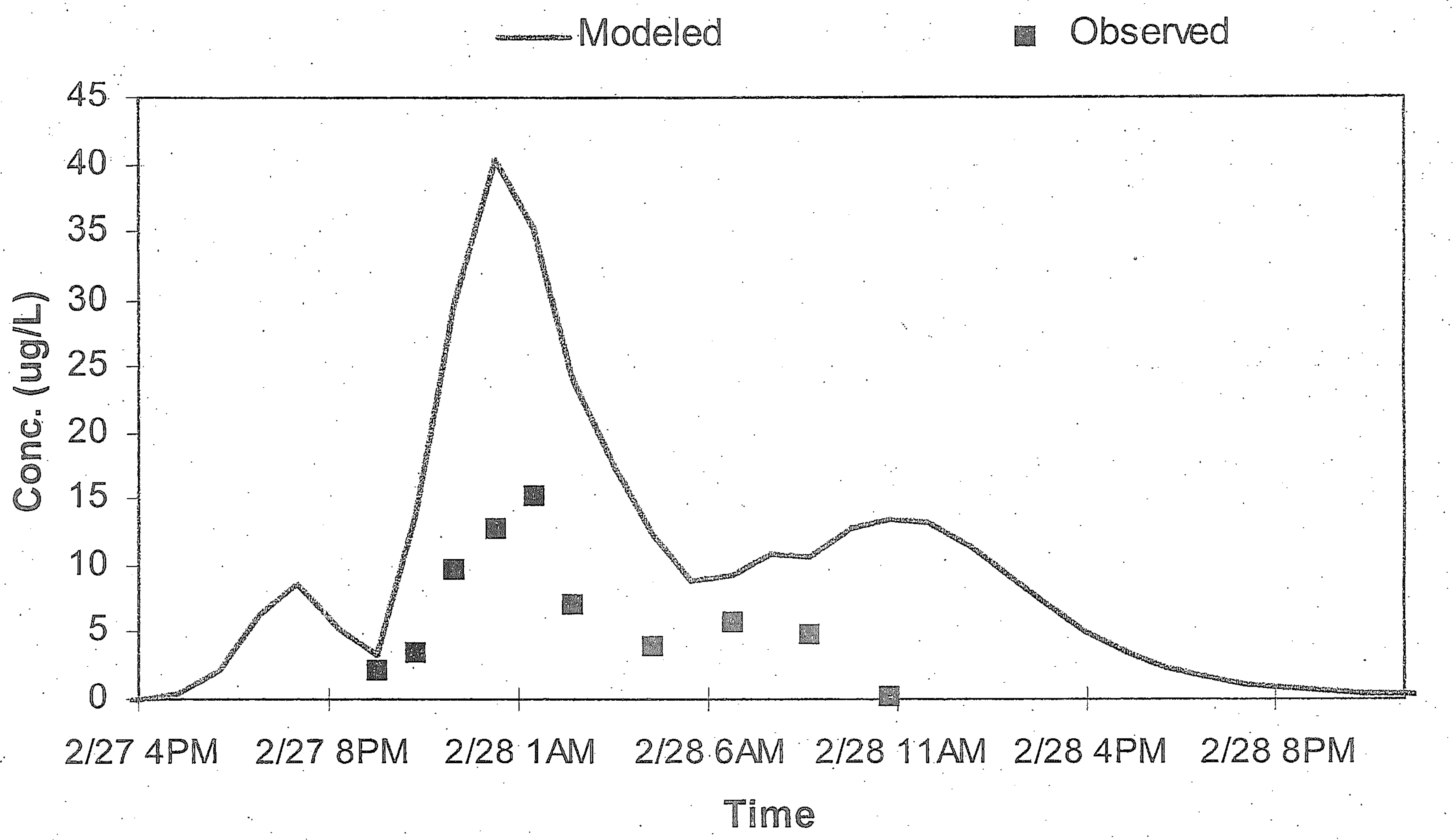


23


South Chollas Creek TSS
Modeled
Observed
Conc. (mg/L)
200
180
160
140
120
100
80
60
40
20
0
2/27 4PM
2/27 8PM
2/28 1AM
2/28 6AM
2/28 11AM
2/28 4PM
2/28 8PM
Time

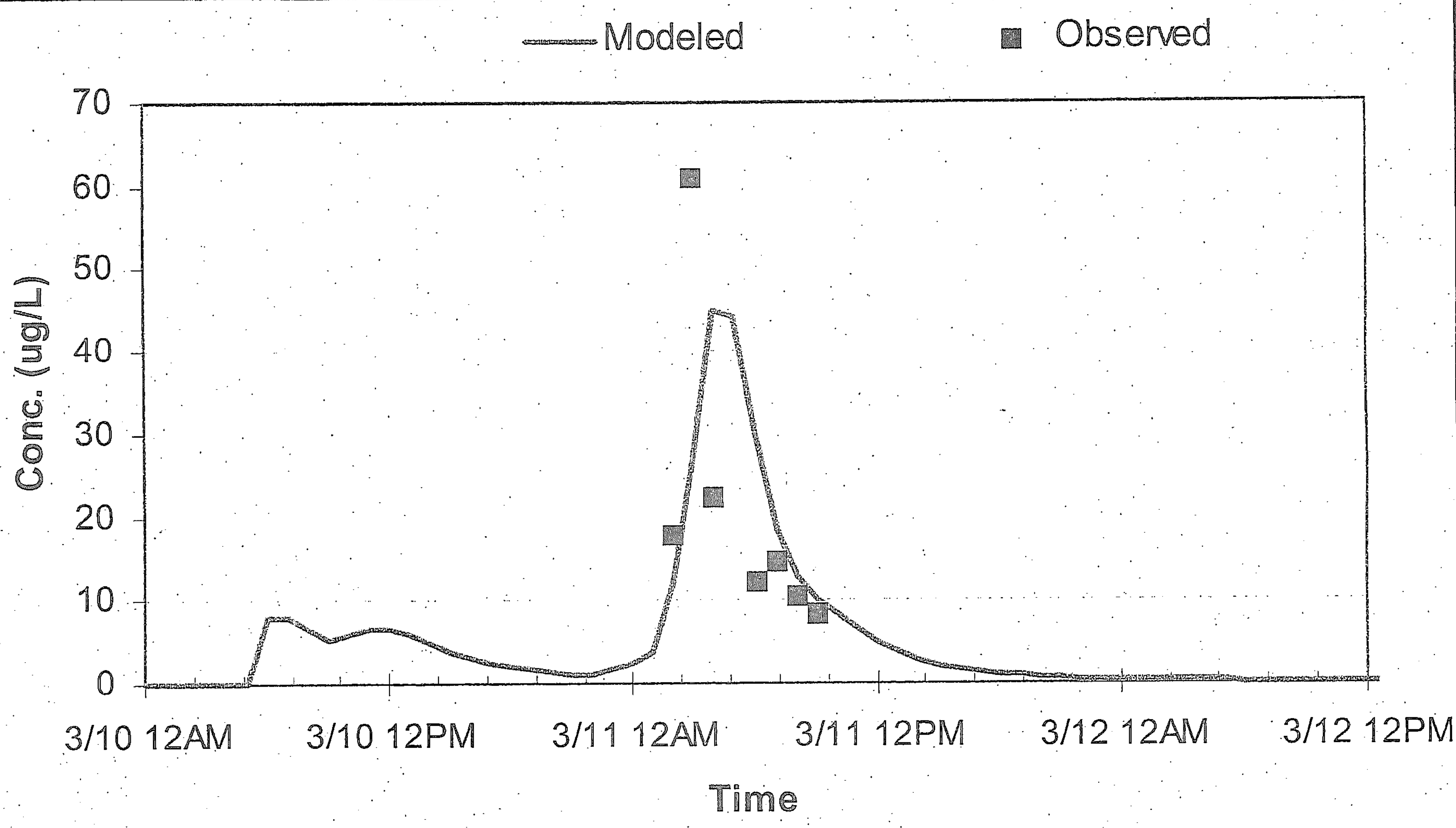
24

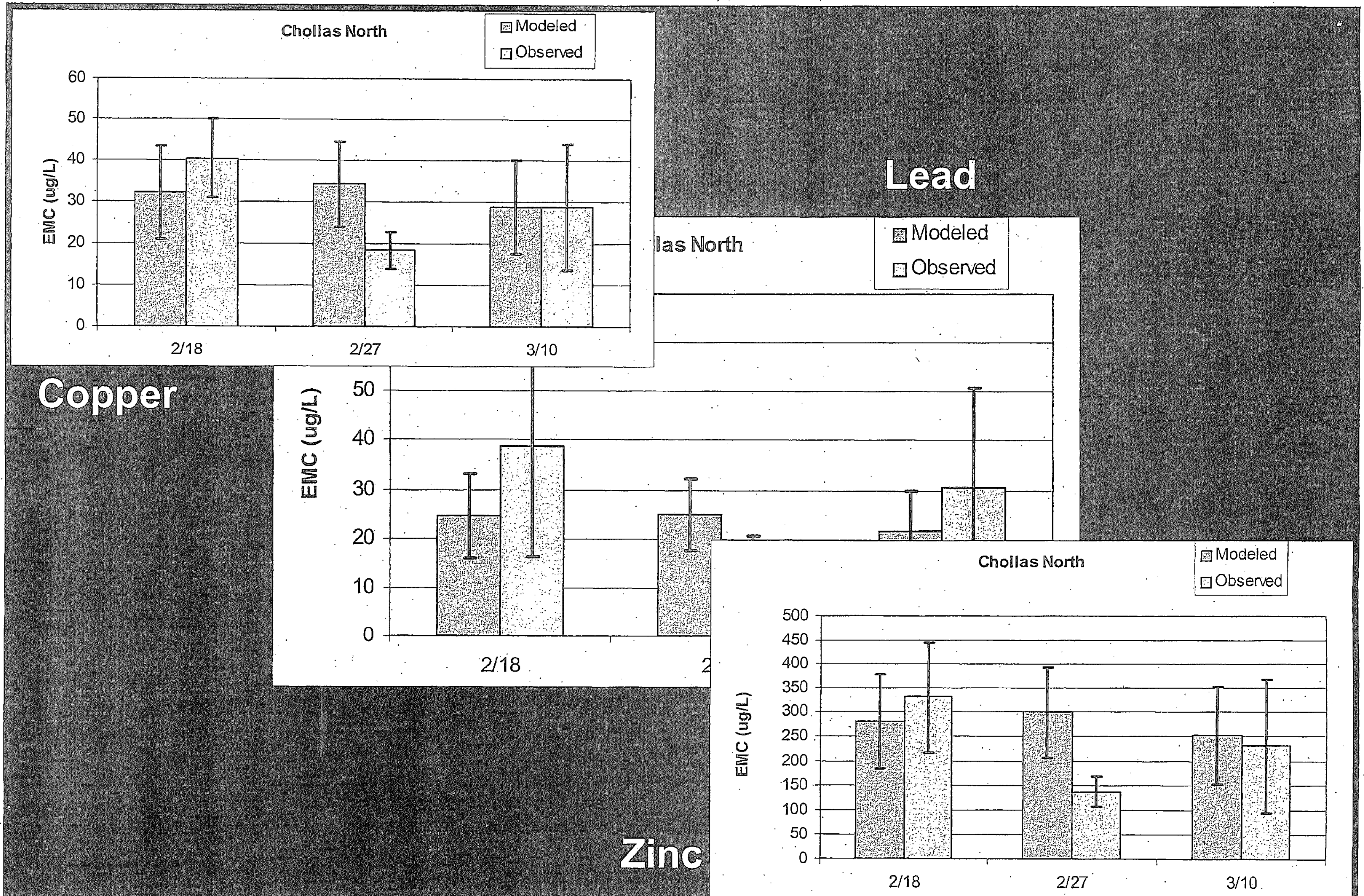
South Chollas Creek Lead



25

North Chollas Creek Lead




Copper
Cholla North
Modeled
Observed
EMC (ug/L)
60
50
40
30
20
10
0
2/18
2/27
3/10
Lead
llas North
Modeled
Observed
EMC (ug/L)
50
40
30
20
10
0
2/18
Zinc
Cholla North
Modeled
Observed
EMC (ug/L)
500
450
400
350
300
250
200
150
100
50
0
2/18
2/27
3/10

27

Modeled versus Measured EMCs

	ACCURACY (# Overlap CI's)	BIAS (% Relative to Actual)	PRECISION (Coeff of Var)
Copper	9/12	-10.7	59.8
Lead	11/12	-18.9	53.8
Zinc	9/12	-33.3	467
Total PAH	7/12	-530	1,744

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Long Term Model Runs

- Decadal simulation
  - 1996 to 2006
- All four watersheds
- All constituents
- Example output
  - what other simulations do we want?

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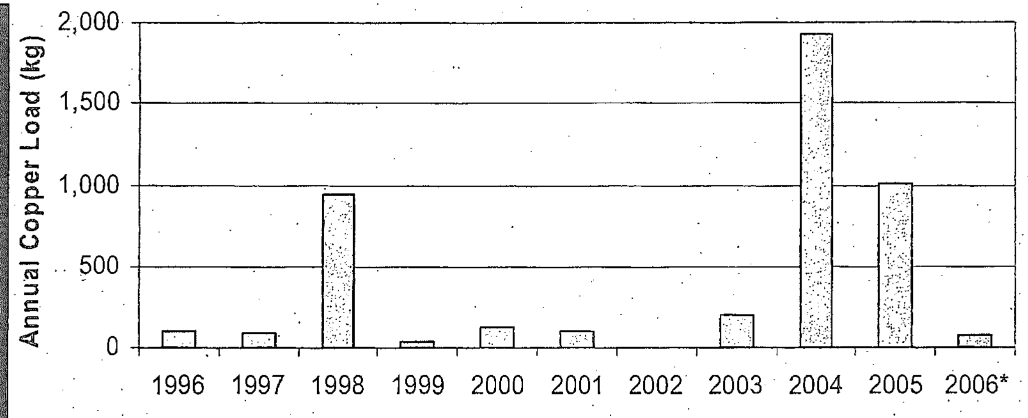
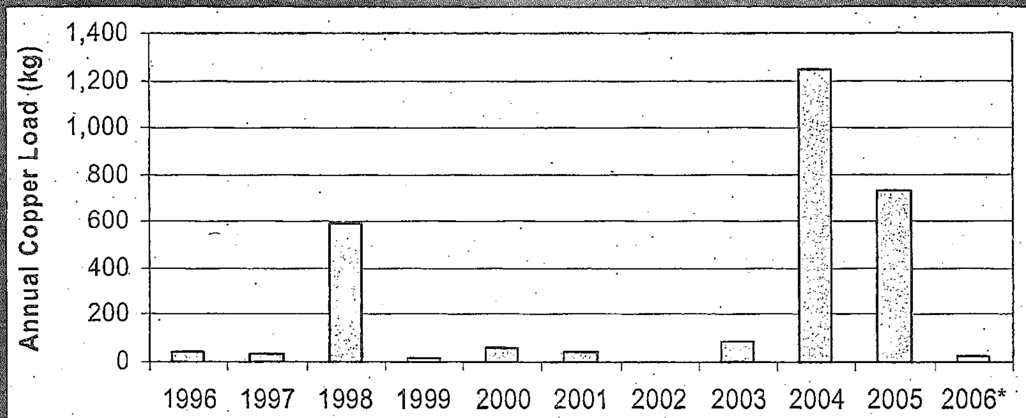
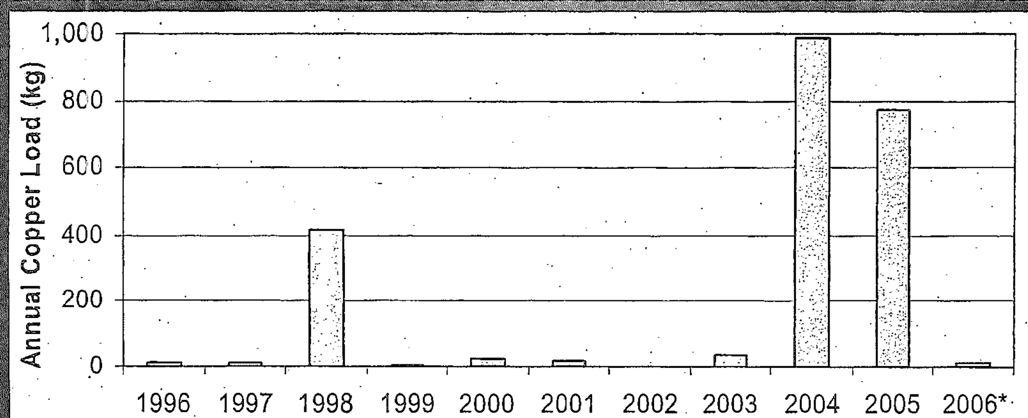


Chollas Ck



Switzer Ck



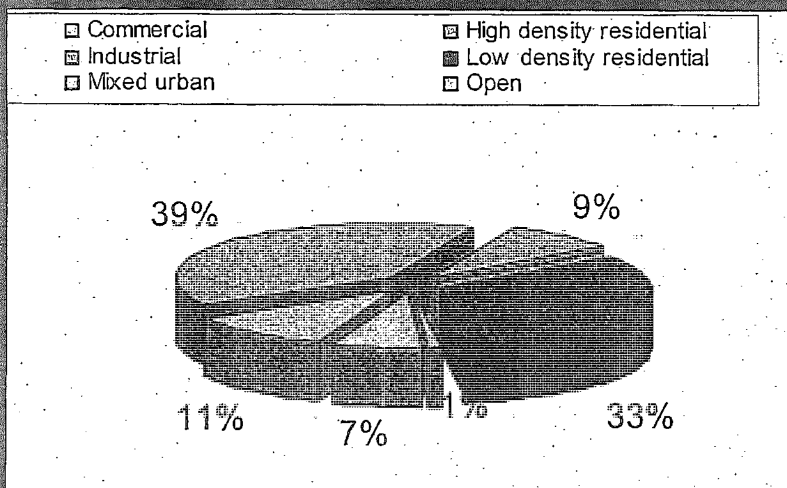
Paleta Ck

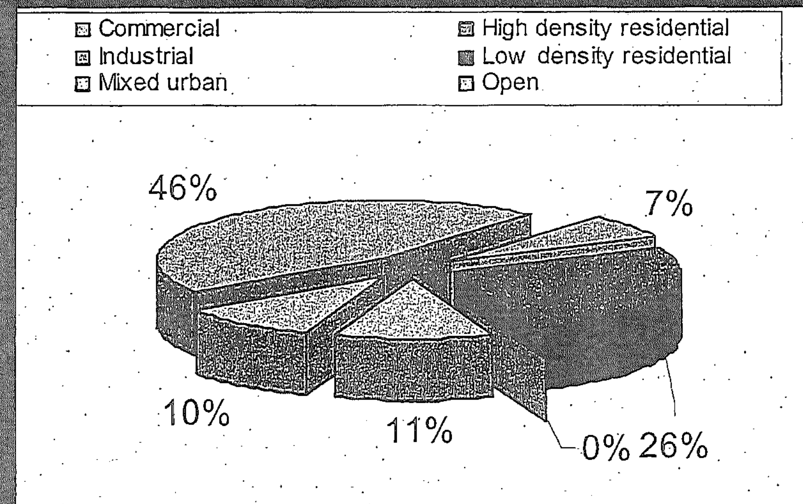
Average Annual Pollutant Loads 1996-2005

Pollutant	Chollas	Paleta	Switzer
Copper (kg)	428.8	273.3	229.2
Lead (kg)	301.2	189.2	109.8
Zinc (kg)	2905.9	1915.4	929.5
PAHs (kg)	2.69	0.20	0.36
Chlordane (g)	20.15	13.04	73.46
PCBs (g)	0.42	0.25	1.03
Arsenic (kg)	0.85	0.31	0.69
Mercury (kg)	0.08	0.05	0.08

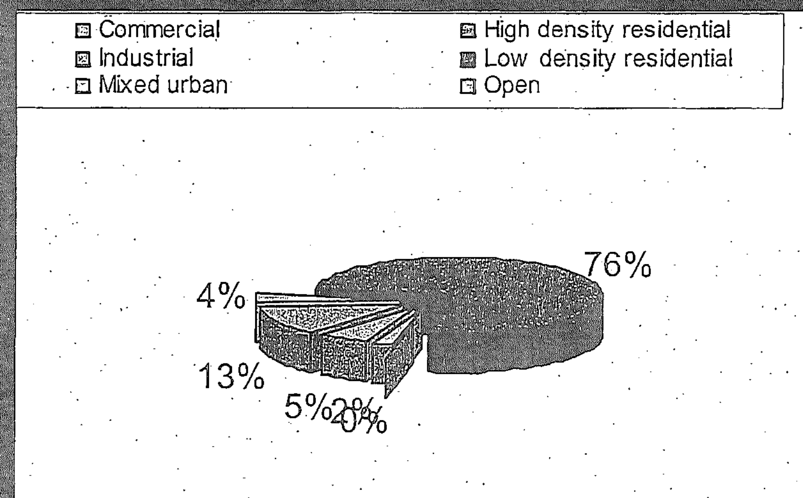
Percent Landuse Loadings for Copper

Switzer Creek





Chollas Creek



Paleta Creek

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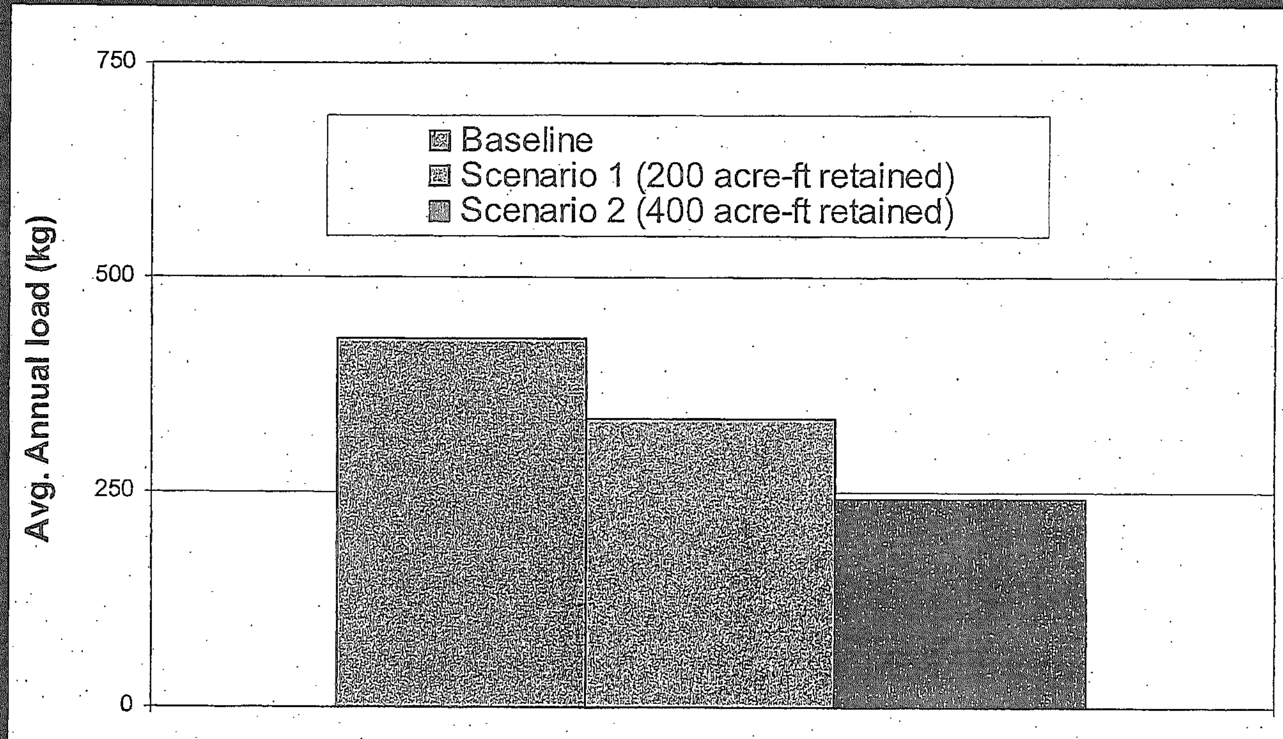
Load Reduction Scenarios

Assumed BMP Storage



22% Reduction **44% Reduction**

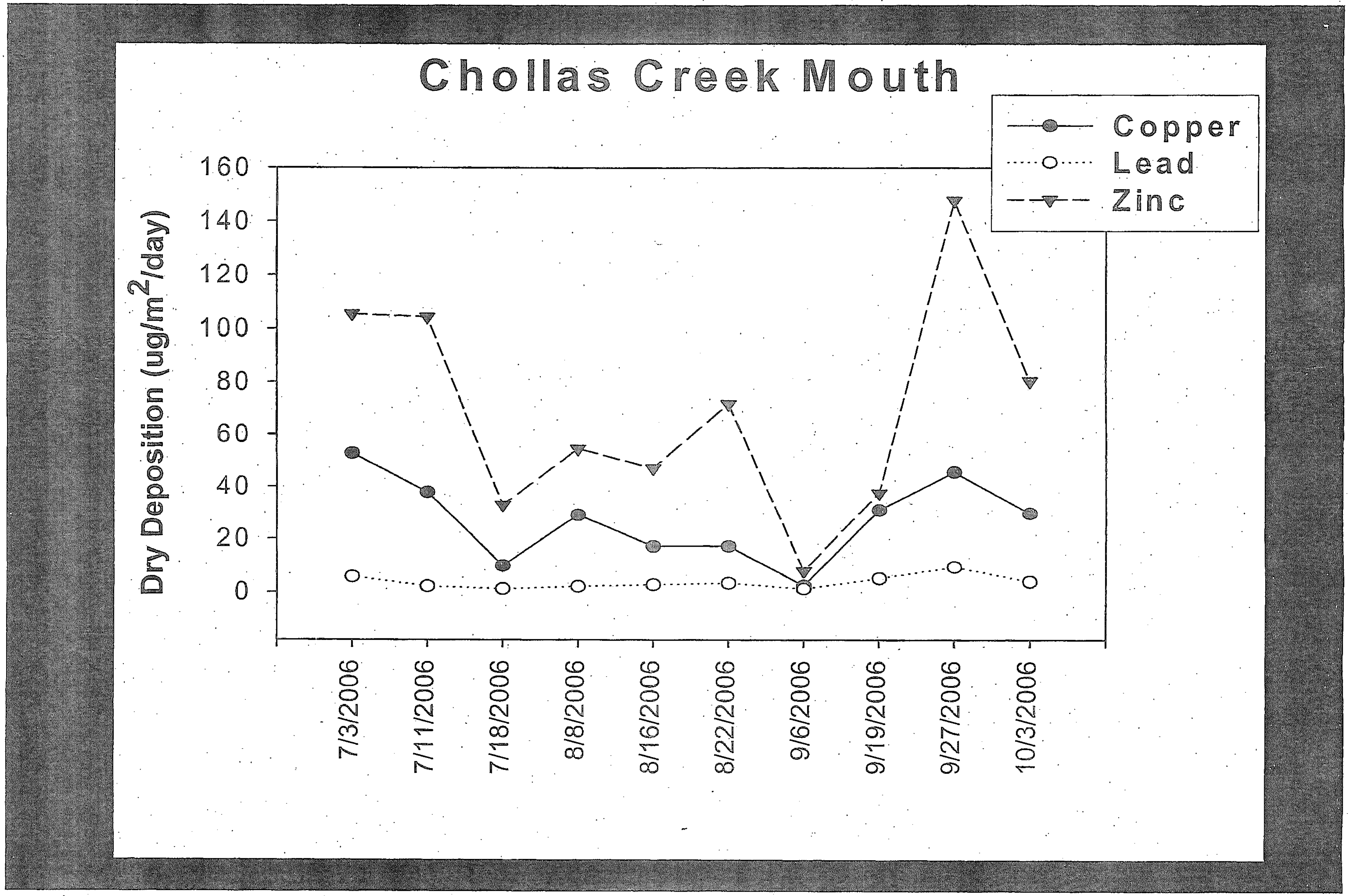
Sources of COPC

- **Cholla Creek watershed**
  - Paleta and Switzer Creek watersheds
- **Runoff directly to the Chollas Creek mouth**
  - Navy, NASSCO
- **Atmospheric deposition to the creek mouth**
- **San Diego Bay**
  - tidal inputs

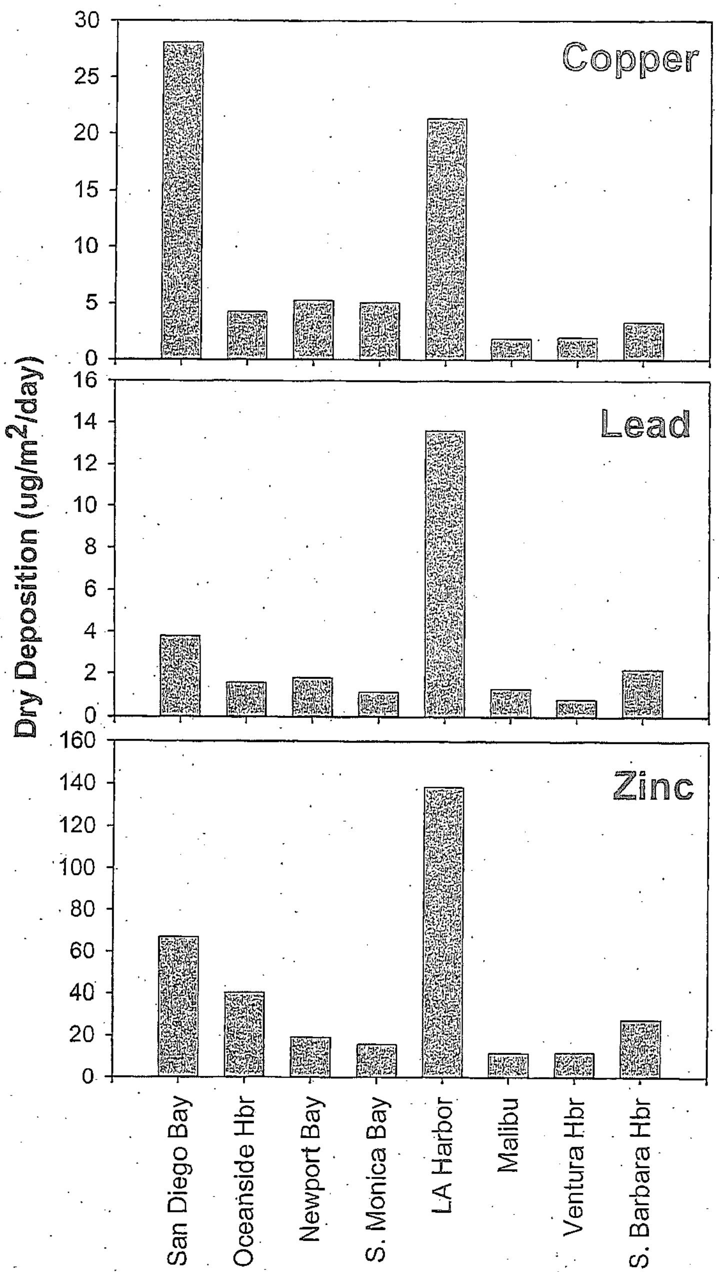
Sampling Design for Atmospheric Deposition

- **Focus was deposition onto the water surface of creek mouth**
- **One site as close to creek mouth as possible**
  - Minimum of 8 sample events
- **Use surrogate surfaces for metals**
- **Use high volume samplers for organics**
  - Supplement with water samples for diffusion estimates

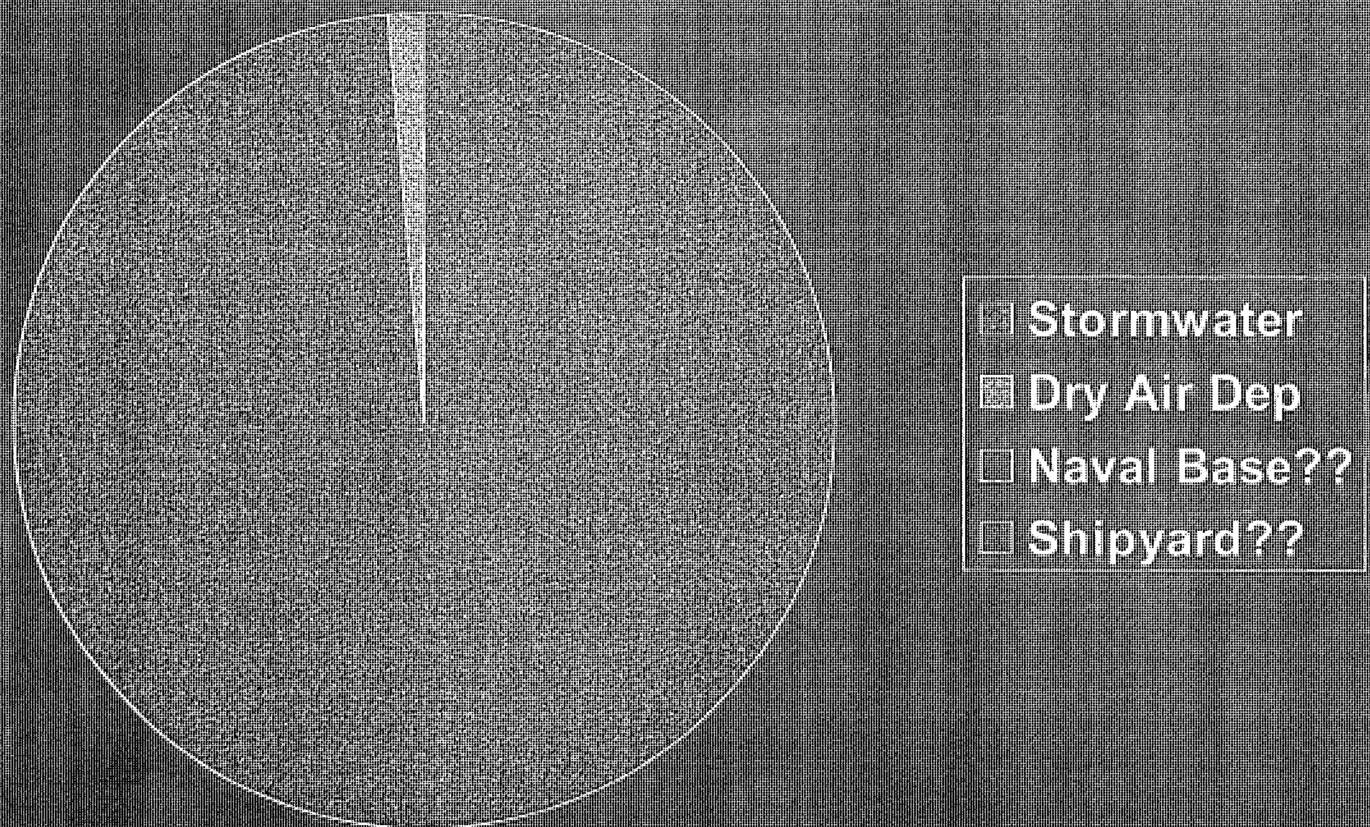
35


Chollas Creek Mouth
Copper
Lead
Zinc
Dry Deposition (ug/m2/day)
160
140
120
100
80
60
40
20
0
7/3/2006
7/11/2006
7/18/2006
8/8/2006
8/16/2006
8/22/2006
9/6/2006
9/19/2006
9/27/2006
10/3/2006

36


Copper
Lead
Zinc
Dry Deposition (ug/m2/day)
30
25
20
15
10
5
0
16
14
12
10
8
6
4
2
0
160
140
120
100
80
60
40
20
0
San Diego Bay
Oceanside Hbr
Newport Bay
S. Monica Bay
LA Harbor
Malibu
Ventura Hbr
S. Barbara Hbr

Comparison Among Sources
Copper



Wet Weather of Summary

- Successfully completed wet weather sampling from last season
- Empirical data for all constituents at all watersheds
- Developed a dynamic model
  - flow and water quality
- Accuracy, bias, and precision near expectations
  - EMCs versus pollutographs
- Modeled long term pollutant loads
  - additional model runs?

Atmospheric Dry Deposition Summary

- Successfully completed dry deposition sampling from last summer

- San Diego $\geq$ other harbors in So Cal
  - direct dep of metals small relative to wet weather at Chollas Ck mouth

- Estimates of dry deposition for organic constituents is nearly finished

Upcoming Work

- **Focused goal on creek mouth modeling**
  - How much of the total load deposits in the creek mouth?
- **Designed study plan last year**
  - SCCWRP and Navy collaboration
- **Enhance existing Bay model for Chollas Creek mouth**
  - Use our new watershed model for inputs
  - Increased spatial resolution
- **Concentrate on particle (and associated COPCs) dynamics**
  - Deposition is mostly a function of settling

Wet Season Sampling

- Wet weather runoff from Chollas Ck
  - Large volume samples for particle separation and COPC analysis
- Creek mouth sampling for hydrodynamics
  - Three dimensional plume mapping
- Creek mouth sampling for particle dynamics
  - *in situ* particle size measurements
- Creek mouth sampling for COPCs
  - Large volume samples for low detection limits

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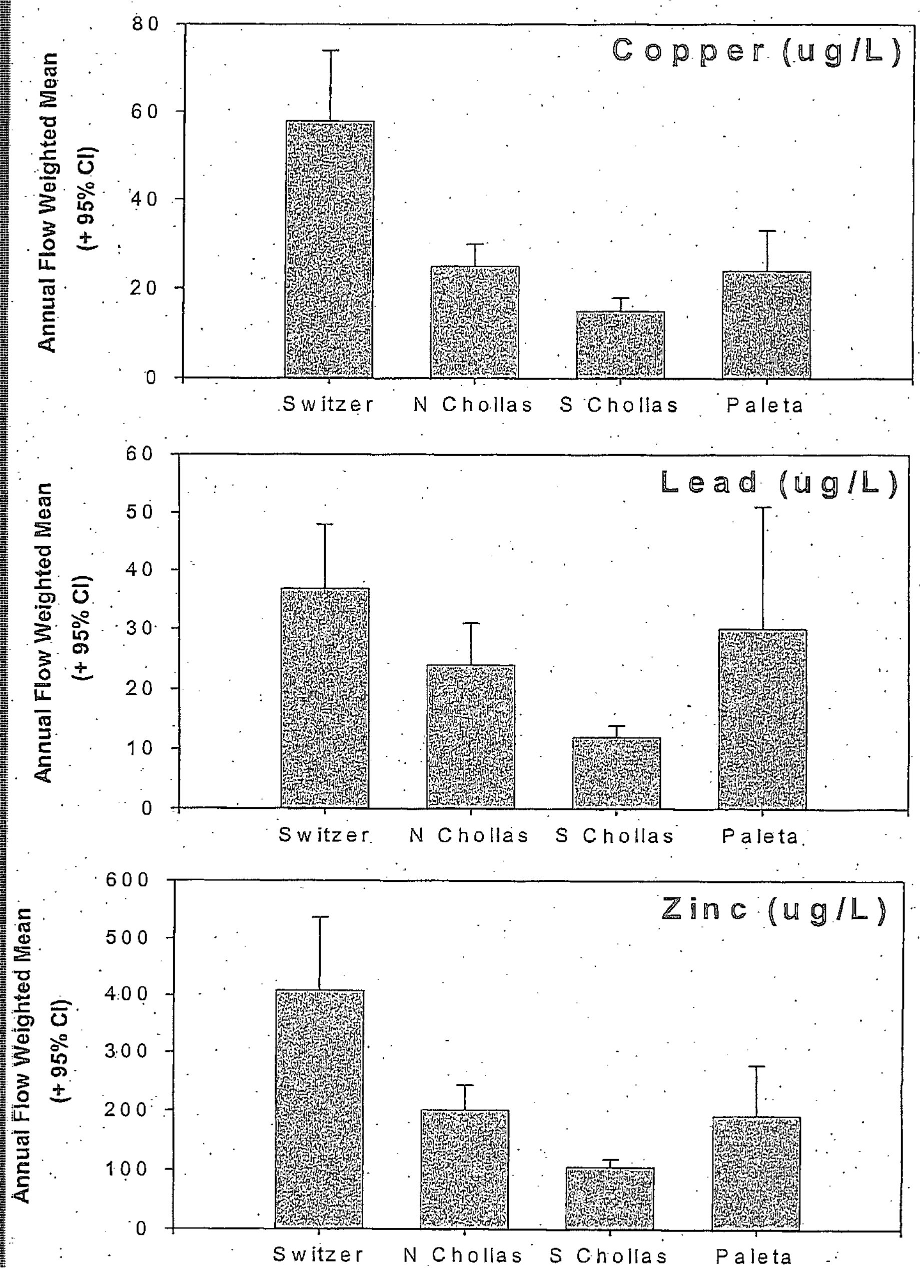
Next Steps

- Final watershed model runs
- Complete atmospheric deposition analysis
- Draft Loading Report by March
- Creek mouth sampling
  - one dry weather, two storm events

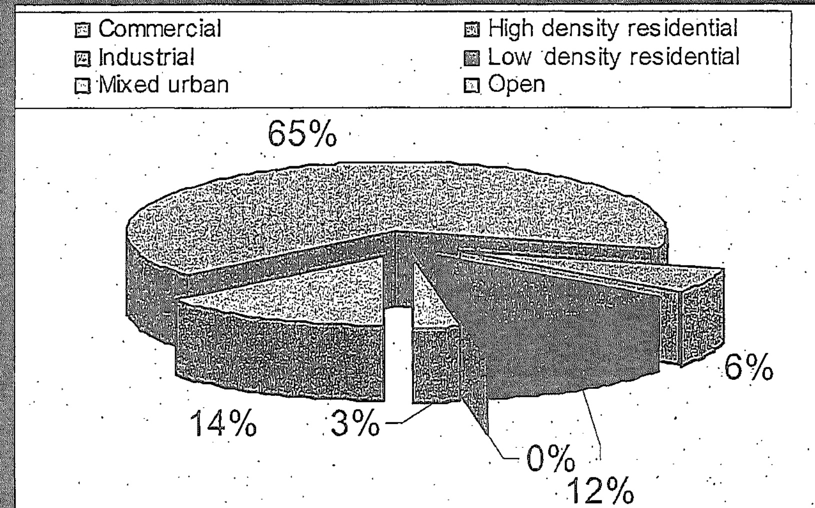

Copper (ug/L)
Annual Flow Weighted Mean (+ 95% CI)
0
20
40
60
80
Switzer
N Chollas
S Chollas
Paleta
Lead (ug/L)
Annual Flow Weighted Mean (+ 95% CI)
0
10
20
30
40
50
60
Switzer
N Chollas
S Chollas
Paleta
Zinc (ug/L)
Annual Flow Weighted Mean (+ 95% CI)
0
100
200
300
400
500
600
Switzer
N Chollas
S Chollas
Paleta

Annual Flow Weighted Mean

	Switzer	N Chollas	S Chollas	Paleta
TSS (mg/L)	365	141	89	166
Copper (ug/L)	58	25	15	24
Lead (ug/L)	37	24	12	30
Zinc (ug/L)	408	201	105	191
Total PAH (ng/L)	558	1,273	388	810
Tot Chlordane (ng/L)	66	20	26	34
Total PCB (ng/L)	ND	ND	ND	ND
Arsenic (ug/L)	3.3	3.3	2.6	3.2
Mercury (ug/L)	0.04	0.02	0.03	0.06

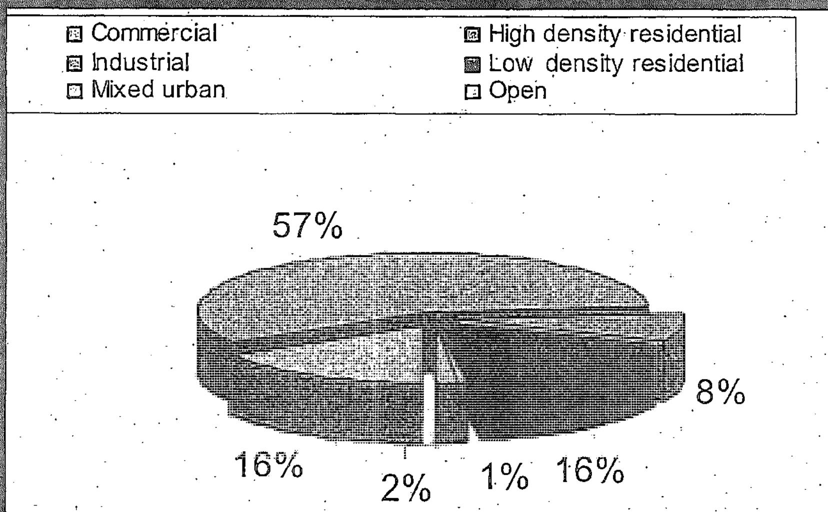
45

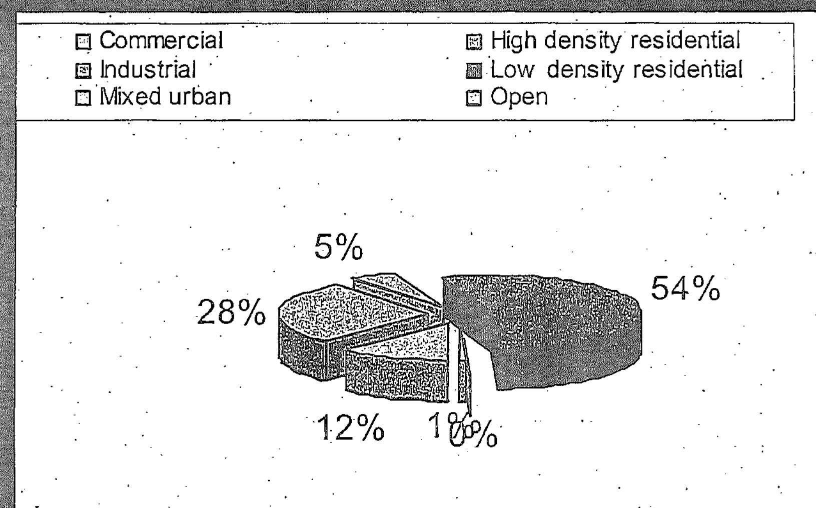
Percent Landuse Loadings for Lead



Chollas Creek

Switzer Creek



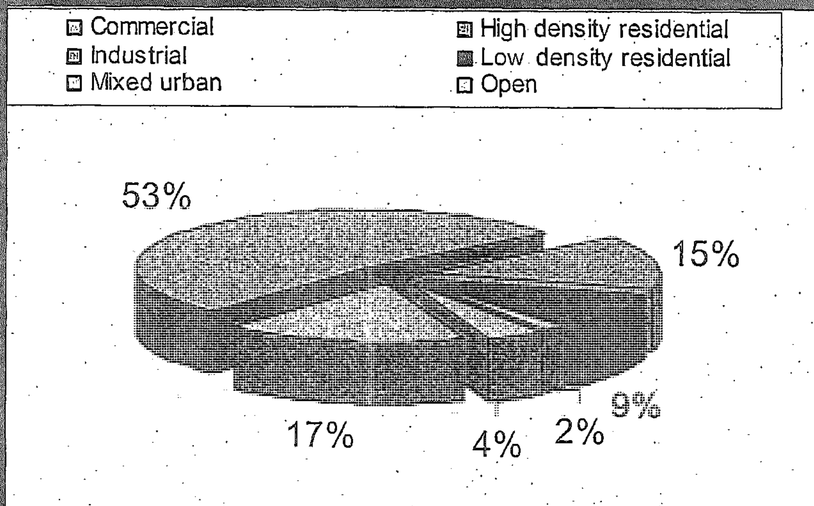


Paleta Creek

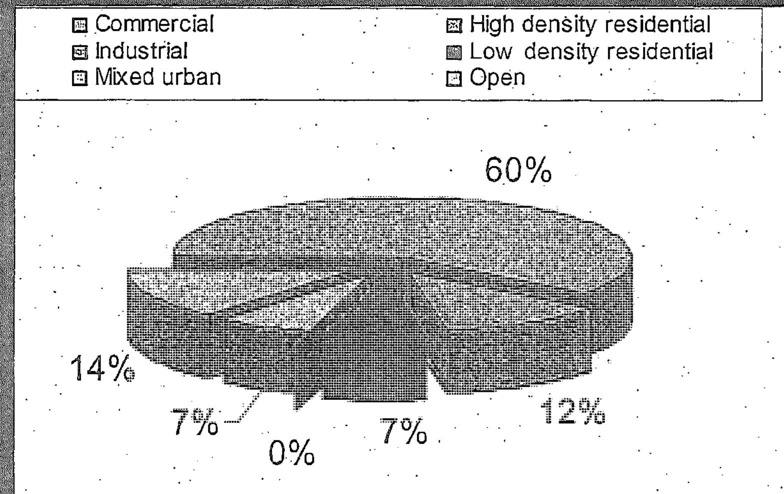
46

Percent Landuse Loadings for Zinc

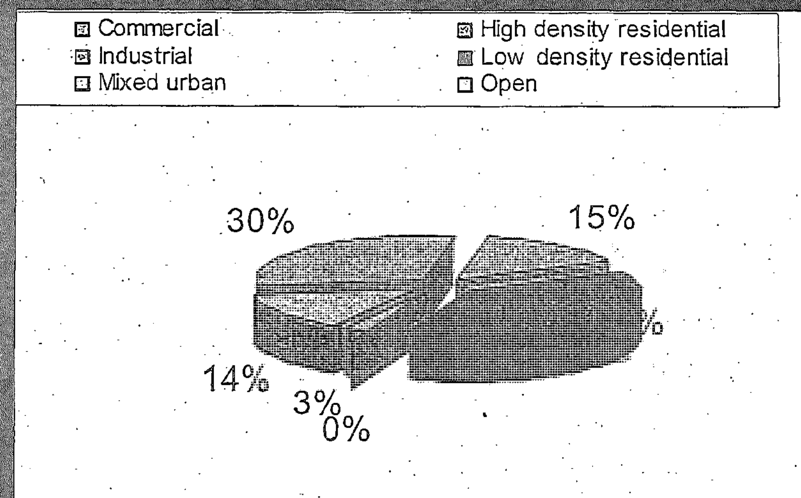
Switzer Creek



Chollas Creek



Paleta Creek



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CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
SAN DIEGO REGION

RESOLUTION NO. R9-2007-0043

A RESOLUTION ADOPTING AN AMENDMENT TO THE WATER QUALITY CONTROL PLAN FOR THE SAN DIEGO BASIN (9) TO INCORPORATE TOTAL MAXIMUM DAILY LOADS FOR DISSOLVED COPPER, LEAD, AND ZINC IN CHOLLAS CREEK, TRIBUTARY TO SAN DIEGO BAY,

AND TO REVISE THE TOXIC POLLUTANTS SECTION OF CHAPTER 3 TO REFERENCE THE CALIFORNIA TOXICS RULE

WHEREAS, The San Diego Regional Water Quality Control Board (hereinafter, San Diego Water Board), finds that:

1. **BASIN PLAN AMENDMENT**: Total Maximum Daily Loads (TMDLs) and allocations for pollutants that exceed water quality objectives in waterbodies that do not meet water quality standards under the conditions set forth in section 303(d) of the Clean Water Act [33 U.S.C. 1250, *et seq.*, at 1313(d)] ("Water Quality Limited Segments") should be incorporated into the *Water Quality Control Plan for the San Diego Basin (9)* (Basin Plan) pursuant to Article 3, commencing with section 13240, of Chapter 4 of the Porter-Cologne Water Quality Control Act, as amended, codified in Division 7, commencing with section 13000, of the Water Code.

2. **CLEAN WATER ACT SECTION 303(d)**: The lowest 1.2 miles of Chollas Creek (from the mouth of Chollas Creek at San Diego Bay to 1.2 miles inland) were placed on the List of Water Quality Limited Segments in 1996 due to levels of dissolved copper, lead, and zinc (metals) in the water column that exceeded numeric water quality objectives for copper, lead, and zinc, and narrative water quality objectives for toxicity, as required by Clean Water Act (CWA) section 303(d).

3. **BENEFICIAL USE IMPAIRMENTS**: Two beneficial uses exist in Chollas Creek that are sensitive to, and subject to impairment by elevated concentrations of dissolved metals in the water column. Warm Freshwater Habitat (WARM) and Wildlife Habitat (WILD) require water quality suitable for the protection of aquatic life and aquatic dependent wildlife. Dissolved metals are toxic to aquatic life and aquatic dependent wildlife at relatively low concentrations. Concentrations of dissolved metals in Chollas Creek exceed the water quality necessary to support the WARM and WILD beneficial uses of Chollas Creek.

4. **NECESSITY STANDARD** [Government Code section 11353(b)]: Amendment of the Basin Plan to establish and implement TMDLs for Chollas Creek is necessary because the existing water quality in the lowest 1.2 miles of Chollas Creek does not meet applicable water quality objectives for copper, lead, zinc, or toxicity. CWA section 303(d) requires the establishment and implementation of TMDLs under the conditions that exist in Chollas

Creek. TMDLs for copper, lead, and zinc are necessary to ensure attainment of applicable water quality objectives and restoration of water quality needed to support the beneficial uses designated for Chollas Creek.

5. **WATER QUALITY OBJECTIVES**: The United States Environmental Protection Agency (USEPA) has established numeric criteria for toxic pollutants which are applicable water quality objectives for dissolved copper, lead, and zinc in the inland surface waters, enclosed bays, and estuaries of California through promulgation of the California Toxics Rule (CTR). [40 CFR 131.38]. These water quality criteria, presented below, are applicable to Chollas Creek.

Water Quality Criteria for dissolved metals in Chollas Creek.

Metal	Numeric Target for Acute Conditions: Criteria Maximum Concentration	Numeric Target for Chronic Conditions: Criteria Continuous Concentration
Copper	(1) * (0.96) * {e^ [0.9422 * ln (hardness) - 1.700]}	(1) * (0.96) * {e^[0.8545 * ln (hardness) - 1.702]}
Lead	(1) * {1.46203 – [0.145712 * ln (hardness)]} * {e^ [1.273 * ln (hardness) - 1.460]}	(1) * {1.46203 – [0.145712 * ln (hardness)]} * {e^[1.273 * ln (hardness) - 4.705]}
Zinc	(1) * (0.978) * {e^ [0.8473 * ln (hardness) + 0.884]}	(1) * (0.986) * {e^[0.8473 * ln (hardness) + 0.884]}

Hardness is expressed as milligrams per liter.
Calculated concentrations should have two significant figures [40 CFR 131.38(b)(2)].
The natural log and exponential functions are represented as "ln" and "e," respectively.

In addition, the Basin Plan establishes the following narrative water quality objective for "toxicity" to ensure the protection of the WARM and WILD beneficial uses.

> **Toxicity Objective**: *All waters shall be maintained free of toxic substances in concentrations that are toxic to, or that produce detrimental physiological responses in human, plant, animal, or aquatic life. Compliance with this objective will be determined by use of indicator organisms, analyses of species diversity, population density, growth anomalies, bioassays of appropriate duration, or other appropriate methods as specified by the San Diego Water Board.*
>
> *The survival of aquatic life in surface waters subjected to a waste discharge or other controllable water factors, shall not be less than that for the same water body in areas unaffected by the waste discharge or, when necessary, for other control water that is consistent with requirements specified in USEPA, State Water Resources Control Board (State Board) or other protocol authorized by the San Diego Water Board. As a minimum, compliance with this objective as stated in the previous sentence shall be evaluated with a 96-hour acute bioassay.*
>
> *In addition, effluent limits based upon acute bioassays of effluents will be prescribed where appropriate, additional numerical receiving water objectives for specific toxicants will be established as sufficient data become available, and source control of*

toxic substances will be encouraged.

6. NUMERIC TARGETS: Numeric targets are established for the purposes of calculating TMDLs. Since the numeric targets are equal to the water quality criteria in the CTR for dissolved copper, lead, and zinc cited in finding 5, attainment of TMDLs will ensure attainment of these water quality criteria.

7. SOURCES OF DISSOLVED METALS: Many land uses and activities associated with urbanization are sources of copper, lead, and zinc to Chollas Creek. Freeways and commercial/ industrial land uses are major contributors. Automobiles are a significant source of all three metals. Water supply systems, pesticides, industrial metal recyclers and other industrial activities also contribute to levels of copper, lead, and zinc in excess of water quality criteria for Chollas Creek. Metals released to the environment by different land uses and activities are washed off of the land surface by urban runoff and storm flows and conveyed to Chollas Creek through municipal separate storm sewer systems. Quantification of bacteria loading in all watersheds is necessary to calculate the load reductions required to meet TMDLs.

8. WATER QUALITY OBJECTIVE VIOLATIONS: Concentrations of dissolved copper, lead, and zinc have frequently exceeded numeric water quality criteria contained in the CTR. Furthermore, in a Toxicity Identification Evaluation performed in 1999, Chollas Creek stormwater concentrations of zinc and to a lesser extent copper, were identified as causing or contributing to reduced fertility in the purple sea urchin.

9. ADVERSE EFFECTS OF COPPER, LEAD, AND ZINC: Concentrations of copper, lead, and zinc in excess of CTR criteria entail increased risk of adverse toxic effects in aquatic organisms exposed to them. Copper, lead, and zinc may bioaccumulate within lower organisms, however they do not biomagnify up the food chain. Of these three metals, copper is considered the most potent toxin at environmentally relevant aqueous concentrations.

10. TOTAL MAXIMUM DAILY LOADS AND ALLOCTIONS: TMDLs for dissolved copper, lead, and zinc are equal to the total assimilative or loading capacity of Chollas Creek for dissolved copper, lead, and zinc. The loading capacities are defined as the maximum amount of each dissolved metal that Chollas Creek can assimilate and still attain water quality criteria needed for the protection of designated beneficial uses. Each TMDLS must accommodate all known sources of a pollutant, whether from natural background, nonpoint sources, or point sources, and must include a margin of safety (MOS) to preclude pollutant loading from exceeding the actual assimilative capacities of Chollas Creek. The TMDL calculations also account for seasonal variations and critical conditions and were developed in a manner consistent with guidelines published by the USEPA. The TMDLs are concentration based, therefore, the allocations are not additive. The TMDLs for dissolved copper, lead, and zinc are equal to the Waste Load Allocations (WLAs) which are 90 percent of the CTR Criteria Continuous Concentration (CCC) and Criteria Maximum Concentration (CMC) equations. Discharges of dissolved copper, lead, and zinc require significant reductions from current levels to meet the allocations.

11. **IMPLEMENTATION PLAN**: The technical report entitled *Total Maximum Daily Loads for Dissolved Copper, Lead and Zinc in Chollas Creek, Tributary to San Diego Bay* dated June 13, 2007, presents a summary of measures that, if adopted by the San Diego Water Board, the State Water Resources Control Board (State Water Board), and local governmental agencies, will promote attainment of the load reductions needed to keep discharges of metals at or below the TMDLs calculated for Chollas Creek. Section 303 of the CWA and the federal National Pollutant Discharge Elimination System (NPDES) regulations direct the USEPA and authorized states to impose requirements consistent with TMDLs for point source discharges to "impaired" waterbodies. When the San Diego Water Board and the State Water Board re-issue or revise NPDES requirements for municipal, construction, and industrial stormwater discharges, and groundwater extraction discharges in the Chollas Creek watershed, including discharges of "small MS4s," they will have to include requirements that will implement all TMDLs applicable to waters affected by the regulated discharges.

12. **COMPLIANCE MONITORING**: Water quality monitoring will be necessary to assess progress in achieving WLAs and compliance in Chollas Creek with the water quality objectives for dissolved copper, lead, and zinc.

13. **COMPLIANCE SCHEDULE**: Full implementation of the TMDLs for dissolved copper, lead, and zinc shall be completed within 20 years from the effective date of the Basin Plan amendment. The compliance schedule for implementing the wasteload reductions required under these TMDLs is structured in a phased manner, with 80 percent of reductions required in 10 years, and 100 percent of reductions required within 20 years. The 20-year compliance schedule is contingent upon the dischargers implementing integrated controls to achieve required copper, lead, zinc, indicator bacteria, diazinon, and trash reductions.

14. **SCIENTIFIC PEER REVIEW**: The scientific basis of this TMDL has undergone external peer review pursuant to Health and Safety Code section 57004. The San Diego Water Board has considered and responded to all comments submitted by the peer review panel and has enhanced the Technical Report appropriately. No change to the fundamental approach to TMDL calculations was necessary as a result of this process.

15. **STAKEHOLDER AND PUBLIC PARTICIPATION**: Interested persons and the public have had reasonable opportunity to participate in review of the proposed TMDL. Efforts to solicit public review and comment included five public workshops held between April 1999 and April 2005, including a CEQA scoping meeting held on March 21, 2003; a public review and comment period of 45 days preceding the San Diego Water Board public hearing in May 2005; a two week extension of the comment period after the public hearing in May 2005; a second public review and comment period of 45 days commencing in July 2006; a third public review and comment period of 45 days commencing on March 9, 2007; and a public hearing on April 25, 2007. Notices for all meetings were sent to interested parties including cities and San Diego County with jurisdiction in Chollas Creek. All of the written comments submitted to the San Diego Water Board during the review and comment periods have been considered, and written responses provided in Appendix M to the Technical Report.

16. **CEQA REQUIREMENTS:** Pursuant to Public Resources Code section 21080.5, the Resources Agency has approved the Regional Water Boards' basin planning process as a "certified regulatory program" that adequately satisfies the California Environmental Quality Act (CEQA) (Public Resources Code, section 21000 et seq.) requirements for preparing environmental documents. [14 CCR section 15251(g); 23 CCR section 3782] As such, the San Diego Water Board's basin planning documents together with an Environmental Checklist are the "substitute documents" that contain the required environmental documentation under CEQA. [23 CCR section 3777] The substitute documents for this project include the Environmental Checklist, the detailed technical report entitled Total Maximum Daily Loads for Dissolved Copper, Lead, and Zinc in Chollas Creek, Tributary to San Diego Bay, responses to comments raised during the development of the TMDL, and this resolution. The project itself is the establishment of TMDLs for toxic metals in Chollas Creek where water quality has been listed as "impaired" by the State Water Board pursuant to section 303(d) of the CWA, as required by that section. While the San Diego Water Board has no discretion to not establish a TMDL (the TMDL is required by federal law) the San Diego Water Board does exercise discretion in assigning wasteload allocations, determining the program of implementation, and setting various milestones in achieving the water quality objectives for Chollas Creek.

17. **PROJECT IMPACTS:** The accompanying CEQA substitute documents satisfy the requirements of substitute documents for a Tier 1 environmental review under CEQA, pursuant to Public Resources Code section 21159 and CCR Title 14, section 15187. Nearly all of the compliance obligations anticipated to be necessary to implement the TMDLs for copper, lead, and zinc in Chollas Creek will be undertaken by public agencies that will have their own obligations under CEQA for implementation projects that could have significant environmental impacts (*e.g.*, installation and operation of structural best management practices). Project level impacts will need to be considered in any subsequent environmental analysis performed by other public agencies pursuant to Public Resources Code section 21159.2.

    If not properly mitigated at the project level, implementation and compliance measures undertaken could have significant adverse environmental impacts. The substitute documents for this TMDL, and in particular the environmental checklist and responses to comments, identify broad mitigation approaches that should be considered at the project level. The San Diego Water Board does not engage in speculation or conjecture regarding the projects that may be used to implement the TMDLs and only considers the reasonably foreseeable alternative methods of compliance, the reasonably foreseeable feasible environmental impacts of the these methods of compliance, and the reasonably foreseeable mitigation measures which would avoid or eliminate the identified impacts, all from a broad general perspective consistent with the uncertainty regarding how the TMDLs, ultimately, will be implemented. The lengthy implementation period allowed by the TMDLs will allow persons responsible for compliance with wasteload allocations to develop and pursue many compliance approaches and mitigation measures.

18. **PROJECT MITIGATION:** The proposed amendment to the Basin Plan to establish TMDLs for copper, lead, and zinc in Chollas Creek could have a significant adverse effect on the environment. However, there are feasible alternatives, feasible mitigation measures, or both, that would substantially lessen any significant adverse impact. The public agencies responsible for implementation measures needed to comply with the TMDLs can and should incorporate such alternatives and mitigation into any projects or project approvals that they undertake for the impaired creek. Possible alternatives and mitigation are described in the CEQA substitute documents, specifically the Technical Report and the environmental checklist. To the extent the alternatives, mitigation measures, or both, are not deemed feasible by those agencies, the necessity of implementing the TMDLs that is mandated by the federal Clean Water Act and removing the copper, lead, and zinc impairments in Chollas Creek (an action required to achieve the express, national policy of the Clean Water Act) outweigh the unavoidable adverse environmental effects identified in the substitute documents.

19. **ECONOMIC ANALYSIS:** The San Diego Water Board has considered the costs of the reasonably foreseeable methods of compliance with the wasteload reductions specified in these TMDLs. The most reasonably foreseeable methods of compliance involve implementation of structural and non-structural controls. Surface water monitoring to evaluate the effectiveness of these controls will be necessary.

20. **NO ADVERSE ENVIRONMENTAL EFFECTS:** This Basin Plan amendment will result in no adverse effect, either individually or cumulatively, on wildlife.

21. **REVISION TO BASIN PLAN:** The USEPA promulgated a final rule prescribing water quality criteria for toxic pollutants in inland surface waters, enclosed bays, and estuaries in California in 2000 (The California Toxics Rule or "CTR;" [40 CFR 131.38]). CTR criteria constitute applicable water quality objectives in California. In addition to the CTR, certain criteria for toxic pollutants in the National Toxics Rule [40 CFR 131.36] constitute applicable water quality objectives in California as well. The section in Chapter 3 of the Basin Plan titled "Toxic Pollutants" should be revised to be consistent with the current federal rules. The subsection entitled "Water Quality Objectives for Toxic Pollutants" in Chapter 3 of the Basin Plan needs to be deleted. This subsection is redundant since the CTR and certain NTR criteria constitute applicable water quality objectives in California.

NOW, THEREFORE, BE IT RESOLVED that

1. **AMENDMENT ADOPTION:** The San Diego Water Board hereby adopts the amendment to the Basin Plan to incorporate the TMDLs for dissolved copper, lead, and zinc in Chollas Creek and to revise the Basin Plan to reference the California Toxics Rule as set forth in Attachment A hereto.

2. **TECHNICAL REPORT APPROVAL:** The San Diego Water Board hereby approves the Technical Report entitled *Total Maximum Daily Loads for Dissolved Copper, Lead, and Zinc in Chollas Creek, Tributary to San Diego Bay*, dated May 30, 2007.

3. **CERTIFICATE OF FEE EXEMPTION**: The Executive Officer is authorized to sign a Certificate of Fee Exemption.

4. **AGENCY APPROVALS**: The Executive Officer is directed to submit this Basin Plan amendment to the State Water Board for approval in accordance with Water Code section 13245.

5. **NON-SUBSTANTIVE CORRECTIONS**: If, during the approval process for this amendment, the State Water Board, San Diego Water Board, or OAL determines that minor, non-substantive corrections to the language of the amendment are needed for clarity or consistency, the Executive Officer may make such changes, and shall inform the San Diego Water Board of any such changes.

6. **ENVIRONMENTAL DOCUMENT CERTIFICATION**: The substitute environmental documents prepared pursuant to Public Resources Code section 21080.5 are hereby certified, and the Executive Officer is directed to file a Notice of Decision with the Resources Agency after State Water Board and OAL approval of the Basin Plan Amendment, in accordance with section 21080.5(d)(2)(E) of the Public Resources Code and the California Code of Regulations, title 23, section 3781.

I, John H. Robertus, Executive Officer, do hereby certify the foregoing is a full, true and correct copy of a Resolution adopted by the California Regional Water Quality Control Board, San Diego Region, on June 13, 2007.

JOHN H. ROBERTUS
EXECUTIVE OFFICER

ATTACHMENT A
TO RESOLUTION NO. R9-2007-0043

AMENDMENT TO THE WATER QUALITY CONTROL PLAN FOR THE SAN DIEGO BASIN (9) TO INCORPORATE TOTAL MAXIMUM DAILY LOADS FOR DISSOLVED COPPER, LEAD, AND ZINC IN CHOLLAS CREEK, TRIBUTARY TO SAN DIEGO BAY,

AND TO REVISE THE TOXIC POLLUTANTS SECTION OF CHAPTER 3 TO REFERENCE THE CALIFORNIA TOXICS RULE

This Basin Plan amendment establishes a Total Maximum Daily Load (TMDL) and associated load and wasteload allocations for copper, lead and zinc in Chollas Creek, and revises the Toxic Pollutants section of Chapter 3 to reference the California Toxics Rule. This amendment includes a program to implement the TMDL and monitor its effectiveness. Chapters 2, 3, and 4 of the Basin Plan are amended as follows:

Chapter 2, Beneficial Uses
Table 2-2. ***Beneficial Uses of Inland Surface Waters***

Add the following footnote 3 to Chollas Creek

> [3]Chollas Creek is designated as an impaired water body for copper, lead and zinc pursuant to Clean Water Act section 303(d). A Total Maximum Daily Load (TMDL) has been adopted to address this impairment. See Chapter 3, Water Quality Objectives for Toxicity and Toxic Pollutants and Chapter 4, Total Maximum Daily Loads.

Chapter 3, Water Quality Objectives
Inland Surface Waters, Enclosed Bays and Estuaries, Coastal Lagoons, and Ground Waters

Water Quality Objectives for Toxicity:
Add a fifth paragraph as follows:

> Chollas Creek is designated as a water quality limited segment for dissolved copper, lead, and zinc pursuant to Clean Water Act section 303(d). Total Maximum Daily Loads have been adopted to address these impairments. See Chapters 2, Table 2-2, *Beneficial Uses of Inland Surface Waters, Footnote 3* and Chapter 4, Total Maximum Daily Loads.

TOXIC POLLUTANTS:
Revise as follows:

> The USEPA promulgated a final rule prescribing water quality criteria for toxic pollutants in inland surface waters, enclosed bays, and estuaries in California on May 18, 2000 (The California Toxics Rule or "CTR;" [40 CFR 131.38]). CTR criteria constitute applicable water quality criteria in California. In addition to the CTR,

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certain criteria for toxic pollutants in the National Toxics Rule [40 CFR 131.36] constitute applicable water quality criteria in California as well.

Chollas Creek is designated as a water quality limited segment for dissolved copper, lead, and zinc pursuant to Clean Water Act section 303(d). Total Maximum Daily Loads have been adopted to address these impairments. See Chapters 2, Table 2-2, *Beneficial Uses of Inland Surface Waters, Footnote 3* and Chapter 4, Total Maximum Daily Loads.

~~Federal Register, Volume 57, Number 246 amended Title 40, Code of Federal Regulations, Part 131.36 (40 CFR 131.36) and established numeric criteria for a limited number of priority toxic pollutant for inland surface waters and estuaries in California. USEPA promulgated these criteria on December 22, 1992, to bring California into full compliance with section 303(c)(2)(B) of the Clean Water Act. California is not currently in full compliance with this section of the Clean Water Act due to the invalidation of the Water Quality Control Plan for Inland Surface Waters of California and the Water Quality Control Plan for Bays and Estuaries of California. However, the criteria established in 57 FR 60848 (December 22, 1992) (specifically pages 60920-60921) are still applicable to surface waters in the Region.~~

~~*Water Quality Objectives for Toxic Pollutants:*~~

~~*Inland surface waters, enclosed bays, and estuaries shall not contain toxic pollutants in excess of the numerical objectives applicable to California specified in 40 CFR 131.36 (§131.36 revised at 57 FR 60848, December 22, 1992).*~~

Chapter 4, Implementation

After the subsection on the TMDL for Dissolved Copper, Shelter Island Yacht Basin, San Diego Bay add the following subsection:

Total Maximum Daily Loads for Copper, Lead, and Zinc in Chollas Creek

On *June 13, 2007,* the Regional Board adopted Resolution No. R9-2007-0043, *Amendment to the Water Quality Control Plan for the San Diego Region to Incorporate Total Maximum Daily Loads for Dissolved Copper, Lead and Zinc in Chollas Creek, Tributary to San Diego Bay.* The TMDL Basin Plan Amendment was subsequently approved by the State Water Resources Control Board on *[Insert Date],* the Office of Administrative Law on *[Insert Date],* and the USEPA on *[Insert Date].*

Problem Statement

Dissolved copper, lead and zinc concentrations in Chollas Creek violate numeric water quality criteria for copper, lead, and zinc promulgated in the California Toxics Rule, and the narrative objective for toxicity. Concentrations of these metals in Chollas Creek threaten and impair the designated beneficial uses of warm freshwater habitat (WARM), and wildlife habitat (WILD).

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Numeric Targets

The TMDL numeric targets for copper, lead, and zinc are set equal to the numeric water quality criteria as defined in the California Toxics Rule (CTR) and shown below. Because the concentration of a dissolved metal causing a toxic effect varies significantly with hardness, the water quality criteria are expressed in the CTR as hardness based equations. The numeric targets are equal to the loading capacity of these metals in Chollas Creek.

Table 4 *[insert number]* Water Quality Criteria /Numeric Targets for dissolved metals in Chollas Creek.

Metal	Numeric Target for Acute Conditions: Criteria Maximum Concentration	Numeric Target for Chronic Conditions: Criteria Continuous Concentration
Copper	(1) * (0.96) * {e^ [0.9422 * ln (hardness) - 1.700]}	(1) * (0.96) * {e^[0.8545 * ln (hardness) - 1.702]}
Lead	(1) * {1.46203 – [0.145712 * ln (hardness)]} * {e^[1.273 * ln (hardness) - 1.460]}	(1) * {1.46203 – [0.145712 * ln (hardness)]} * {e^[1.273 * ln (hardness) - 4.705]}
Zinc	(1) * (0.978) * {e^ [0.8473 * ln (hardness) + 0.884]}	(1) * (0.986) * {e^[0.8473 * ln (hardness) + 0.884]}

Hardness is expressed as milligrams per liter.
Calculated concentrations should have two significant figures [40 CFR 131.38(b)(2)].
The natural log and exponential functions are represented as "ln" and "e," respectively.

Source Analysis

The vast majority of metals loading to Chollas Creek are believed to come through the storm water conveyance system. An analysis of source contributions reveals many land uses and activities associated with urbanization to be potential sources of copper, lead and zinc to Chollas Creek. Modeling efforts point toward freeways and commercial/industrial land uses as the major contributors

Total Maximum Daily Loads

The TMDLs for dissolved copper, lead and zinc in Chollas Creek are concentration-based and set equal to 90 percent of the numeric targets/loading capacity.

Margin of Safety

The TMDL includes an explicit margin of safety (MOS). Ten percent of the loading capacity was reserved as an explicit MOS.

Allocations and Reductions

The source analysis showed that nonpoint sources and background concentrations of metals are insignificant, and thus, were set equal to zero in the TMDL calculations. The wasteload allocations are set equal to 90 percent of the numeric targets/loading capacity. Concentrations of dissolved copper, lead and zinc require significant reductions from current concentrations to meet the loading capacity.

TMDL Implementation Plan

Persons whose point source discharges contribute to exceedance of Water Quality Criteria (WQC) for copper, lead, and zinc in Chollas Creek will be required to meet the WLA hardness dependant concentrations in their urban runoff discharges before it is discharged to Chollas Creek. Actions to meet the WLAs in discharges to Chollas Creek will be required in WDRs that regulate MS4 discharges, industrial facility and construction activity stormwater discharges, and groundwater extraction discharges in the Chollas Creek watershed. The following orders may be reissued or revised by the Regional Board to include requirements to meet the WLAs. Alternatively, the Regional Board may issue new WDRs to meet the WLAs.

Order No. 2007-0001, NPDES No. CAS0108758, *Waste Discharge Requirements for Discharges of Urban Runoff from the Municipal Separate Storm Sewer Systems Draining the Watersheds of the County of San Diego, the Incorporated Cities of San Diego County, and the San Diego Unified Port District*, or subsequent superceding NPDES renewal orders.

Order No. 2000-90, NPDES No. CAG19001, *General Waste Discharge Requirements for Temporary Groundwater Extraction and Similar Waste Discharges to San Diego Bay and Storm Drains or other Conveyance Systems Tributary Thereto,* or subsequent superceding NPDES renewal orders.

Order No. 2001-96, NPDES No. CAG 919002, *General Waste Discharge Requirements for Groundwater Extraction Waste Discharges from Construction, Remediation and Permanent Groundwater Extraction Projects to Surface Waters within the San Diego Region Except for San Diego Bay* or subsequent superceding NPDES renewal orders.

Order No. 97-11, *General Waste Discharge Requirements for Post-Closure Maintenance of Inactive Nonhazardous Waste Landfills within the San Diego Region* or subsequent superceding NPDES renewal orders.

The Regional Board shall request the State Water Resources Control Board amend the following statewide orders:

Order No. 99-06-DWQ, NPDES No. CAS000003, *National Pollutant Discharge Elimination System (NPDES) Permit, Statewide Storm Water Permit, and Waste Discharge Requirements (WDRs) for the State of California, Department of Transportation (Caltrans)*, or subsequent superceding NPDES renewal orders.

Order No. 97-03-DWQ, NPDES No. CAS 000001, *Waste Discharge Requirements for Discharges of Storm Water Associated with Industrial Activities Excluding Construction Activities,* or subsequent superceding NPDES renewal orders.

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Order No. 2003-0005-DWQ, NPDES No. CAS000004, *Waste Discharge Requirements for Storm Water Discharges from Small Municipal Separate Storm Sewer Systems,* or subsequent superceding NPDES renewal orders.

Order No. 99-08-DWQ, NPDES No. CAS000002, *General Permit for Storm Water Discharges Associated with Construction Activity*, or subsequent superceding NPDES renewal orders.

The Regional Board shall require the U.S. Navy to submit a Notice of Intent to enroll the Naval Base San Diego facility under statewide Order No. 2003-005-DWQ or subsequent superseding NPDES renewal orders .

Implementation Monitoring Plan

The dischargers will be required to monitor Chollas Creek and provide monitoring reports to the Regional Board for the purpose of assessing the effectiveness of the management practices implemented to meet the TMDL allocations. The Regional Board shall amend the following order to include a requirement that the cities of San Diego, Lemon Grove, and La Mesa, the County of San Diego, the San Diego Unified Port District, and CalTrans investigate excessive levels of metals in Chollas Creek and feasible management strategies to reduce metal loadings in Chollas Creek, and conduct additional monitoring to collect the data necessary to refine the watershed wash-off model to provide a more accurate estimate of the mass loads of copper, lead and zinc leaving Chollas Creek each year.

Order No. R9-2004-0277, *California Department of Transportation and San Diego Municipal Separate Storm Sewer System Copermittees Responsible for the Discharge of Diazinon into the Chollas Creek Watershed, San Diego, California.*

Schedule of Compliance

Concentrations of metals in urban runoff shall only be allowed to exceed the WLAs by a certain percentage for the first nineteen years after initiation of this TMDL. Allowable concentrations shall decrease as shown in Table 4 *[insert number]*. For example, if the measured hardness in year ten dictates the WLA for copper in urban runoff is 10 µg/l, the maximum allowable measured copper concentration would be 12.0 µg/L. By the end of the twentieth year of this TMDL, the WLAs of this TMDL shall be met. This will ensure that copper, lead and zinc water quality objectives are being met at all locations in the creek during all times of the year.

Table 4 *[insert number]* Interim goals for achieving Wasteload Allocations

	Allowable Exceedance of the WLAs (allowable percentage above)		
Compliance Year	**Copper**	**Lead**	**Zinc**
1	100%	100%	100%
10	20%	20%	20%
20	0%	0%	0%

Compliance with the interim goals in this schedule can be assessed by showing that dissolved metals concentrations in the receiving water exceed the WQC for copper, lead, and zinc by no

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more than the allowable exceedances for WLAs shown in the table above. Regulated groundwater discharges to Chollas Creek must meet the WLAs at the initiation of the discharge. No schedule to meet interim goals will be allowed in the case of groundwater discharges.

The compliance schedule for implementation of the TMDLs shall be as follows in Table 4 *[insert number]*.

Table 4 *[insert number]* Compliance Schedule

Item	Implementation Action	Responsible Parties	Date
1	Effective date of Chollas Creek Metals TMDL Waste Load Allocations.	San Diego Water Board, Municipal Dischargers, Caltrans, Navy, Industrial Stormwater Dischargers, Construction Stormwater Dischargers, Landfill Stormwater Dischargers	October 22, 2008[1]
2	Recommend High Priority for grant funds.	San Diego Water Board	Immediately after effective date
3	Submit annual Progress Report to San Diego Water Board due January 1 of each year.	Municipal Dischargers	Annually after reissue of NPDES WDRs.
4	Submit annual Progress Report to San Diego Water Board due April 1 of each year.	Caltrans	Annually after reissue of NPDES WDRs.
5	Submit annual Progress Report to San Diego Water Board due July 1 of each year.	Industrial Stormwater Dischargers	Annually after reissue of NPDES WDRs.
6	Submit annual Progress Report to San Diego Water Board due July 1 of each year.	Construction Stormwater Dischargers	Annually after reissue of NPDES WDRs.
7	Municipal NPDES WDRs shall be issued, reissued, or revised to include WQBELs consistent with the assumptions and requirements of the Chollas Creek WLAs.	San Diego Water Board	Within 5 years of effective date
8	Caltrans NPDES WDRs shall be issued, reissued, or revised to include WQBELs consistent with the assumptions and requirements of the Chollas Creek WLAs.	State Water Board	Within 5 years of effective date
9	Construction NPDES WDRs shall be issued, reissued, or revised to include WQBELs consistent with the assumptions and requirements of the Chollas Creek WLAs.	State Water Board	Within 5 years of effective date
10	Industrial NPDES WDRs shall be issued, reissued, or revised to include WQBELs consistent with the assumptions and requirements of the Chollas Creek WLAs.	State Water Board	Within 5 years of effective date

[1] Upon approval of by Office of Administrative Law.

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Item	Implementation Action	Responsible Parties	Date
11	Amend Orders No. 2000-90, and No. 2001-96 (or superseding renewal orders) which regulates temporary groundwater extraction discharges to San Diego Bay and its tributaries to include WQBELs consistent with the assumptions and requirements of the Chollas Creek WLAs.	San Diego Water Board	Within 5 years of effective date
12	Municipal and Navy WDR Order No. R9-2004-0277 shall amended to require additional monitoring for metals and hardness.	San Diego Water Board	Within 5 years of effective date
13	Landfill NPDES WDR Order No. 97-11 (or superseding renewal orders) shall be issued, reissued, or revised to monitor for metals and hardness.	San Diego Water Board	Within 5 years of effective date
14	Navy and all other Phase II small MS4 permittees in the Chollas Creek watershed shall be enrolled in Order No. 2003-0005-DWQ (or superseding renewal orders).	San Diego Water Board	Immediately after effective date.
15	Take enforcement actions	San Diego Water Board	As needed after effective date.
16	Meet 80% Chollas Creek Metals TMDL WLA reductions.	Municipal Dischargers, Caltrans, Navy, Industrial Stormwater Dischargers, Construction Stormwater Dischargers, Landfill Stormwater Dischargers	10 years after effective date.
17	Meet 100% Chollas Creek Metals TMDL WLA reductions.	Municipal Dischargers, Caltrans, Navy, Industrial Stormwater Dischargers, Construction Stormwater Dischargers, Landfill Stormwater Dischargers	20 years after effective date.

Shaw Environmental, Inc.
1230 Columbia Street, Suite 1200
San Diego, CA 92101
619.239.1690
Fax: 619.239.1238

Shaw Shaw Environmental, Inc.

June 3, 2003

Shaw Project 831459

Mr. Mike Chee, Environmental Manager
NASSCO
PO Box 85278, MS 22A
Harbor Drive and 28th Street
San Diego, CA 92113

Letter of Certification
Stormwater Containment
NASSCO Shipyard

Dear Mr. Chee:

Shaw Environmental, Inc. (Shaw) has prepared this Letter of Certification that verifies that the capacity of the overall stormwater containment system at the NASSCO Shipyard in San Diego, California, exceeds the 100-year, 24-hour storm event. Shaw originally performed an analysis of the containment system and prepared a report that contained recommendations and costs for various improvements that, if implemented, could contain a 2-, 5-, 10-, 25-, 50-, or 100-year, 24-hour storm event, depending on which improvements were selected. This analysis was based upon engineering calculations, discussions with NASSCO personnel, visual observations, surveying, and equipment information provided by NASSCO. Since then, improvements either have been made in accordance with this report or in accordance with similar improvements suggested by NASSCO resulting in the system's current capacity. Record drawings of the improvements are attached.

The implemented improvements resulted in the following:

- Stormwater runoff is now contained or controlled by perimeter containment berms or walls, and by pumping or draining the contained runoff to a combination of aboveground storage tanks, the waste water treatment plant, and to the Graving Dock.
- The Graving Dock and Ways 3 and 4 have sufficient stormwater storage capacity in excess of a 100-year, 24-hour storm event.

EXHIBIT 182
PENGAD 800-631-6989
304
Tobler

If you have any questions or need additional information, please call the undersigned at 619.533.7313.

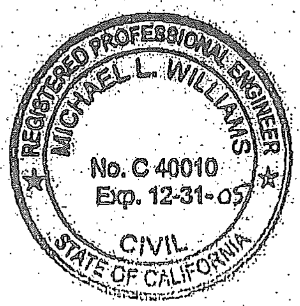
Sincerely,
Shaw Environmental, Inc.

Prepared by:

Michael L. Williams, P.E.
Civil Engineer

Reviewed by:

Leonard O. Yamamoto, P.E.
Business Line Manager



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CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD - SAN DIEGO REGION
WATERSHED MANAGEMENT PROGRAM

FACILITY INSPECTION REPORT

INSPECTION DATE: 9/23/04 & 9/24/04 TIME: 9-3 / 9-1 WDID: N/A

FACILITY REPRESENTATIVE(S) PRESENT DURING INSPECTION: See attached

See Attached
NAME OF OWNER, AGENCY OR PARTY RESPONSIBLE FOR DISCHARGE

See Attached
OWNER CONTACT NAME AND PHONE #

"
FACILITY OR DEVELOPER NAME (if different from owner)

"
FACILITY OR DEVELOPER CONTACT NAME AND PHONE #

"
FACILITY STREET ADDRESS

"
FACILITY CITY AND STATE

APPLICABLE WATER QUALITY LICENSING REQUIREMENTS

- ☐ MS4 URBAN RUNOFF REQUIREMENTS NPDES NOS. CAS0108758, CAS0108740 or CAS0108766
- ☐ GENERAL PERMIT ORDER NO. 99-08-DWQ, NPDES NO. CAS000002 – CONSTRUCTION
- ☐ GENERAL PERMIT ORDER NO. 99-06-DWQ, NPDES NO. CAS000003 - CALTRANS
- ☐ GENERAL OR INDIVIDUAL WASTE DISCHARGE REQUIREMENTS
- ☐ GENERAL OR INDIVIDUAL WAIVER OF WASTE DISCHARGE REQUIREMENTS
- ☐ SECTION 401 WATER QUALITY CERTIFICATION
- ☐ CWC SECTION 13264
- ☒ Other - Enforcement Investigation

INSPECTION TYPE (Check One)

A1 ____ "A" type compliance--Comprehensive inspection in which samples are taken. (EPA Type S)

B1 ____ "B" type compliance--A routine nonsampling inspection. (EPA Type C)

02 ____ Noncompliance follow-up–Inspection made to verify correction of a previously identified violation.

03 ____ Enforcement follow-up--Inspection made to verify that conditions of an enforcement action are being met.

04 ____ Complaint–Inspection made in response to a complaint.

05 ____ Pre-requirement--Inspection made to gather info. relative to preparing, modifying, or rescinding requirements.

06 ____ No Exposure Certification (NEC) - verification that there is no exposure of industrial activities to storm water.

07 ____ Notice of termination request for industrial facilities or construction sites - verification that the facility or construction site is not subject to permit requirements (Type, NOT I or NOT C - circle one).

08 ____ Compliance Assistance Inspection - Outreach inspection due to discharger's request for compliance assistance.

INSPECTION FINDINGS

Y Were violations noted during this inspection? (Yes/No/Pending Sample Results)

N Were samples taken? (N=no) If YES then; G= grab or C= Composite and attach a copy of the sample results/chain of custody form

I. COMPLIANCE HISTORY:

See File

PENGAD 800-631-6989 EXHIBIT 1015 305 Tobler

SAR156644

FACILITY:______________ (WDID)__________ INSPECTION DATE:__________

II. FINDINGS

* See Attached

III. SIGNATURE SECTION

BENJAMIN TOBLER		9/23/04
STAFF INSPECTOR	SIGNATURE	INSPECTION DATE
		9/24/04

IV. (For internal use only)

Reviewed by Supervisor:______________ Date

cc: Jeremy Johnstone (EPA), John Norton (SWRCB), City ______________ Storm Drain Enforcer

Inter-office Referral: 1) ________ 2) ________ 3) ________ 4) ________ 5) ________

C:\My Documents\Forms\Inspection Report.doc(vrs. 04/30/01)
LIS

Field observations and

Tour of NASSCO, SWM, SDG&E, ARCO, Chevron, and Storm Drains

9/23/04 and 9/24/04

Notes based on information provided by property owner & tenant representatives. (See "Tour Participants")

SWM

SWM last dredged their site in the early '90s. The sediment went to LA5 for ocean disposal.

SWM started collecting storm water runoff off the piers in 2001/2.

Trash and sheen has been observed many times at SW4 discharges into Bay. Shaun Halvax has video footage of discharge from SW4 with report.

Old ARCO lines (run underneath SWM property and under pier 4) from ARCO's pier and wharf have not been used since 1979. ARCO used these lines for fueling ships (mostly diesel) and delivery of fuel. The majority of the fuel changed from ship loading to pipeline in the 1960s with the installation of the Kinder Morgan pipeline that is currently used today by ARCO and Chevron. SWM has converted these lines into use for its fire protection system, sewage, and potable water (in early 80's). Three of the four old ARCO lines are used by SWM. The water in the fire protection lines is tested for copper.

Berms around property to keep storm water from flowing into bay installed 1997-1998.

SDG&E

Silver Gate Power Plant was run on natural gas, with some oil.

All equipment was cleaned of PCBs in the '90's. Mineral oil was mostly used in equipment because it was cheaper then PCB oil.

Waste water ponds now a parking lot at SWM (covered by asphalt). Wastewater went to the ponds for evaporation and settling.

Don't want to be named in CAO. Would rather us tell them do a full site assessment investigation, and if the results show them to be dischargers, be named in the CAO later. SDG&E feels that the sediment directly offshore from their leasehold and at the north end of SWM is not fully characterized and needs more samples to determine if SDG&E contributed to the contamination.

Tunnels from plant to the bay are currently not sealed. Still open to tidal influences.

Plant is currently slated for demolition to begin in November 2004.

Maintenance crews are routinely sent in to the property to clean up trash, paint chips, and other debris from property. Did anyone ask about testing of this material? PCBs or metals in the old paint?

Run-off from transformer area collected and tested, then transferred to storm water pipes.

ARCO

Capture all storm water on site. Only discharged once in past 3(?) years. Don't get enough rain. Runoff evaporates in ponds/holding tanks. Test visually for sheen and send to lab for btex, oil and grease, TSS.

Did a bay water study and found no tidal influence on their property or remediation wells.

Groundwater flows north into tank farm. This flow took the contaminant plume there, thus no groundwater or soil contamination bayside of Belt Street. All product is localized on ARCO property. Currently skimming product off the top of groundwater.

NASSCO

Exponent labeled SW3 wrong in report. Only SW9 is a city drain on NASSCO.

Building 6 groundwater contamination roughly 200 yards from the Bay. Monitoring wells are being placed by DTSC to see if plume is in the Bay.

RB (Ben) requested documentation of the changes to the storm water/sewer system. Diversion of storm water from old system to the capping of some outlets and the complete diversion to sewer?

Chevron

Did a bay water study and found no tidal influence on their property or remediation wells. Only ½ to ¼ foot of tidal influence at Belt Street. This will affect all the Chevron wells on the NASSCO leasehold. There is no tidal influence at the Upper Tank Farm (across the street from ARCO). It is 10 ft to groundwater at MW-9 (Belt Street) and 20 ft to groundwater at the Upper tank farm.

Storm water goes through a 3-stage clarifier. Visual inspection for sheen upon release to storm drain (SW4?).

Former lower tank farm (between SWM and NASSCO) received closure notice from County in 2002. All equipment since moved to Upper Tank Farm.

Free gasoline product near NASSCO gate 14. This is the site of the pipeline rupture caused by the City driller. Chevron not named in CAO. Recovery is ongoing at this site (MW-9).

Gasoline product is found at MW-19 (on NASSCO leasehold). Initially over 1 foot of product, now less then half a foot.

Diesel recovery at C-2 (near ARCO).

MW-20 on NASSCO leasehold is clean.

MW-21 on NASSCO leasehold has diesel 200 – 300 ppb.

Old Chevron fuel pier is dismantled. Operation stopped in the mid 1970's. Was located south of SW1.

Storm Drains

Send a 13267 to the City to figure out if SW4 at SWM is a municipal outfall?

Get video footage and report from Shaun Halvax on discharge from SW4 drain (chevron activity).

Catch basin, located on the north side of Chevron, between ARCO and Chevron, has two pipes discharging into it. Large pipe is from Chevron. Smaller pipe inside catch basin is of unknown origin. Chevron says it's not theirs. Is it a City drain? Appears to connect to SW4 at SWM. There was no grate for the outfall. City storm drain discharges in this area too – north side of street, next to ARCO. It discharges into this larger drain near Chevron. Chevron put in riprap between the City's drain (with a grate) and the Chevron drain. 13267 should be sent to figure out RP for the small drain inside culvert.

Tour Participants

Regional Board
SDGE
South West Marine
NASSCO
Arco
Chevron
Levine – Fricke
City of San Diego – Port

ADD NAMES

SAR156648

Photographic Key Map

Sho

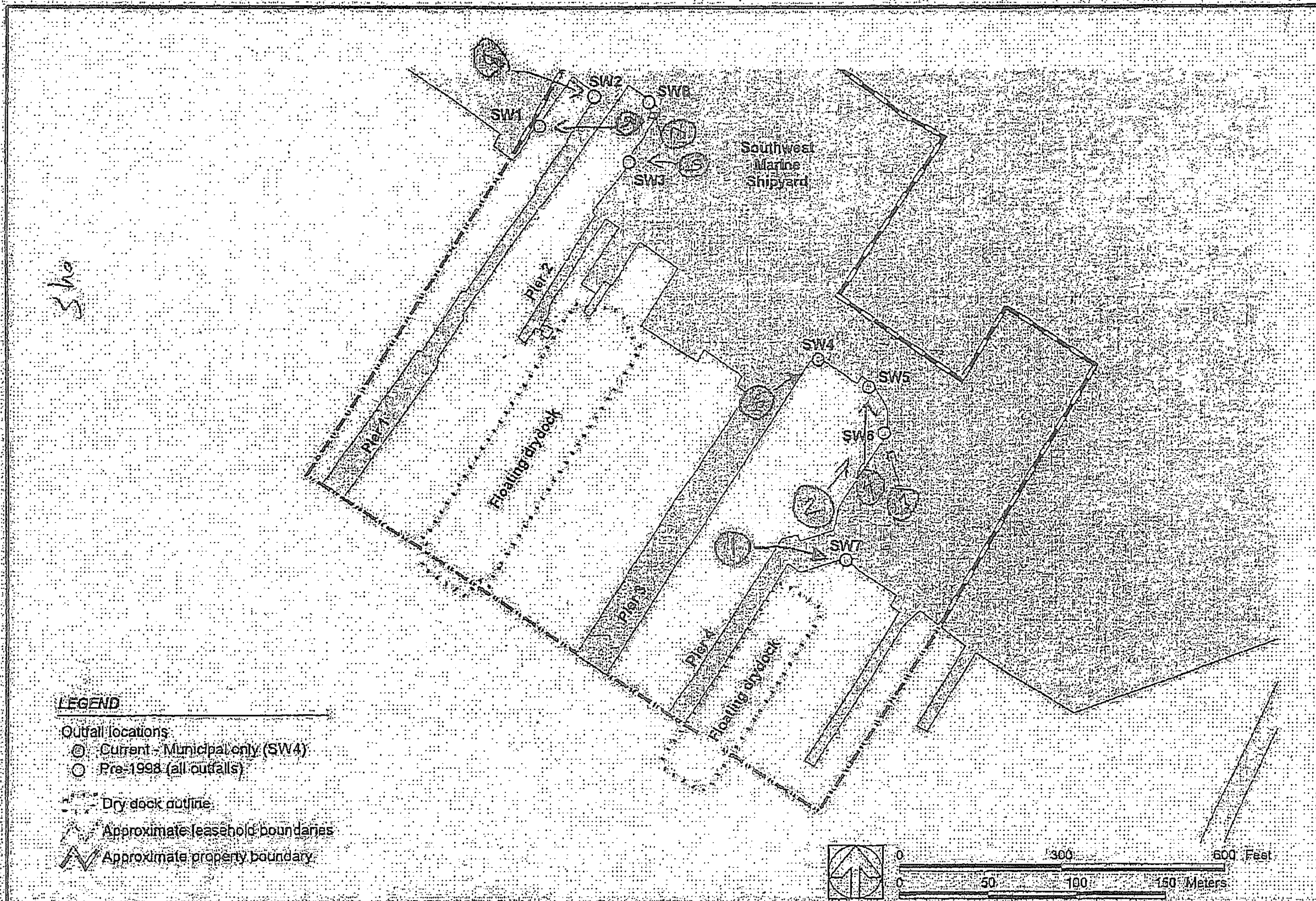

Figure 1-5. Current and previous stormwater discharge locations at Southwest Marine

Exponent

8601718.002 1201 | Sep 22, 2003 | fig 01-5 outfall SWM view | fig 01-5 SWM outfall layout

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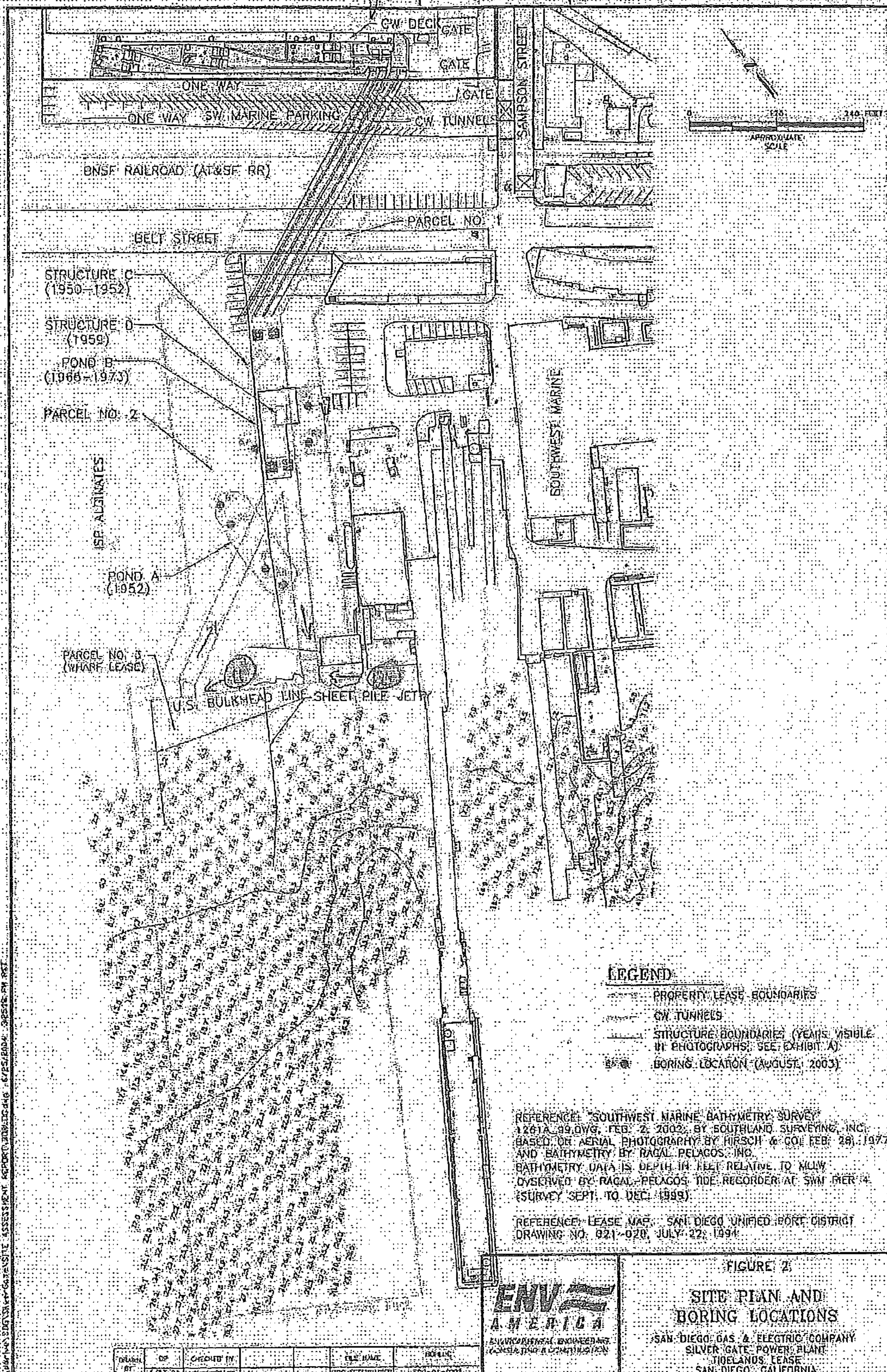
Photographic Key Map 2



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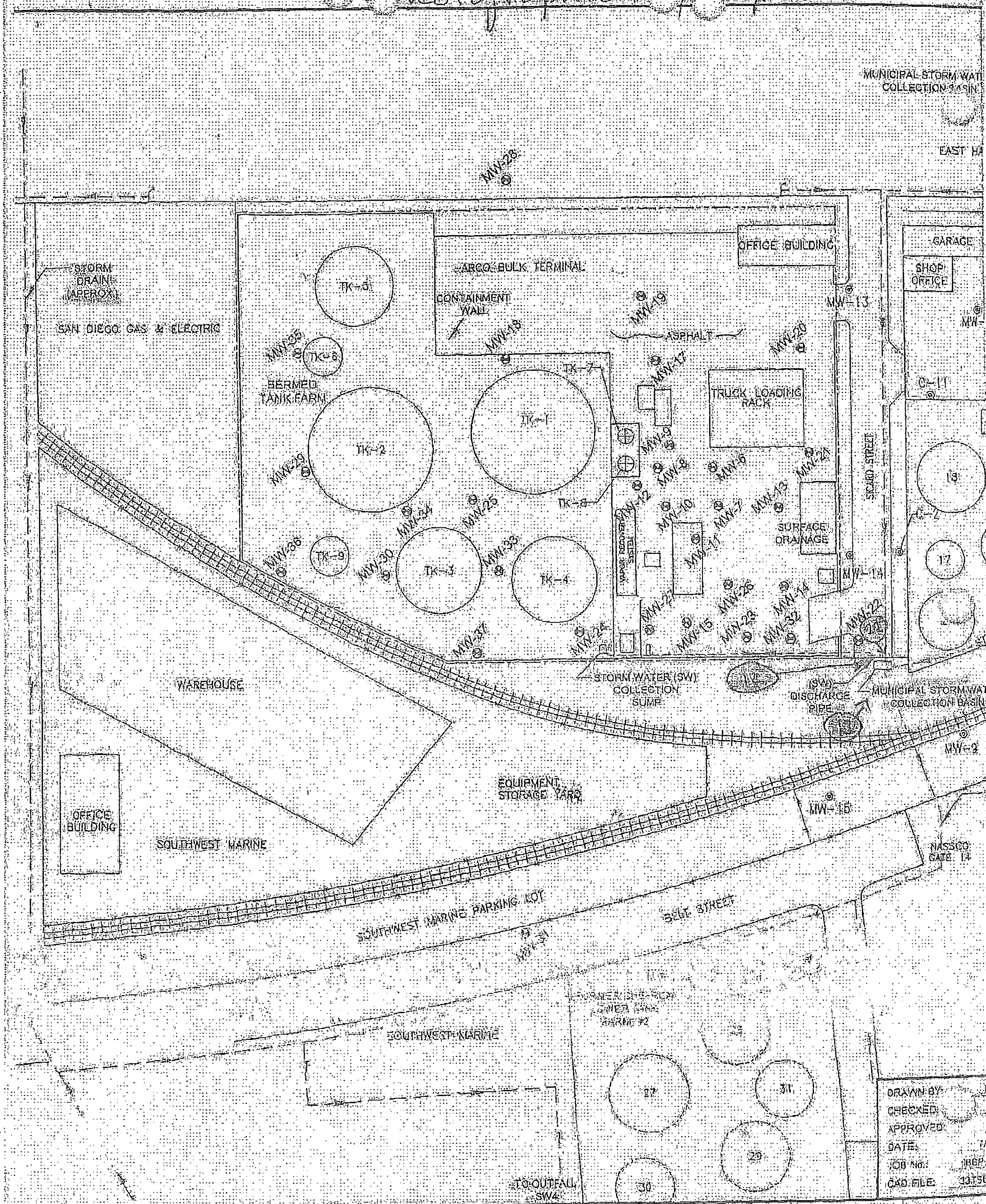
Photographic Key Map 3



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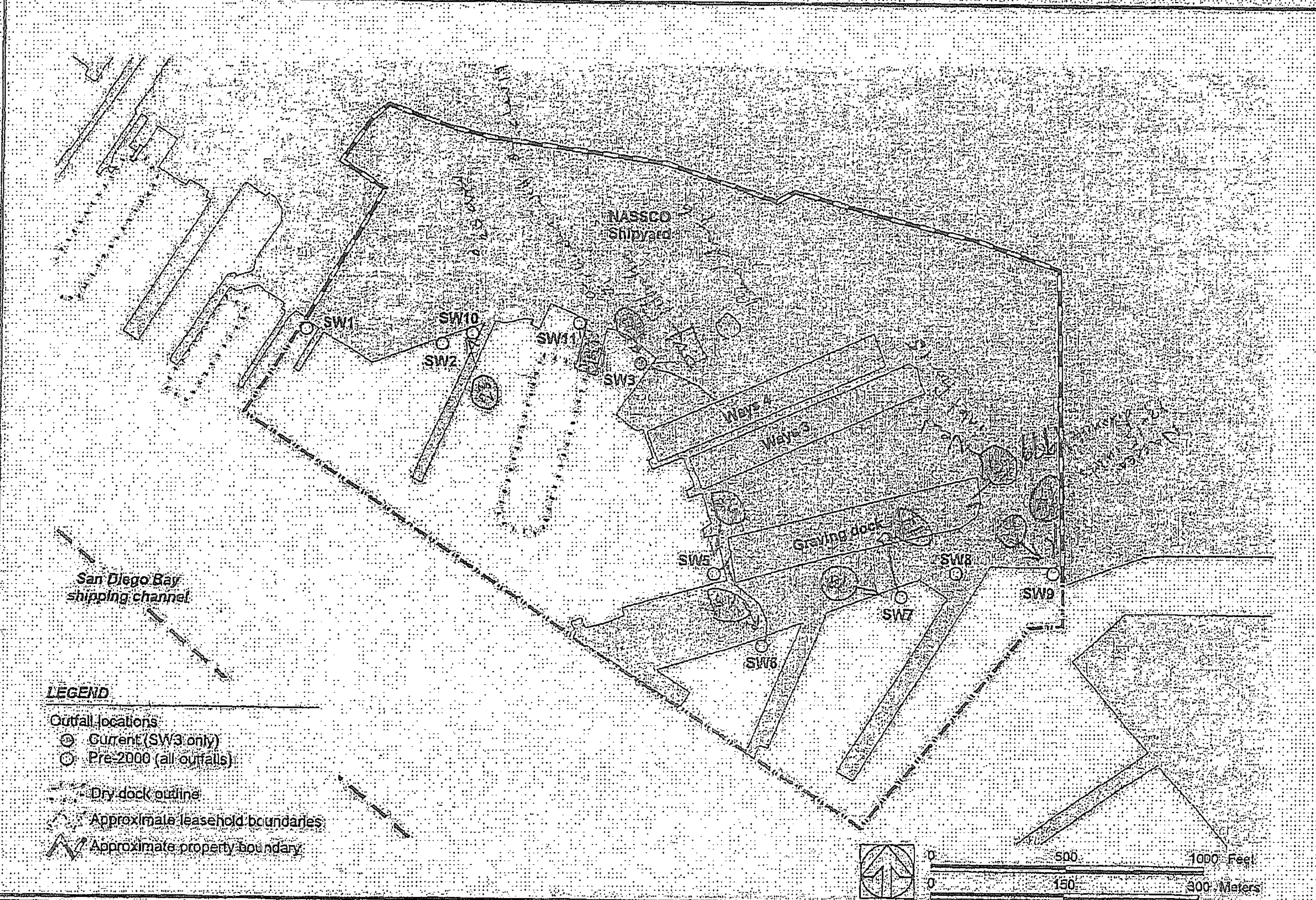
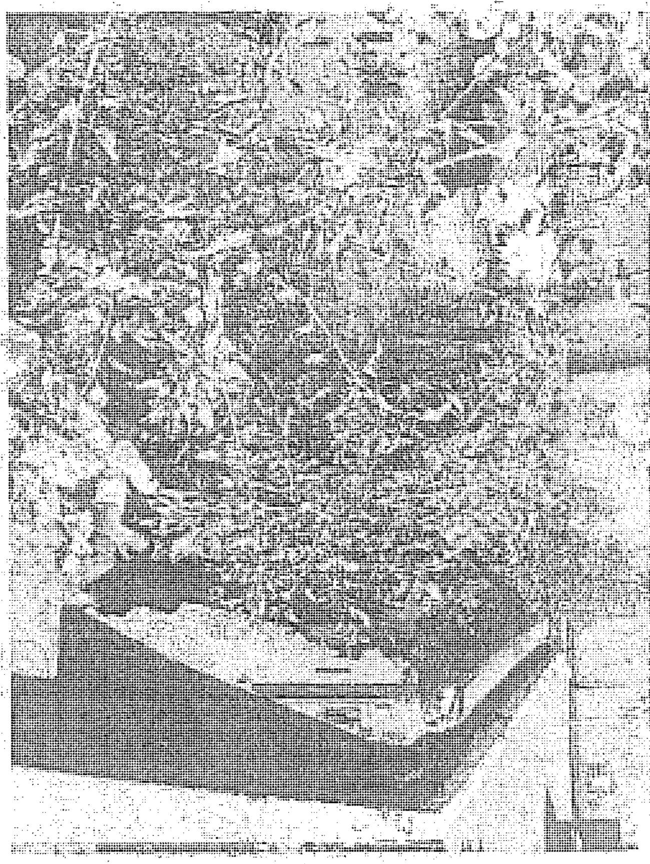


Figure 1-4. Current and previous stormwater discharge locations at NASSCO

Exponent

8601719.002 1201 | Sep 22, 2003 | fig 01-4 outfall NASSCO www | Fig 01-4 NASSCO outfall layout | p:/swm_nassco/projects/shipyard_rpt.apr

SAR156652



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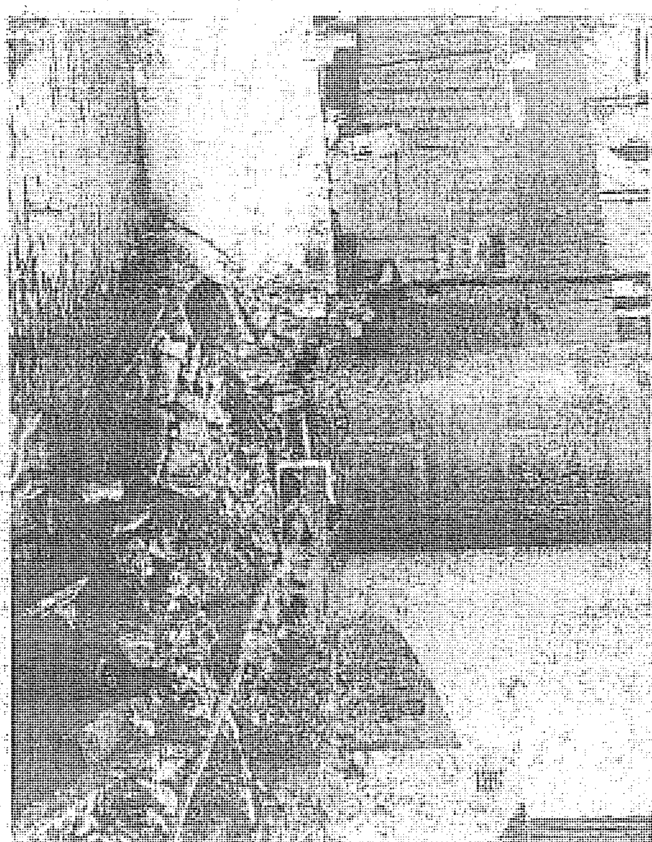

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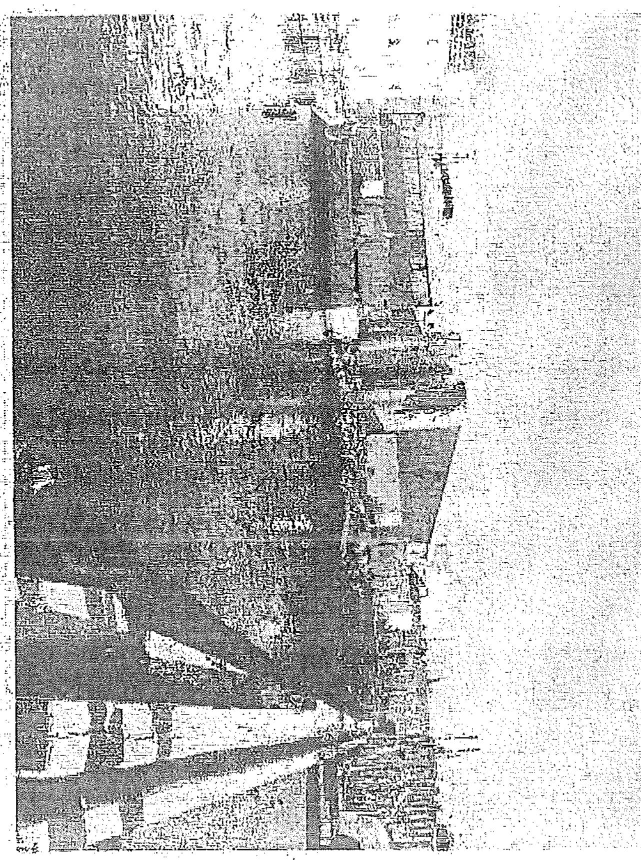

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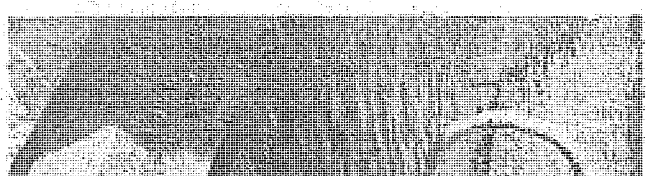

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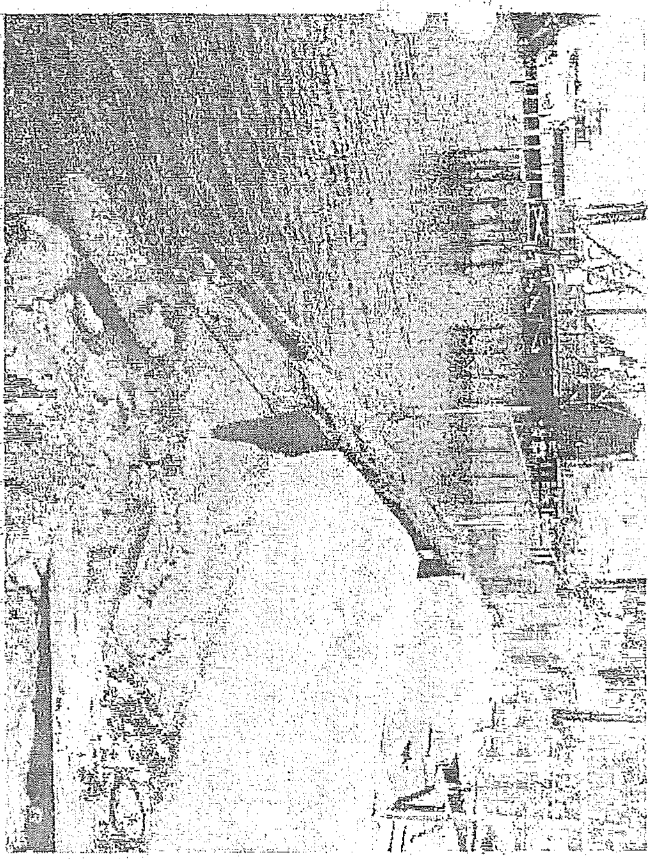
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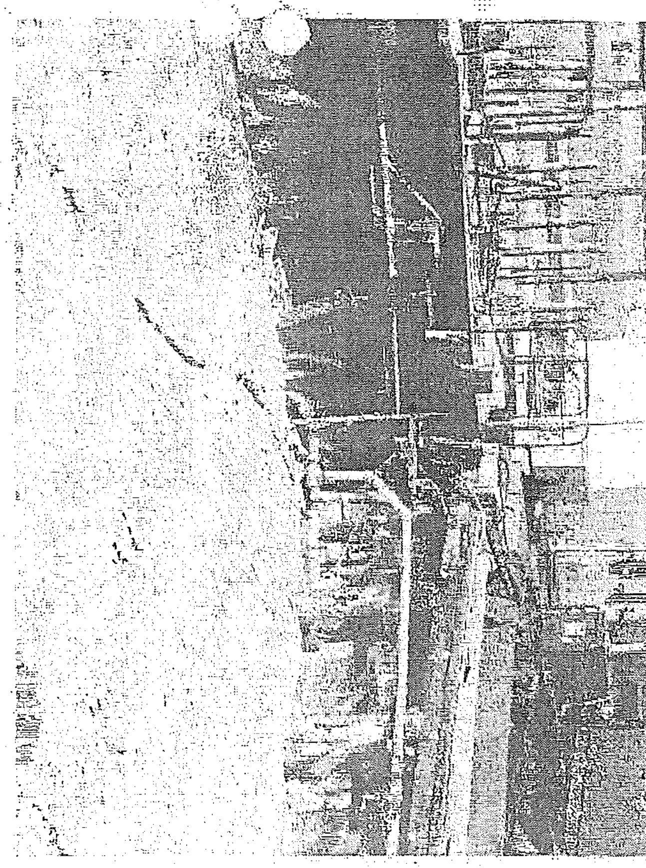
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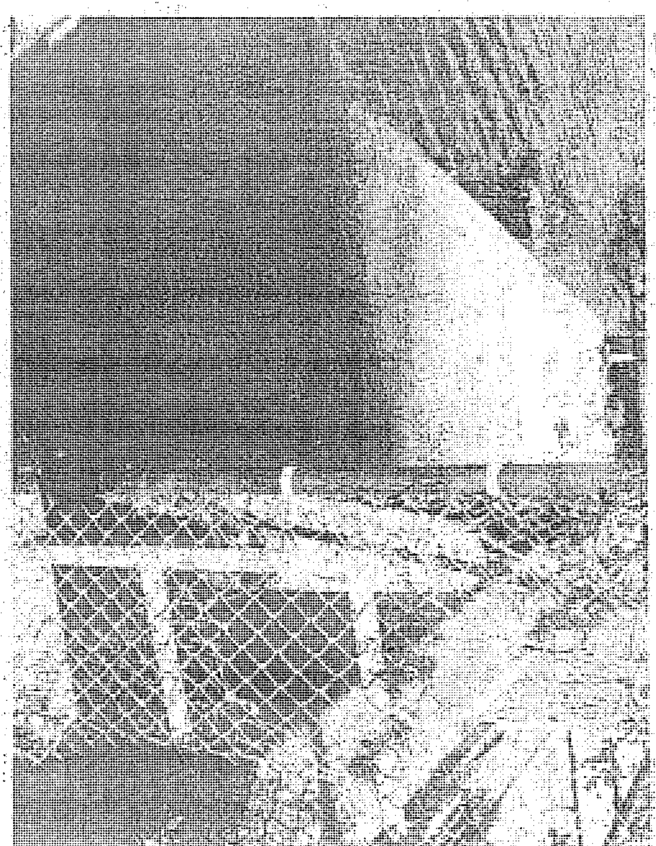
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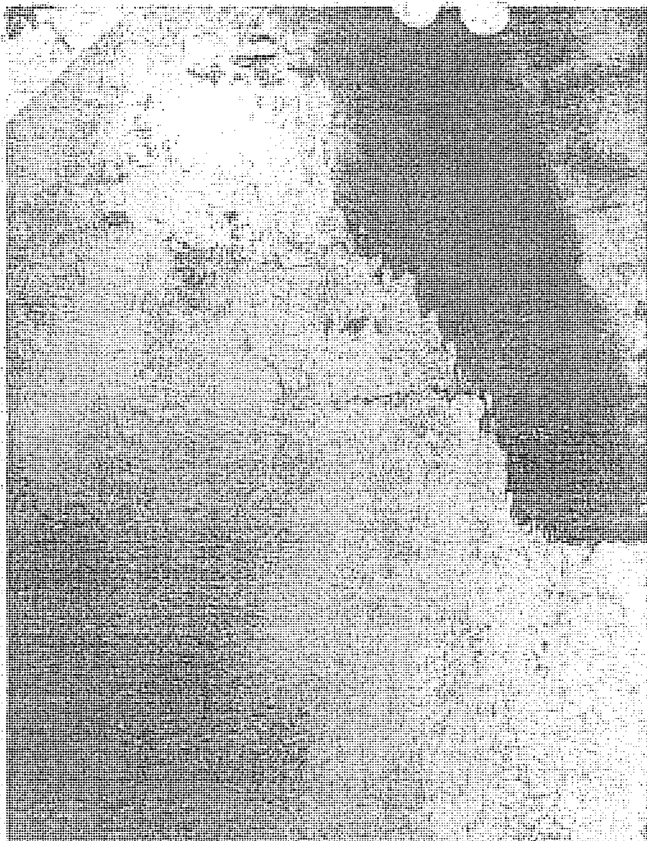

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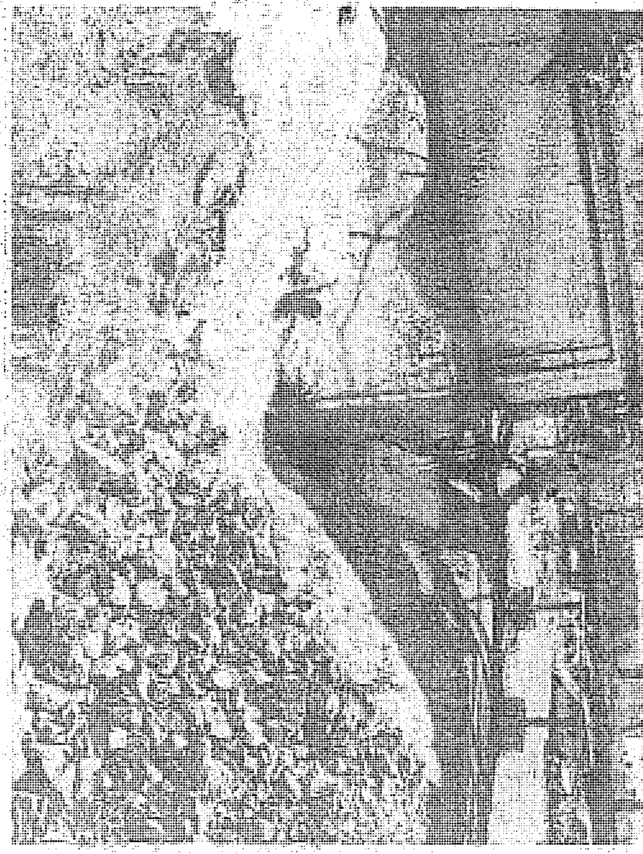

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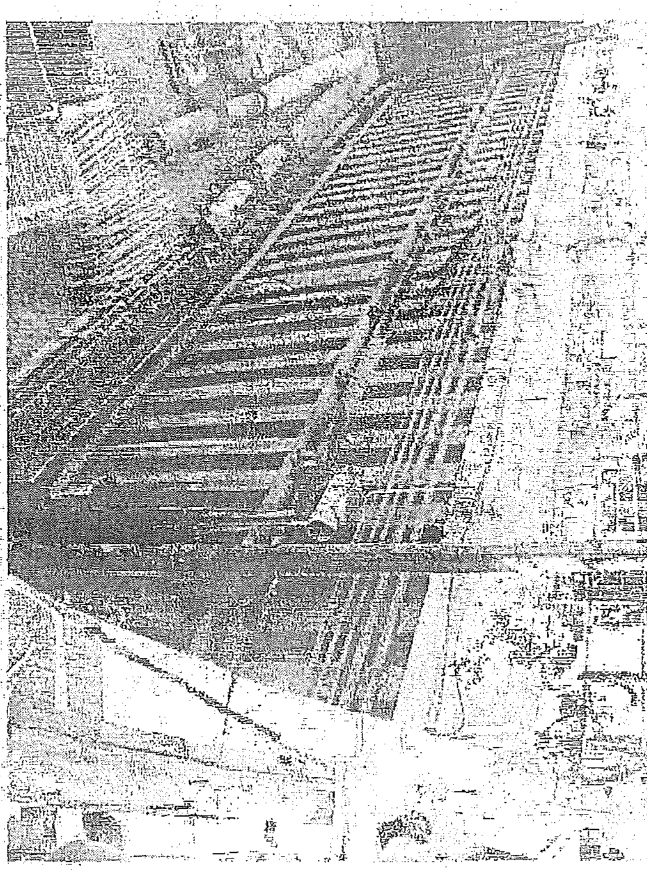

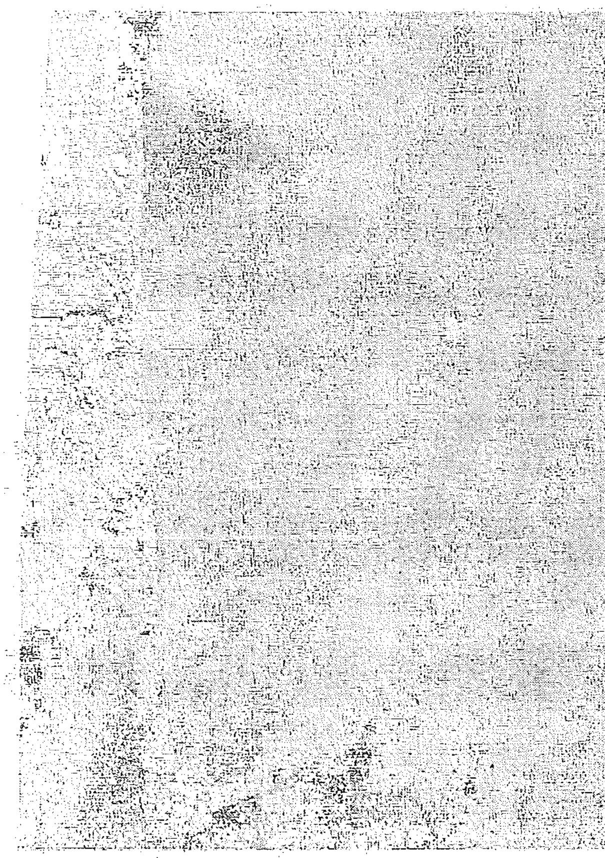

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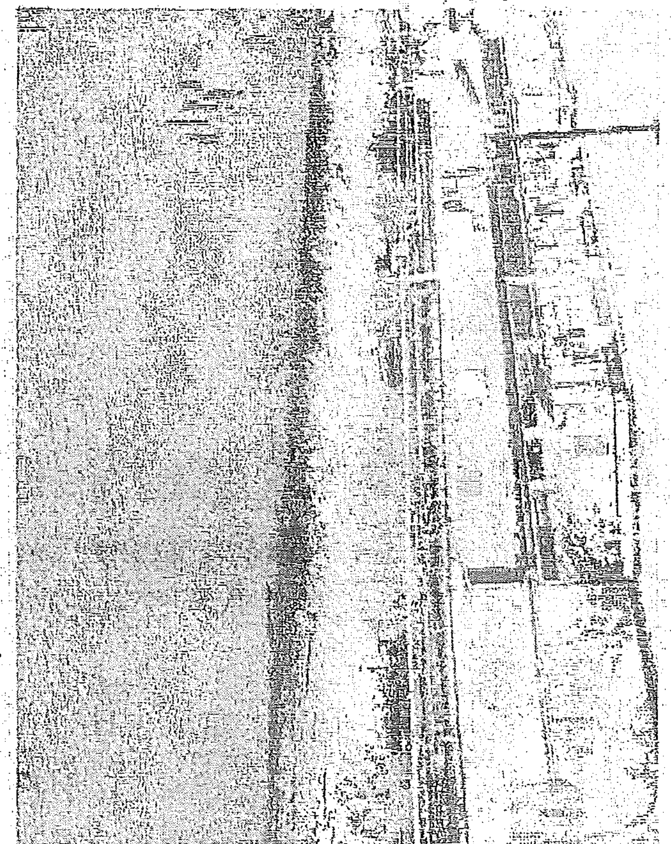

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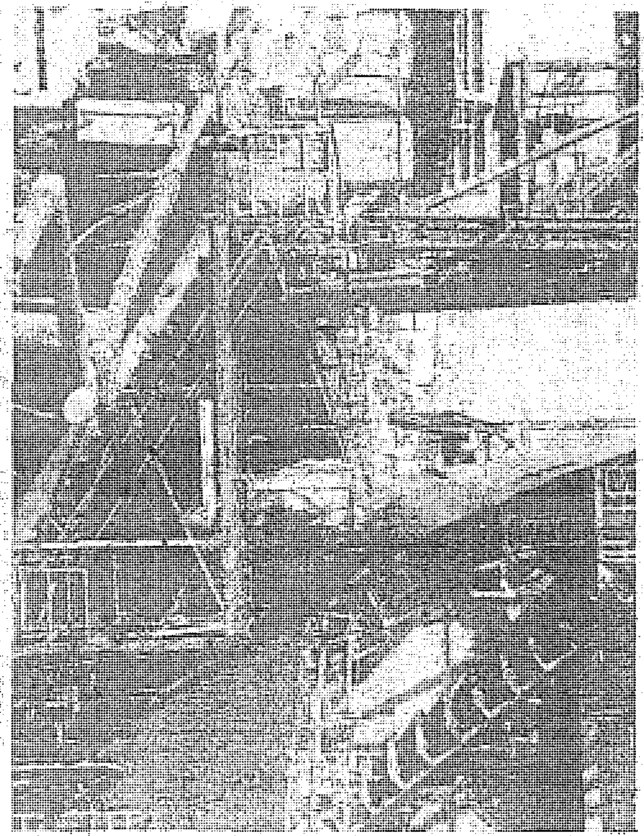

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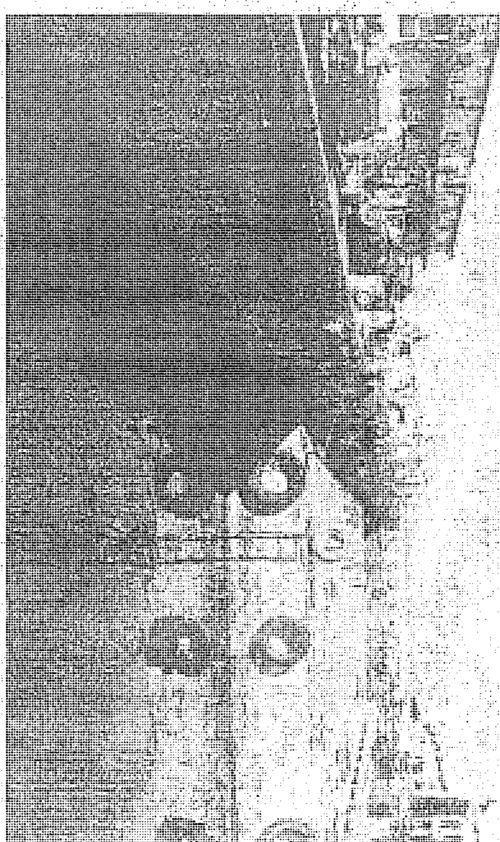

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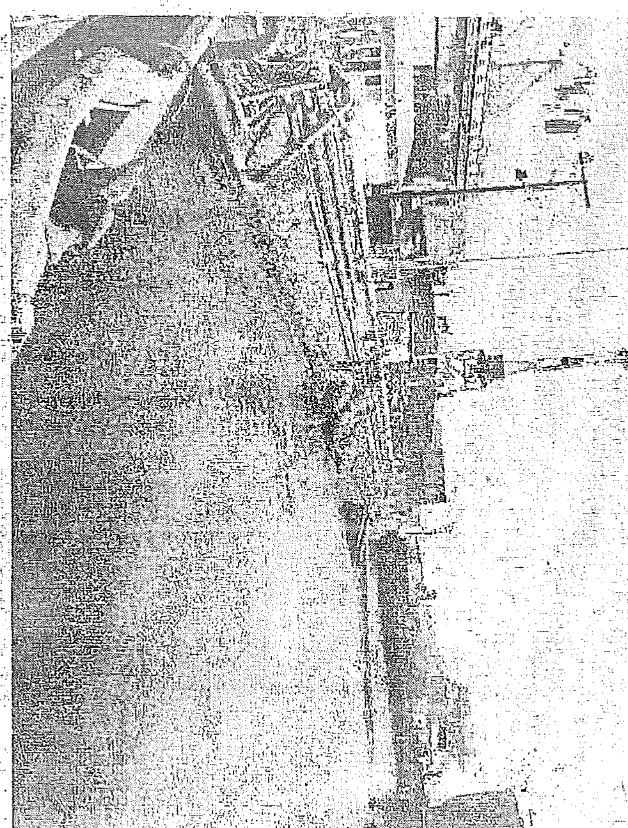

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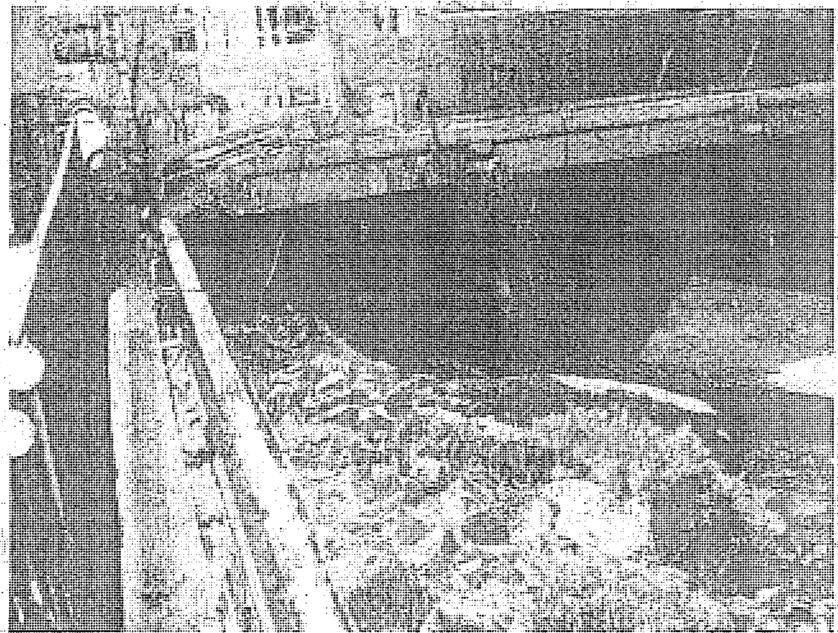

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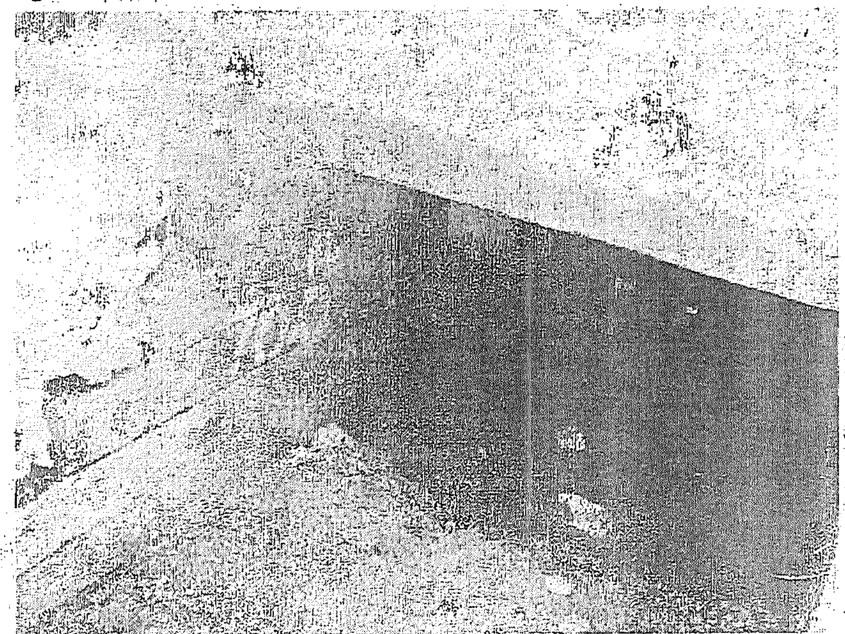

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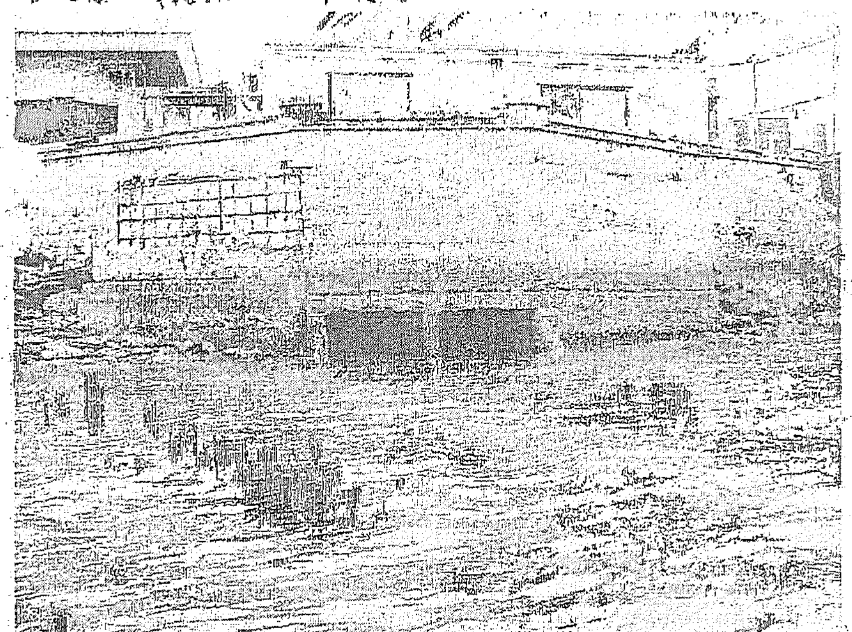

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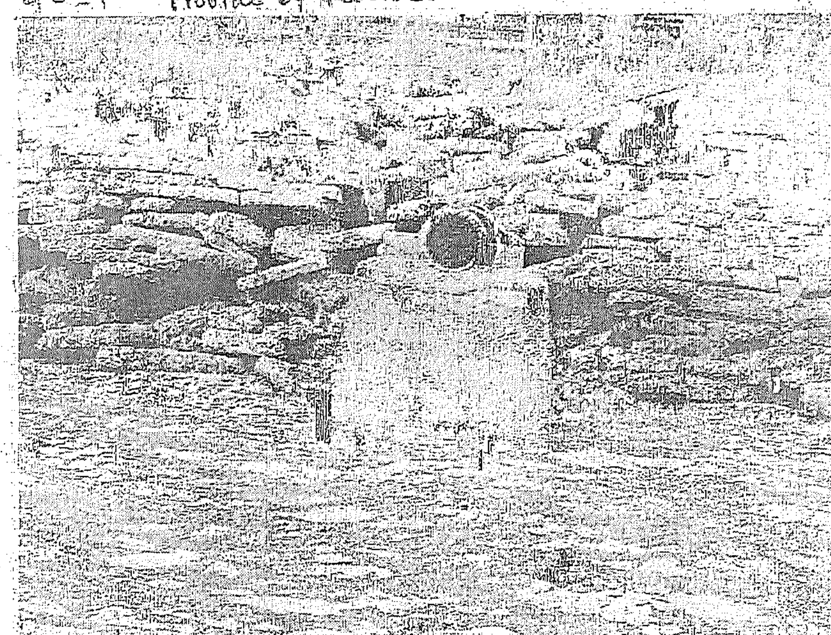

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SITE INVESTIGATION AND CHARACTERIZATION REPORT FOR 401 WATER QUALITY CERTIFICATION

BAE SYSTEMS, INC.
(FORMERLY SOUTHWEST MARINE, INC.)
BULKHEAD EXTENSION AND YARD IMPROVEMENT
PHASE 2 ACTIVITIES

Submitted to

California Regional Water Quality Control Board

San Diego Region

File # 04C-097

Submitted by

BAE Systems, Inc.

2205 E. Belt Street

San Diego, California 92113

Prepared by

Anchor Environmental, CA LP

3914 Murphy Canyon Road, Suite A242

San Diego, California 92123

Revised August 2005

SITE INVESTIGATION AND CHARACTERIZATION REPORT FOR 401 WATER QUALITY CERTIFICATION

BAE SYSTEMS, INC. (FORMERLY SOUTHWEST MARINE, INC.) BULKHEAD EXTENSION AND YARD IMPROVEMENT PHASE 2 ACTIVITIES

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2205 E. Belt Street

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Prepared by

Anchor Environmental, CA LP

3914 Murphy Canyon Road, Suite A242

San Diego, California 92123

Revised August 2005

Table of Contents

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1 OVERVIEW

1.1 Project Description and History

BAE Systems, Inc. (formerly known as Southwest Marine, Inc.) is planning to reconfigure a portion of its San Diego Ship Repair yard, currently occupied by three abandoned marine railways, by constructing a new section of sheetpile bulkhead. Material will then be placed in the area behind the sheetpile bulkhead to create additional upland yard space for the facility. Figure 1 identifies the general location of the proposed bulkhead extension and yard improvement project (henceforth, project) relative to BAE Systems' shipyard and facilities. Figures 2 and 3 present detailed plan and cross-sectional views of the bulkhead improvement area and proposed construction activities. The project will be performed in two phases; the general sequence of construction is illustrated as a typical cross-section on Figure 2.

Phase 1 of the project will be accomplished by removing marine structures from the area and installing a new section of sheetpile bulkhead across the face of the abandoned railways. BAE Systems has received a 401 Water Quality Certification (WQC; File No.03C-065) from the California Regional Water Quality Control Board, San Diego Region (SDRWQCB) for Phase 1 activities. All other permits have been received, including an approved mitigation plan, a Phase 1 Water Quality Monitoring Plan (WQ Plan), and a provisional U.S. Army Corps of Engineers (Corps) permit.

After completion of Phase 1, Phase 2 construction activities will commence, involving removal of selected sediments from the project footprint, and backfilling ~~within~~ the project site with clean material. First, a wedge of impacted sediments immediately inside the new bulkhead alignment will be removed (Figure 3), along with any near-surface sediments that have chemical concentrations exceeding the criteria established in California Code of Regulations (CCR) section 66261.24, in Title 22, Division 4.5, Chapter 11, Article 3). Second, the excavated area and the remainder of the bulkhead-enclosed area will be backfilled with imported, clean, granular fill to the elevation of the surrounding grade (approximately +12 feet Mean Lower Low Water [MLLW]). After adequate settlement, the area will be paved to support yard operations.

The provisional Corps permit for the overall project is contingent on receipt of the 401 WQC for Phase 2 construction activities, so receipt of the Phase 2 WQC, and subsequently, the Corps permit, will allow construction to commence. In support of obtaining a 401 WQC for Phase 2 construction activities, BAE Systems met with the SDRWQCB on November 12, 2004 to finalize data collection and evaluation requirements. A previous version of this Site Investigation and Characterization Report (henceforth, "Report") was submitted in January 2005, presentings the required information, evaluations, and conclusions. Following review of the January 2005 Report by the SDRWQCB and subsequent discussions with BAE Systems on August 5, 2005, the Report has been revised to be fully consistent with the SDRWQCB's expectations and requirements regarding removal of excavated sediments from the project area.

1.2 Purpose of this Report

This Report was prepared for the SDRWQCB to support BAE Systems' application for a 401 WQC from the SDRWQCB for Phase 2 construction activities. This Report provides information specifically requested by the SDRWQCB in their evaluation of the proposed project, as documented in a letter dated September 14, 2004, as discussed during a meeting on November 12, 2004, and in subsequent communications on August 5, 2005, which followed submittal of the original version of this Report in January 2005. This Report supplements previous submittals to the SDRWQCB, as indicated below.

1.3 Development and Sequence of Previous Submittals

In August 2004, BAE Systems submitted to the SDRWQCB a Data Evaluation Report (DER) for Phase 2 Activities (Anchor 2004a), that provided information supporting issuance of a 401 WQC and Waste Discharge Requirements (WDR) for Phase 2 of the work. Specifically, the DER included a detailed evaluation of the long-term potential for impacts to the surface waters of San Diego Bay associated with the placement of imported fill over impacted sediments behind the sheetpile wall. The DER documented the results of analytical testing of two groundwater samples obtained from chemically impacted sediments in the project area, and presented modeling results of tidally influenced groundwater flow and resulting potential water quality impacts from the project. The DER also included a revised WQ Plan to address both Phase 1 and Phase 2 activities.

After reviewing the DER, the SDRWQCB issued a letter dated September 14, 2004, in which the SDRWQCB requested additional site investigation and characterization activities to better define the lateral and vertical extent of waste impacts at the site, and further evaluation of mechanisms of waste transport through soil and groundwater. This letter also required BAE Systems to submit the proposed methods and approach for this investigation in a Site Investigation Workplan (henceforth, "Workplan") prior to initiating field activities. BAE Systems prepared and submitted the requested Workplan in November 2004.

BAE Systems subsequently met with SDRWQCB staff on November 12, 2004 to discuss comments on the Workplan. At this meeting, the SDRWQCB requested the following modifications to the Workplan, necessary for BAE Systems to receive a 401 WQC:

- Additional soil sampling from the underlying Bay Point Formation from each planned sediment core sample location
- Subdivision of sediment cores into a maximum of 2-foot intervals for chemical analyses, rather than compositing all sediment into a single sample from each core

The requested changes were made to the Workplan, and BAE Systems carried out the field investigation program in late November and early December of 2004. The September 14, 2004 letter from the SDRWQCB required that the results of the investigation be documented in a Site Investigation and Characterization Report. (The field investigation program and related chemical analyses are described in further detail in Section 3 of this Report.) This Report was originally submitted to the SDRWQCB in January of 2005, fulfillings the SDRWQCB's requests, and prepared in full accordance with the requirements documented in the September 14 letter. Specifically, the Report identified the nature and extent of existing site sediments, and evaluated the proposed project's overall protectiveness of site surface water and groundwater.

After the SDRWQCB reviewed the January 2005 Report, they prepared a letter to BAE Systems, dated April 1, 2005, defining the proposed project as a discharge of waste to land. This would put the project under the purview of section 13260 of the California Water Code, requiring submittal of a Report of Waste Discharge and application for Waste Discharge Requirements.

Subsequent discussions between BAE Systems and the SDRWQCB on August 5, 2005, resulted in the understanding that the project would not be subject to these requirements if the following actions were accomplished before filling the project area:

- All sediments excavated out from behind the bulkhead (creating the clean sand buffer described in Section 5.5) to be disposed off-site.
- Any sediments containing chemical concentrations in excess of levels established in CCR section 66261.24 (Title 22, Division 4.5, Chapter 11, Article 3) to be excavated and disposed off-site, subject to confirmatory sampling.

This Report is a modified version of the January 2005 Report, incorporating the above requirements.

1.4 Structure of this Report

This Report addresses the study objectives and concerns documented in the SDRWQCB letter dated September 14, 2004. The study objectives include the following specific elements, listed with the corresponding section where they are addressed in this Report:

- Site Conceptual Model – updated based on the results of the investigation (documented in Section 5.5)
- Source Characterization – results of an investigation of all potential sources of waste constituent discharges to the soil, groundwater, and stormwater conveyance systems, based on historical records of operations, site reconnaissance, and previous and current studies (documented in Section 5.4)
- Geologic Characterization – subsurface materials at the site, including the hydrogeologic characteristics and identification of geologic features that may affect groundwater flow and contaminant migration, are presented (documented in Section 5.1)
- Groundwater Flow Characterization – the magnitude and direction of groundwater flow at the site, in both the horizontal and vertical directions, for all water bearing units potentially affected by the waste constituents (documented in Section 5.2)
- Waste Constituent Characterization – characterization of the lateral and vertical extent of waste constituents in soil, sediment, and groundwater relative to existing "background" conditions (documented in Section 5.3, and in Tables 1 through 5).

- Fate and Transport – assessment of the movements, dispositions, and transformations of waste constituents within and between environmental media, such as soil, surface water, groundwater, and biota (documented in Section 6, and in Tables 7 through 9)
- Description of Field Methodologies used for the investigation and characterization study (documented in Section 3.2)
- Chemical Analyses – description of the analytical methods used for each environmental medium, adequate to identify the full range of waste constituents that may occur (documented in Section 4)
- Sample Locations and Numbers – the locations, type, and number of samples identified and shown on a site map and cross-sections; sufficient to identify the nature of waste constituent sources, to define the distribution of waste constituents in the subsurface, and to provide data for fate and transport evaluation, risk assessment, remedy selection, and remedial design, if necessary (documented in Section 3.1 and 3.2.1)

2 SUMMARY OF PREVIOUSLY AVAILABLE INFORMATION

2.1 Site Layout and History

BAE Systems' San Diego shipyard is located on the eastern shore of San Diego Bay, approximately 1 mile south of the Coronado Bridge. The shipyard has been leased by BAE Systems (formerly Southwest Marine, Inc.) from the San Diego Unified Port District since 1979, during which time BAE Systems has provided ship repair, alteration, and overhaul services for various commercial and government customers (the Navy being a prominent example).

The bulkhead extension project area under consideration will be constructed across the mouth of an intertidal embayment around the landward end of Pier 1. The embayments are occupied by abandoned shipway marine railways: Ways 1 on the northwest side of Pier 1, and Ways 2 and 3 on the southeast side (see Figure 2).

A history of the BAE Systems property area is summarized and documented in Woodward-Clyde (1995), Exponent (2003), and the San Diego Unified Port District (2004). The subject site has been used for industrial operations since the early 20th century, when the current shoreline was created by filling between 1906 and 1914. The property area was subsequently used by San Diego Marine Construction Corporation for marine vessel construction, repair, and maintenance. Historical evidence (San Diego Unified Port District 2004) indicates that marine railways were present in the project area since approximately the beginning of San Diego Marine Construction Corporation's use of the site. From this time through to the mid-1970s, sandblast and paint wastes were discharged directly to the Bay from upland and drydock areas.

Between 1952 and 1974, a pair of wastewater settling ponds were present on the adjacent San Diego Gas and Electric (SDG&E) property for separation of oil and water from the SDG&E power plant. These ponds may have contributed machine oils, hydraulic fluid, and possibly polychlorinated biphenyls (PCBs) to the subsurface (San Diego Unified Port District 2004). The approximate locations and extents of these previously existing settling ponds are shown on Figure 2.

During the 1980s and 1990s, the three marine railways in the project area generally accommodated about one to seven vessels annually for repair and maintenance, with abrasive sandblasting activities common (SWM 2004). The railways were abandoned in 1992 (Ways 1) and 1997 (Ways 2 and 3). Comprehensive pollution prevention programs and best management practices have been in place since the mid-1980s, preventing releases of contaminants from construction activities or from stormwater runoff (E^{x}ponent 2003).

2.2 Geology and Groundwater

Prior to the field investigation documented in this Report, the main source of information on sediment conditions at the site was the result of a detailed site sediment investigation conducted by the former Southwest Marine and the adjoining NASSCO shipyard in 2002 and 2003 to determine the existence and extent of potential chemical contamination associated with historical operations at the shipyards. This investigation, documented by E^{x}ponent (2003) in the report entitled, "NASSCO and Southwest Marine Detailed Sediment Investigation," was conducted in response to SDRWQCB Resolution Nos. 2001-02 and 2001-03 and subsequent Water Code Section 13267 letters issued to the shipyards. The investigation involved a series of surface and core samples taken from site sediments throughout both shipyards' leasehold areas and beyond. Figures 1 and 2 identify the locations of cores and sediment surface samples taken during the 2002/2003 investigation.

Information on subsurface geology and groundwater characteristics was provided by the site sediment investigation prepared by E^{x}ponent (2003) described above, and by a series of soil probes and borings advanced for geotechnical design of the bulkhead (Christian-Wheeler 2002).

These data sources indicate that the site is underlain by the following sequence of soil/sediment types:

- Upland areas are underlain by fill materials originally placed when the site land was constructed in the early 20th century. More recent sand fill areas within landward portions of the original railway embayment (Figure 2) were created during a 1998 remedial action undertaken by the former Southwest Marine under SDRWQCB oversight.

- Three to 11 feet of soft, geologically recent, surface sediments were observed throughout the offshore areas by E^{x}ponent (2003) and by Christian-Wheeler (2002). These surface sediments consist of interbedded silts, clayey silts, and sandy silts, and contain the elevated chemical concentrations observed in the study.
- The offshore surface sediments and upland fill materials are underlain by the firmer Bay Point Formation, which is Quaternary in age and consists of intermixed, medium dense to dense sands and silty sands, and stiff to hard silty to sandy clays.

Groundwater at the site is tidally influenced, responding to the tidal action of San Diego Bay. The ground surface elevation at the site is approximately 12 feet MLLW, while tidal levels fluctuate roughly between elevations -1 and 7 feet MLLW. Borings conducted by Christian-Wheeler (2002) indicated groundwater at depths of 8.5 to 10 feet below ground surface (bgs) in upland areas. Work conducted by ENV America on the neighboring SDG&E parcel indicated groundwater at approximately 15 feet bgs in upland areas (ENV America 2002).

2.3 Waste Characterization of Existing Sediments

Sediments along and in the vicinity of the planned bulkhead are best represented by cores SW04 and SW08, which represent sediments in close proximity to the alignment of the bulkhead (Figure 2). Sediment chemistry from various depth intervals in these cores are summarized in Table 1. Impacted sediments were identified in both cores to a depth of about 4 feet (although core SW04 could not be penetrated beyond this depth because refusal was reached, so deeper materials could not be sampled at this location).

The primary constituents of concern (COCs) in the impacted sediments include elevated metals, PCBs, and polycyclic aromatic hydrocarbons (PAHs). It is likely that these chemicals exist as sorbed phases on clays and carbon-rich particulate matter in the fine-grained sediments, thus limiting their bioavailability. This is supported by bioassay testing and microbial analysis by E^{x}ponent (2003), which indicate that the sediments do not exhibit significant toxicity.

In 1998, under the SDRWQCB's oversight, the former- Southwest Marine dredged chemically impacted sediments from the landward (northeastern) portions of this embayment, and replaced the dredged material with clean sand fill. Pursuant to Order No. 98-38, the action was required to remove sediments to depths sufficient to reach mandated sediment cleanup levels for copper (810 mg/kg), lead (231 mg/kg), mercury (4.2 mg/kg), zinc (820 mg/kg), and PCBs (0.95 mg/kg). Figure 2 identifies the areas where sediments were removed and clean sand fill placed (shown on the figure as "Sand Fill Areas"), and Figure 3 shows a typical section through the sand fill in cross-section. Confirmation grab samples of surface sediments were obtained at regularly spaced intervals after dredging these areas to confirm that all sediments exceeding the relevant cleanup standards were removed. The locations of the confirmation surface samples are shown on Figure 2. The analytical results from these samples are summarized in Table 2, and demonstrate that sediments remaining below the sand fill have bulk concentrations well below the cleanup levels mandated by Order 98-38 (SWM 1998). Table 2 also compares the confirmation sediment concentrations to reference background concentration levels (E^xponent 2002; see further discussion of background concentrations in Section 4.1).

As part of BAE Systems' DER for Phase 2 activities (Anchor 2004a), a pair of temporary well points were installed within the upper 3 feet of site sediments near the alignment of the planned bulkhead wall. Porewater samples were obtained from each well point and analyzed for metals, PAHs, and PCBs. The locations of these two well point samples are shown on Figure 2, and the chemistry results are documented in Table 3.

The well point samples detected dissolved metals (arsenic, cadmium, chromium, lead, nickel, selenium, silver, and zinc) and PCBs. PAHs were not detected in the well point samples. These concentrations were used to predict porewater concentrations entering surface waters from the completed bulkhead project, accounting for tidal mixing behind the bulkhead wall. Results of this evaluation were presented in the previous DER and indicate that porewater expressed from the project footprint will have chemical concentrations below chronic water quality criteria upon entry into site surface waters, and are not expected to impact ambient surface water quality.

2.4 Data Gaps

This previously available site information has been supplemented by the current site investigation and characterization program requested by the SDRWQCB and presented in this Report. At the request of the SDRWQCB, the site investigation has been designed to address the following data gaps:

- Characterize lateral and horizontal extent of waste constituents within and below the chemically impacted surface sediments.
- Evaluate the presence and extent (if any) of chemical impacts to upland fill soils outside the perimeter of the project area and in the underlying Bay Point Formation.
- Document the groundwater flow regime and gradient in the immediate project area and adjacent areas.

3 SAMPLING PROGRAM

3.1 Overview of Sampling Design

This site investigation provides additional vertical and lateral characterization of COCs in the soil, sediment, and groundwater at the BAE Systems bulkhead extension/yard improvement area. All field and laboratory work has been performed in accordance with the methods and procedures described in the Workplan and accompanying Quality Assurance Project Plan (QAPP; Anchor 2004b), while incorporating additional requirements requested by the SDRWQCB during a meeting with BAE Systems representatives on November 12, 2004.

Continuous core samples were collected at three stations (labeled 1, 2, and 3 on Figure 2) to sample the upland fill and underlying Bay Point Formation. Composite samples from the Bay Point Formation at Stations 1 and 2 were analyzed for total organic carbon (TOC), metals, PCBs, and PAHs (Table 4). Samples from distinct geologic layers within the overlying material were also collected and archived for future analysis, if needed. At Station 3, samples were also collected from distinct geologic layers within the upland fill and the Bay Point Formation. The Bay Point Formation sample from Station 3 was archived and the upland fill samples were analyzed for TOC, metals, PCBs, and PAHs (Table 3).

Two additional core samples were collected near the previous well point sample locations (July 2004), and are labeled Stations 4 and 5 on Figure 2. Composite samples were collected from distinct geologic layers (determined visually), or every 2 feet if the material appeared homogeneous, for the sediment overlying the Bay Point Formation. These samples were analyzed for metals, PCBs, and PAHs. In addition, the upper 2 feet of the Bay Point Formation was also collected for sediment characterization analyses at Stations 4 and 5.

To determine the spatial extent of the chemical concentrations and the hydrologic characteristics of the site groundwater regime, a pair of nested temporary monitoring wells (piezometers) were installed at sample Stations 1, 2, and 3 (Figure 2). Groundwater was sampled from both the Bay Point Formation (well number 1 in each pair) and from the overlying upland fill and surface sediments (well number 2 in each pair). Each groundwater sample was analyzed for metals, PCBs, and PAHs (Table 5).

Logs of all cores and diagrams depicting the monitoring well installations are provided in Appendix A. Note that the logs indicate "gaps" for some depth intervals, resulting from the fact that incomplete sediment recovery was obtained for some of the cores.

Groundwater elevations were also measured during ebb, low, flood, and high tidal conditions to document hydrologic gradients for the upland fill, surface sediments, and underlying Bay Point Formation.

3.2 Field Methodologies

Detailed methods for sample collection, handling, and shipping are described in the Workplan (Anchor 2004b), and summarized in this section. Procedures for the following tasks are included:

- Locations of sampling stations
- Collecting and compositing sediment core samples
- Collecting groundwater samples and groundwater elevation measurements
- Sample packaging, handling, and shipping procedures
- Completing standard forms to document the collection effort and field conditions

3.2.1 Sample Locations and Numbers

Five sample locations are shown on Figure 2. Monitoring well and core locations were assigned designations corresponding to their station number (i.e., monitoring wells MW-1.1 and MW-1.2 at Station 1; sediment core SW-4 at Station 4, etc). In the monitoring well designations, the first number indicates the sample station and the second number identifies whether it is the deeper well (1) or the shallower well (2).

At three stations (Stations 1, 2, and 3), a continuous core sample was taken and two monitoring wells installed. Stations 1 and 2 (continuous cores SW-1 and SW-2 and wells MW-1.1, MW-1.2, MW-2.1, and MW-2.2) are located in the sand fill areas near the railways' shoreward terminus where impacted sediments were previously removed. Station 3 (continuous core SW-3 and wells MW-3.1 and MW-3.2) is located in the paved uplands area immediately east of the project area. Stations 4 and 5 (cores only; labeled SW-4 and SW-5) were co-located as close as possible to previous well point stations (WP-1 and WP-2) sampled in July 2004. Station 4 (core SW-4) is within surface

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sediments between Marine Railway Number 2 and Number 3. Station 5 (core SW-5) is located to the east of Pier 1 within the existing ship cradles.

Station locations were chosen relative to existing conditions in the field and as close as possible to locations described in the Workplan. Stations 1 and 2 were located by measuring the distance across the sand fill areas and placing the stations equidistant from either side of the enclosed area. Station 3 was moved slightly upland from the original location to avoid utility lines underneath the pavement. Stations 4 and 5 were placed as close as possible to the previous well point stations described above. Due to restrictions with the coring equipment, Station 4 was relocated between marine railways 2 and 3 at the water's edge at low tide, moving the original location slightly shoreward. Station 5, also restricted due to the coring equipment, was relocated slightly seaward of the original location to provide a safe and stable platform for the equipment and field crew. All of the station locations were measured in the field relative to existing landmarks, and are shown to scale on Figure 2.

3.2.2 Sample Collection

3.2.2.1 Direct-Push Continuous Cores

Continuous soil cores were collected from each station using a direct-push sampling rig, to a target depth of at least 4 feet into the Bay Point Formation or until refusal. Five foot acetate core liners were decontaminated immediately prior to use following the procedures outlined in the QAPP (Anchor 2004b). Care was taken during sampling to avoid contact of the sample tube with potentially contaminated surfaces. Push core equipment (i.e., sample tubes and extension rods) was steam cleaned prior to use and between stations.

Each core was split open vertically, photographed, and geologically characterized into a core log. In cases of incomplete recovery, the top of the recovered sediment was assumed to correlate to the top of the cored interval. The core was sectioned into two distinct geologic layers, the upland fill or surface sediment layer, and the underlying Bay Point Formation. At sampling Stations 1 and 2, a composite sample was collected from the Bay Point Formation layer and analyzed for TOC, trace metals, PCBs, and PAHs. Samples from the overlying material were archived.

At Station 3, two composite samples were collected that represented distinct geologic layers of the upland fill material. A sample was also collected from the underlying Bay Point Formation and archived.

At Stations 4 and 5, composite samples were collected from four distinct layers that were visually determined from the overlying sediment along with a composite sample from the upper 2 feet of the Bay Point Formation. Each composite sample was split into 50-gram glass containers for laboratory analysis of TOC, trace metals, PCBs, and PAHs.

At all stations, sampling information, including sample identifier, sample location, date and time of sampling, requested analysis, and sampler name, was recorded on a chain-of-custody form and on the sampling jar label. Following collection, samples were placed immediately on ice in a cooler and taken to Federal Express for delivery to CRG Laboratory the next business day by 10:30 a.m. Chain-of-custody forms were filled out as the samples were placed in the coolers and were kept with the samples in Ziplock bags at all times. The coolers were tracked the next business day using the Federal Express tracking numbers to ensure arrival at the lab.

3.2.2.2 Groundwater

Upon completion of the continuous-push cores at Stations 1, 2, and 3, two temporary monitoring wells were installed at each station. One well was installed into the same location the core sample was taken from and the other was installed approximately 1 meter from the first. Both were installed using direct-push methods. The monitoring wells consisted of 0.75-inch pre-packed well screens as per the typical detail shown on Figure 4. One screen was set approximately 1 foot below the upper boundary of the Bay Point Formation materials, and the other was placed in the overlying fill material just above the underlying Bay Point Formation materials. This process was used to determine vertical and horizontal groundwater gradients in each material type.

Groundwater elevations were measured in each monitoring well during ebb, low, flood, and high tidal conditions to characterize hydrologic gradients for the upland fill, surface sediments, and underlying Bay Point Formation. Groundwater elevations were measured using a decontaminated, electronic well probe and tape measure lowered into each well and recorded on a data sheet. The maximum tidal exchange in San Diego Bay for the day of the water level monitoring (December 6, 2004) was 3.2 feet.

Groundwater samples were collected from each well and analyzed for salinity, total dissolved solids (TDS), PAHs, dissolved metals, and PCBs. Groundwater samples were collected 24 hours after each of the wells were installed using a peristaltic pump with disposable tubing. To ensure maximum potential for groundwater inclusion, all sampling was conducted as close to low tide as possible, particularly in the wells located near the shore. Wells were purged of at least three well volumes of groundwater prior to collecting samples, which were collected by discharging water from the peristaltic pump directly into the laboratory-provided sample jars. All samples collected for dissolved metals analyses were filtered with a 0.45 µm in-line filter prior to placement in the sampling bottles. Sampling information, including sample identifier, sample location, date and time of sampling, requested analysis, and sampler name, was recorded on a chain-of-custody form and on the sampling jar label. Following collection, samples were placed immediately in a cooler on ice and delivered to the laboratory as described above.

3.2.3 Sample Processing and Record Keeping

All sample handling, labeling, packaging, documentation, chain-of-custody forms, and shipping were accomplished and recorded in full accordance with the procedures detailed in the Workplan and associated QAPP (Anchor 2004b). Sample station duplicates were obtained and analyzed as described in the QAPP to ensure project quality control objectives were met.

Results of chemical analyses, and validation of the chemistry data, are presented in the next section.

3.2.4 Field Quality Control Sample Procedures

The following quality control samples were collected in the field and analyzed in the testing laboratory with the other samples:

- Station Location Duplicates – Field duplicate samples are collected to assess the variability of chemical concentrations at the station location and provide a measure of the total analytical bias (field and laboratory variance). One field duplicate was collected from core SW-5 at depth interval 5 feet to 6 feet 5 inches and monitoring well MW 2.2, which was located in the overlying surface sediments.

3.2.5 Field Documentation and Chain-of-Custody Forms

A field log book was maintained throughout the study to document daily field activities and field observations. Core logs were produced for each continuous-push core collected. Photo documentation of each core was collected and identified in the field book with sample identification and photograph number. Repositioned station locations were noted during field sampling to update the station location map after sampling was completed.

Sample labels were completed for each sample, and included station identification, date, and time, sampling personnel, preservative, and analysis required. All labels were completed using indelible ink and covered with clear tape to prevent smearing.

Chain-of-custody forms were completed at the end of each sampling day to trace samples from collection to final disposition. The chain-of-custody form included sample identification, collection date and time, matrix, analysis requested, number of containers, and preservative. Chain-of-custody forms were completed in triplicate with one copy retained in the field notebook.

4 CHEMICAL ANALYSES

4.1 Soil/Sediment Chemistry

A total of 14 soil/sediment samples were analyzed for chemical constituents from the five sampling stations (Figure 2), and represent upland fill, overlying sediment, and Bay Point Formation material. Table 4 presents the sediment chemistry results for metals, PAHs, and PCBs measured in each of the soil/sediment samples.

For comparison purposes, and to comply with SDRWQCB guidance, chemical concentrations measured in this study have been compared to "background" chemical concentrations. In this Report, reference pool sediment concentrations as determined by Exponent in their 2003 study are considered to be reasonably representative of "background" conditions, and are included in the first column of Table 4 for comparison purposes.

Measured chemical concentrations have also been compared against State of California Total Threshold Limit Concentration (TTLC) bulk chemistry values, which, if exceeded, are one basis by which materials qualify as California hazardous waste (per CCR 66261.24, in Title 22, Division 4.5, Chapter 11, Article 3). The applicable TTLC values are included in the second column of Table 4.

Metal concentrations measured in the upland fill material at core SW-3 and in the Bay Point Formation material in cores 1 and 2 were all below background concentrations (Table 4). Metal concentrations were consistently measured above background concentrations in the upper surface sediment layers in cores SW-4 and SW-5, but were below detection limits in underlying sediment and Bay Point Formation samples. Elevated metal concentrations were identified to a depth of 5 feet 9 inches in core SW-4, and to 2 feet in core SW-5.

Elevated concentrations were also noted in these near-surface (upper two feet) samples for copper, lead, and zinc, with maximum concentrations of 6,950 mg/kg, 955 mg/kg, and 6,630 mg/kg, respectively. In these near-surface samples, measured concentrations of copper exceeded TTLC criteria in cores SW-4 and SW-5, as did the measured concentration of zinc in core SW-4. No exceedances of TTLC criteria were encountered for any other analytes, nor in any other samples.

Total PCB concentrations were detected above reference concentrations in the same surface sediment layers containing elevated metals concentrations. The maximum total PCB concentration measured was 5,198 μg/kg in core SW-4, between depths of 2 feet 1 inch, and 3 feet 6 inches; this is above the reference concentration of 170 μg/kg. Elevated total PCB concentrations were identified to the same depths in these cores as for metals (to 5 feet 9 inches in core SW-4, and to 2 feet in core SW-5). PCB concentrations did not exceed TTLC criteria (50 mg/kg).

PAHs were also detected in the same samples where metals and total PCBs were elevated (Table 4); however, reference values do not exist for PAHs, so no comparison is provided.

4.2 Groundwater Chemistry

Three pairs of temporary monitoring wells, at Stations 1, 2, and 3, were sampled for groundwater within the project area (Figure 2). The results of the groundwater chemistry analyses are shown in Table 5 along with California Toxic Rule (CTR) water quality criteria for comparison. These results show that low concentrations of dissolved metals were detected in all six wells. However, only nickel exceeded the CTR criteria in well MW-2.1 (screened in the Bay Point Formation) and copper and nickel exceeded the criteria in well MW-3.1 (also screened in the Bay Point Formation).

All other detected concentrations were below the CTR criteria. Low concentrations of some PAHs were also reported in all six wells, however, several were below the analytical detection limits. PCBs were detected only in well MW-1.1 (screened in the Bay Point Formation), where the total PCB concentration exceeded the CTR criteria of 0.03 μg/L (see Table 5).

4.3 Data Validation

Data validation and review were performed on the seven water samples and 14 sediment samples submitted to Anchor by CRG Marine Laboratories of Torrance, California. The two matrices are reported in separate data validation reports, attached to this Report in Appendix B.

5 SITE CHARACTERIZATION

A site conceptual model is a representation of the site's potential chemical sources, eaffected media, potential pathways to exposure, and receptors.

5.1 Geological Characterization

Figure 2 depicts a typical cross-section through the site and the geological layers observed in the field investigation. Geologic logs from the soil borings taken as part of this investigation are shown in Appendix A. These logs confirm earlier conclusions about the geology of the site discussed in Section 2.2. The following details specific to the proposed project area supplement and/or verify the information summarized in Section 2.2:

- Up to 6.5 feet of recent sand fill was observed in cores SW-1 and SW-2, representing backfilling of areas remediated by the former Southwest Marine in 1998.
- Fill materials and sediments overlying the Bay Point Formation in the upland area (core SW-3) are approximately 15 feet thick.
- Eleven to 18 feet of soft, geologically recent, surface sediments were observed in the offshore areas (cores SW-4 and SW-5). These surface sediments were dominated by gray silty sands.
- The offshore surface sediments and upland fill materials are underlain by the firmer Bay Point Formation at all sampling stations.

5.2 Groundwater Flow Characterization

Water levels were measured in each monitoring well under ebb, low, flood, and high tide conditions to determine the magnitude and direction of groundwater flow at the site. Table 6 provides a summary of the water level information. In general, saturated conditions were observed approximately 7 feet bgs in upland areas of the project area, typical of tidally influenced conditions.

The water level information from upland and offshore monitoring wells was used to generate piezometric surface maps for the project area for shallow and deep geologic units. Examples of these maps at low tide and high tide conditions are shown in Figures 5 through Figure 8.

The following provides a summary of the findings from the water level monitoring:

- The maximum observed groundwater gradient was 0.0047, and occurred during low tide with flow in a South/Southwest direction. This direction is essentially orthogonal to the uplands shoreline areas with flow towards the Bay. Gradient and flow were consistent for formational and fill materials.
- A complete reversal of flow during high tide was not observed during the monitoring described here, but the gradient essentially fell to a value of zero for groundwater flow from land to the Bay during high tide. It is likely there is a complete reversal of gradient during extreme tides.
- The vertical gradient between formation and fill materials was very low and reversed from net downward at low tide to net upward during high tide.

Because of the tidal action at the site, there is a small net flow of water emanating from upland areas to San Diego Bay through sediments bordering the site. The data from the monitoring wells show there is not a significant difference in the flow characteristics of groundwater in upper formational sediments and recent sediments. These data indicate the system can be functionally treated as one water-bearing unit.

5.3 Waste Constituent Characterization

Concentrations of COCs in sediments, soil, and groundwater are summarized here for the upland fill, surface sediment, and Bay Point Formation, to describe both the vertical and spatial extent of COCs in each. This information supplements the results of confirmational sampling that was done following the former Southwest Marine's 1998 sediment removal project (described in Section 2.3).

Distinct spatial gradients of sediment chemical concentrations were found both vertically and horizontally in the improvement area. Figures 9 and 10 illustrate, in plan view and in cross-sectional view, the distribution of chemically impacted sediments and groundwater at the project site. The general observed trends include:

- Concentrations of constituents measured in groundwater samples were generally below CTR concentrations in both the upland fill and Bay Point Formation wells.
- The horizontal distribution of COCs above relevant criteria was confined to the seaward portions of the project area, in the upper near-surface sediment at Stations 4 and 5 (Figures 9 and 10).

- The vertical distribution of COCs above relevant criteria, including California TTLC criteria, was confined to the upper 2 feet of near-surface sediment at Stations 4 and 5 (Figures 9 and 10).

The few COCs that were measured in groundwater at concentrations marginally above CTR values (nickel, copper, and total PCBs) were from the Bay Point Formation (wells MW-2.1 and MW-3.1; Table 5). Groundwater samples from the wells located in upper fill material did not have any elevated concentrations of COCs.

The horizontal distribution of elevated COCs in the project area was confined to the seaward sediment samples at Stations 4 and 5 (cores SW-4 and SW-5; refer to Figure 9). These stations represent the western extent of the project area both north and south of Pier 1 (Figure 2). Concentrations measured in these sediment cores are consistent with results found by E^{x}ponent in 2003 at core SW08 (Table 1), which also detected elevated COC concentrations in this area. The upland sampling station, Station 3, did not have elevated COCs in the upland fill material (Table 4). In the sand fill area where Stations 1 and 2 are located, the 1998 cleanup actions described previously removed sediment with elevated COCs to depths ranging from 3.5 to 12 feet; the excavated areas were subsequently filled with clean sand fill material (as described in Section 2.3).

Elevated COC concentrations are confined to the upper surface sediment layers at Stations 4 and 5 (Figure 10). Concentrations of metals and total PCBs are above background concentrations (as defined by E^{x}ponent 2003), above a depth of 5 feet 9 inches at Station 4 and above a depth of 2 feet at Station 5 (Table 4). The sediment layers below these depths extending down to the Bay Point Formation material do not show elevated COC concentrations. The upland fill material at Station 3 also did not have elevated concentrations of COCs, nor did Stations 1 and 2, as previously described. Bay Point Formation material had low concentrations of metals and generally no detected organics at all the sampling stations. The metal concentrations detected likely represent natural background levels.

Sediment with detected metals concentrations in excess of California TTLC limits are confined to the upper 2 feet of cores SW-4 and SW-5. Concentrations measured in nearby core SW08 (by E[x]ponent, 2003), however, did not exceed TTLC criteria (see Table 1). This indicates that sediments exceeding TTLC criteria are limited to specific areas. These specific areas are presented on Figure 9, and have a total volume estimated as approximately 1,000 cubic yards, though confirmation sampling will be performed during removal to confirm the vertical and horizontal extent of sediments exceeding the TTLC criteria.

5.4 Source Characterization

Cores taken during the E[x]ponent (2003) site investigation in 2002 and 2003, and those taken during this study, indicate that chemical concentrations were generally highest in the surface sediment and decreased with depth. Elevated chemical concentrations in soil and sediment are seen to be concentrated in shallow, near-surface sediment layers (Figures 9 and 10), as follows:

- To a depth of 4 feet in cores SW04 and SW08 taken in 2002/2003 (E[x]ponent 2003)
- To depths ranging from 3.5 to 12 feet excavated and sampled during the former Southwest Marine's remediation of the landward portions of the site (SWM 1998)
- To depths of 5 feet 9 inches and 2 feet in cores SW-4 and SW-5 sampled during this study

In each case, underlying sediments have been shown to be free of chemical concentrations above background concentrations. This is consistent with the fact that the surface sediments were deposited in recent industrial times in the vicinity of the marine railway. The nature of the elevated chemical concentrations (metals and PCBs) is consistent with past industrial uses of the marine railways (repair, maintenance, and sandblasting). Therefore, the potential sources of waste constituent discharges at the project site appear to be, overall, primarily confined to historical ship repair and maintenance activities.

There does not appear to be chemical impacts to shallow porewater from the sediment bulk chemistry observed in this investigation. As is discussed in Section 5.3, more chemical detections were noted in the deeper monitoring wells screened in the Bay Point Formation, than from the shallower wells screened in overlying sediment. The concentrations of some metals observed in wells screened in the Bay Point Formation likely reflect ambient conditions.

BAE Systems has controlled all stormwater runoff from the site since the mid-1980s, routing all surface water runoff into a site stormwater collection and treatment system. As a result, site groundwater chemistry is unaffected by site surface water influences. This is supported by the relatively low concentrations of chemicals observed in shallow monitoring wells during this study.

5.5 Site Conceptual Model

Since the surface sediments are laterally bounded by timber and steel bulkhead walls that form the perimeter of the project area, near-surface sediments with elevated chemical concentrations in the project area are not continuous with adjacent upland soils. Neither the 2002/2003 site investigation nor the 1998 remedial action involved samples taken from upland areas immediately around the bulkhead extension project area. Samples taken from Station 3 for this study indicate that the upland fill materials are free of significant chemical impacts to sediment and to groundwater.

Based on groundwater measurements made as part of this study, groundwater at the site moves in a generally horizontal direction from the uplands toward the Bay. Within and adjacent to the project site, groundwater is influenced both by overall regional gradients and by tidal action.

The potential receptor of concern for this project is the surface waters of San Diego Bay. The primary route for possible water-quality impacts is potential contaminant release from sediments behind the bulkhead, as a result of groundwater seepage through and under the sheetpile, via a sediment to groundwater to surface (Bay) water pathway. Porewater, driven by tidal flushing and groundwater gradients, could move through, around, or under the sheetpile bulkhead, thereby coming in contact with the surface water. Infiltration and percolation of surface water will be relatively insignificant because the site will be paved.

Construction of the project will provide both horizontal and vertical isolation and confinement of the existing contaminated sediments underlying the area, restricting the potential for contaminants to leach into the surrounding environment. Vertical confinement will be provided by placement of up to 15 feet of fill and an impervious asphalt surface. Horizontal confinement will be provided by the installation of sheetpiling across the front of the former shipways to a depth of about 20 to 25 feet below existing mudline and about 8 to 10 feet into the relatively impermeable Bay Point Formation, which underlies the more recent surface sediments. The presence of the sheetpile wall as a relatively impervious barrier to water flow will significantly restrict flow of aqueous contaminants into receiving waters.

To provide for additional protection, the project has been designed with a clean, imported sand buffer between impacted sediments and the bulkhead wall (Figure 3). Approximately 500 cubic yards of impacted sediments along the interior of the bulkhead will be excavated, removed from the site, and replaced with imported, clean, granular fill sand. This sand buffer will both increase the distance the porewater must move and will increase tidal attenuation, adsorption, and partitioning of the migrating water within the sand as it approaches the bulkhead and surface waters of San Diego Bay.

Modeling of tidal attenuation presented in the DER for Phase 2 activities (Anchor 2004a) indicates that the overall effect of the project's design features (sheetpile bulkhead and clean sand buffer) will be to decrease concentrations in the groundwater/porewater at least 400-fold before surface waters are reached. Based on this evaluation, porewater expressed from the project site via the sediment-groundwater-surface water pathway is predicted to have chemical concentrations well below chronic WQC upon entry into site surface waters, and thus is not expected to impact ambient surface water quality.

As requested by the SDRWQCB, additional modeling has been performed using the results of this site investigation program and the updated Site Conceptual Model, to supplement and verify the conclusions cited above from the previous DER. The methods, assumptions, and results of this additional modeling are presented in the next section.

6 FATE AND TRANSPORT

Consistent with SDRWQCB requirements as documented in the letter dated September 14, 2004, this section presents a rigorous and updated evaluation of the sediment to groundwater to surface water chemical transport pathway, thus providing an assessment of the movements, dispositions, and transformations of waste constituents in soil, sediment, and groundwater within and between environmental media (soil, sediment, groundwater, surface water, and potentially biota).

Information collected during the current site investigation was combined with data collected during previous site investigations and the Site Conceptual Model (Section 5.5), to determine the fate and transport of waste constituents using a standard flow and partitioning model (Reible 1998, promulgated by the Corps). The end result of this modeling was to quantify potential water quality impacts to surface waters, to update the Site Conceptual Model (Sections 5.4 and 5.5), and to update conclusions cited in the DER (Anchor 2004a).

6.1 Modeling Approach

One-dimensional chemical transport modeling (Reible 1998) was used to conservatively assess the long-term effectiveness of the sheetpile wall as a horizontal barrier, in conjunction with clean fill placed behind the wall, to mitigate the potential transport of chemicals via the sediment-groundwater-surface water pathway to the surface waters of San Diego Bay. Reible's (1998) modeling approach is described in an appendix to nationally recognized Corps guidance on the design of sediment caps: *Guidance for Subaqueous Dredged Material Capping* (Palermo et al. 1998). Results predicted from this conservative modeling approach have then been evaluated against actual groundwater concentrations to assess the overall protectiveness of the project.

The model described by Equation B32 of Reible (1998) was executed in Microsoft Excel. This model describes advective/diffusive transport of a dissolved chemical through a homogeneous porous media, such as clean quarried sand or dredged material. The output of the model is expressed as the concentration of the COCs in porewater at specified times as it exits the project limits and enters surrounding surface waters. The model conservatively assumes no biodegradation of the chemical takes place over time.

For this assessment, copper, lead, zinc, and total PCBs were selected as COC's for modeling due to their relatively high concentrations in the project area. Although groundwater samples indicated virtually no significant chemical impacts to site groundwater at Stations 1, 2, and 3, theoretical porewater concentrations for each constituent were conservatively calculated using bulk sediment concentrations (defined as the 95% upper confidence limit [UPL] from all samples), divided by appropriate adsorption distribution coefficients (K_{oc} for PCBs; K_d for metals), and calculated for the medium through which groundwater would move (i.e., fill placed behind the sheetpile bulkhead). The planned removal of sediments exceeding TTLC criteria has been accounted for in the development of the theoretical porewater concentrations. The partitioning coefficient (K_{oc}) for PCBs was calculated using the measured organic carbon content of site sediments. A range of K_ds were considered from low literature-derived values to high, site-specific values estimated from E[x]ponent's previous work (2003; Table 7). A conservative estimate of K_d was chosen from the low end of the range and used to calculate initial porewater concentrations. The model was used to predict porewater concentrations for each COC at a point 10 centimeters behind the sheetpile wall, at 25-, 50-, and 100-year intervals after bulkhead construction.

6.2 Parameters and Assumptions

Table 8 presents the input parameters required by the model and the input values used for each COC. The model assumes a homogeneous layer of clean fill placed behind the bulkhead and over the impacted sediments within the project area. Two different types of fill materials were assessed to estimate their overall effectiveness for restricting COC migration through the different materials. The first clean fill material analyzed was a clean quarried sand with a low TOC fraction. This low TOC fraction does not allow for PCBs to adsorb to cap material and is, therefore, theoretically not as effective at controlling any PCB migration. The second clean fill material analyzed was dredged material with a higher TOC fraction, which more effectively controls PCB migration. Using K_ds, any modeled metals migration will not be affected by the differing TOC levels in these potential fill materials.

The horizontal advection of groundwater through sediment and overlying materials is a key factor in the rate of chemical migration and, therefore, is a particularly significant parameter for this model. As a result, field measurements of groundwater flow and gradient (documented in Section 5.2) were used in defining this parameter. The advection rate was calculated from Darcy's law which used the hydraulic gradient (calculated using site specific data), the hydraulic conductivity, and the effective porosity of the isolating material. For this modeling, conservative estimates of both hydraulic conductivity and effective porosity were used.

Values for all other model input parameters were obtained from standard sources noted in Table 8, including values for cap porosity, specific gravity of cap material, cap material organic carbon content, partition coefficients for PCBs, and molecular diffusion coefficients for PCBs in water.

6.3 Results

Results of cap effectiveness modeling are presented in Table 9 in terms of mg/L of COCs in isolated material porewater. The results are compared to CTR surface water criteria. Table 9 shows the dissolved concentrations of the selected COCs in porewater expressed from the project area 25, 50, and 100 years after the project is complete. All modeled COCs are well below CTR criteria well after 100 years (and for several centuries beyond in most cases). Expressed dissolved concentrations of total PCBs are below CTR criteria when quarried sand material is used as backfill, and are seen to be at even lower concentrations when a fill material with higher TOC content – such as dredged Bay sediment – is used for construction.

In summary, the modeling results demonstrate that the use of either fill material would be effective over the long term in isolating COCs from San Diego Bay waters. Notably, actual water quality impacts would be significantly less even than those predicted by the model, because measured concentrations of COCs in site groundwater (as documented in Tables 3 and 5) are lower than those that were input to the model.

Thus, the highly conservative modeling approach presented here shows no significant impacts to surface water quality, and verifies that the planned project will be fully protective of water quality.

7 CONCLUSIONS

This study addresses questions and requirements documented by the SDRWQCB in their letter dated September 14, 2004 (as well as input obtained during BAE Systems' subsequent communications with the SDRWQCB on August 5, 2005), necessary to support a 401 WQC for Phase 2 activities.

Additional coring and groundwater sampling at the site, in conjunction with past sampling events, indicate that significant chemical impacts to site sediments are confined to near-surface sediments surrounding the now defunct marine railways. The nature of chemical impacts to site sediments (namely, high metals and PCB concentrations in the upper several feet) are consistent with past industrial uses of these railways (i.e., repair, maintenance, sandblasting).

An upland sampling station (continuous core SW-3 and monitoring wells MW-3.1 and 3.2) did not show significant impacts to subsurface materials. Walls bounding the project site on the north and south separate the marine railway area from adjacent upland fills.

Chemical impacts to groundwater appears to be largely restricted to shallow depths, corresponding to the highest chemical detections in site sediment.

A standard groundwater flow and chemical partitioning model was used to predict potential long-term effects to water quality in the adjacent waters of San Diego Bay. Conservative input parameters were used, as were conservative upper 95 percent limits of measured sediment concentrations. Even with "worst case" assumptions made for model inputs, the modeling results indicate that chemical breakthrough of site COCs is not expected for time durations on the order of well over 100 years, which is consistent with typical cap design projects in San Diego and elsewhere. This model does not account for tidal mixing, which (as discussed in the DER and Anchor 2004a) would reduce water quality impacts by additional orders of magnitude.

Altogether, this study indicates that the proposed project will be fully protective of adjacent surface waters after construction, and that chemical concentrations will not exceed existing surface water quality criteria along the bulkhead wall after construction.

As an added measure, and to meet post-closure maintenance requirements for inactive nonhazardous waste landfills (SDRWQCB 1997 and 2000), long-term monitoring of groundwater quality will be instituted at this site. The long-term water quality monitoring plan for the site is presented in the Data Evaluation Report (Anchor 2004a).

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TABLES

Table 1
Bulk Sediment Chemistry - Sediment Cores SW04 and SW08

Analyte of Concern	Background Sediment Concentrations [1]	California TTLC Criteria [2]	SW04 8/7/2001 0-2 cm	SW04 9/10/2002 0-2 cm	SW04 8/27/2002 0-2 ft	SW04 8/27/2002 2-4.1 ft	SW04 Depth Averaged	SW08 8/8/2001 0-2 cm	SW08 8/28/2002 0-2 ft	SW08 8/28/2002 0-2 ft	SW08 8/28/2002 2-4 ft	SW08 8/28/2002 4-6 ft	SW08 8/28/2002 6-6.5 ft	SW08 Depth Averaged
Conventionals														
Fines content (%)			31.8	-	-	-	31.8	68.8	-	-	-	-		68.8
TOC (% dry)			1.59	-	0.91	1.8	1.37	3.35	1.5	-	1.1	0.12	-	0.93
Metals (mg/kg)														
Arsenic	9	500	95.5	-	67.7	107	89.65	25.5	26.6	-	13.2	4.9	-	15.12
Cadmium	0.29	100	2.35	-	0.79	3.17	2.05	0.67	1.13	-	0.86	0.07	-	0.69
Chromium	57	2500	64.7	-	25.5	97.2	63.36	77.8	110	-	109	7.4	-	76.00
Copper	120	2500	1880	-	370	2170	1325.60	1030	1540	-	1480	49	-	1029.94
Lead	48	1000	482	-	154	413	295.73	248	343	-	341	10.6	-	233.26
Mercury	0.56	20	1.19	-	1.14	7.4	4.36	2.53	4.97	-	5.95	0.3	-	3.76
Nickel	17	2000	20.1	-	8.3	40	24.87	22.7	16.8	-	9.1	2.6	-	9.71
Selenium	0.72	100	1.2	-	1.2 U	3.1	2.19	1 U	1.6 U	-	1.4 U	1.2 U	-	1.6 U
Silver	1	500	1.72	-	0.59	1.4	1.04	1.38	1.04	-	0.49	0.03	-	0.63
Zinc	210	5000	4550	-	669	1450	1158.31	859	1410	-	786	33.7	-	749.46
PCB (µg/kg)														
Aroclor 1016			190 U	-	150 U	1500 U	1500 U	330 U	1900 U	950 U	1400 U	130 U	12 U	1900 U
Aroclor 1221			370 U	-	290 U	2900 U	2900 U	650 U	3800 U	1900 U	2800 U	250 U	24 U	3800 U
Aroclor 1232			190 U	-	150 U	1500 U	1500 U	330 U	1900 U	950 U	1400 U	130 U	12 U	1900 U
Aroclor 1242			190 U	-	150 U	1500 U	1500 U	330 U	1900 U	950 U	1400 U	130 U	12 U	1900 U
Aroclor 1248			190 U	-	1300	16000	8664	990	9300	12000	15000	1100	12 U	8223
Aroclor 1254			2400	-	1200	13000	7153	2400	7000	8700	12000	600	12 U	6303
Aroclor 1260			600	-	610	6500	3570	640	4100	4400	6600	290	12 U	3427
Total PCBs	170	50000	3000	-	3110	35500	19387	4030	20400	25100	33600	1990	0	17954
PAHs (µg/kg)														
2-Methylnaphthalene			31	-	10	460	240	32	18	-	50	6.1 U	-	25
Acenaphthene			110	-	22	3100	1594	83	54	-	110	6.1 U	-	57
Acenaphthylene			120	-	47	190	122	280	100	-	84	6.1 U	-	66
Anthracene			710	-	150	2400	1312	1500	360	-	360	10	-	258
Benz(a)anthracene			1100	-	370	3400	1937	2300	770	-	950	17	-	601
Benzo(a)pyrene			1500	-	1100	5800	3527	2900	2600	-	3000	85	-	1918
Benzo(b)fluoranthene			1600	-	950	5800	3456	3500	2900	-	3000	88	-	2025
Benzo(ghi)perylene			640	-	630	2100	1393	1300	970	-	1000	26	-	677
Benzo(k)fluoranthene			1300	-	790	5200	3065	2400	2600	-	2900	85	-	1880
Chrysene			1800	-	580	4500	2615	4900	1200	-	1200	38	-	862
Dibenzo(a,h)anthracene			230	-	120	650	395	450	310	-	370	8.4	-	233
Fluoranthene			2100	-	700	10000	5485	3500	1000	-	1200	25	-	776
Fluorene			180	-	34	1500	785	220	77	-	120	6.1 U	-	70
Indeno[1,2,3-cd]pyrene			880	-	750	2600	1711	1800	1400	-	1300	34	-	927
Naphthalene			38	-	20	3800	1949	38	19	-	58	6.1 U	-	28
Phenanthrene			1100	-	260	5000	2699	1300	490	-	620	13	-	387
Pyrene			2000	-	1400	18000	9906	2600	6000	-	8400	51	-	4826
Total PAHs		-	15439	-	7933	74500	42191	29103	20868	-	24722	510.9	-	15617

Notes:
U = analyte not detected at the indicated detection limit
From E^{x}ponent (2003)

[1] Background sediment concentrations defined as 95% UPL Final Reference Pool levels from E^{x}ponent (2003)
[2] TTLC = Total Threshold Limit Concentration, per CCR Title 22, Division 4.5, Chapter 11, Article 3.

Table 2
Chemical Concentrations Measured In 1998 Confirmatory Sampling Event

Parameter	1998 Sediment Cleanup Criteria (per Order 98-38)	Background Sediment Concentrations [1]	A1 8/17/1998 10 ft	A2 8/13/1998 8 ft	A3 8/13/1998 8 ft	B1 8/19/1998 6 ft	B2 8/10/1998 3.5 ft	B3 8/17/1998 5.5 ft	C1 8/19/1998 6.5 ft	C2 8/24/1998 4 ft	C3 8/31/1998 8 ft	D1 8/21/1998 8 ft	D2 8/25/1998 6 ft	D3 8/27/1998 5 ft
Metals (mg/kg)														
Copper	810	120	8.0	6	85	3.1	59	3.7	1.4	22	49	0 U	1.5	**650**
Lead	231	48	0 U	12	9.7	0 U	7.9	0 U	0 U	6.8	39	0 U	0 U	0 U
Mercury (total)	4.2	0.56	0 U	0 U	0.27	0 U	0 U	0 U	0 U	0 U	**0.97**	0.07	0 U	0 U
Zinc	820	210	14	16	**520**	17	51	**340**	8.4	31	47	11	7.7	**450**
PCBs (µg/kg)														
Total PCBs	950	170	0 U	0 U	**914**	68	0 U	0 U	0 U	0 U	0 U	0 U	0 U	0 U

Parameter	1998 Sediment Cleanup Criteria (per Order 98-38)	Background Sediment Concentrations [1]	E1 8/12/1998 12 ft	E2 8/18/1998 12 ft	E3 8/13/1998 6 ft	F1 8/20/1998 9.5 ft	F2 8/20/1998 10 ft	F3 8/13/1998 5.5 ft	G1 8/24/1998 8.5 ft	G2 8/24/1998 7.5 ft	G3 8/17/1998 8 ft	H1 8/26/1998 5.5 ft	H2 8/26/1998 6.5 ft	H3 8/14/1998 5.5 ft	I1 8/31/1998 3.5 ft	I2 8/31/1998 5 ft	I3 8/14/1998 5.5 ft
Metals (mg/kg)																	
Copper	810	120	47	67	**510**	24	12	7.9	6.5	**144**	61	0 U	29	59	625	56	10
Lead	231	48	6.2	20	**78**	8.1	0 U	9.1	0 U	42	26	0 U	10	11	8.2	0 U	0 U
Mercury (total)	4.2	0.56	0 U	0.38	0.44	0 U	0 U	0.4	0.41	**0.97**	0.1	0 U	**0.68**	**0.66**	**4.14**	**0.66**	0.28
Zinc	820	210	76	91	61	48	27	18	17	87	25	9.6	8.3	**620**	**270**	**290**	54
PCBs (µg/kg)																	
Total PCBs	950	170	125	**207**	**810**	0 U	0 U	**196**	0 U	**530**	0 U	0 U	0 U	0 U	0 U	0 U	0 U

Bold values exceed reference sediment concentrations
U = analyte not detected at the indicated detection limit

[1] Background sediment concentrations defined as 95% UPL Final Reference Pool levels from Exponent (2003)

Table 3
Chemical Concentrations Measured in Well Point Samples

Chemical	Well Point 1 ASW-WP1 µg/L (Dissolved)	Well Point 2 ASW-WP2 µg/L (Dissolved)	Ambient Concentrations Measured in Site Surface Water ASW-SW1 Ambient [1]	Ambient [2]	Water Quality Criteria in µg/L (Dissolved) [3] Acute	Chronic
Conventionals						
Total Suspended Solids (mg/L)	24	120	15			
Salinity (ppt)	33	30	33			
Fines content (%)				-		
TOC (% dry)				-		
Metals (mg/kg or µg/L)						
Arsenic	1.03	14.4	1.35	8.8 J	69	36
Cadmium	0.215	0.33	0.1	1.2 U	42	9.3
Chromium[4]	1.18	2.06	0.99	2.1 J	1100	50
Copper	2.005	0.98	5.42	5	4.8	3.1
Lead	0.32	0.36	0.07	0.55 J	210	8.1
Mercury	0.1 U	.01 U	.01 U	0.1 U	0.4	0.04
Nickel	1.545	0.98	1.05	5 U	74	8.2
Selenium	0.035	0.01	0.02	11	290	71
Silver	0.36	0.33	0.27	1.2 U	1.9	-
Zinc	7.22	18.8	9.03	18	90	81
Butyltins (µg/kg)						
Tributyltin				15.43		
PCB (µg/kg or µg/L)						
Aroclor 1016	0.15 U [5]	0.15 U [5]	1 U	0.5 U		
Aroclor 1221	0.10 U	0.10 U	1 U	0.5 U		
Aroclor 1232	0.10 U	0.10 U	1 U	0.5 U		
Aroclor 1242	0.10 U	0.10 U	1 U	0.5 U		
Aroclor 1248	1.3	0.63	1 U	0.5 U		
Aroclor 1254	0.10 U	0.10 U	1 U	0.5 U		
Aroclor 1260	1.1	0.63	0.1 U	0.5 U		
Aroclor 1262	0.10 U	0.10 U				
Aroclor 1268	0.024 U	0.024 U				
Total PCBs[8]	2.7[6]	1.6[6]	1 U	-	10[7]	0.03[7]
PAHs (µg/kg or µg/L)						
2-Methylnaphthalene	1.0 U	1.0 U	1.0 U	-		
Acenaphthene	1.0 U	1.0 U	1.0 U	1 U		
Acenaphthylene	1.0 U	1.0 U	1.0 U	5 U		
Anthracene	1.0 U	1.0 U	1.0 U	5 U		
Benz(a)anthracene	1.0 U	1.0 U	1.0 U	5 U		

Table 4
Sediment Chemistry Results

Parameter	Background Sediment Concentrations[a]	California TTLC Criteria[b]	Core SW-1 Bay Point Formation 16'-17'10"	Core SW-2 Bay Point Formation 18'-20'	Core SW-3 Upland Fill 5'-7'8"	Core SW-3 Upland Fill 12'2"-14'2"	Surface Sediment 0'-2'1"	Surface Sediment 2'1"-3'6"	Core SW-4 Surface Sediment 3'-5'9"	Surface Sediment 5'9"-8'10"	Bay Point Formation 15'-16'	Surface Sediment 2"-2'	Surface Sediment 2'-3'11"	Core SW-5 Surface Sediment 5'-6'5"	Surface Sediment 6'5"-7'5"	Bay Point Formation 10'-12'9"
Total Organic Carbon (percent)																
			0.01	0.02	0.22	0.13	1.48	0.29	0.21	0.01	0.03	0.46	0.04	0.06	0.03	0.02
Metals (mg/kg)																
Arsenic	9	500	3.65	1.15	3.46	3.9	**154**	**35.4**	**65.9**	1.42	1.56	**177**	3.57	3.13	2.62	6.42
Cadmium	0.29	100	0.05 J	0.04 J	0.05 J	0.07	**3.13**	**0.73**	**1.13**	0.05 J	0.04 J	**2.83**	0.08	0.08	0.08	0.06
Chromium	57	2500	3.6	12.3	6.46	3.89	**173**	**138**	**75.2**	3.22	22.4	**192**	8.7	5.4	21.4	4.73
Copper	120	2500	1.75	5.57	4.76	11.3	**2640**	**981**	**1040**	2.4	12.6	**16950**	12.7	5.85	14.1	4.52
Lead	48	1000	0.81	2.1	5.39	4.04	**668**	**352**	**326**	0.73	3.75	**955**	21.4	5.25	**3.98**	1.04
Mercury (total)	**0.56**	20	0.03 J	0.01 U	0.05 J	0.03 J	**0.69 J**	**2.4 J**	**0.7 J**	0.01 J	0.03 J	**0.91 J**	0.24 J	0.1 J	0.01 U	0.01 U
Nickel	17	2000	2.06	6.22	2.29	1.74	**25.9**	10.6	12	2.02	10.1	**28.1**	3.7	2.1	8.17	3.58
Selenium	0.72	100	0.13	0.15	0.3	0.09	**2.91**	**0.95**	**1.24**	0.68	0.25	**3.52**	0.1	0.09	0.05 J	0.8
Silver	1	500	0.05 U	0.05 U	0.05 U	0.05 U	**1.77 J**	0.55 J	0.76 J	0.05 U	0.18 J	**2.1 J**	0.28 J	0.15 J	0.04 J	**0.05 U**
Zinc	210	5000	23.9 J	23.9 J	17.8 J	13.7 J	**6830 J**	**1560 J**	**2250 J**	6.18 J	42.1 J	**4470 J**	28.8 J	19.3 J	49.3 J	9.77 J
PAHs (µg/kg)																
1-Methylnaphthalene			5 U	5 U	5 U	2.30 J	29.90	22.30	20.40	5 U	5 U	5 U	5 U	5.00 U	5.00 U	5 U
1-Methylphenanthrene			5 U	5 U	5 U	2.80 J	102	15.50	34.10	5 U	5 U	5 U	1.20 J	5.00 U	5.00 U	5 U
2,3,5-Trimethylnaphthalene			5 U	5 U	5 U	2.40 J	44.50	13.30	12.90	5 U	5 U	5 U	5 U	5.00 U	5.00 U	5 U
2,6-Dimethylnaphthalene			5 U	5 U	5 U	1.0 J	34.60	22.70	19.0	5 U	5 U	5 U	5 U	5.00 U	5.00 U	5 U
2-Methylnaphthalene			5 U	5 U	5 U	1.70 J	38.40	32.80	29.40	5 U	1.0 J	5 U	1.10 J	5.00 U	5.00 U	5 U
Acenaphthene			5 U	5 U	5 U	22.90	5 U	62.90	66.50	5 U	5 U	5 U	5 U	5.00 U	5.00 U	5 U
Acenaphthylene			5 U	5 U	5 U	6.80	35.70	31.90	17.60	5 U	5 U	5 U	1.40 J	1.20 J	5.00 U	5 U
Anthracene			5 U	5 U	5 U	13.90	5 U	5 U	5 U	5 U	5 U	5 U	2.70 J	2.20 J	5.00 U	5 U
Benz(a)anthracene			5 U	2.30 J	1.10 J	46.30	5 U	5 U	5 U	5 U	5 U	5 U	4.40 J	7.20 J	5.00 U	5 U
Benzo(a)pyrene			5 U	5 U	1.50 J	103	5 U	5 U	5 U	5 U	5 U	5 U	6.70	18.80 J	5.00 U	5 U
Benzo(b)fluoranthene			5 U	5 U	1.40 J	81.60	5 U	5 U	5 U	5 U	5 U	5 U	5.10	16.40 J	5.00 U	5 U
Benzo(e)pyrene			5 U	5 U	1.30 J	67.90	5 U	5 U	5 U	5 U	5 U	5 U	4.0 J	9.70 J	5.00 U	5 U
Benzo(ghi)perylene			5 U	5 U	1.40 J	101.0	5 U	5 U	5 U	5 U	5 U	5 U	5.40	14.00 J	5.00 U	5 U
Benzo(k)fluoranthene			5 U	5 U	1.20 J	77.40	5 U	5 U	5 U	5 U	5 U	5 U	4.80 J	15.30 J	5.00 U	5 U
Biphenyl			5 U	5 U	5 U	1.90 J	15.60	13.10	10.60	5 U	5 U	5 U	5 U	5.00 U	5.00 U	5 U
Chrysene			5 U	1.40 J	1.30 J	62.30	5 U	5 U	5 U	5 U	5 U	5 U	6.10	8.00	5.00 U	5 U
Dibenzo(a,h)anthracene			5 U	5 U	5 U	11.50	5 U	5 U	5 U	5 U	5 U	5 U	5 U	1.50 J	5.00 U	5 U
Fluoranthene			5 U	1.20 J	2.60 J	168	5 U	5 U	5 U	5 U	1.20 J	5 U	7.90	16.10	5.00 U	5 U
Fluorene			5 U	5 U	5 U	2.10 J	5 U	58.10	5 U	5 U	5 U	5 U	5 U	5.00 U	5.00 U	5 U
Indeno[1,2,3-cd]pyrene			5 U	5 U	5 U	89.60	5 U	5 U	5 U	5 U	5 U	5 U	4.30 J	11.90 J	5.00 U	5 U
Naphthalene			5 U	5 U	5 U	14.90	39.10	31.30	31.70	5 U	1.20 J	5 U	1.10 J	5.00 U	5.00 U	5 U
Perylene			5 U	5 U	5 U	28.30	5 U	5 U	5 U	5 U	5 U	5 U	3.20 J	4.40 J	5.00 U	5 U
Phenanthrene			1.10 J	1.30 J	1.60 J	14.70	5 U	5 U	5 U	5 U	1.40 J	5 U	4.70 J	5.00	5.00 U	5 U
Pyrene			1.30 J	10.90	8.20	178	5 U	5 U	5 U	6.50	1.30 J	5 U	130	29.60	5.00 U	5 U
Total PAHs			2.40 J	17.02	21.60	1102.50	339.80	303.90	242.20	6.50	6.10	0	194.10	159.40	0.00	0
PCBs (µg/kg)																
Aroclor 1016			20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20.00 U	20.00 U	20.00 U
Aroclor 1221			20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20.00 U	20.00 U	20.00 U
Aroclor 1232			20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20.00 U	20.00 U	20.00 U
Aroclor 1242			20 U	20 U	20 U	20 U	379	2410	459	20 U	20 U	452	20 U	20.00 U	20.00 U	20.00 U
Aroclor 1248			20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20.00 U	20.00 U	20.00 U
Aroclor 1254			20 U	20 U	20 U	20 U	1270	2260	1100	20 U	20 U	851.0	20 U	20.00 U	20.00 U	20.00 U
Aroclor 1260			20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20.00 U	20.00 U	20.00 U
Total PCBs (U=0)	170	50000	0	0	0	0	**1769**	**5198.10**	**1894.80**	0	0	**1310.80**	0	0	0.00	0.00

U = analyte not detected at the indicated detection limit
J = estimated value
Bold values exceed reference sediment concentrations
Shaded values exceed California TTLC criteria
UPL = upper prediction limit

Table 5
Groundwater Chemistry Results

Parameter	California Toxic Rule Water Quality Criteria	Station 1 MW-1.1 Bay Point Formation 18-23 feet	Station 1 MW-1.2 Upland Fill 10-15 feet	Station 2 MW-2.1 Bay Point Formation 22-27 feet	Station 2 MW-2.2 Upland Fill 15-20 feet	Station 3 MW-3.1 Bay Point Formation 18-23 feet	Station 3 MW-3.2 Upland Fill 12-17 feet
Conventionals							
Salinity (PSU)		16.0	12.0	25.0	9.7	3.0	< 2.0
Total dissolved solids (mg/L)		599	803	12,570	6,010	274	60
Metals (µg/L)							
Arsenic	36	1.67	1.01	3.70	0.50	5.20	23.20
Cadmium	9.3	0.01 U	0.01 U	0.03	0.01	0.01 U	0.01 U
Chromium		0.71	0.47	0.95	0.46	7.77	2.22
Copper	3.1	0.38	0.18	0.91	0.009 E	**3.34**	0.97
Lead	8.1	0.03	0.02	0.05	0.01	0.50 U	0.38 E
Mercury (total)		0.006 E	0.01 U	0.01 U	0.006 E	0.10 U	0.10 U
Nickel	8.2	24.5	6.19	**11.2**	1.58	**8.25**	4.73
Selenium	71	0.13	0.22	0.01 U	0.01 U	3.85	1
Silver		0.04	0.05	0.07	0.06	0.20 U	0.20 U
Zinc	81	6.88	4.57	4.86	1.88	8.84	3.52
PAHs (µg/L)							
1-Methylnaphthalene		0.015	0.006	0.005 U	0.005 U	0.006	0.011
1-Methylphenanthrene		0.057	0.035	0.005 U	0.005 U	0.012	0.028
2,3,5-Trimethylnaphthalene		0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
2,6-Dimethylnaphthalene		0.010	0.010	0.005 U	0.005 U	0.006	0.005
2-Methylnaphthalene		0.016	0.012	0.005 U	0.01	0.009	0.015
Acenaphthene		1.19	0.051	0.005 U	0.01	0.030	0.116
Acenaphthylene		0.005 U	0.005 U	0.005 U	0.005 U	0.005	0.049
Anthracene		0.057	0.018	0.060	0.12	0.038	0.111
Benz(a)anthracene		0.028	0.005 U	0.005 U	0.15	0.008	0.276
Benzo(a)pyrene		0.010	0.010	0.005 U	0.005 U	0.005 U	0.485
Benzo(b)fluoranthene		0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.422
Benzo(e)pyrene		0.008	0.008	0.005 U	0.005 U	0.005 U	0.286
Benzo(ghi)perylene		0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.432
Benzo(k)fluoranthene		0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.344
Biphenyl		0.006	0.005 U	0.005 U	0.01	0.005 U	0.011
Chrysene		0.022	0.005 U	0.005 U	0.09	0.012	0.313
Dibenzo(a,h)anthracene		0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.086
Fluoranthene		0.452	0.039	0.08	1.14	0.088	1.020
Fluorene		0.053	0.007	0.005 U	0.005 U	0.005 U	0.015
Indeno[1,2,3-cd]pyrene		0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.504
Naphthalene		0.024	0.010	0.005 U	0.02	0.01	0.040
Perylene		0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.192
Phenanthrene		0.113	0.032	0.005 U	0.03	0.024	0.056
Pyrene		0.382	0.039	2.76	2.97	0.185	1.640
PCBs (µg/L)							
Aroclor 1016		0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
Aroclor 1221		0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
Aroclor 1232		0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
Aroclor 1242		0.1	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
Aroclor 1248		0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
Aroclor 1254		0.0233	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
Aroclor 1260		0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
Total PCBs (U=0)	0.03	**0.1233**	0	0	0	0	0

Notes:
U = analyte not detected at the indicated detection limit
E = estimated value
Bold values exceed water quality criteria

Table 6
Summary of Measured Water Levels

	Water Level (MLLW)			
	Ebb Tide	Low Tide	Flood Tide	High Tide
Deep Piezometers				
Station 1	4.05	3.57	3.94	4.21
Station 2	3.99	3.46	3.88	4.53
Station 3	4.31	4.13	4.21	4.36
Shallow Piezometers				
Station 1	4.08	3.6	3.97	4.24
Station 2	4.16	3.65	4.03	4.36
Station 3	4.44	4.21	4.22	4.31

Table 7
Summary of Modeling Parametric Analyses

Parameter	Co (mg/kg)[1]	Kd (L/kg)	Co (mg/L)	Information Source
Copper	331	20,452	0.02	Calculated from E^xponent sediment partitioning equations (2003).
	331	85	3.89	Calculated from sediment 95 percent UCL and Kd's from Aziz et al. 2001.
Lead	108	15402	0.01	Calculated from E^xponent sediment partitioning equations (2003).
	108	1150	0.09	Calculated from sediment 95 percent UCL and Kd's from Aziz et al. 2001.
Zinc	373	20067	0.02	Calculated from E^xponent sediment partitioning equations (2003).
	373	140	2.66	Calculated from sediment 95 percent UCL and Kd's from Aziz et al. 2001.
PCBs	1.35	60.2	0.022	(TOC = 0.001)[2] weighted average of Aroclors 1254 and 1242 Koc (RAIS 2004).
	1.35	602	0.002	(TOC = 0.01)[2] weighted average of Aroclors 1254 and 1242 Koc (RAIS 2004).
	1.35	820	0.002	(TOC = 0.001)[2] using total PCB Koc (RAIS 2004).
	1.35	8200	0.0002	(TOC = 0.01)[2] using total PCB Koc (RAIS 2004).

Notes:
[1] Calculated as 95% Upper Confidence Limit of all samples taken within project footprint
[2] TOC = Total Organic Carbon, pertaining to range measured in native site sediment

Table 8
Fate and Transport Modeling Input Parameters

Parameter	Units	Constituents Modeled Copper	Lead	Zinc	Total PCBs	Total PCBs	Information Source
Controlling Cap Layer	NA	Sand	Sand	Sand	Sand / lower TOC	Sediment / higher TOC	Possible cap alternatives.
Cap Layer Thickness	cm	90	90	90	90	90	Assumed effective thickness was 100 cm less 10 cm at bioturbation.
Cap Material Porosity	unitless	0.4	0.4	0.4	0.4	0.4	Typical values for placed sand and clean sediment that may be used.
Specific Gravity of Cap	g/cm^3	2.5	2.5	2.5	2.5	2.5	Typical values for these materials.
In Situ Bulk Density Cap	g/cm^3	1.5	1.5	1.5	1.5	1.5	Calculated from porosity and specific gravity per page B24 of Reible (1998).
Cap TOC Content [1]	fraction	0.001	0.001	0.001	0.001	0.01	Typical values for these materials.
PCB K_{oc} [2]	L/kg_{OC}				60,200	60,200	Weighted average of Aroclors found in sediment (1242 and1254; RAIS 2004).
Cap K_d [3]	L/kg	100	1,200	200	60.2	602	PCB $K_d = K_{oc}$ * TOC; Copper, Lead, and Zinc Kds from Aziz et al. 2001.
Groundwater Seepage Velocity	cm/yr	17.79	17.79	17.79	17.79	17.79	$Vx = Q/(n_e*A)$, where Q = discharge and A = cross-sectional area. Or: $Vx = (kdh)/(n_e dl)$ Assume K = 0.00003 cm/sec, ne = 0.25, dh/dl = 0.0047.
Diffusion Coefficient	cm^2/yr	225	267	222	190	190	Conservatively high value from range of diffusion coefficients for PCBs (RAIS 2004); For metals D = (RT/F2)(lambda/charge of the ion).
Porewater Concentration in Underlying Sediments [4]	mg/L	3.89E+00	9.39E-02	2.66E+00	2.244E-02	2.244E-03	95 percent UCL porewater concentration calculated from bulk chemistry cores.

Notes:

[1] TOC - Total Organic Carbon. Varies based on possible types of backfill (cap) materials used

[2] Koc - Organic Carbon Partitioning Coefficient

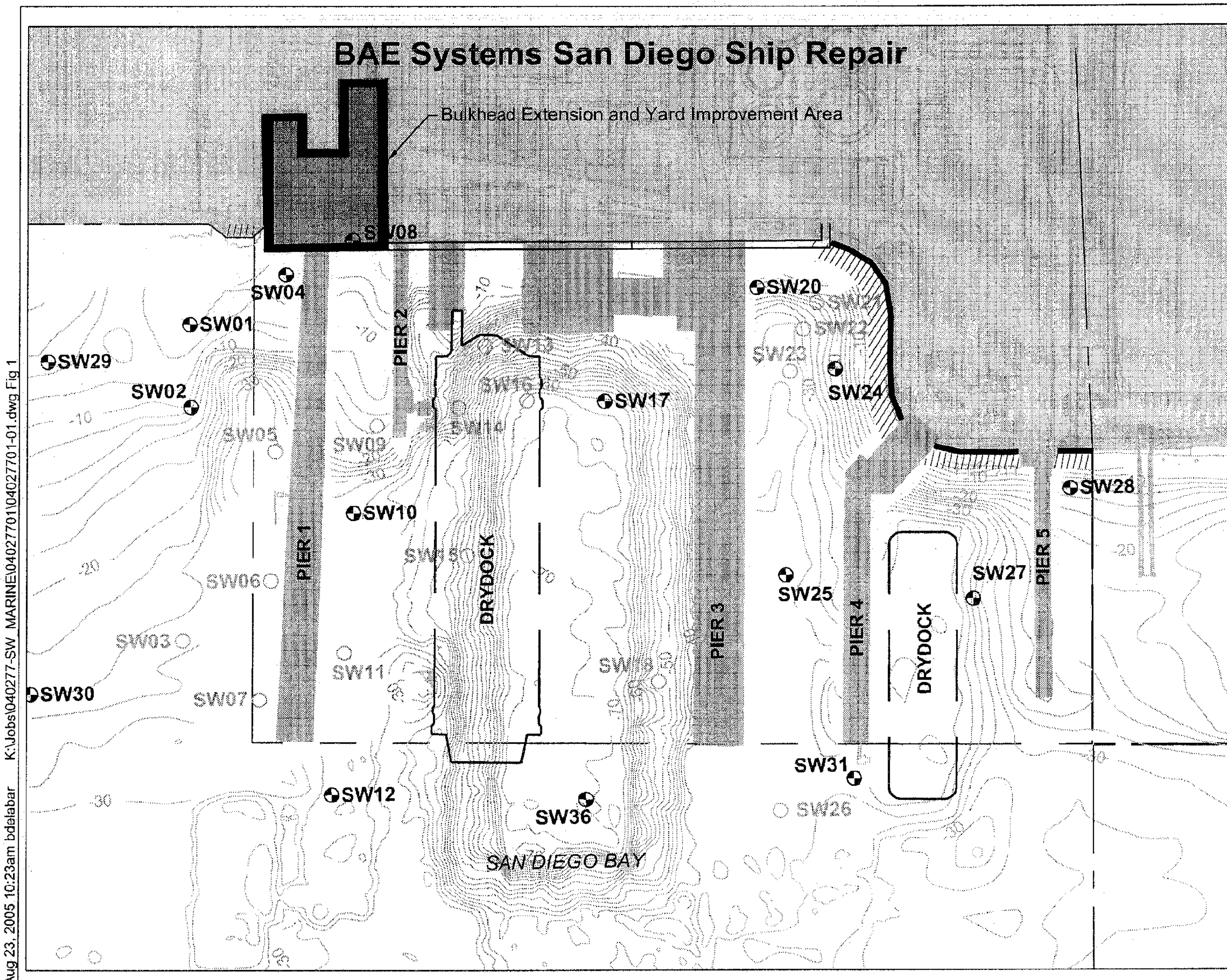
[3] Kd - Calculated partitioning equilibrium coefficient

[4] Calculated as shown in Table 7, using the most conservative (highest) value

Table 9
Fate and Transport Modeling Results

Chemical	Years after Construction (mg/L)			California Toxics Rule WQ Criteria (mg/L)	Years until predicted breakthrough
	25	50	100		
Copper	0	0	0	3.10E-03	690
Lead	0	0	0	8.10E-03	13,600
Zinc	0	0	0	8.10E-02	1,760
Total PCBs (clean sediment cap)	0	0	0	3.00E-05	2,280
Total PCBs (quarry sand cap)	0	0	3.84E-10	3.00E-05	185

FIGURES



Existing Shoreline

Bulkhead Wall

Revetted Slope

Previous Sediment Investigation Sample Location and Number (Exponent, 2003)

SW06 – Surface Sample

SW32 – Subsurface Core

0 200

Scale in Feet

Notes:

1. Bathymetric contours from "Southwest Marine Bathymetric Survey" by Racal Pelagos, dated Janurary 25, 2000; and supplemented by neashore soundings by URS (2002)

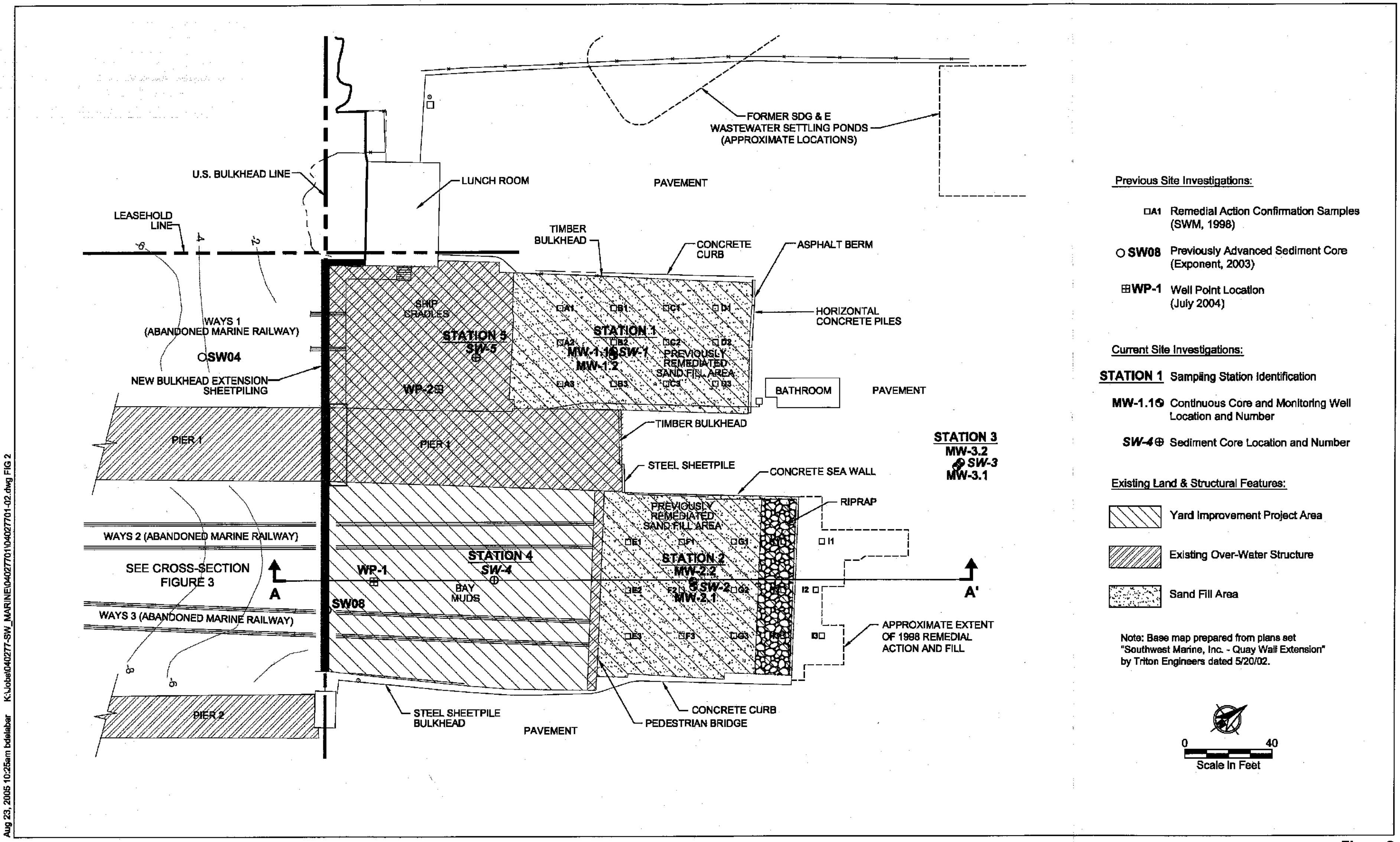
2. 10 foot contours labeled. 2 foot contours also shown.

3. Horizontal Datum is UTM NAD83 Zone 11 North, Meters.

4. Vertical Datum is MLLW in Feet

ANCHOR ENVIRONMENTAL, L.L.C.

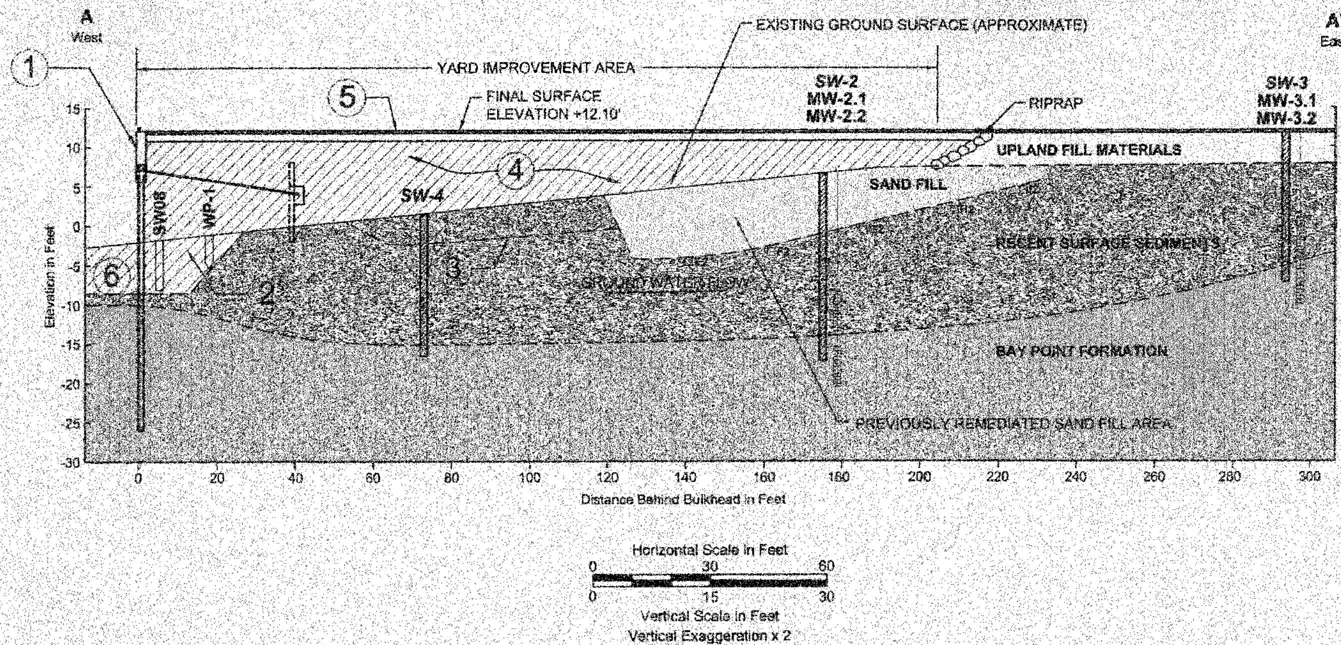
Figure 1
Project Location Plan
Bulkhead Extension and Yard Improvement
BAE Systems San Diego Ship Repair



Aug 23, 2005 10:25am bdelabar K:\Jobs\040277-SW_MARINE\04027701\04027701-02.dwg FIG 2

ANCHOR ENVIRONMENTAL, L.L.C.

Figure 2
Project Site Plan and Sampling and Well Locations
Bulkhead Extension and Yard Improvement
BAE Systems San Diego Ship Repair



Project Construction Sequence
(refer to circled numbers on cross section above)

1. Sheetpile Bulkhead Installed.
2. 500 Cubic Yards of Chemically Impacted Sediment to be Excavated from Vicinity of Installed Bulkhead. Excavation Backfilled with Clean Imported Sand Buffer.
3. Excavate 1,000 Cubic Yards of Sediment Exceeding TTLC Criteria. Removal Extents to be Verified by Confirmational Sampling.
4. Yard Improvement Area Backfilled With Compacted Import Fill.
5. Aggregate Base and Asphalt Placed Over Entire Yard Improvement Area.
6. Sheetpile Wall Designed for Potential Future Removal of Sediments Outside Wall.

SW08 Previously Advanced Sediment Core (Exponent, 2003)

SW-4 Sediment Core

SW-2 MW-2.1 Continuous Core and Monitoring Well

E2 Remedial Action Confirmation Sample (SWM, 1996)

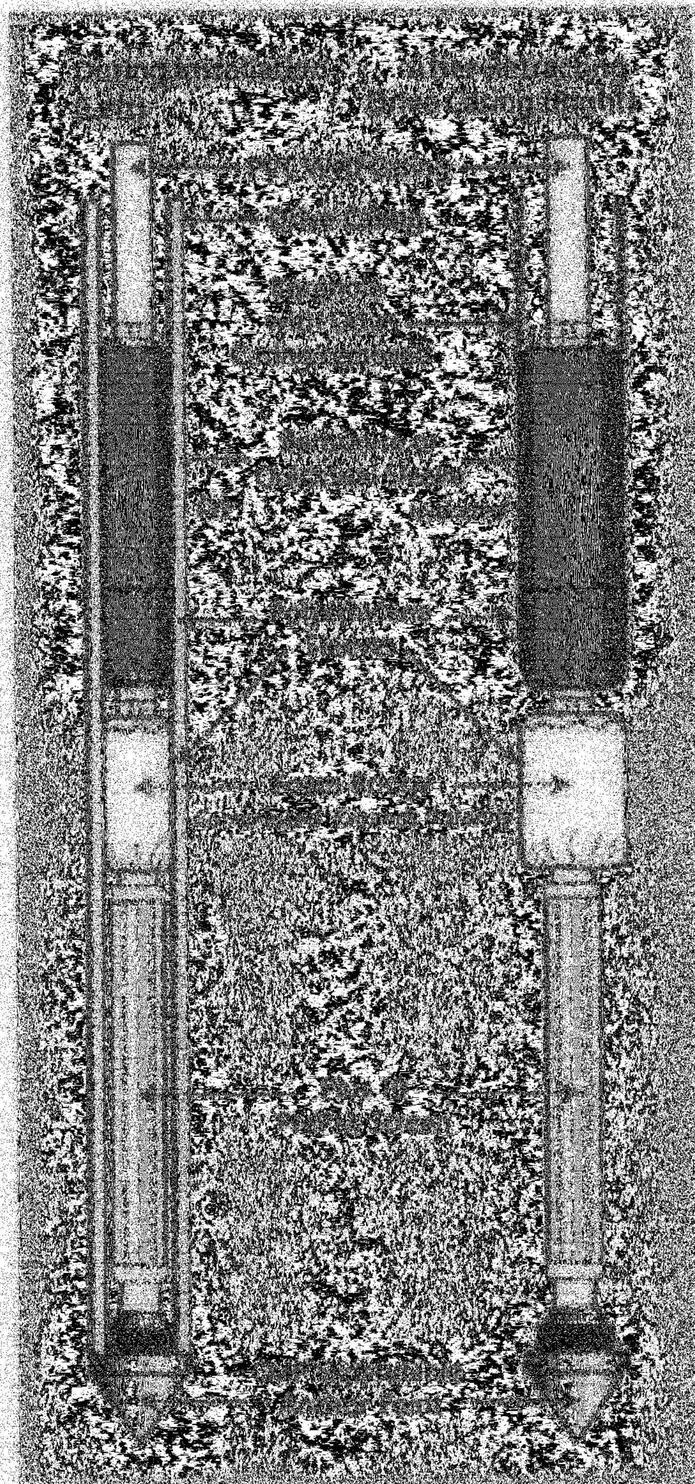
Clean Backfill

Note:
Structural features and existing ground surface based on plans set "Southwest Marine, Inc. - Quay Wall Extension" by Triton Engineers Dated 5/20/02.

Aug 25, 2005 12:55pm bdekeiser K:\Jobs\040277-SW_MARINE\04027701\04027701-03.dwg FIG 3

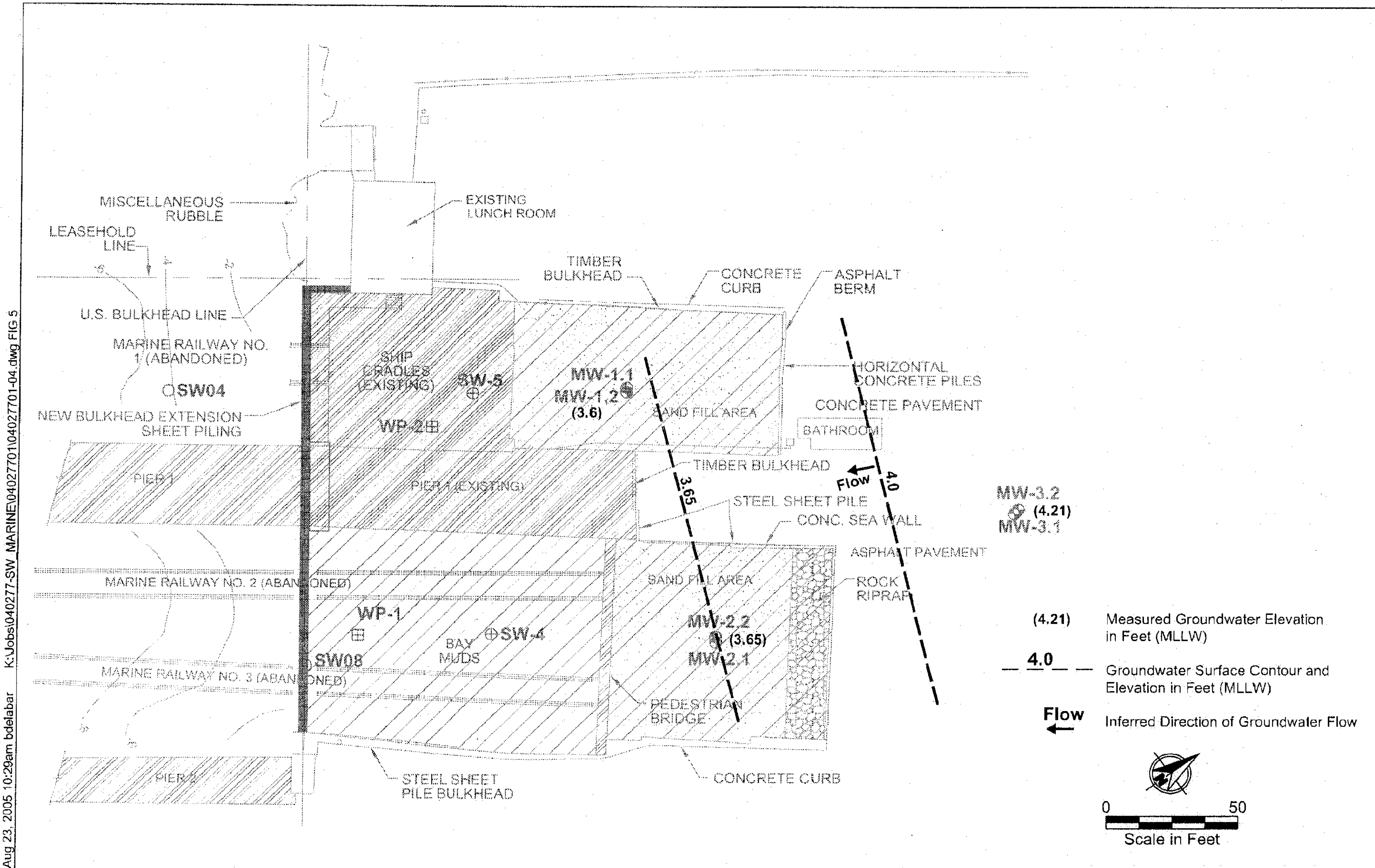
ANCHOR ENVIRONMENTAL, L.L.C.

Figure 3
Cross-Section A-A' and Sequence of Planned Construction Events
Bulkhead Extension and Yard Improvement
BAE Systems San Diego Ship Repair



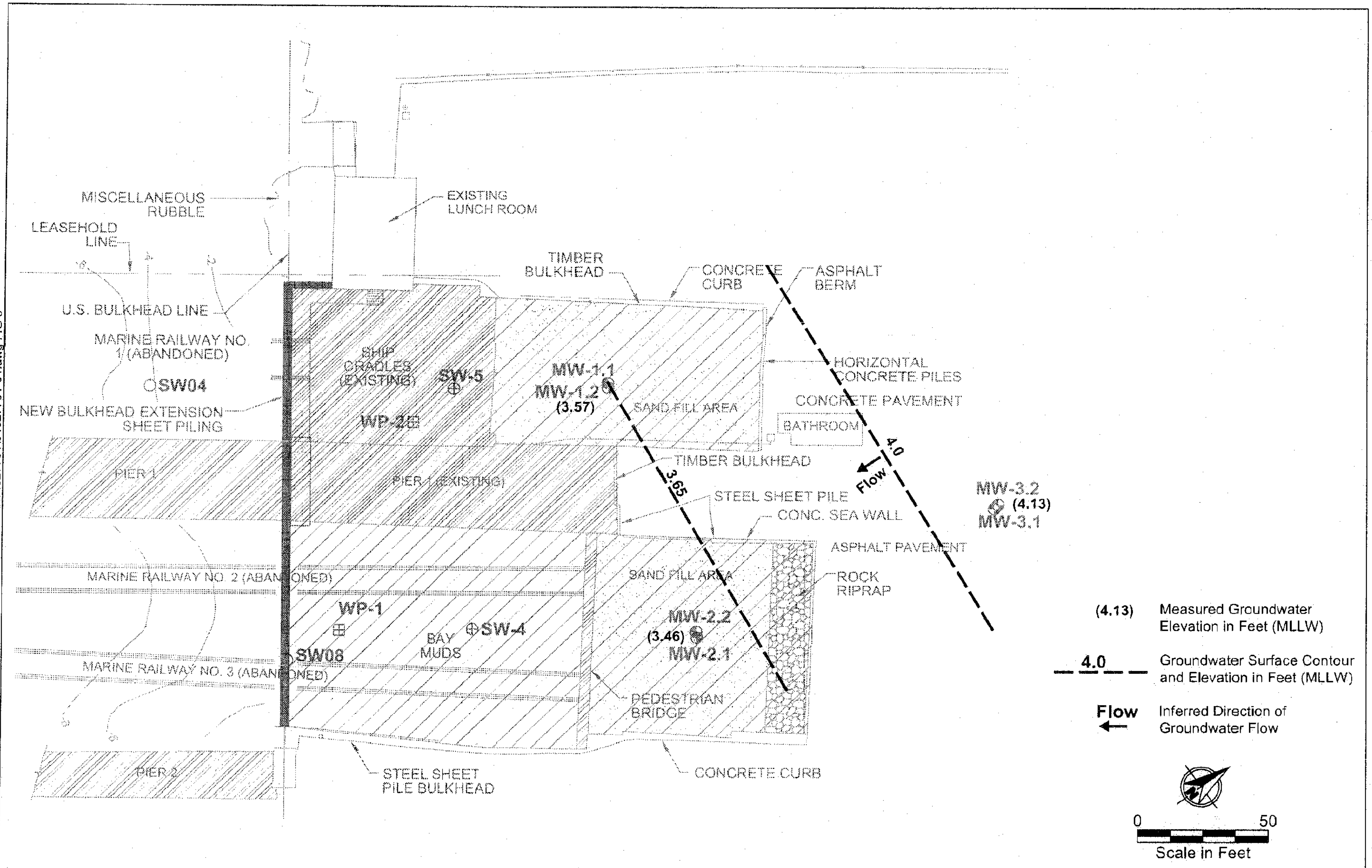
ANCHOR ENVIRONMENTAL, L.L.C.

Figure 4
Typical Detail - Prepacked Well Screen
Bulkhead Extension and Yard Improvement
BAE Systems San Diego Ship Repair



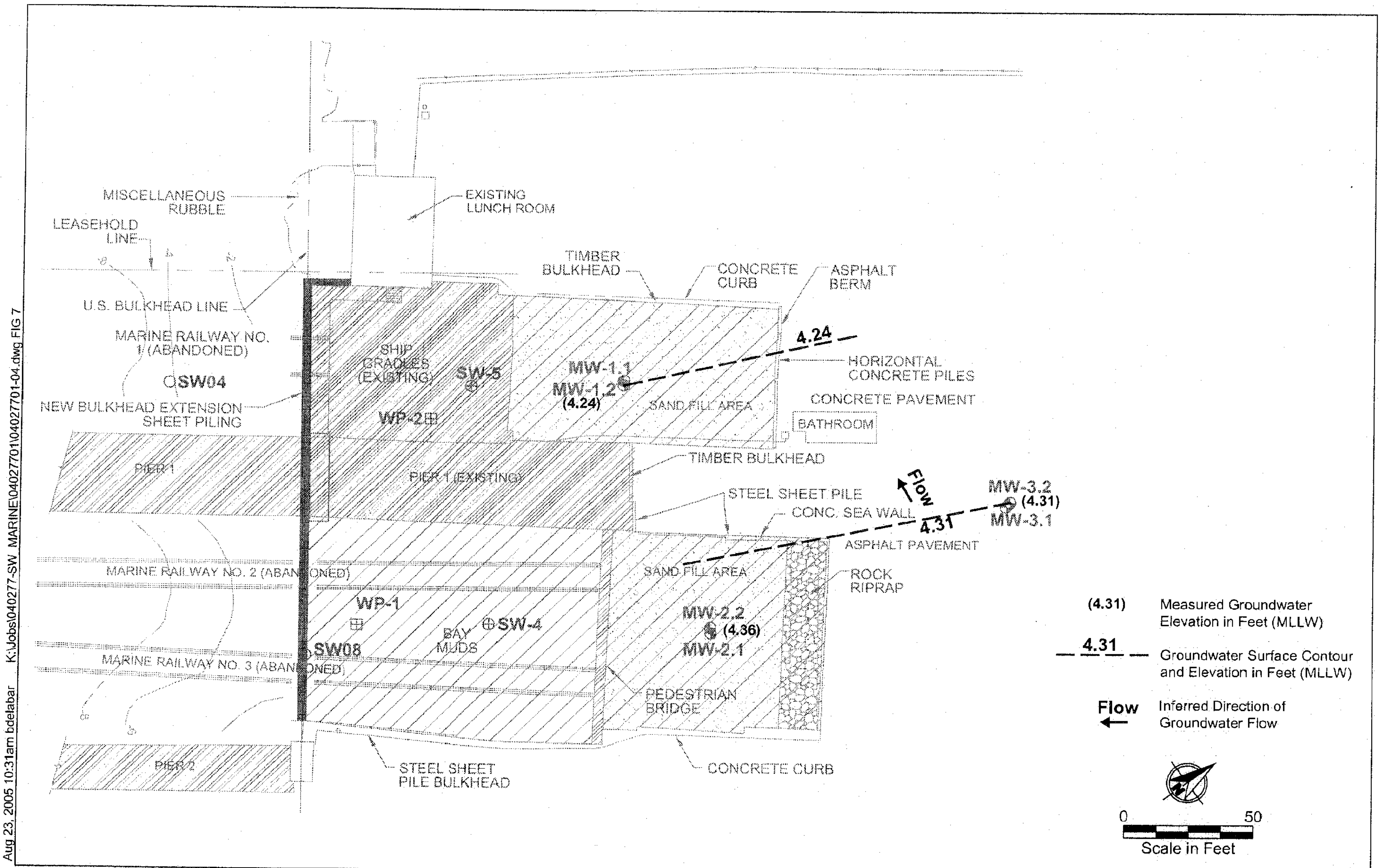
ANCHOR ENVIRONMENTAL, L.L.C.

Figure 5
Low Tide Piezometric Surface
Shallow Monitoring Wells (Recent Sediments)
Bulkhead Extension and Yard Improvement
BAE Systems San Diego Ship Repair



ANCHOR ENVIRONMENTAL, L.L.C.

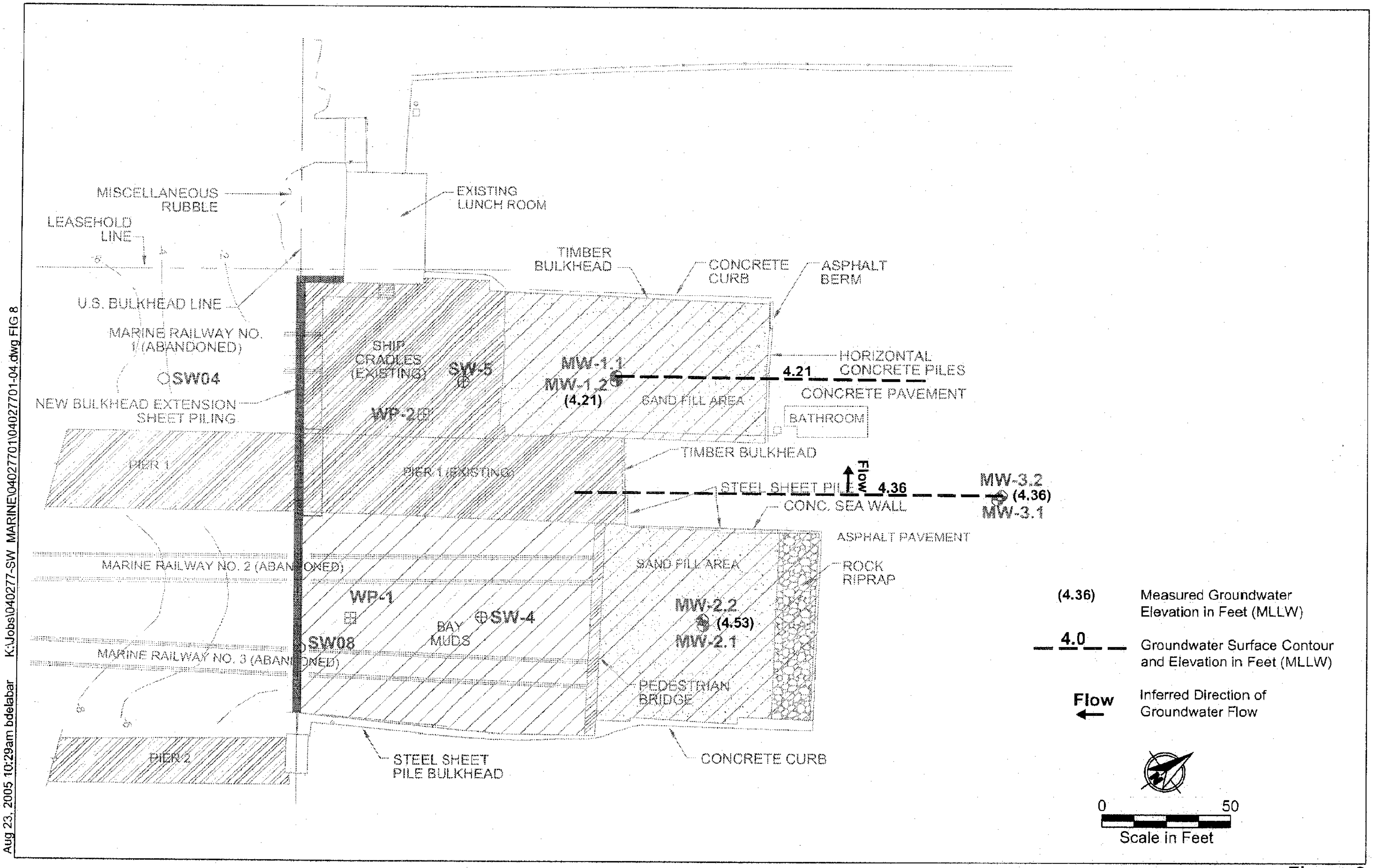
Figure 6
Low Tide Piezometric Surface
Deep Monitoring Wells (Bay Point Formation)
Bulkhead Extension and Yard Improvement
BAE Systems San Diego Ship Repair



Aug 23, 2005 10:31am bdelabar K:\Jobs\040277-SW MARINE\04027701\04027701-04.dwg FIG 7

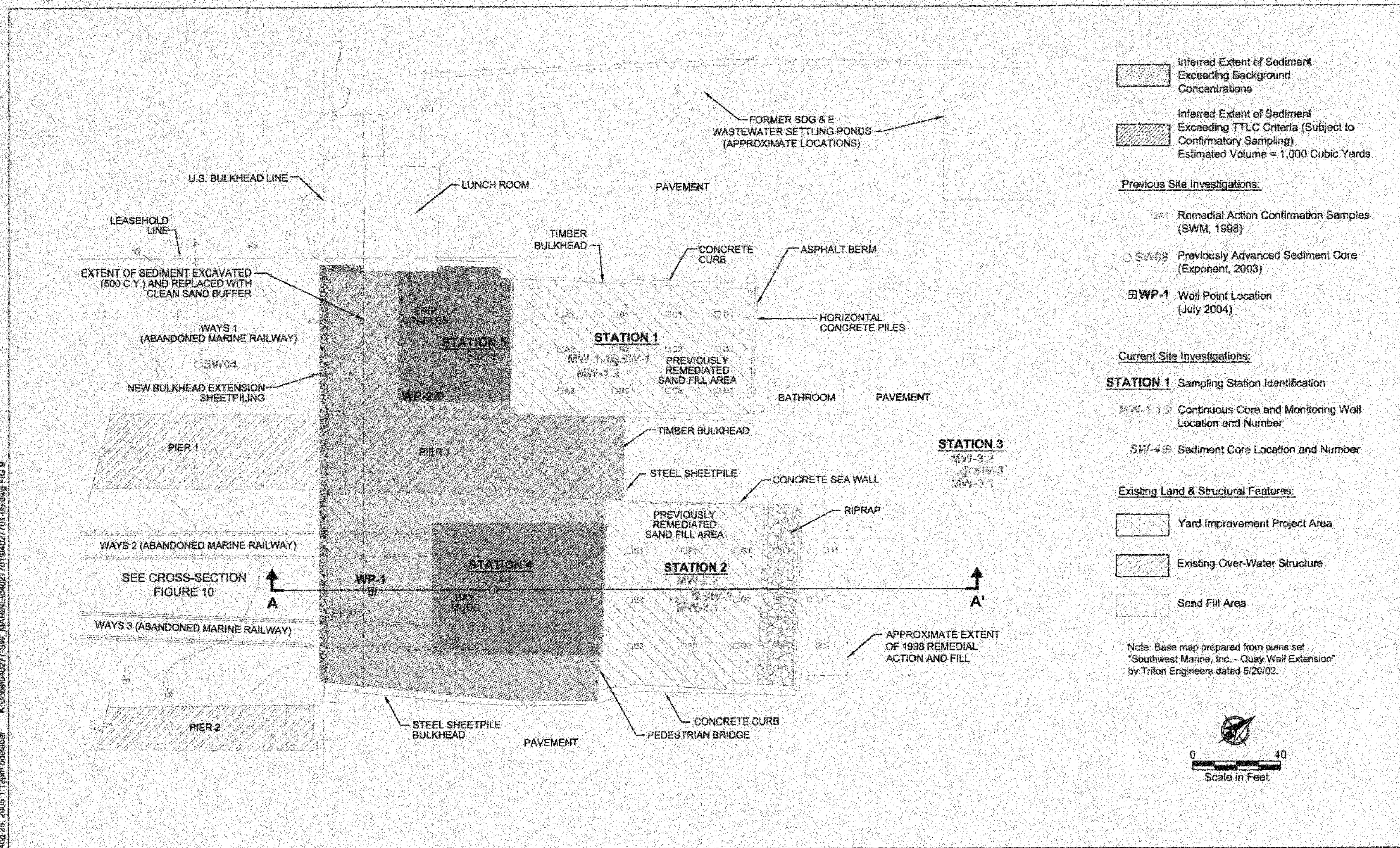
ANCHOR ENVIRONMENTAL, L.L.C.

Figure 7
High Tide Piezometric Surface
Shallow Monitoring Wells (Recent Sediments)
Bulkhead Extension and Yard Improvement
BAE Systems San Diego Ship Repair



ANCHOR ENVIRONMENTAL, L.L.C.

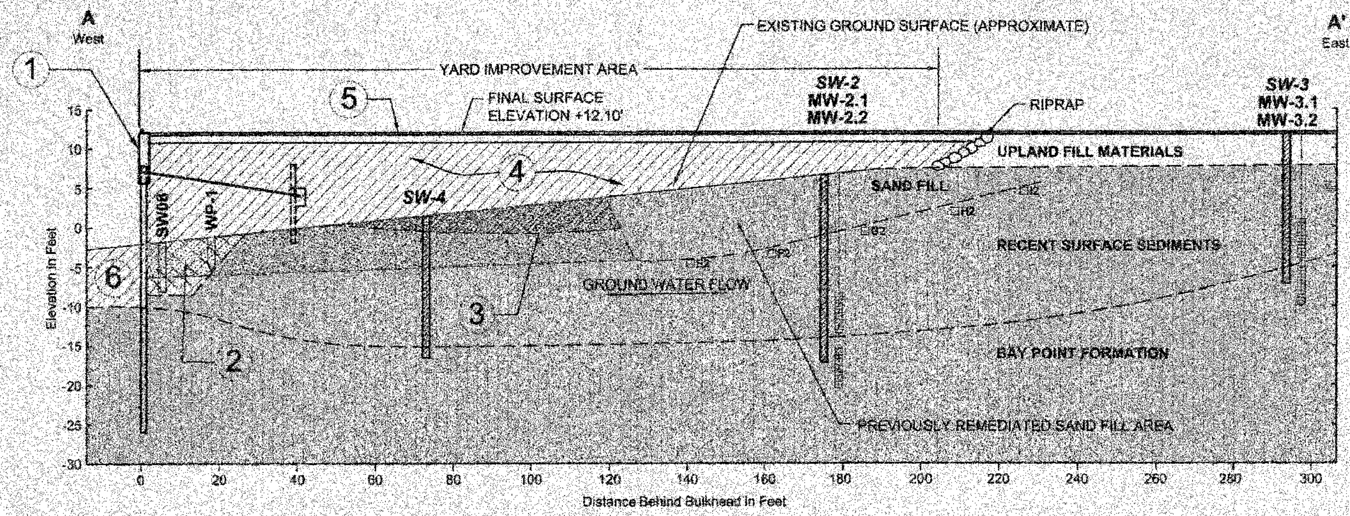
Figure 8
High Tide Piezometric Surface
Deep Monitoring Wells (Bay Point Formation)
Bulkhead Extension and Yard Improvement
BAE Systems San Diego Ship Repair



ANCHOR ENVIRONMENTAL, L.L.C.

Figure 9
Distribution of Waste Constituents - Plan View
Bulkhead Extension and Yard Improvement
BAE Systems San Diego Ship Repair

10'



Project Construction Sequence
(refer to circled numbers on cross section above)

1. Sheetpile Bulkhead Installed.
2. 500 Cubic Yards of Chemically Impacted Sediment to be Excavated from Vicinity of Installed Bulkhead. Excavation Backfilled with Clean Imported Sand Buffer.
3. Excavate 1,000 Cubic Yards of Sediment Exceeding TTLC Criteria. Removal Extents to be Verified by Confirmational Sampling.
4. Yard Improvement Area Backfilled With Compacted Import Fill.
5. Aggregate Base and Asphalt Placed Over Entire Yard Improvement Area.
6. Sheetpile Wall Designed for Potential Future Removal of Sediments Outside Wall.

Inferred Extent of Sediment Exceeding Background Concentrations

Inferred Extent of Sediment Exceeding TTLC Criteria (Subject to Confirmatory Sampling)

SW08 Previously Advanced Sediment Core (Exponent, 2003)

SW-4 Sediment Core

SW-2 MW-2.1 Continuous Core and Monitoring Well

E2 Remedial Action Confirmation Sample (SWM, 1998)

Clean Backfill

Note:
Structural features and existing ground surface based on plans set "Southwest Marine, Inc. - Quay Wall Extension" by Triton Engineers Dated 5/20/02.

Aug 26, 2005 12:51pm bdelabar K:\Jobs\040277-SW_MARINE\04027701\04027701-08.dwg FIG 10

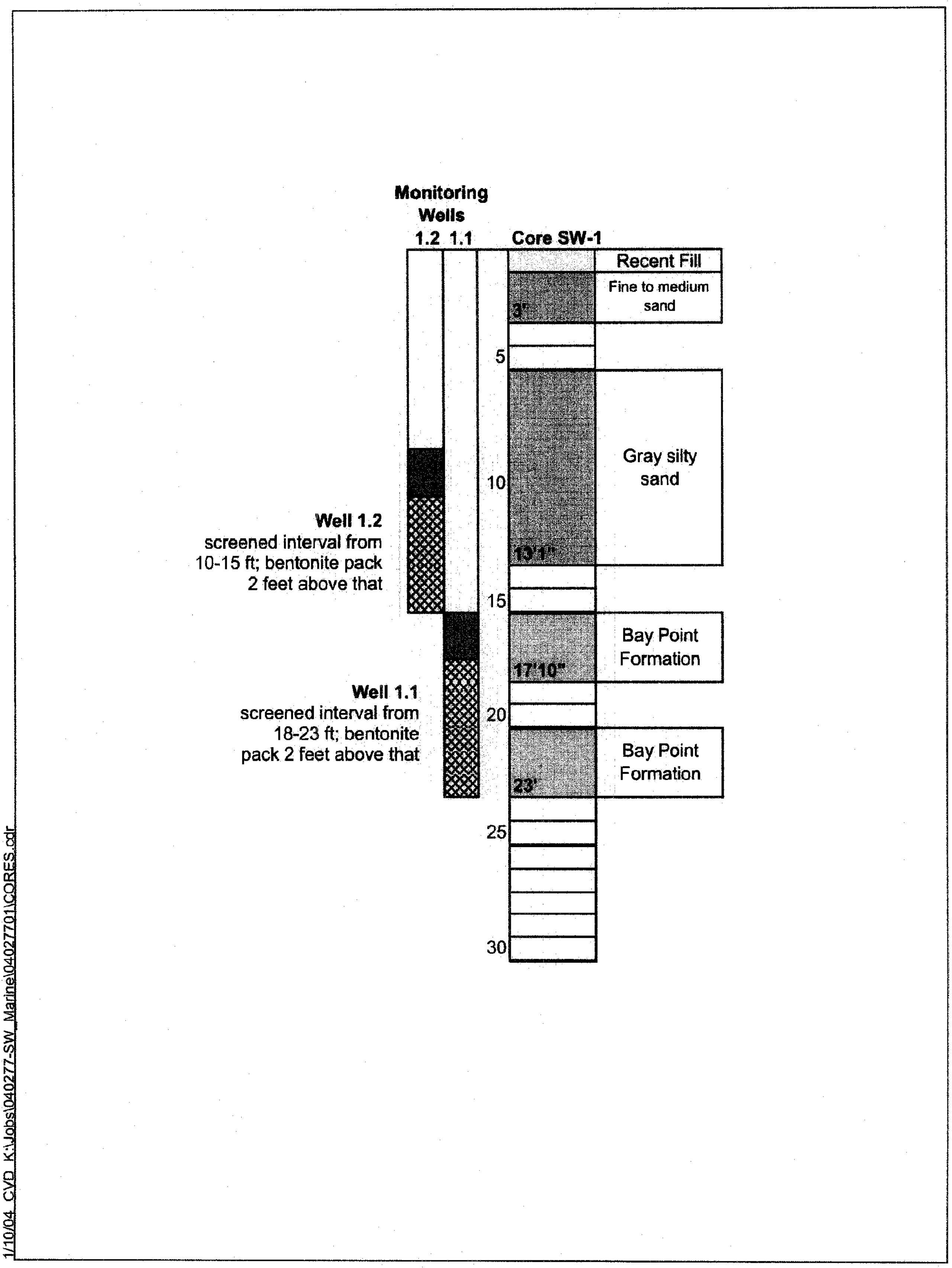
ANCHOR ENVIRONMENTAL, L.L.C.

Figure 10
Distribution of Waste Constituents - Cross-Section View
Bulkhead Extension and Yard Improvement
BAE Systems San Diego Ship Repair

APPENDIX A

CORING AND WELL INSTALLATION LOGS

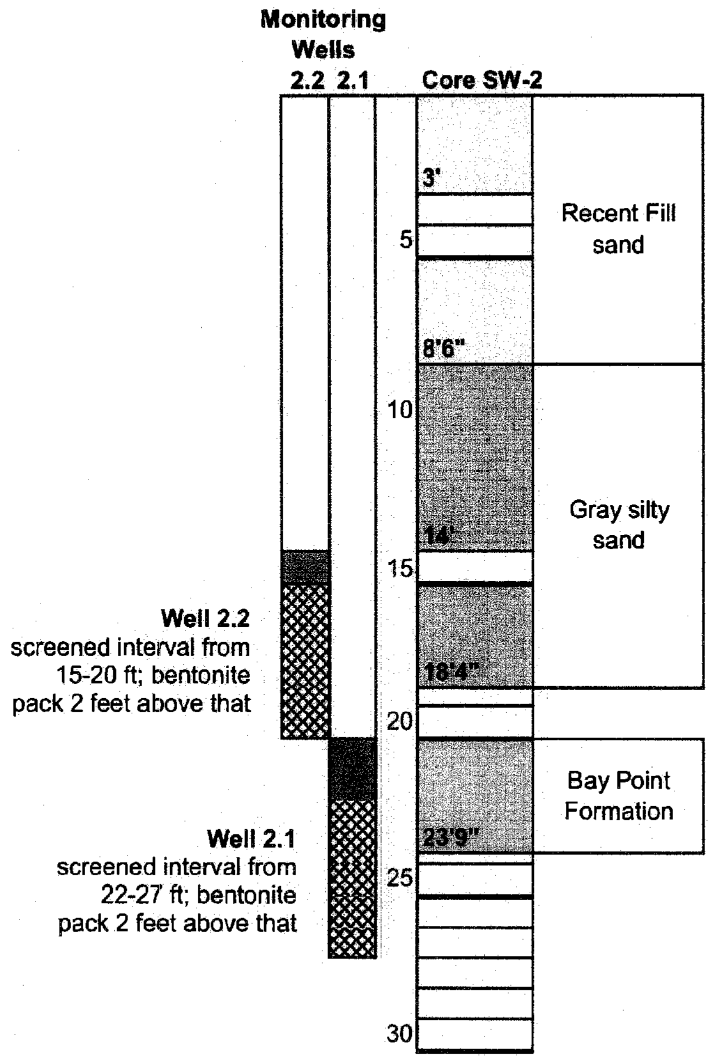
BULKHEAD EXTENSION AND YARD IMPROVEMENT PROJECT
PHASE 2 ACTIVITIES



ANCHOR ENVIRONMENTAL, L.L.C.

Figure A-1
Monitoring Wells MW-1.1 and MW-1.2
Southwest Marine Bulkhead Extension and Yard Improvement

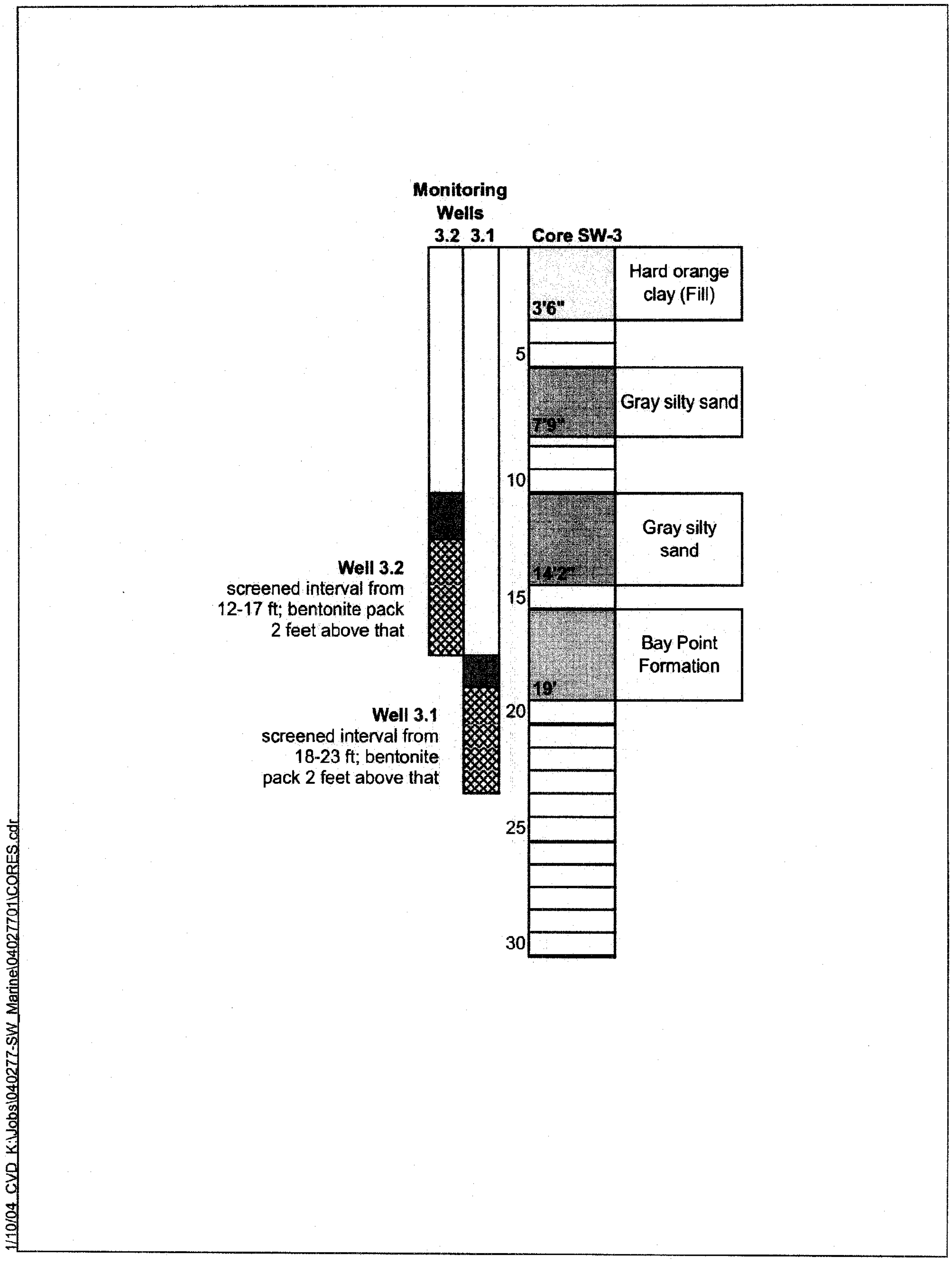
BAE00085485



1/10/04 CVD K:\Jobs\040277-SW_Marine\04027701\CORES.cdr

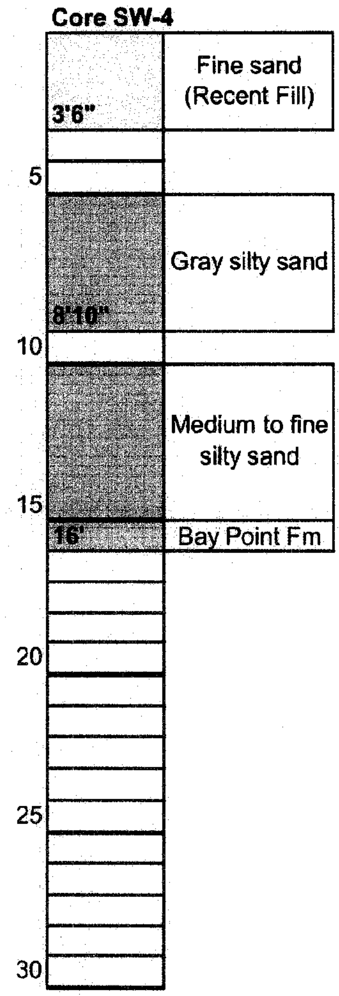
ANCHOR ENVIRONMENTAL, L.L.C.

Figure A-2
Monitoring Wells MW-2.1 and MW-2.2
Southwest Marine Bulkhead Extension and Yard Improvement



ANCHOR ENVIRONMENTAL, L.L.C.

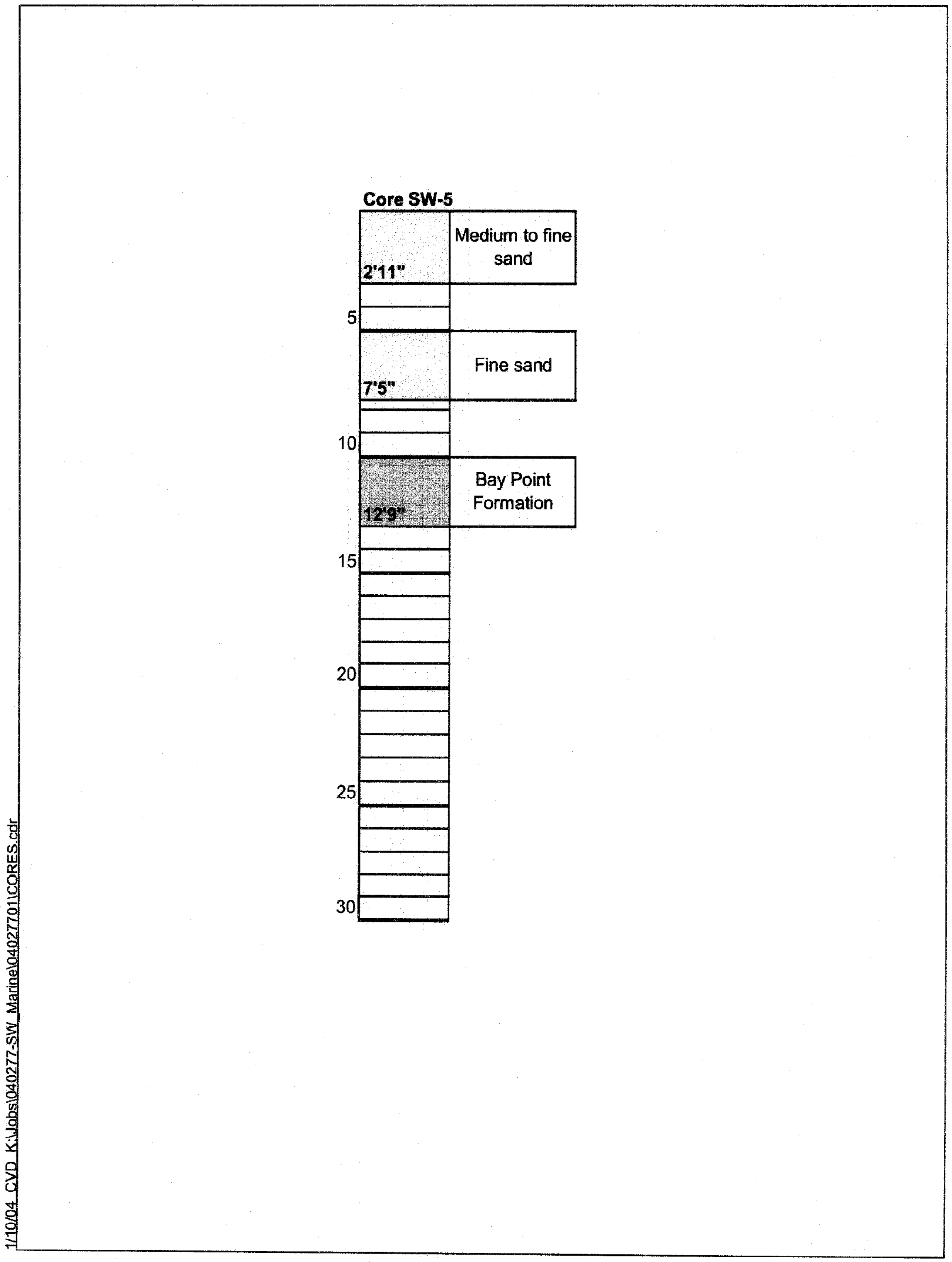
Figure A-3
Monitoring Wells MW-3.1 and MW-3.2
Southwest Marine Bulkhead Extension and Yard Improvement



1/10/04 CVD K:\Jobs\040277-SW_Marine\04027701\CORES.cdr

ANCHOR ENVIRONMENTAL, L.L.C.

Figure A-4
Sediment Core SW-4
Southwest Marine Bulkhead Extension and Yard Improvement



ANCHOR ENVIRONMENTAL, L.L.C.

Figure A-5
Sediment Core SW-5
Southwest Marine Bulkhead Extension and Yard Improvement

APPENDIX B

DATA VALIDATION REVIEW REPORTS

BULKHEAD EXTENSION AND YARD IMPROVEMENT PROJECT PHASE 2 ACTIVITIES

DATA VALIDATION REVIEW REPORT FOR GROUNDWATER SAMPLES

SOUTHWEST MARINE BULKHEAD EXTENSION

Prepared for

SW Marine, Inc.

2205 E. Belt Street

San Diego, California 92113

Prepared by

Anchor Environmental, L.L.C.

1423 Third Avenue, Suite 300

Seattle, Washington 98101

January 2005

This report summarizes the review of analytical results for seven water samples collected on December 3, 2004 at the Southwest Marine site in San Diego, California. Samples were collected by Anchor Environmental, LLC and submitted to CRG Marine Laboratories, Inc. (CRG) in Torrance, California. Samples were analyzed for total dissolved solids (TDS) by SM 2450-C, Chromium (CR) +6 by SM3500-CR, salinity by SM 2510, metals by United States Environmental Protection Agency (USEPA) Method 1640 or 200.8, polychlorinated biphenyls (PCBs) and congeners by USEPA Method 625, and polycyclic aromatic hydrocarbons (PAHs) by USEPA Method 625. CRG project ID P24152 and P24153c were reviewed.

Sample ID	Location	Lab ID	Matrix	Analysis Requested
SWM-Well 2-27-22	Station 2, MW-2.1	21498	Water	TDS, CR+6, salinity, metals, PCB, congeners, and PAH
SWM-Well 2-15-20	Station 2, MW-2.2	21499	Water	TDS, CR+6, salinity, metals, PCB, congeners, and PAH
SWM-Well 2-15-20 DUP	"	21500	Water	TDS, CR+6, salinity, metals, PCB, congeners, and PAH
SWM-Well 3-18-23	Station 3, MW-3.1	21388	Water	TDS, CR+6, salinity, metals, PCB, congeners, and PAH
SWM-Well 3-12-17	Station 3, MW-3.2	21389	Water	TDS, CR+6, salinity, metals, PCB, congeners, and PAH
SWM-Well 1-18-23	Station 1, MW-1.1	21386	Water	TDS, CR+6, salinity, metals, PCB, congeners, and PAH
SWM-Well 1-10-5	Station 1, MW-1.2	21387	Water	TDS, CR+6, salinity, metals, PCB, congeners, and PAH

DATA VALIDATION AND QUALIFICATIONS

The following comments refer to the laboratory's performance in meeting the quality assurance/quality control (QA/QC) guidelines outlined in the data quality objective section of the Quality Assurance Project Plan (QAPP; Anchor 2004). Laboratory results were reviewed following USEPA guidelines (USEPA 1999 and 2004). Unless noted in this report, laboratory results for the samples listed above were within QC criteria.

Laboratory Data Package and Field Documentation

Field documentation was checked for completeness and accuracy. The following was noted by CRG at the time of sample receipt: the samples were received in good condition and were consistent with the accompanying Chain-of-Custody form as documented on the Sample Receipt Form.

Holding Times and Sample Preservation

Samples were appropriately preserved and analyses were conducted within holding times. No data were qualified.

LABORATORY METHOD BLANKS

Laboratory method blanks were analyzed at the required frequencies. No analytes were detected in the laboratory method blanks.

FIELD QUALITY CONTROL

Field Duplicates

One field duplicate pairs was collected: SWM Well 2-15-20/SWM Well 2-15-20-DUP. The field duplicate pairs were comparable. No data were qualified due to these results.

SURROGATE RECOVERIES

There were no surrogate recoveries reported for the PCB or congener analyses. The surrogate recoveries for the semivolatile organics (PAH) analyses were performed at the required frequencies. Surrogate recoveries were within the QAPP-specified control limits, except for the following:

- d8-Naphthalene in samples SWM-Well 1-18-23, SWM-Well 1-10-15, SWM-Well 3-18-23, SWM-Well 3-12-17, and the method blank. The recoveries for the surrogate were below the QAPP-specified control limit. As the method allows for up to one surrogate to be outside the control limit for each sample, no data were qualified based on the surrogate recoveries.

MATRIX SPIKE (MS) AND MATRIX SPIKE DUPLICATE

Matrix spike (MS) and matrix spike duplicate (MSD) samples, were analyzed at the required frequency for the inorganic analyses. The following exceptions were noted:

- The inorganic MS and MSD percent recoveries (%Rs) were within the QAPP-specified control limits, except for hexavalent chromium MS on sample SWM-Well 3-12-17. As the MSD was within the QAPP-specified control limits no data were qualified.
- There were no MS or MSD analyzed for the organic analyses: PCBs, congeners, or PAH.

LABORATORY CONTROL SAMPLE, LCS DUPLICATE, AND SAMPLE REPLICATES

Laboratory control samples (LCS) for the inorganics were analyzed at the required frequencies. All LCS and LCS Duplicate (LCSD) %Rs were within QAPP-specified control limits, with the following exceptions:

- Trace metals recoveries for Antimony, iron, and manganese were outside the QAPP-specified control limits low in Method USEPA 1640 LCS. Iron and manganese were also outside the QAPP-specified control limit for Relative Percent Difference (RPD) in the LCSD. All associated data were flagged with the "J" flag for estimated.
- Cadmium RPD was above the QAPP-specified control limit in both the sample replicate (SWM-Well 2-27-22) and the dissolved LCS control limit.
- Titanium was above the sample replicate RPD control limit in sample SWM-Well 2-27-22.
- Selenium and mercury were not reported in the dissolved LCS or in the sample replicate analysis.
- Antimony and beryllium were above the RPD limit in the sample replicates for sample SWM-Well 1-18-23. Data associated with these recoveries will be qualified with the "J" flag to indicate the values reported are estimates.
- Aluminum and cadmium in the LCS and LCSD were above the QAPP-specified control limit for RPDs in USEPA method 1640 analyzed on December 13, 2004. Associated sample data will be qualified with the "J" flag to indicate the values reported are estimates.
- There were no laboratory control samples analyzed for the PCB, congener, or PAH analyses.

METHOD REPORTING LIMITS

Sample results were reported using the QAPP method reporting limits. Reporting limits were acceptable unless noted below:

- Samples SWM-Well 3-18-23 and SWM-Well 3-12-17 were analyzed using USEPA Method 200.8 rather than USEPA Method 1640. This resulted in a reporting limit of ten times the QAPP requirement.

OVERALL ASSESSMENT

The inorganic data are judged to be acceptable for their intended use. Due to the lack of surrogates for the PCB and congener analyses, it was difficult to access whether this data met minimal acceptance criteria. This compounded with the lack of any precision or accuracy data for the PCB, congener, or PAH data qualifies the data as estimated.

PRECISION, ACCURACY, AND COMPLETENESS

Precision:	All precision goals were not met.
Accuracy:	All accuracy goals were not met.
Completeness:	Completeness was 100 percent for all inorganic data, these data are useable as qualified. For the organic data, completeness cannot be determined.

REFERENCES

Anchor, 2004. Site Investigation Workplan, for 401 Water Quality Certification, Southwest Marine Bulkhead Extension and Yard Improvement Phase 2 Activities. Includes Quality Assurance Project Plan (QAPP). November 2004.

USEPA. 2004. USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review. U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response. EPA 540/R-94/013. February.

USEPA. 1999. USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review. U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response. EPA 540/R-99/008. October.

DATA VALIDATION REVIEW REPORT FOR SEDIMENT SAMPLES

SOUTHWEST MARINE BULKHEAD EXTENSION

Prepared for

SW Marine, Inc.
2205 E. Belt Street
San Diego, California 92113

Prepared by

Anchor Environmental, L.L.C.
1423 Third Avenue, Suite 300
Seattle, Washington 98101

January 2005

This report summarizes the review of analytical results for 14 sediment samples collected on November 29 and December 2, 2004, at the Southwest Marine site in San Diego, California. Samples were collected by Anchor Environmental, LLC and submitted to CRG Marine Laboratories, Inc. (CRG) in Torrance, California. Samples were analyzed for total organic carbon (TOC), trace metals by United States Environmental Protection Agency (USEPA) Method 6020, polychlorinated biphenyls (PCBs) and congeners by USEPA Method 8270C, and polycyclic aromatic hydrocarbons (PAHs) by USEPA Method 8270C. CRG project ID P24152b was reviewed.

Sample ID	Location	Lab ID	Matrix	Analysis Requested
SWM-Core 2-18-20	Station 2, core SW-2	21439	Sediment	TOC, Metals, PCB, congeners, and PAH
SWM-Core 1-17.2-20	Station 1, core SW-1	21440	Sediment	TOC, Metals, PCB, congeners, and PAH
SWM-Core 3-13-15	Station 3, core SW-3	21441	Sediment	TOC, Metals, PCB, congeners, and PAH
SWM-Core 3-5-10	"	21442	Sediment	TOC, Metals, PCB, congeners, and PAH
SWM-Core 4-6.11-10	Station 4, core SW-4	21443	Sediment	TOC, Metals, PCB, congeners, and PAH
SWM-Core 4-0-2	"	21444	Sediment	TOC, Metals, PCB, congeners, and PAH
SWM-Core 4-19-20	"	21445	Sediment	TOC, Metals, PCB, congeners, and PAH
SWM-Core 4-6.2-6.11	"	21446	Sediment	TOC, Metals, PCB, congeners, and PAH
SWM-Core 4-2-3.4	"	21447	Sediment	TOC, Metals, PCB, congeners, and PAH
SWM-Core 5-2.1-2.3	Station 5, core SW-5	21448	Sediment	TOC, Metals, PCB, congeners, and PAH
SWM-Core 5-2.3-4.1	"	21449	Sediment	TOC, Metals, PCB, congeners, and PAH
SWM-Core 5-4.1-5.0	"	21450	Sediment	TOC, Metals, PCB, congeners, and PAH
SWM-Core 5-7.7-9	"	21451	Sediment	TOC, Metals, PCB, congeners, and PAH
SWM-Core 5-9-10	"	21452	Sediment	TOC, Metals, PCB, congeners, and PAH
SWM-Core 5-12.3-15	"	21470	Sediment	TOC, Metals, PCB, congeners, and PAH

DATA VALIDATION AND QUALIFICATIONS

The following comments refer to the laboratory's performance in meeting the quality assurance/quality control (QA/QC) guidelines outlined in the data quality objective section of the Quality Assurance Project Plan (QAPP; Anchor 2004). Laboratory results were reviewed following USEPA guidelines (USEPA 1999 and 2004). Unless noted in this report, laboratory results for the samples listed above were within QC criteria.

Laboratory Data Package and Field Documentation

Field documentation was checked for completeness and accuracy. The following were noted by CRG at the time of sample receipt: the samples were received in good condition and were consistent with the accompanying Chain-of-Custody forms as documented on the Sample Receipt Form.

Holding Times and Sample Preservation

Samples were appropriately preserved and analyses were conducted within holding times. No data were qualified.

LABORATORY METHOD BLANKS

Laboratory method blanks were analyzed at the required frequencies. No analytes were detected in the laboratory method blanks.

FIELD QUALITY CONTROL

Field Duplicates

No field duplicates were taken with this data set.

SURROGATE RECOVERIES

There were no surrogate recoveries reported for the PCB or congener analyses. The surrogate recoveries for the semivolatile organics (PAH) analyses were performed at the required frequencies. Surrogate recoveries were within the QAPP-specified control limits, except for the following:

- d8-Naphthalene in the method blank, samples SWM-Core 5-7.7-9, SWM-Core 5-12.3-15, and SWM-Core 1-17.2-20 (matrix spike [MS]). The recovery for the surrogates were below the QAPP-specified control limit. As the method allows for up to one surrogate to be outside the control limit for each sample, no data were qualified based on the surrogate recoveries.

BAE00085499

- Surrogates d8-Naphthalene and d12-perylene in sample SWM-Core 5-9-10. The recovery for the surrogates were below the QAPP-specified control limit. As the sample was non-detect for all analytes of interest, no data qualifications were made.

MATRIX SPIKE AND MATRIX SPIKE DUPLICATE

MS and matrix spike duplicate (MSD) samples, were analyzed at the required frequency for the inorganic analyses. The following exceptions were noted:

- The MS and MSD for sample SWM-Core 5-12.3-15 has numerous analytes outside the QAPP-specified control limits of 75 to 125 percent recovery (%R) in the PAH analysis. All relative percent difference (RPDs) were within the QAPP-specified control limits. Since the second MS and MSD set were within QAPP-specified control limits, the low recoveries were attributed to matrix effects rather than poor laboratory performance. No data were qualified based on these recoveries.
- The MS RPD for strontium and titanium were outside the QAPP-specified control limit. Results associated with these MSs were qualified with a "J" to indicate the values associated with this data are estimates.
- The MSD recovery for sample SWM-Core 5-12.3-15 has PCB congener PCB189 below the QAPP-specified control limit. Since this was the only congener that fell below the QC criteria, no data qualifications were made based on this recovery. All associated RPDs were within the control limits.

SAMPLE REPLICATES

- A sample replicate was performed on sample SWM-Core 5-2.3-4.1. The resulting RPDs for manganese, silver, and vanadium were above the QAPP-specified control limits.
- The sample replicate for SWM-Core 5-12.3-15 was missing data for mercury analysis.
- The sample replicate for SWM-Core 5-12.3-15 for PCB analysis does not match that of the original analysis. The replicate appears to have been done on sample SWM-Core 4-0-2 based on the congener results. The replicate data for this sample should not be used in any evaluation until further clarification can be ascertained.

LABORATORY CONTROL SAMPLE AND LCS DUPLICATE

Laboratory control samples (LCS) for the inorganics were analyzed at the required frequencies. All LCS and LCS Duplicate (LCSD) %Rs were within QAPP-specified control limits, with the following exceptions:

- Trace metals recoveries for Antimony, iron, strontium, and zinc were outside the QAPP-specified control limits low in the LCS and LCSD. Titanium recovery was also outside the QAPP-specified control limit in the LCSD. All associated data were qualified with the "J" flag for estimated.
- There were no laboratory control samples analyzed for the PCB, congener or PAH analyses.

METHOD REPORTING LIMITS

Sample results were reported using the QAPP method reporting limits. Reporting limits were acceptable.

OVERALL ASSESSMENT

The data are judged to be acceptable for their intended use. Due to the lack of surrogates for the PCB and congener analyses, it was difficult to access whether this data met all acceptance criteria. Since the resulting precision and accuracy data met the criteria, assessment was based on these recoveries.

PRECISION, ACCURACY, AND COMPLETENESS

For the organic analyses precision and accuracy were judged from the matrix spike data.

Precision:	All precision goals were met.
Accuracy:	All accuracy goals were met.
Completeness:	As the TOC data had not been submitted at the time of publication, completeness was not evaluated for it at this time.

REFERENCES

Anchor, 2004. Site Investigation Workplan, for 401 Water Quality Certification, Southwest Marine Bulkhead Extension and Yard Improvement Phase 2 Activities. Includes Quality Assurance Project Plan (QAPP). November 2004.

USEPA. 2004. USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review. U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response. EPA 540/R-94/013. February.

USEPA. 1999. USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review. U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response. EPA 540/R-99/008. October.

APPENDIX C

FATE AND TRANSPORT MODELING RESULTS

Modeling Results for Copper

Inputs Copper

Symbol	Value	Units	Comments	
O	0.4	unitless	Porosity of cap sediments	Drever, 1988. Well sorted sand or gravel range 25 - 50%
SG	2.5	g/cm3	Specific gravity of cap sediments	
Pb	1.50	g/cm3	Bulk sediment density of cap sediments (per page B24)	Bulk density = Specific gravity X porosity
Koc		L/kgOC	Organic carbon partitioning coefficient	
TOC	0.001	fraction	Cap Total Organic Carbon Content	
Kd	100	L/kg	Cap adsorption distribution coefficient	
Rf	376	unitless	Retardation factor calculated per Eq. B3	**Retardation factor = 1+ (dry bulk mass density of soil/volumetric moisture content of the soil)*Kd -- Reible equation is not consistent with Drever or Fetter.**
L	90	cm	Effective cap depth (total cap minus bioturbation depth)	Assumes a 100cm thick cap and 10 cm for bioturbation
U	17.786304	cm/yr	Seepage velocity (not Darcy velocity)	Vx = Q/(n_e*A), where Q = discharge and A = cross-sectional area. Or: Vx = (k*dh*)/(n_e*dl*) Assume K = 0.00003 cm/sec, ne = 0.25, dh/dl = 0.0047
Do	225	cm2/yr	Molecular diffusion for chemical of interest in water	For metals D = (RT/F^2)(lambda/charge of the ion) RT/F^2 = 2.66E-07
Deff	66	cm2/yr	Effective diffusion through cap	Per Millington and Quirk, 1961. (Reible assumption)
D	84	cm2/yr	Diffusion/Dispersion combined coefficient	
Co	3.891	mg/L	Porewater conc. of underlying sediments	- 95% UCL for copper in sediments = 746.9 mg/Kg / 20452 L/Kg
TS	5	years	Desired time step for results	
Criteria	mg/L	3.10E-03		

Model Calculation and Results

Years Time (t)	Fac1	EF	Fac2	Comb	mg/L Conc. (Cpw)	mg/kg Conc. Seds
5	-	1.84E+08	-	-	-	-
10	-	1.84E+08	-	-	-	-
15	0.00E+00	1.84E+08	0.00E+00	0.00E+00	0.00E+00	0.00E+00
20	0.00E+00	1.84E+08	0.00E+00	0.00E+00	0.00E+00	0.00E+00
25	0.00E+00	1.84E+08	0.00E+00	0.00E+00	0.00E+00	0.00E+00
30	0.00E+00	1.84E+08	0.00E+00	0.00E+00	0.00E+00	0.00E+00
35	0.00E+00	1.84E+08	0.00E+00	0.00E+00	0.00E+00	0.00E+00
40	0.00E+00	1.84E+08	0.00E+00	0.00E+00	0.00E+00	0.00E+00
45	0.00E+00	1.84E+08	0.00E+00	0.00E+00	0.00E+00	0.00E+00
50	0.00E+00	1.84E+08	0.00E+00	0.00E+00	0.00E+00	0.00E+00
55	0.00E+00	1.84E+08	0.00E+00	0.00E+00	0.00E+00	0.00E+00
60	0.00E+00	1.84E+08	0.00E+00	0.00E+00	0.00E+00	0.00E+00
65	0.00E+00	1.84E+08	0.00E+00	0.00E+00	0.00E+00	0.00E+00
70	0.00E+00	1.84E+08	0.00E+00	0.00E+00	0.00E+00	0.00E+00
75	0.00E+00	1.84E+08	0.00E+00	0.00E+00	0.00E+00	0.00E+00
80	0.00E+00	1.84E+08	0.00E+00	0.00E+00	0.00E+00	0.00E+00
85	0.00E+00	1.84E+08	0.00E+00	0.00E+00	0.00E+00	0.00E+00
90	0.00E+00	1.84E+08	0.00E+00	0.00E+00	0.00E+00	0.00E+00
95	0.00E+00	1.84E+08	0.00E+00	0.00E+00	0.00E+00	0.00E+00
100	0.00E+00	1.84E+08	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Modeling Reults for Lead

Inputs lead

Symbol	Value	Units	Comments	
O	0.4	unitless	Porosity of cap sediments	Drever, 1988. Well sorted sand or gravel range 25 - 50%
SG	2.5	g/cm3	Specific gravity of cap sediments	
Pb	1.50	g/cm3	Bulk sediment density of cap sediments (per page B24)	Bulk density = Specific gravity X porosity
Koc		L/kgOC	Organic carbon partitioning coefficient	
TOC	0.001	fraction	Cap Total Organic Carbon Content	
Kd	1200	L/kg	Cap adsorption distribution coefficient	
Rf	4501	unitless	Retardation factor calculated per Eq. B3	**Retardation factor = 1+ (dry bulk mass density of soil/volumetric moisture content of the soil)*Kd -- Reible equation is not consistent with Drever or Fetter.**
L	90	cm	Effective cap depth (total cap minus bioturbation depth)	Assumes a 100cm thick cap and 10 cm for bioturbation
U	17.786304	cm/yr	Seepage velocity (not Darcy velocity)	Vx = Q/(n_e*A), where Q = discharge and A = cross-sectional area. Or: Vx = (*kdh*)/(n_e*dl*) Assume K = 0.0003 cm/sec, ne = 0.25, dh/dl = 0.0047
Do	267	cm2/yr	Molecular diffusion for chemical of interest in water	**For metals D = (RT/F^2)**(lambda/charge of the ion) RT/F^2 = 2.66E-07
Deff	79	cm2/yr	Effective diffusion through cap	Per Millington and Quirk, 1961. (Reible assumption)
D	96	cm2/yr	Diffusion/Dispersion combined coefficient	
Co	9.39E-02	mg/L	Porewater conc. of underlying sediments	
TS	100	years	Desired time step for results	
Criteria	mg/L	8.10E-03		

Model Calculation and Results

Years Time (t)	Fac1	EF	Fac2	Comb	mg/L Conc. (Cpw)	mg/kg Conc. Seds
100	-	1.60E+07	-	-	-	-
200	-	1.60E+07	-	-	-	-
300	-	1.60E+07	-	-	-	-
400	-	1.60E+07	-	-	-	-
500	-	1.60E+07	-	-	-	-
600	0.00E+00	1.60E+07	0.00E+00	0.00E+00	0.00E+00	0.00E+00
700	0.00E+00	1.60E+07	0.00E+00	0.00E+00	0.00E+00	0.00E+00
800	0.00E+00	1.60E+07	0.00E+00	0.00E+00	0.00E+00	0.00E+00
900	0.00E+00	1.60E+07	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1000	0.00E+00	1.60E+07	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1100	0.00E+00	1.60E+07	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1200	0.00E+00	1.60E+07	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1300	0.00E+00	1.60E+07	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1400	0.00E+00	1.60E+07	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1500	0.00E+00	1.60E+07	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1600	0.00E+00	1.60E+07	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1700	0.00E+00	1.60E+07	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1800	0.00E+00	1.60E+07	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1900	0.00E+00	1.60E+07	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Modeling Results for Zinc

Inputs Zinc

Symbol	Value	Units	Comments	
O	0.4	unitless	Porosity of cap sediments	Drever, 1988. Well sorted sand or gravel range 25 - 50%
SG	2.5	g/cm3	Specific gravity of cap sediments	
Pb	1.50	g/cm3	Bulk sediment density of cap sediments (per page B24)	Bulk density = Specific gravity X porosity
Koc		L/kgOC	Organic carbon partitioning coefficient	
TOC	0.001	fraction	Cap Total Organic Carbon Content	
Kd	200	L/kg	Cap adsorption distribution coefficient	
Rf	751	unitless	Retardation factor calculated per Eq. B3	**Retardation factor = 1+ (dry bulk mass density of soil/volumetric moisture content of the soil)*Kd -- Reible equation is not consistent with Drever or Fetter.**
L	81.4	cm	Effective cap depth (total cap minus bioturbation depth)	Assumes a 100cm thick cap and 10 cm for bioturbation
U	17.786304	cm/yr	Seepage velocity (not Darcy velocity)	$Vx = Q/(n_e*A)$, where Q = discharge and A = cross-sectional area. Or: $Vx = (kdh)/(n_e dl)$ Assume K = 0.0003 cm/sec, ne = 0.25, dh/dl = 0.0047
Do	222	cm2/yr	Molecular diffusion for chemical of interest in water	**For metals D = (RT/F^2)(lambda/charge of the ion)** RT/F^2 = 2.66E-07
Deff	65	cm2/yr	Effective diffusion through cap	Per Millington and Quirk, 1961. (Reible assumption)
D	83	cm2/yr	Diffusion/Dispersion combined coefficient	
Co	2.66E+00	mg/L	Porewater conc. of underlying sediments	
TS	10	years	Desired time step for results	
Criteria	mg/L	8.10E-02		

Model Calculation and Results

Years Time (t)	Fac1	EF	Fac2	Comb	mg/L Conc. (Cpw)	mg/kg Conc. Seds
10	-	3.67E+07	-	-	-	-
20	-	3.67E+07	-	-	-	-
30	-	3.67E+07	-	-	-	-
40	0.00E+00	3.67E+07	-	-	-	-
50	0.00E+00	3.67E+07	0.00E+00	0.00E+00	0.00E+00	0.00E+00
60	0.00E+00	3.67E+07	0.00E+00	0.00E+00	0.00E+00	0.00E+00
70	0.00E+00	3.67E+07	0.00E+00	0.00E+00	0.00E+00	0.00E+00
80	0.00E+00	3.67E+07	0.00E+00	0.00E+00	0.00E+00	0.00E+00
90	0.00E+00	3.67E+07	0.00E+00	0.00E+00	0.00E+00	0.00E+00
100	0.00E+00	3.67E+07	0.00E+00	0.00E+00	0.00E+00	0.00E+00
110	0.00E+00	3.67E+07	0.00E+00	0.00E+00	0.00E+00	0.00E+00
120	0.00E+00	3.67E+07	0.00E+00	0.00E+00	0.00E+00	0.00E+00
130	0.00E+00	3.67E+07	0.00E+00	0.00E+00	0.00E+00	0.00E+00
140	0.00E+00	3.67E+07	0.00E+00	0.00E+00	0.00E+00	0.00E+00
150	0.00E+00	3.67E+07	0.00E+00	0.00E+00	0.00E+00	0.00E+00
160	0.00E+00	3.67E+07	0.00E+00	0.00E+00	0.00E+00	0.00E+00
170	0.00E+00	3.67E+07	0.00E+00	0.00E+00	0.00E+00	0.00E+00
180	0.00E+00	3.67E+07	0.00E+00	0.00E+00	0.00E+00	0.00E+00
190	0.00E+00	3.67E+07	0.00E+00	0.00E+00	0.00E+00	0.00E+00
200	0.00E+00	3.67E+07	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Modeling Results for PCBs (quarry sand)

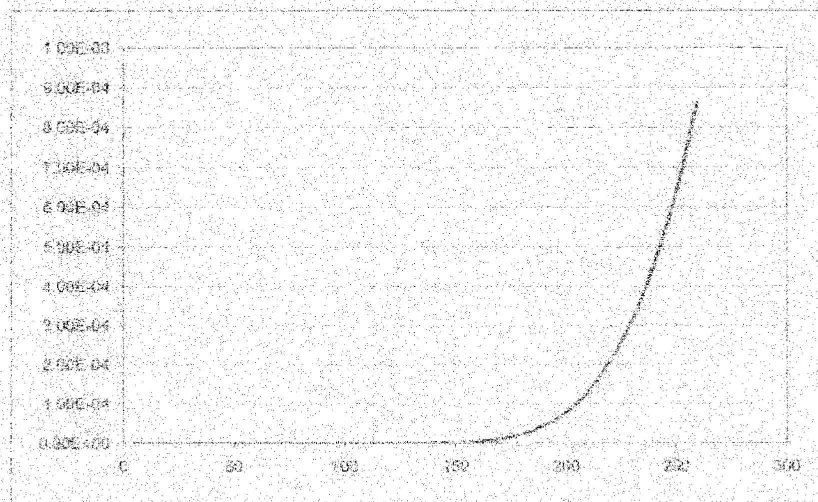
Inputs

PCBs (quarry sand cap)

Symbol	Value	Units	Comments
θ	0.4	unitless	Porosity of cap sediments
SG	2.6	g/cm3	Specific gravity of cap sand
ρb	1.56	g/cm3	Bulk sediment density of cap sediments (per page 524)
Koc	60,200	L/kgOC	Organic carbon partitioning coefficient
TOC	0.001	fraction	Cap Total Organic Carbon Content
Kd	60.2	L/kg	Cap adsorption distribution coefficient
Rf	[illegible]	unitless	Retardation factor calculated per Eq. B3
L	30	cm	Effective cap depth (total cap minus bioturbation depth)
V	17.738304	cm/yr	Seepage velocity (not Darcy velocity)
Dw	180	cm2/yr	Molecular diffusion for chemical of interest in water
Deff	58	cm2/yr	Effective diffusion through cap
D	73	cm2/yr	Dispersion/Diffusion combined coefficient
C_0	[illegible]	mg/L	PW conc. of underlying sediments
TS	5	years	Desired time step for results
Criteria	3.00E-06	mg/L	Porewater criteria at top of isolation cap

Model Calculation and Results

Years Time (t)	Erfc1	Kt	Erfc2	Conc	mg/L Conc. (Cpw)	mg/kg Conc. (sed)
0	0.00E+00	2.64E+09	0.00E+00	0.00E+00	0.00E+00	0.00E+00
10	0.00E+00	2.64E+09	0.00E+00	0.00E+00	0.00E+00	0.00E+00
15	0.00E+00	2.64E+09	0.00E+00	0.00E+00	0.00E+00	0.00E+00
20	0.00E+00	2.64E+09	0.00E+00	0.00E+00	0.00E+00	0.00E+00
25	0.00E+00	2.64E+09	0.00E+00	0.00E+00	0.00E+00	0.00E+00
30	0.00E+00	2.64E+09	0.00E+00	0.00E+00	0.00E+00	0.00E+00
35	0.00E+00	2.64E+09	0.00E+00	0.00E+00	0.00E+00	0.00E+00
40	0.00E+00	2.64E+09	0.00E+00	0.00E+00	0.00E+00	0.00E+00
45	0.00E+00	2.64E+09	0.00E+00	0.00E+00	0.00E+00	0.00E+00
50	0.00E+00	2.64E+09	0.00E+00	0.00E+00	0.00E+00	0.00E+00
55	1.11E-16	2.64E+09	0.00E+00	1.11E-16	1.25E-18	7.50E-17
60	2.44E-15	2.64E+09	0.00E+00	2.44E-15	2.74E-17	1.65E-15
65	5.81E-14	2.64E+09	0.00E+00	5.81E-14	6.52E-16	3.92E-14
70	8.88E-13	2.64E+09	0.00E+00	8.86E-13	9.95E-15	5.99E-13
75	9.36E-12	2.64E+09	0.00E+00	9.36E-12	1.05E-13	6.32E-12
80	7.31E-11	2.64E+09	0.00E+00	7.34E-11	8.23E-13	4.96E-11
85	4.50E-10	2.64E+09	0.00E+00	4.50E-10	5.05E-12	3.04E-10
90	2.24E-09	2.64E+09	0.00E+00	2.24E-09	2.5187E-11	1.52E-09
95	9.43E-09	2.64E+09	0.00E+00	9.43E-09	1.06E-10	6.37E-09
100	3.42E-08	2.64E+09	0.00E+00	3.42E-08	3.84E-10	2.31E-08



Modeling Results for PCBs (clean sediment)

Inputs — **PCBs (clean sediment cap)**

Symbol	Value	Units	Comments
O	0.4	unitless	Porosity of cap sediments
SG	2.5	g/cm3	Specific gravity of cap sand
Pb	1.50	g/cm3	Bulk sediment density of cap sediments (per page B24)
Koc	60,200	L/kgOC	Organic carbon partitioning coefficient
TOC	0.010	fraction	Cap Total Organic Carbon Content
Kd	602	L/kg	Cap adsorption distribution coefficient
Rf	903	unitless	Retardation factor calculated per Eq. B3
L	90	cm	Effective cap depth (total cap minus bioturbation depth)
U	17.786304	cm/yr	Seepage velocity (not Darcy velocity)
Do	190	cm2/yr	Molecular diffusion for chemical of interest in water
Deff	56	cm2/yr	Effective diffusion through cap
D	74	cm2/yr	Diffusion/Dispersion combined coefficient
Co	2.24E-03	mg/L	PW conc. of underlying sediments
TS	25	years	Desired time step for results
Criteria	3.00E-05	mg/L	Porewater criteria at top of isolation cap

Model Calculation and Results

Years Time (t)	Fac1	EF	Fac2	Comb	mg/L Conc. (Cpw)	mg/kg Conc. Seds
25	-	2.64E+09	-	-	-	-
50	-	2.64E+09	-	-	-	-
75	-	2.64E+09	-	-	-	-
100	-	2.64E+09	-	-	-	-
125	-	2.64E+09	-	-	-	-
150	-	2.64E+09	-	-	-	-
175	0.00E+00	2.64E+09	0.00E+00	0.00E+00	0.00E+00	0.00E+00
200	0.00E+00	2.64E+09	0.00E+00	0.00E+00	0.00E+00	0.00E+00
225	0.00E+00	2.64E+09	0.00E+00	0.00E+00	0.00E+00	0.00E+00
250	0.00E+00	2.64E+09	0.00E+00	0.00E+00	0.00E+00	0.00E+00
275	0.00E+00	2.64E+09	0.00E+00	0.00E+00	0.00E+00	0.00E+00
300	0.00E+00	2.64E+09	0.00E+00	0.00E+00	0.00E+00	0.00E+00
325	0.00E+00	2.64E+09	0.00E+00	0.00E+00	0.00E+00	0.00E+00
350	0.00E+00	2.64E+09	0.00E+00	0.00E+00	0.00E+00	0.00E+00
375	0.00E+00	2.64E+09	0.00E+00	0.00E+00	0.00E+00	0.00E+00
400	0.00E+00	2.64E+09	0.00E+00	0.00E+00	0.00E+00	0.00E+00
425	0.00E+00	2.64E+09	0.00E+00	0.00E+00	0.00E+00	0.00E+00
450	0.00E+00	2.64E+09	0.00E+00	0.00E+00	0.00E+00	0.00E+00
475	0.00E+00	2.64E+09	0.00E+00	0.00E+00	0.00E+00	0.00E+00
500	0.00E+00	2.64E+09	0.00E+00	0.00E+00	0.00E+00	0.00E+00

SITE INVESTIGATION AND CHARACTERIZATION REPORT FOR 401 WATER QUALITY CERTIFICATION

SOUTHWEST MARINE
BULKHEAD EXTENSION AND YARD IMPROVEMENT
PHASE 2 ACTIVITIES

Submitted to

California Regional Water Quality Control Board
San Diego Region

Submitted by

Southwest Marine, Inc.
2205 East Belt Street
San Diego, California 92113

Prepared by

Anchor Environmental, CA LP
3914 Murphy Canyon Road
San Diego, California 92123

See revised report
August 2005

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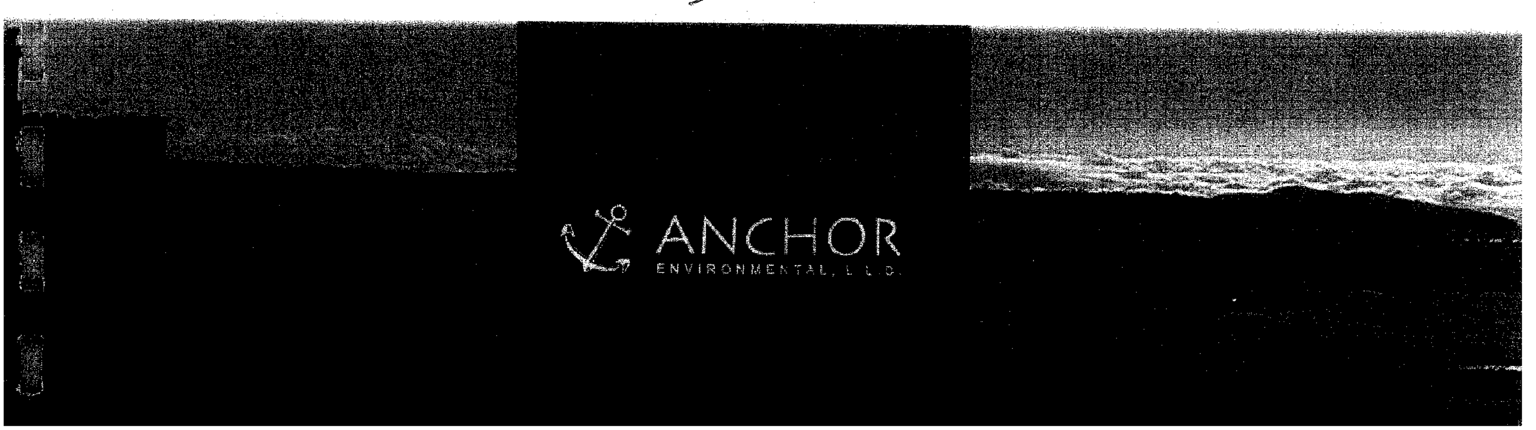
~~January 2005~~



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January 2005

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