

GENERAL DYNAMICS
Ordnance and Tactical Systems

Richard P. Davitt
Vice President, General Manager
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July 24, 2007

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Sacramento, CA 95826

Mr. Buck King, P.G., CHG
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Department of Toxic Substances Control
Geology, Permitting and Corrective Action Branch
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**Subject: Corrective Measures Implementation Workplan, SWMU #21,
General Dynamics, Ordnance and Tactical Systems Division**

**CALIFORNIA, INC. (FORMERLY KNOWN AS PRIMEX TECHNOLOGIES), 32727
CORRAL HOLLOW ROAD, TRACY, CALIFORNIA, EPA ID No. CAD 000 626 762**

Dear Mr. Zimudio:

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to be the best of my knowledge and belief, true, accurate, and complete.

I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Sincerely,



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**Revised
Corrective Measures Implementation Work Plan
Solid Waste Management Unit No. 21
(SWMU #21)**

**TRACY TEST FACILITY
EPA ID No. 000 626 762
32727 CORRAL HOLLOW ROAD
Tracy, California**

PREPARED FOR:

**GENERAL DYNAMICS OTS (CALIFORNIA), INC.
686 OTI Road
DeFuniack Springs, FL 32435**

Prepared by:

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July 2007

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**Revised Work Plan to Implement the
Amended Corrective Measures Study
Solid Waste Management Unit 21**

**GENERAL DYNAMICS OTS, TRACY TEST FACILITY
32727 Corral Hollow Road
Tracy, California**

1.0 EXECUTIVE SUMMARY

This workplan (WP), prepared by Chow Engineering, Inc. (CE), for submittal to the Department of Toxic Substances Control (DTSC) on behalf of General Dynamics OTS (GD-OTS), presents the scope of work for the Corrective Measures Implementation (CMI) Workplan at Solid Waste Management Unit #21 (SWMU 21) at the former Tracy Test Site located at 32727 Corral Hollow Road.

The Amended CMS of September 2005 as amended in January 2006 concluded that the mineral oil at SWMU 21 was non-toxic in nature and posed no human health risk due to this and the low risk of exposure at the site. Monitored Natural Attenuation was recommended as the corrective measure for petroleum hydrocarbons in groundwater at the site.

2.0 BACKGROUND

2.1 Site Location

The Tracy Test Facility site is located at 32727 Corral Hollow Road, approximately 3.2 miles southwest of the intersection of Interstate Highway (IH) 580 S.W. and Corral Hollow Road, near Tracy, California (see Figure 1). Historically, SWMU 21 was a large aboveground mineral oil storage tank. More recently this aboveground tank was converted to a welding shop. During the time of this assessment, SWMU 21, the large aboveground tank/weld shop was vacant and no longer in use for any purpose. Field activities at the site have included soil borings and groundwater monitoring well installation and sampling occurred in an area outside the tank around the south and east side of the aboveground tank (see Figure 2).

2.2 SWMU History

Pursuant to the approved RCRA Facility Investigation Workplan (RFI Workplan), dated August 9, 1999, prepared by Environmental Resources Management, CHOW ENGINEERING, INC. (CE) performed initial soil sampling at SWMU 21 on December 13, 1999. The results of the sampling and analysis were presented in the RCRA Facility Investigation, Field Investigation Results report, dated February 16, 2000.

On April 6, 2001, the Department of Toxic Substances Control (DTSC) approved the Corrective Measure Study (CMS) work plan (May 11, 2000) for evaluation of petroleum hydrocarbons soil impact at SWMU #21. Approximately 1,200 tons of hydrocarbon impacted soil were excavated around the aboveground tank at SWMU #21 and disposed of as regulated waste at Forward Landfill. Analytical results for soil collected from the excavation sidewall and floor indicated the presence of two (2) limited areas in the excavation with hydrocarbons exceeding 1,000 milligrams per kilogram (mg/kg) at approximately 15 to 17 feet below ground surface (bgs). The results of the CMS were resented in the "Corrective Measures Study, Preliminary Field Activities & Results Report" prepared by CE in August 2001.

Based upon the information obtained from the confirmation soil samples, it was noted that at least one additional horizontal lens of impacted soil was present on site. As a result, three additional rounds of soil delineation sampling were undertaken both vertically to an average termination depth of approximately 40 feet (maximum depth 60 feet bgs) and horizontally to a point averaging approximately 40 feet from the location of the initial confirmation sample with the highest concentration of petroleum hydrocarbons. The results of several rounds of sampling has indicated that impacted soil on site forms a "layer cake" banding of impacted versus non-impacted soils, likely tied to relative differences in soil permeabilities. Data obtained to date indicates that the residual hydrocarbon levels retained in the soil substrate are relatively low.

Eight groundwater monitoring wells (Figure 3) were installed at the site during the field activities as summarized in the Revised RFI Report (August 2005). For seven of the wells, there have been nine quarters of groundwater monitoring and for the eighth well, there have been six quarters of monitoring to date. The levels of mineral oil observed in groundwater fluctuates seasonally, but monitoring data suggests that the area of petroleum hydrocarbons in groundwater is contained within the identified area and is not migrating beyond this location. The recent Total Petroleum Hydrocarbons in the diesel range (TPH-d) concentration contours is presented in Figure 4.

2.3 Corrective Measure Selected

GD-OTS proposed and DTSC approved Monitored Enhanced Natural Attenuation (MENA) for the corrective measure for groundwater at SWMU 21. Natural Attenuation allows the natural biodegradation of the petroleum hydrocarbons by microbes that are naturally present. The Monitored Enhanced Natural Attenuation approved includes the addition of non-toxic substances (e.g., an oxygen-source like hydrogen peroxide) into the system to enable greater biodegradation by the existing microbes. This brings about quicker attenuation of Total Petroleum Hydrocarbon (TPH) levels.

This work plan proposes oxygenation of the groundwater using a hydrogen peroxide solution. The addition of oxygen, which is generally the main limiting factor of aerobic bacteria that remediate the soil hydrocarbons, will enhance such bioremediation.

3.0 SCOPE OF WORK

The following subsections of this workplan presents tasks implement the Amended CMS at the site.

3.1 Safety Plan Preparation and Implementation

The Site Specific Safety Plan (SP) will be revised to include the oxygenation of the wells. The equipment used for the activities will be similar to those used during the quarterly monitoring previously performed at the site. Modifications to the plan may be implemented upon the Direction of the Site Safety Officer or Project Manager if there are any changes in the site or work conditions.

3.2 Pre-Implementation Monitoring

Prior to the initial injection of Hydrogen Peroxide (H_2O_2), additional sampling will be performed at each well to establish a baseline for analytes that have not had the baseline established. The baselines and the analytical methods that have not been completely established are:

Volatile Organic Compounds (VOCs)	EPA Method 8260B
CAM - 17 metals	EPA Method 6010 and others

If the timing is close to the standard monitoring period, then addition sampling will be performed at that time for the standard monitoring parameters at this site. If not, such monitoring can be performed independently.

Baselines have been established for the ranges of TPH, Methyl tert-butyl ether (MTBE), Benzene, Toluene, Ethylbenzene, and Xylenes (BTEX) [M-BTEX], Semi-Volatile Organic Compounds (SVOCs), and Polychlorinated Biphenyls (PCBs). Although VOCs have been tested, the March 2005 results found carbon disulfide, acetone, and methylene chloride in the trip blanks, and very low concentrations of carbon disulfide was found in all wells. To establish a more reliable baseline, an additional round of VOC testing will be performed.

A bench scale testing of site groundwater with hydrogen peroxide will be performed to determine if the injection of H_2O_2 might produce hazardous by-products such as hexavalent chromium (by the oxidation of naturally occurring trivalent chromium, Cr^{III}).

The analyses for all the bench testing will be conducted for the analytes of concern. Those include analytes that have shown to been present in the groundwater during this investigation, including TPH-d and Total Petroleum Hydrocarbons in the motor oil range (TPH-mo), and any others test methods that have any analytes present (and above background for the metals) in the additional baseline testing.

Since MW-1 is the well with the highest TPH concentrations, two samples for each analysis will be collected. One will be analyzed for the analytes of concern as the baseline for the samples, and the others will be divided into two aliquots and an equal volume of 2% H₂O₂ will be added to each sample. One will be analyzed after 48 hours, and the second after 5 days, for the same analytes of concern. This will give a limited time dimension to the kinetics. The bench scale test of groundwater will be conducted on the order of 500 ml of groundwater from MW-1 and 500 ml of the 2% hydrogen peroxide solution.

Soil samples from MW-1 were proposed for a bench scale test of soil. Unfortunately, the samples which were thought to have been stored from MW-1 cannot be located. Therefore, CE is in favor of removing the bench scale testing of soil. We believe that the little additional information that can be obtained is not worth the cost of mobilizing a drill rig to obtain new soil samples from the vicinity of MW-1.

It has been requested that VOCs and SVOCs be tested in the bench studies. Only mineral oil was stored onsite. All analysis, including that of last semi-annual monitoring have shown that neither VOCs nor SVOCs are constituents of concern at the site. We recommend that neither VOCs or SVOCs be tested for the bench test.

The Workplan calls for injecting the H₂O₂ into the northern most wells, and allow the oxygenated groundwater to migrate toward the wells with mineral oil ensuring the reaction with the materials between the wells. However, if the bench test shows any problems, such as release of oxidized chemicals that are more toxic, e.g. hexavalent chromium (Cr^{IV}), then a pilot test will be done on MW-1 with a smaller volume of H₂O₂ and the water will be evacuated after two to five days (depending on the bench test results) and the water tested for the analytes indicated from the bench test.

Once DTSC approval is obtained for bench scale testing, the groundwater bench scale test will be completed and the results reported to DTSC in approximately 1 month. Any subsequent bench scale or pilot testing will have similar reporting times. Once DTSC approval is obtained for full scale implementation, three monthly applications will be conducted and a quarterly groundwater monitoring report will be submitted. If no changes are warranted in the method or frequency of applications, reports will be submitted semiannually and cover two quarters of monitoring.

3.3 Monitored Enhanced Natural Attenuation

Based on discussion with DTSC, a solution of hydrogen peroxide at a concentration of 2% will be added to the upgradient wells, MW-3, MW-5, and MW-7¹. The oxidation-reduction potential (ORP) and dissolved oxygen (DO) of the down gradient wells will be monitored to

¹ The object of the oxygenation is to increase the bioremediation activity, by supplying the remedial bacteria with oxygen to ensure anaerobic catabolism of the mineral oil. Thus the H₂O₂ concentration will be 2%, since anything above 3% may adversely affect the remedial bacteria.

evaluate the effectiveness of the process. In addition all other physical parameters; pH, electrical conductivity (EC), turbidity, will be monitored during each injection period. On a quarterly basis, petroleum hydrocarbon analysis will be performed.

The dilute hydrogen peroxide solution will be poured into the well to form a constant head so that it spreads out into the adjacent formation as much as possible. Initially a 500-gallon water tank will be brought to the site, during each injection period. A 2% ratio will be maintained such that the equivalent of 10 gallons of 100% hydrogen peroxide would be mixed with 490 gallons of water. Of the 500 gallons, up to 300 gallons will be injected into MW-3, if the aquifer can absorb that quantity of water. Then 100 gallons will be injected each into MW-5 and MW-7. To verify if there is sufficient natural communication & migration between the wells on site, the hydrogen peroxide solution will be initially introduced to MW-3, MW-5, and MW-7 on a monthly basis. The total volume of hydrogen peroxide that will be applied during the course of the Monitored Enhanced Natural Attenuation is unknown at this time. Following the initial rounds of applying hydrogen peroxide, the impact can be better evaluated and the schedule reevaluated. Monthly applications are anticipated for several quarters.

The water in MW-1 and the assumed down gradient wells will be checked for ORP values and DO before and after the H₂O₂ addition, before leaving the site. This proposed frequency should be sufficient to see if there has been any significant H₂O₂ migration & to measure the extent of oxygen depletion in the inoculated wells.

Following the initial oxygenation, four quarters of monitoring is proposed to evaluate the effectiveness of the oxygenation. At the end of four quarters of monitoring and data collection, the necessity of further monitoring and adjustments to the hydrogen peroxide injection will be evaluated.

The sampling methodology will be the same as the previous quarterly monitoring events. The monthly readings will be presented in semi-annual reports.

This planned remediation employs an empirical methodology. Knowledge of various parameters, including the hydraulic properties of the aquifer, will be built up with each injection. The knowledge obtained will then be used to adapt changes in the remediation plan; injection volumes, which wells to be injected, and any change in monitoring procedures.

4.0 REFERENCES

Chow Engineering, Inc., RCRA Facility Investigation, Field Investigation Results, Tracy Test Facility, February 16, 2000.

Chow Engineering, Inc., Corrective Measures Study, Preliminary Field Activities & Results Report, Tracy Test Facility, August 20, 2001.

Chow Engineering, Inc., Revised RCRA Facility Investigation, Solid Waste Management Unit #21, Tracy Test Facility, August 9, 2005.

Chow Engineering, Inc., Amended Corrective Measures Study, Tracy Test Facility, revised
January 2006.

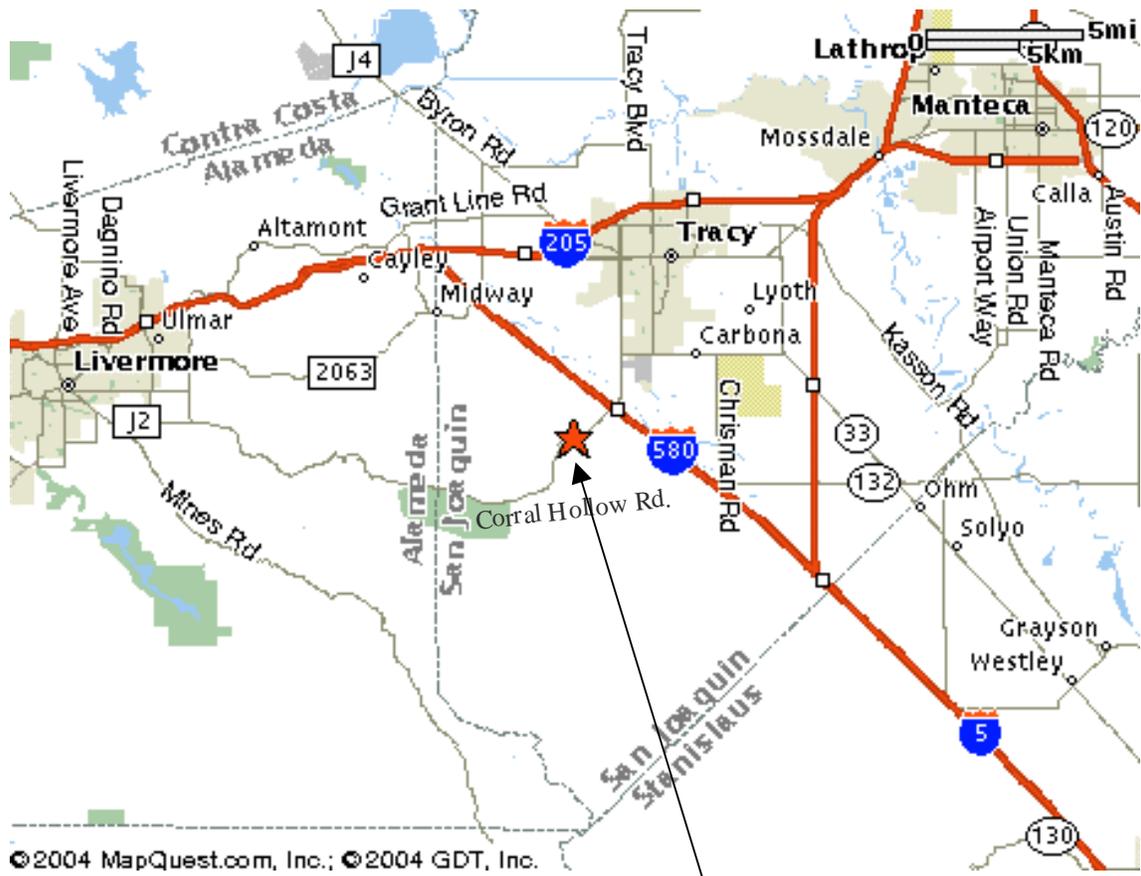
5.0 SIGNATURE

This workplan has been prepared under the direction of the person listed below.



A handwritten signature in cursive script that reads "Dani Renan".

Dani Renan, J.D., R.G., REA
Registered Geologist No. 6107
Registered Environmental Assessor No. 1892



GENERAL DYNAMICS
 Former Tracy Test Facility
 32727 Corral Hollow Road
 Tracy, CA

FIGURE 1
 LOCATION MAP

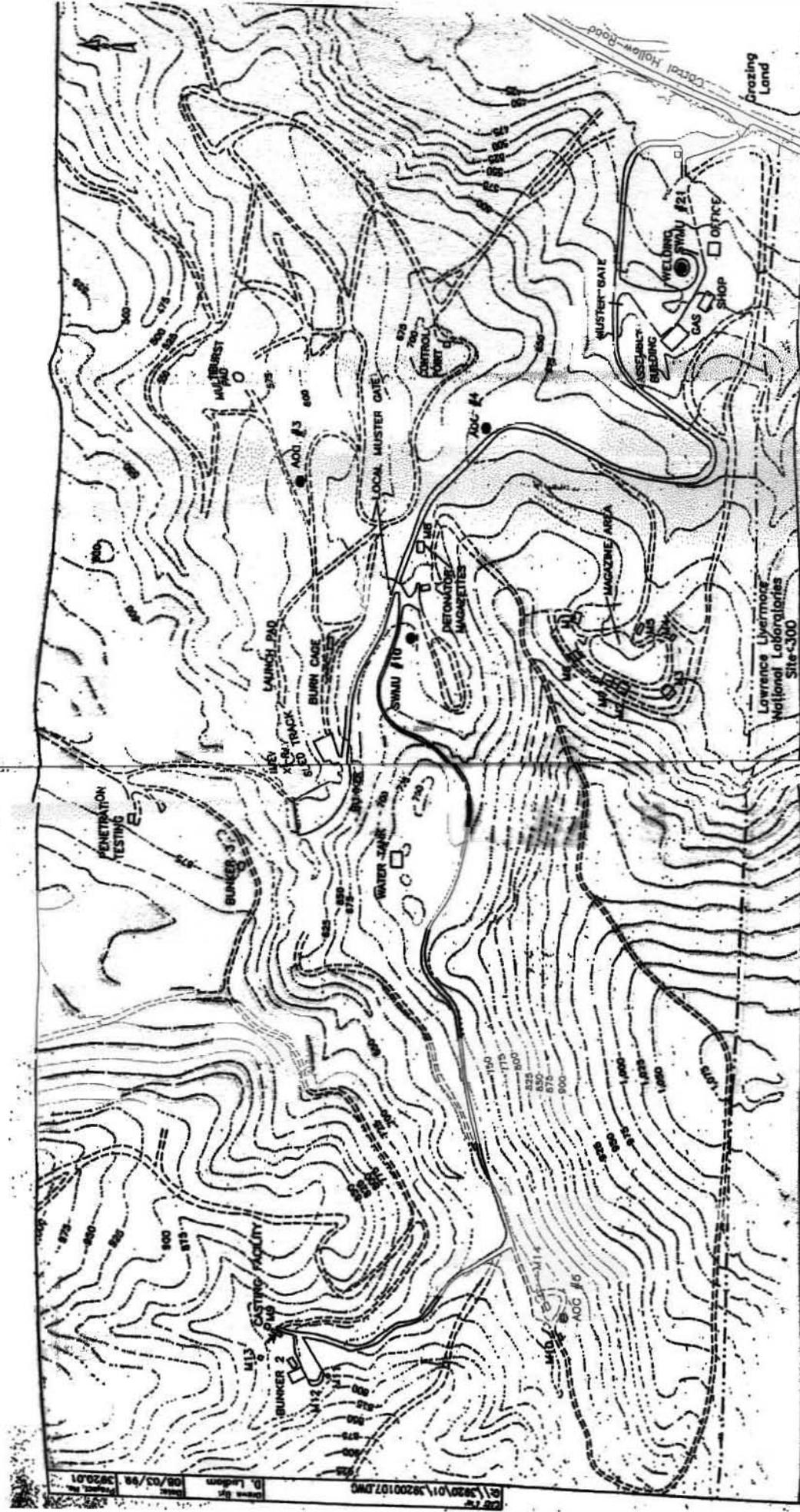
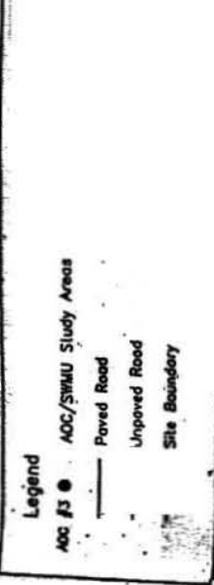


Figure 2
Site Map
Primex Technologies Tracy Test Facility
 3.2 Miles SW from I-580
 Corral Hollow Road
 Tracy, California



Source: Primex Technologies, RCA Facility Investigation, Field Investigation Workplan
 EPA ID No. CAD 000 626 762, Environmental Resources Management, 8/9/99



08/03/98 08/03/98
 B. Ludlum
 08/03/98 08/03/98
 08/03/98 08/03/98
 08/03/98 08/03/98

MONITORING WELL AND SAMPLE POINT LISTING:

PT ID	MAD83 Geodetic Lat (DDD) N / Long (DDD) W	MAD83 Geodetic Lat (DMS) N / Long (DMS) W	CS83 Z3 North/ East	NAVD88 Elevations PVC Rim Grnd
MW-1	37.649852 121.4914284	37 38 59.47865 121 29 29.14235	2060609.9 6274645.2	511.53 511.71 511.6
MW-2*	37.6497781 121.4912516	37 38 59.20117 121 29 28.50590	2060581.3 6274696.1	511.09 511.74 511.8
MW-3	37.6498564 121.4915715	37 38 59.48307 121 29 29.65748	2060610.8 6274603.8	512.08 512.26 512.0
MW-4	37.6499202 121.4913624	37 38 59.71284 121 29 28.90478	2060633.4 6274664.6	510.91 511.25 511.1
MW-5	37.6499849 121.4914469	37 38 59.94579 121 29 29.20895	2060657.2 6274640.4	510.11 510.52 510.4
MW-6	37.6498016 121.4913654	37 38 59.28590 121 29 28.91532	2060590.2 6274663.3	511.55 511.99 511.9
MW-7	37.6500073 121.4913681	37 39 00.02642 121 29 28.92515	2060665.1 6274663.3	509.59 510.08 510.0
MW-8	37.6497324 121.4913312	37 38 59.10880 121 29 28.79230	2060572.2 6274673.0	511.62 511.98 511.9
SB1			2060565.0 6274676.2	511.8
SB2			2060638.8 6274688.1	510.7
SB3			2060641.4 6274743.1	490.3

* REVISED HORIZONTAL VALUES

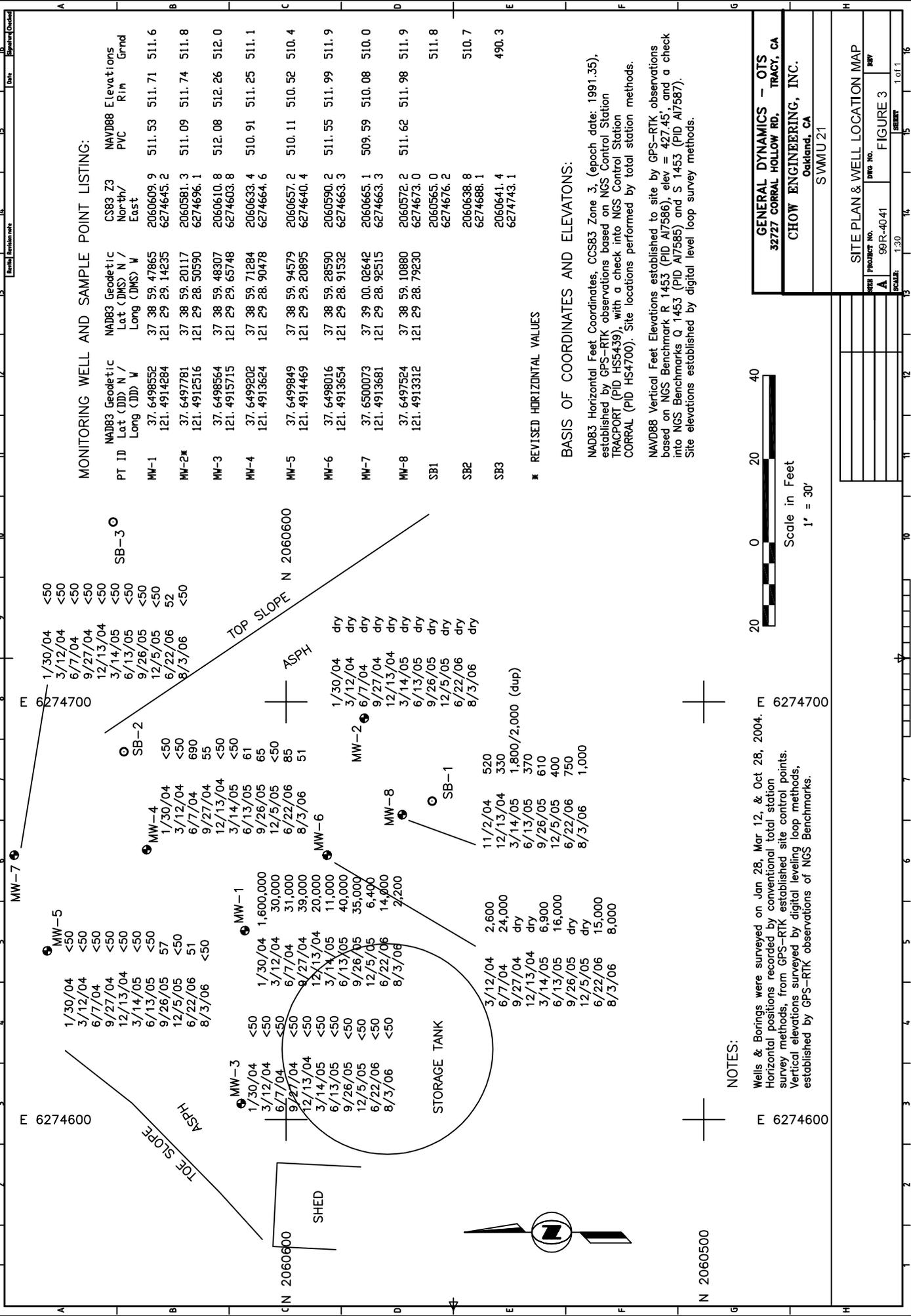
BASIS OF COORDINATES AND ELEVATIONS:

NAVD88 Horizontal Feet Coordinates, CCS83 Zone 3, (epoch date: 1991.35), established by GPS-RTK observations based on NGS Control Station TRACPORT (PID HS5439), with a check into NGS Control Station CORRAL (PID HS4700). Site locations performed by total station methods.

NAVD88 Vertical Feet Elevations established to site by GPS-RTK observations based on NGS Benchmark R 1453 (PID A17586), elev = 427.45', and a check into NGS Benchmarks Q 1453 (PID A17585) and S 1453 (PID A17587). Site elevations established by digital level loop survey methods.

NOTES:

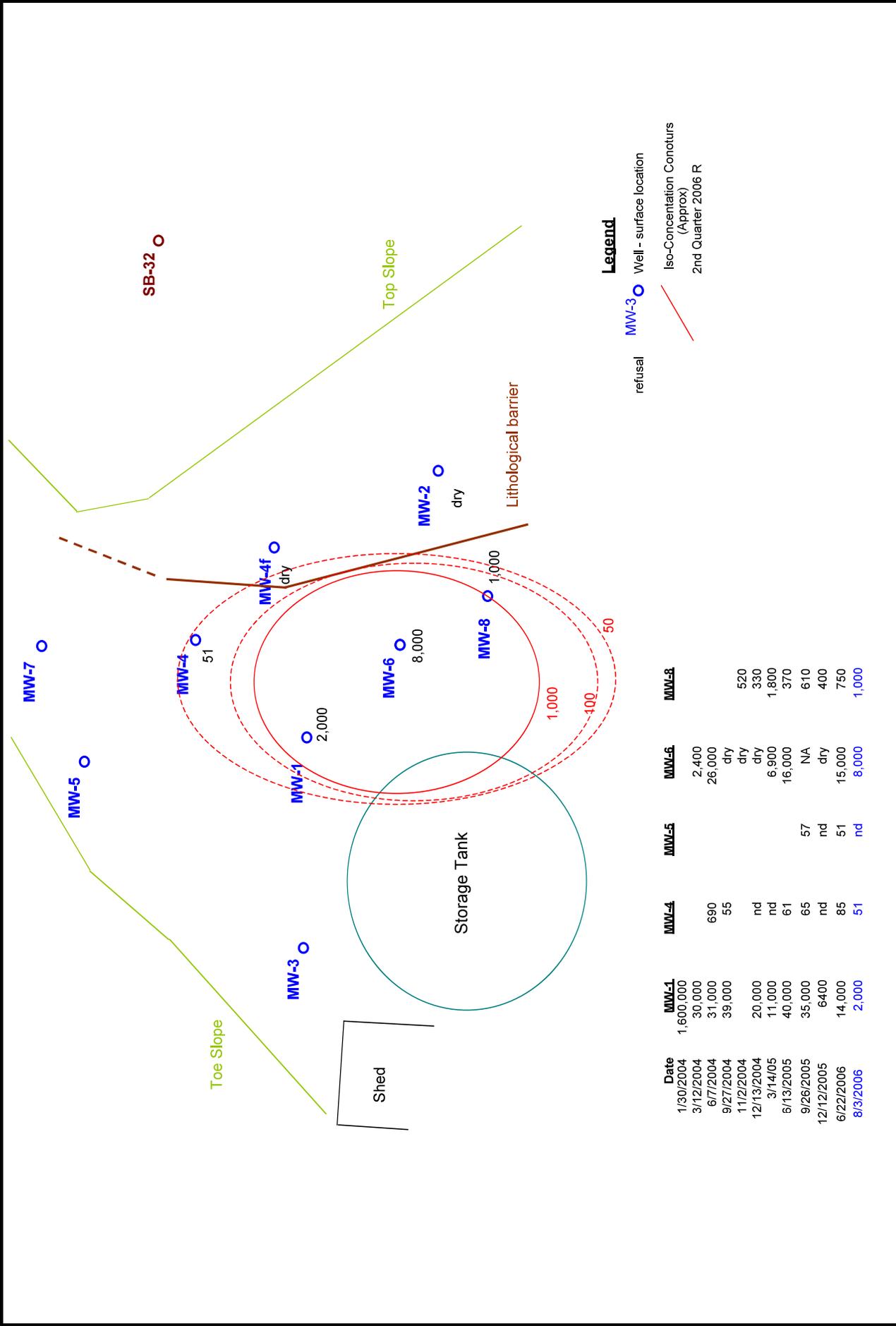
Wells & Borings were surveyed on Jan 28, Mar 12, & Oct 28, 2004.
Horizontal positions were recorded by conventional total station survey methods, from GPS-RTK established site control points.
Vertical elevations surveyed by digital leveling loop methods, established by GPS-RTK observations of NGS Benchmarks.



GENERAL DYNAMICS - OTS
32727 CORRAL HOLLOW RD., TRACY, CA
CHOW ENGINEERING, INC.
Oakland, CA
SWMU 21

SITE PLAN & WELL LOCATION MAP

PROJECT NO. 99R-4041
DRAWING NO. FIGURE 3
SCALE: 1:30
SHEET 1 of 1



Legend

- MW-3 Well - surface location
- refusal
- Iso-Concentration Contours (Approx) 2nd Quarter 2006 R

Date	MW-1	MW-4	MW-5	MW-6	MW-8
1/30/2004	1,600,000			2,400	
3/12/2004	30,000			26,000	
6/7/2004	31,000	690		dry	520
9/27/2004	39,000	55		dry	330
11/2/2004				dry	1,800
12/13/2004	20,000	nd		6,900	370
3/14/05	11,000	nd		16,000	610
6/13/2005	40,000	61		NA	400
9/26/2005	35,000	65	57	nd	750
12/12/2005	6400	nd	nd	15,000	1,000
6/22/2006	14,000	85	51	8,000	
8/3/2006	2,000	51	nd		

Chow Engineering, Inc.		Dwg. Title: TPH-d Concentration Contours - Schematic		Figure No. 4	
		1st Semiannual 2006-resample		Sh. of	
		Corral Hollow		Rev. No.	
		GENERAL DYNAMICS, INC.			
Drawn by:	Appvd by:	Date:	Aug 2006		
Job No.: 99R-4041					