ENVIRONMENTAL DUE DILIGENCE EVALUATION AND REMOVAL ACTION COMPARATIVE ANALYSIS TRACY BOWTIE PROJECT TRACY, CALIFORNIA

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San Francisco, California 94111

Subject: Environmental Due Diligence Evaluation and
Removal Action Comparative Analysis
Tracy Bowtie Project
Tracy, California

Dear Ms. Morris:

This Environmental Due Diligence Evaluation and Removal Action Comparative Analysis report includes a summary of environmental reports prepared for the Tracy Bowtie Project in the City of Tracy, County of San Joaquin, California. It is our understanding that the City of Tracy is evaluating options to develop select properties for commercial and/or and residential use. The objective of this Environmental Due Diligence Evaluation and Removal Action Comparative Analysis is to summarize environmental reports relating to past site investigations and characterizations, discuss data gaps, present remedial options for soil, and order of magnitude costs for those options.

We appreciate the opportunity to be of service to EIP/PBS&J Associates, on this project.

Sincerely,
NINYO & MOORE

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Senior Geologist

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Distribution: (1) Addressee

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1. INTRODUCTION

This Environmental Due Diligence Evaluation for the EIP will summarize reports and documents, discuss data gaps, and include remedial options and costs for the Tracy Bowtie Project in Tracy, California. The Project boundaries include East 6th Street to the north, MacArthur Drive to the east, West 4th Street to the south, and Tracy Boulevard to the west (Figure 1). According to the Bowtie Master Plan prepared in June 2004, the site is divided into 10 separate parcels (Areas A through J), totaling approximately 64.3 acres (Figure 2). The City of Tracy is considering commercial and residential redevelopment options for Areas A, B, D, E, F, G, H, and J. No plans for commercial or residential development were provided for Areas C and I. The options include:

- Residential, lodging, civic, office, retail, other commercial, parks and parking lots in Areas A, B, and J.
- Parks and parking lots in Areas D, G, and H.
- Multimodal station buildings, a plaza and bus terminal in Areas E and F.

Historically the site has been utilized for commercial and industrial use, and is currently comprised of vacant land and several commercial buildings located in the northwest section of the site (Area A). Union Pacific Railroad Company (UPRR) is the current site owner, who acquired the property from the Southern Pacific Transportation Company (SP) in 1996. SP used the site as a maintenance facility until it was decommissioned in the 1940s. The site was then used as a rail welding facility until sometime prior to 1980. Most of the on-site structures and railroad track were removed in the 1980s.

Potential areas of on-site hazardous materials use and storage were identified in several previous environmental reports as follows:

- Area A: Proposed surface areas of potential environmental concern included railroad right-of-way, railroad maintenance areas, packing sheds, a signal repair building, and two warehouses. Reported subsurface areas of potential environmental concern included two 8-inch oil pipelines. Existing structures on-site include a radiator repair shop and warehouse located at 306 and 601 West 6th Street, respectively.

- Area B and eastern section of Area I: Historical surface areas of potential environmental concern included railroad tracks, wheel shops, oiled macadam (stone) roads, rail beds, a coal house, refuse pit, and rail welding. Subsurface areas of potential environmental concern included two (500-gallon unleaded gasoline and 1,000-gallon diesel) underground storage tanks (USTs) removed in 1989. No evidence of regulatory closure for the USTs was discovered during our document review.

- Areas C and D: No information was available for these areas.

- Areas E, F, G, and H: Surface areas of potential environmental concern included railroad ties, a former oil shed, oil filled sumps and soil stockpiles. Subsurface areas of potential environmental concern included oil pipelines.

- Area J and western section of Area I: This was reported as the most industrialized area of the site. Surface areas of potential environmental concern included three ponds filled with soil and concrete debris, one large aboveground storage tank (AST) containing oil, an oil pump house, railroad tracks, two railroad roundhouses, a railroad turntable, an engine pit, an oil sump, a tool house, store houses, a lumber shed, an AST with unidentified contents, a power house, and railroad tracks. Subsurface areas of potential environmental concern included several oil pipelines.

2. SUMMARY OF ENVIRONMENTAL REPORTS

Three environmental reports were reviewed during our due diligence evaluation for the site. The reports included:

- A *Phase II Environmental Site Assessment, Proposed Tracy Multimodal Station, San Joaquin, California,* prepared by Geocon in July 2005.

- An *Additional Site Investigation Report, Proposed Tracy Multimodal Station, San Joaquin, California,* prepared by Geocon in October 2005.

- A *Draft Phase I Remedial Investigation Report, Former Tracy Railyard, Tracy, California,* prepared by Kennedy/Jenks Consultants in April 2006.

A summary of the reports is provided below.

2.1. Geocon July 2005 Phase II Environmental Site Assessment, Proposed Tracy Multimodal Station, San Joaquin, California

This report discussed subsurface evaluations conducted by both Geocon in February 2005 and Kleinfelder in February 1998 in site Areas E, F, G, and H. Kleinfelder and Geocon reportedly collected soil and groundwater samples from 17 boring locations (B1 through B9 for Kleinfelder, and B1 through B8 for Geocon), and Geocon collected additional soil samples from ten trench locations (T1 through T10). Analytical results from both sampling events are discussed below in Sections 2.1.1 through 2.1.5. Geocon compared the soil sample analytical results to United States Environmental Protection Agency (USEPA) Industrial Preliminary Remedial Goals (PRGs), and California EPA's Commercial/Industrial California Human Health Screening Levels (CHHSLs) taking into consideration that Areas E, F, G, and H would be developed as a Multimodal Transportation Facility. Groundwater sample analytical data were not compared to regulatory guidelines. Additionally, neither PRGs nor CHHSLs have values established for total petroleum hydrocarbons (TPHs) in soil, therefore TPH results were not compared to regulatory cleanup standards.

2.1.1. Kleinfelder Soil Sample Analytical Results

Soil samples were collected from depths of 5- and 10- feet below ground surface (bgs) in Kleinfelder borings B1 through B6, and 15-feet bgs from boring B7. The samples were analyzed for volatile organic compounds (VOCs) using USEPA Method 8260, semi-volatile organic compounds (SVOCs) using USEPA Method 8270, fuel fingerprint using the DHS LUFT Method, UEH (fuel finger analyte), and CAM 17 Metals (no method was specified). Results from the Kleinfelder data indicated the following:

- Reported VOCs included toluene and methylene chloride. Neither constituent was reported above their respective PRGs, which is 21,000 micrograms per kilograms (µg/kg) for methylene chloride and 520,000 µg/kg for toluene.
- SVOCs, DHS LUFT or UEH were not reported above their respective constituent reporting limits (RLs).

- Several CAM 17 Metals were reported above RLs including barium, chromium, cobalt, copper, lead, mercury, nickel, vanadium, and zinc. None of the constituents were reported above PRGS or CHHSLs; however the RL for arsenic (10 milligrams per kilogram [mg/kg]) was above the screening levels for Industrial Cal-Modified PRGs (0.25 mg/kg) and Commercial/Industrial CHHSLs (0.24 mg/kg).

2.1.2. Kleinfelder Groundwater Sample Analytical Results

Groundwater samples were collected from borings B1 [hydropunch (HP-1)] through B6 (HP-6) and analyzed for similar constituents as the soil samples. Results from the groundwater data included:

- Benzene reported from HP-6 at 2.4 micrograms per liter (µg/L). Benzene was the only VOC reported above RLs.
- Phenanthrene was reported at HP-6 at 110 µg/L. Phenanthrene was the only SVOC reported above RLs.
- UEH was reported at 340 µg/L in HP-1, and 190,000 µg/L in HP-6.
- Chromium and barium were the only compounds reported from CAM 17 analysis. Chromium was reported in samples HP-1 through HP-5, ranging from 0.0076 µg/L in HP-4 to 0.041 µg/L in HP-5, and barium was reported in samples HP-5 (0.08 µg/L) and HP-6 (0.7 µg/L).

2.1.3. Geocon Soil Sample Analytical Data

Eight soil borings (B1 through B8) were advanced in Areas E, F, G, and H up to 24 feet bgs. Soil was characterized as fill material from the ground surface to approximately 3-feet bgs, underlain by silt and clay alluvial material to the bottom of the borings. Petroleum hydrocarbon stained soil was observed above the groundwater table (18- to 20- feet bgs) in borings B5 and B8, and two soil samples were collected at 20 feet bgs from these borings. The samples were analyzed for TPH as gasoline (TPH-G,) diesel (TPH-D), and motor oil (TPH-MO) using USEPA Method 8015B; benzene, toluene, ethylbenzene and total xylenes (BTEX) using USEPA Method 8021B; VOCs using USEPA Method 8260, and SVOCs using USEPA Method 8270.

Three to four soil samples were collected from each of the 10 exploratory trenches (T1 through T10) excavated in areas F and G. The trenches were excavated with a backhoe to depths of 3- to 6- feet bgs. Select trench samples were analyzed for the same compounds listed above, plus CAM 17 Metals using USEPA Method 6010B; and chlorinated herbicides using USEPA Method 8151A. Polynuclear aromatic hydrocarbons (PAHs) were also analyzed using USEPA Method 8270SIM, replacing the SVOC analysis. Results of the soil boring and trench sampling are below.

- The highest TPH-G concentration detected was in boring samples was soil samples B8-20 (440 mg/kg). TPH-G was not detected above RLs in any of the trench samples collected.

- The highest TPH-D concentration detected was in soil boring sample B8-20 (770 mg/kg). The highest TPH-D detected in trench samples was from sample T5-1.5 (820 mg/kg).

- The highest boring TPH-MO concentration detected was in soil boring sample B8-20 (260 mg/kg). The highest TPH-D detected in trench samples was from T5-1.5 (2,000 mg/kg).

- BTEX compounds reported from soil boring samples included toluene at 1,400 µg/kg, ethylbenzene at 2,400 µg/kg, and total xylene at 4,400 µg/kg from B5-20, and Toluene at 3,600 µg/kg, ethylbenzene at 12,000 µg/kg, and total xylene at 9,100 µg/kg from sample B8-20. BTEX compounds were not reported above RLs in trench samples collected and analyzed. PRGs were not exceeded for the BTEX compounds reported.

- VOCs were analyzed in samples collected from borings B5 and B8, and trench samples T1, T4 through T6, T8 and T9. PRGs were not exceed by VOCs above RLs, including n-propylbenzene, naphthalene, and sec-butylbenzene. PRGs were not listed for isopropylbenzene, which exceeded RLs.

- PAHs were analyzed in samples collected from trenches T1 through T10. PAHs were reported above RLs in trench samples T3-0, T4-0, T6-0, T8-0, T9-0, T9-1.5, T10-0, and T10-1.5. PAH samples were not reported above Industrial PRGs. The only constituent approaching the Industrial PRG was benzo(a)pyrene, whose PRG is listed at 210 µg/kg.

- CAM 17 Metals were analyzed in samples collected from trenches T1 through T10. Lead was reported in two trench samples above the Industrial PRG of 800 mg/kg, (including samples T8-0 at 1,400 mg/kg and T10-0 at 2,000 mg/kg), however below the Commercial/Industrial CHHSLs of 3,500 mg/kg.

- Pesticides and herbicides were analyzed in trench samples T1-0 through T10-0. Pesticides were reported above RLs in samples T1-0, T3-0, T5-0, T8-0, and T10-0. Herbicides were not reported above RLs in the samples analyzed. PRGs were not exceeded for DDD, DDE and DDT, and chlordane.

2.1.4. Geocon Groundwater Sample Analytical Data

Groundwater samples were collected from borings B1 [groundwater-B1(GW-B1)] through B8 (GW-B8) and analyzed for TPH-G, TPH-D, and TPH-MO using USEPA Method 8015B; BTEX using USEPA Method 8021A; VOCs using USEPA Method 8260B; and SVOCs using USEPA Method 8270C. Groundwater was encountered between 18-feet to 20-feet bgs during sampling activities. A summary of groundwater analytical results is below.

- TPH-G was reported in samples GW-B5 and GW-B8 at 1.5 and 1.4 milligrams per liter (mg/L), respectively.
- TPH-D was reported highest in sample GW-B5 at 380 mg/L.
- TPH-MO was reported highest in samples GW-B5 at 120 mg/L.
- Toluene was reported highest in sample GW-B5 at 7.0 µg/L, and ethylbenzene (15 µg/L), and total xylene (11.2 µg/L) were reported highest in sample GW-B8.
- VOCs reported other than BTEX compounds included isopropylbenzene (83 and 100 µg/L), n-propylbenzene (9.4 and 96 µg/L), naphthalene (9.0 and 39 µg/L), and sec-butylbenzene (24 and 25 µg/L) in samples GW-B5 and GW-B8, respectively.
- GW-B5 and GW-B8 were analyzed for SVOCs. 2-methylnaphthalene was the only SVOC reported, and was detected at 120 µg/L in sample GW-B5.

2.1.5. Geocon Conclusions

Fill material in the exploratory trenches was composed of black sandy soil, coal, slag, pipes, concrete, and wood debris. Petroleum hydrocarbon-stained soil was observed in samples collected from near the groundwater table in two exploratory borings. Laboratory analytical results from trench samples indicated that soils in Areas E, F, G and H were impacted by metals, TPH, pesticides and PAHs. Laboratory analytical results from soil boring sampling indicated that both soil and groundwater were impacted by TPH.

2.2. Geocon October 2005 Additional Site Investigation Report, Proposed Tracy Multimodal Station, San Joaquin, California

This report discussed subsurface evaluations conducted by Geocon in September 2005 in Areas E, F, G, and H. Geocon collected soil and groundwater samples from nine boring locations (B9 through B17), including B9 through B12 in Areas E and F, and B13 through B17 in Area G. Soil and groundwater samples were collected from these borings to delineate the lateral extent of soil and groundwater contamination within the vicinity of borings B5 and B8, where elevated concentrations of TPH was detected in samples from these borings from the previous Gecon sampling event. Additionally four trench locations (MT1 through MT4) were excavated in the southern section of Areas G and H where several petroleum pipelines were located. No soil samples were collected from the trenches. Pipelines discovered during trenching included 2-inch, 4-inch, 5-inch, 9-inch, and 12-inch diameter metal; 9-inch diameter wood with a coil wrap, and 10-inch diameter vitrified clay pipe. The 12-inch diameter pipes were used for oil transport, and the clay pipe was presumed to a sewer line. Uses for the other pipelines were not specified.

2.2.1. Soil Sample Analytical Data

Soil in the exploratory borings was characterized as fill material from the ground surface to approximately 4-feet bgs, underlain by silt and clay alluvial material to the bottom of the borings. Greenish-gray stained soil which reportedly had a strong petroleum hydrocarbon odor was encountered just above the water table (18 to 20 feet-bgs) in borings B9 and B12 through B17. Free product was also observed in soil samples collected at B9 (20.5 to 23.5-feet bgs), B14 (19 to 23 feet-bgs), and B17 (14.5 to 22.5 feet-bgs).

Soil in the trenches were characterized as gravelly sand, and silty sandy fill to 4-feet bgs. Coal, pipes, wire, brick, and wood debris were observed in the fill. TPH-G was reported in soil boring samples B5-20 and B8-20 at 100 mg/kg and 440 mg/kg, respectively. TPH-G was not detected above RLs in any of the trench samples collected.

Soil samples were analyzed for TPH-D, and TPH-MO using USEPA Method 8015B; and TPH-G and BTEX using USEPA Method 8260B. No soil samples were collected from the trenches. Soil analytical data is summarized below.

- The highest TPH-G soil concentration was reported in sample B17-16 at 2,300 mg/kg.
- The highest TPH-D soil concentration was reported in sample B16-15.5 at 5,800 mg/kg.
- The highest TPH-MO soil concentration was reported in sample B9-15.5 at 330 mg/kg.
- BTEX compounds were not detected above RLs in samples analyzed from borings B9 through B17.

2.2.2. Groundwater Sample Analytical Data

Groundwater samples were collected from borings B9 (GW-B9) through B17 (GW-B17) and analyzed for TPH-D, and TPH-MO using USEPA Method 8015B; and TPH-G and BTEX using USEPA Method 8260B. Ground was encountered between 17-feet and 20-feet bgs. A summary of groundwater analytical results is below.

- TPH-G ranged from 520 µg/L in sample GW-B13 to 21,000 µg/L in sample GW-B17. TPH-G was not detected in samples GW-B10 through GW-B12, GW-B15, and GW-B16.
- TPH-D ranged from 92 µg/L in sample GW-B10 to 38,000 µg/L in sample GW-B17. TPH-D was not detected in samples GW-B11 and GW-B12.
- TPH-MO was detected at 3400 µg/L in sample GW-B9. TPH-MO was not detected in samples GW-B10 through and GW-B17.
- Toluene, ethylbenzene, and total xylene constituents were detected at 1.2 µg/L, 1.1 µg/L, 6.7 µg/L, respectively, in GW-B13. No other BTEX constituents were detected above RLs in groundwater samples GW-B9 through GW-B12, and GW-B14 through GW-B17.

2.2.3. Recommendations

Geocon recommended the removal of the pipelines in southern section of areas G and H. Geocon also recommended the installation of groundwater monitoring wells to evaluate changes in TPH concentrations in Areas F and G, plus the installation of groundwater monitoring wells west of Central Avenue to monitor the potential migration of TPH constituents downgradient of Areas F and G.. Geocon recommended that groundwater monitoring should be conducted on a quarterly schedule.

2.3. Kennedy/Jenks Consultants April 2006 Draft Phase I Remedial Investigation Report, Former Tracy Railyard, Tracy, California

This Remedial Investigation report (RI) contains a comprehensive evaluation of soil and groundwater conditions of Areas A, B, E, F, G, H, I, and J gathered during sampling events conducted by Kennedy/Jenks (KJ) between December 2005 and January 2006. The RI was conducted under a Voluntary Cleanup Agreement with the California Department of Toxic Substances Control (DTSC). A RI Workplan for the site was submitted to the DTSC in August 2005. A Sampling Analysis Plan, Quality Assurance Project Plan and Site Health and Safety Plan was also submitted prior to commencing filled activities. No information was noted in the RI regarding DTSC approval for any of these documents.

KJ divided the site into five areas of evaluation identified as Operable Units 1 through 5 discussed in Sections 2.3.1 and 2.3.3 below. Groundwater was encountered between 13-feet bgs to 15-feet bgs in Area J, and slightly deeper (no depths to groundwater were discussed) in Area A. Groundwater reportedly flows in a north to northwest direction. The soil and groundwater borings were surveyed in January 2006.

Several investigations were conducted prior to the time KJ began their site-remedial investigation. Two tables present a summary of site history and investigations conducted by consultants between 1992-2005 (Table 1), and by KJ in 2006 (Table 2). The tables include a discussion of historical features, area of environmental concern, previous investigations and constituents of concern (COCs), highest constituent concentrations detected during site in-

vestigations, hotspots, previous remedial actions, and regulatory closures, if any, in Areas A and B, and Areas E through J. Areas C and D were not discussed because of lack of information. The following sections include a summary (supplementing Tables 1 and 2) of the site investigations and remediation history that was presented in the KJ report, and a brief discussion of the findings, conclusions and recommendations in the KJ report.

2.3.1. Background of Operable Units 1 Through 5 (1989-2005)

Operable Unit 1 (Areas B and I)

This section of the site corresponds to Area B and the eastern section of Area I. This area was historically utilized for industrial purposes, and at one time contained railroad tracks, wheel shops, oiled macadam roads, rail beds, a coal house, refuse pit, and a rail welding shop. Subsurface features included air and water pipelines, and two (500-gallon unleaded gasoline and 1,000-gallon diesel) USTs removed in 1989. After the USTs were removed, the area was over-excavated, removing 16 cubic yards (CY) of soil. Monitoring wells were subsequently installed for quarterly groundwater sampling. Groundwater samples were collected for three quarters, and analyzed for COCs including TPH-G and TPH-D, and BTEX. Constituents were not detected above RLs, so the wells were abandoned in 1992. No evidence of regulatory closure for the USTs was discovered during our document review.

A Phase II Site Investigation was conducted in 1992, during which two groundwater monitoring wells and four borings were installed. The wells were installed in the eastern section of Area I (MW-1), and the vicinity of a former refuse pit (MW-2). The Soil samples were collected and analyzed for metals, PAHs, TPH-G and TPH-D, BTEX and VOCs,

TPH constituents were not detected in the soil or groundwater samples. The constituents analyzed above were not detected in groundwater samples. PAHs and VOCs were detected in trace compounds soil samples. Lead was detected in soil samples ranging from 19 mg/kg to 2,100 mg/kg. Due to the high concentrations of lead reported, additional

soil sampling was conducted for lead analysis. A workplan was prepared in 1993 to collect several surface (0.5- to 1.0- feet bgs), and shallow (1.0- feet to 1.5-feet, and 1.5- to 2-feet bgs) soil samples. The highest load concentrations included 3,125 for the surface samples, 3,520 mg/kg for the 1.0-foot samples, and 882 mg/kg for the 1.5-foot samples.

A risk assessment was conducted by SPs consultant in 1993 using the Lead Exposure Model developed by the DTSC. The result was a mean soil action level for lead of 240 mg/kg. Based on the assumption that the property would be used as residential development, the DTSC requested that the cleanup goals be lowered to 220 mg/kg for lead in April 1995. In July 1995, 9,900 CY of soil were excavated and transported off-site for disposal. An additional 15,600 CY of soil was stabilized for potential re-use on-site. Concentrations of lead in stabilized soil exceeded the cleanup goals, so the soil was used as backfill on-site, and the plans for residential development were canceled.

Operable Unit 2 (Areas J and I)

No former subsurface investigations or remediation were conducted in this parcel. The area historically included three holding ponds with unidentified contents, one large AST containing oil, an oil pump house, two railroad roundhouses, a railroad turntable, an engine pit, an oil sump, a tool house, store houses, a lumber shed, an AST with unidentified contents, a power house, and railroad tracks. Subsurface areas of potential environmental concern included several oil pipelines.

Operable Units 3 and 4 (Areas E, F, G, and H)

These parcels were investigated by Kleinfelder and Geocon, and a summary of the investigations are in Sections 2.1 and 2.2, above. No remedial Actions have been conducted in these parcels.

Operable Unit 5 (Area A)

No remedial actions have occurred in this parcel. Subsurface investigations were conducted by Geocon in December 2004 and July 2005. The investigations consisted of

trench excavations and direct push borings. The soil and groundwater samples were analyzed for TPH-G, TPH-D, TPH-MO, BTEX, pesticides, herbicides, VOCs, SVOCs, PAHs, PCBs, asbestos, and Metals. The highest concentrations of arsenic and lead were reported at 280 to 390 mg/kg, respectively in the trench samples, the highest TPH-D concentrations in soil and groundwater were reported at 9,900 mg/kg, and 290 mg/L, respectively. Soil observations in trench PTP5 (located in the northern portion of Area A) included purple colored soil containing arsenic, pesticides and PAHs. Soil containing coal, asphalt, and PAHS were observed in trench PTP-9, located in the eastern section of Area A.

2.3.2. Findings and Conclusions of Soil and Groundwater Sampling

This section discusses arsenic, lead and TPH soil sample analytical results and TPH groundwater sample analytical results from the five operable units on-site, and compares the data to regulatory cleanup goals set forth by KJ in their report. The RI report compared the data for lead impacted soil to either Residential or Industrial PRGs (150 mg/kg and 800 mg/kg) and/or Residential or Commercial CHHSLs (150 mg/kg and 3500 mg/kg), respectively. Groundwater results were compared to US Department of Health Services Maximum Contaminant Levels for Drinking Water (MCLs), where applicable. No cleanup goals were discussed in the report for TPH impacted soil and groundwater.

Operable Unit 1 (Areas B and I)

Soil samples collected in OU-1 were analyzed for total and soluble lead. No groundwater samples were collected in this parcel.

Total lead exceeding Industrial PRGs was reported in the south central and northern sections of Area I (Table 2). Commercial CHHSLs for total lead were not exceeded. Total lead exceeding residential PRGs and CHHSLs was reported in the northwest and north-central sections of Area B (Figure 2). Arsenic was reported above PRGs and CHHSLs

in every sample. Elevated concentrations of arsenic (>10 mg/kg) were generally in the same samples where elevated concentrations of lead were detected.

Soluble lead concentrations were analyzed in 57 soil samples collected in Area B and the eastern section of Area I. Eleven samples (approximately 19%) were reported above 5.0 mg/L, which is the boundary where lead impacted soil changes from non-hazardous to hazardous waste.

Operable Unit 2 (Areas I and J)

Soil samples collected in OU-2 were analyzed for Title 22 Metals, TPH-G, TPH-D, TPH-MO, VOCs and SVOCs. Groundwater samples were analyzed for TPH-D, TPH-MO, and VOCs.

Lead impacted soil reported above Residential PRGs was detected in several soil samples collected in the central, south, and western section of Area J (Figure 2). Elevated concentrations of TPH impacted soil were also detected in the northeast, southeast, central and western section of Area J (Figure 3).

Lead and TPH impacted soils were not reported above Industrial/Commercial PRGS/CHHSLs in the western section of Area I. The other constituents analyzed were not reported above PRGs or CHHSLs.

Highest concentrations of TPH in groundwater were reported in the northwest corner of Area J. Minor concentrations of tetrachloroethene was detected below the MCL of 5.0 µg/L in groundwater samples collected in the same area.

Operable Unit 3 and 4 (Areas E, F, G, and H)

Lead in soil was reported below Industrial PRGs in soil samples collected from these Areas. Arsenic was above both PRGs and CHHSLs. Elevated concentrations of TPH were detected in soil samples collected from the south-central section of Area F.

Operable Unit 5 (Area A)

Lead impacted soil was reported above Residential PRGs/CHHSLs in the central, north and northeast sections of Area A (Figure 2). Arsenic was reported above PRGs and CHHSLs in every sample. Elevated arsenic samples were detected in locations containing elevated lead concentrations. Elevated TPH-G, TPH-D and TPH-MO concentrations were reported in groundwater samples collected near the western boundary of Area A.

3. DATA GAPS

Several areas of lead and TPH impacted soil detected during previous investigations are outlined in Figures 2 and 3. The outlines indicate a rough estimate of the potential area of lead and TPH impacted soils where soil remediation may be needed for future commercial or residential use. Data gaps are summarized for each Area below, and are also presented in Table 3.

- Area A - The KJ report was reviewed for this Area. Inorganic compounds analyzed included total lead and arsenic. Organic compounds analyzed included TPH, BTEX, VOCs and SVOCs. Most of the samples were concentrated in the north, southwest and eastern sections of this Area. Much of the central section of this Area was not sampled. Lead and arsenic results indicated elevated concentrations of each analyte in several samples in the northern and central sections of the Area (Figure 2). Several sections of Area A need further evaluation for lead and arsenic, including the southern, northwestern, central and northeastern. TPH in groundwater is defined in the western section of Area A, however additional groundwater characterization for TPH should be conducted in the southern, southeastern, and southwestern sections of the Area. Elevated TPH concentrations were reported in samples collected in the western section of Area A, and there may be a potential for TPH impacted groundwater to migrate off-site toward residential property west and northwest of Area J. Therefore, groundwater samples should be collected in residential areas along the western border of Area A. Additionally, solubility analysis for lead, should be conducted on several soil samples to evaluate waste disposal criteria.

- Area B and Eastern Section of Area I - The KJ report was reviewed for this Area. Previous evaluations included analysis of several constituents including metals, PAHs, TPH, BTEX, and VOCs in soil and groundwater samples. KJs sampling plan included soil samples analyzed for total and soluble lead in several sections of Area B and I. Much of the sampling data provides a fairly good coverage for lead impacted soil, however several sections of Area B were not characterized, including the south-central section of Area B and the northeast section of Area I. Also, since TPH-containing products were used for past site activities, and because soluble lead was elevated in certain boring locations, more groundwater samples should be collected throughout Area B and analyzed for TPH and dissolved lead. No

future development is scheduled for the eastern section of Area I, so no further sampling is planned.

- Areas C and D - No information was available in the reports reviewed for these Areas. We understand that there is no plan to develop Area C, however a park and parking lot may be constructed on area D. If a park is constructed on Area D, site characterization and a risk assessment is appropriate to evaluate human health risk factors for a public park. The risk assessment should consider scenarios where commercial and residential construction may occur, and the hazards associated with groups for each scenario. Groundwater sampling should be conducted in the northeast corner of Area D to evaluate potential groundwater contamination migrating from Area G..

- E, F, G and H - The Gecon and KJ reports were reviewed for these Areas. The TPH groundwater plume was defined in these Areas. Elevated TPH concentrations were reported in soil samples collected in the central section of Area F, so additional soil samples should be collected within the vicinity of this boring to evaluate the lateral and vertical TPH contamination. Groundwater samples should also be collected in this section of Area F to evaluate potential TPH impacted groundwater relating to the soil contamination. Free product was observed in the soil samples collected from the central and northern section of Area G. The source may originate from the oil pipelines in the Area. The pipelines should be removed to evaluate areas where leaking may have occurred, and soil and groundwater samples should be collected in those sections of Area G to evaluate the potential extent of contamination.

- Western Section of Area I and Area J. Elevated concentrations of lead and TPH impacted soil were reported in several sections of Area J (Figures 2 and 3). Lead concentrations were as high as 1,400 mg/kg. No soluble lead analysis was conducted in samples collected by KJ. Additional soil sampling should include soluble lead analysis. Sections of J where further lead sampling and analysis should occur include the south-central, southeastern, and northeastern sections. No residential or commercial construction is scheduled for the western section of Area I, so no further sampling is planned.

- General Data Gaps - Due to the elevated concentrations of arsenic, lead and TPH constituents in Areas A, B and J, and the planned use of these Areas for partial residential, risk assessments are appropriate to establish cleanup goals for residential use. COCs were not above Industrial/Commercial PRGs and CHHSLs in soil samples collected from Areas E, F, G and H, which are either planned for commercial and/or industrial use, or will not be developed. Regulatory closure should be considered for these Areas.

4. SOIL REMEDIATION

Ninyo & Moore used a standard polygonal method to develop an area of influence for each boring sampled during the former site soil and groundwater investigations. The resulting polygons

are shown on Figures 2 and 3. Impacted soil volumes were loosely calculated by estimating the depth of soil in each boring having concentrations of lead and arsenic COCs above the Residential or Industrial PRGs, and concentrations of TPH above State Regional Water Quality Control Board (RWQCB) Environmental Screening Levels (ESLs). CHHSLs were not used because they are a screening tool and not a recognized cleanup standard by regulatory agencies. When soil contaminants exceeding PRGs were detected in a sample from a shallow depth, and not detected (at levels exceeding PRGs) in the sample at a deeper depth, the impacted depth was considered to be halfway between the two sample depths. Excavation depths were generally measured to the closest foot (1, 2, 3, 4 or 5-foot depths), however there were a few exceptions. The total volume of potential TPH, arsenic or lead impacted soils (where remediation may be needed) was estimated at 76,000 tons.

The remediation technology considered for lead soil contamination reduction was excavation and off-site disposal. Two remediation technologies for TPH impacted soils were considered, including excavation and off-site disposal and in-situ remediation through bioventing. Also discussed in the sections below are alternatives for no action, and reusing the impacted soils on-site. Due to the lack of VOCs and the presence of heavier hydrocarbon constituents, and lead in the soil, methods such as soil vapor extraction and low temperature thermal desorption were not considered to be viable alternatives for site remediation. The alternatives are also summarized in Table 4, and soil volumes and order of magnitude costs associated with each alternative are presented in Tables 5 and 6.

4.1. Alternative 1: No Action

Under the no action alternative, COCs would remain in place at their current concentrations. Concentrations of arsenic and lead were above PRGs, and elevated concentrations of TPH were detected, and would require remediation in order to obtain regulatory closure. A no action alternative would potentially expose human and ecological receptor to existing site soil contamination. The existing soil contamination could potentially create environmental liabilities and increased health risks to construction workers and residents.

Demolition of site facilities does not occur under this scenario, and therefore asphalt surfaces and concrete pads would continue to function as barriers limiting the potential exposures of COCs to site workers and the public. This alternative does not reduce the concentration of TPH, lead, and arsenic in on-site soil to below their established cleanup levels. The potential for mobilizing soil contaminants to groundwater via precipitation infiltration could increase if impacted soils are not isolated or removed. Reduction in toxicity, mobility or volume of site COCs would result from natural degradation of TPHs under this alternative. Metal concentrations in soils would potentially remain unaffected.

4.2. Alternative 2: Reusing TPH, Arsenic and Lead Impacted Soil On-Site

According to the City of Tracy's Development Plan for the Bowtie Areas; Areas A, B and J will be mostly residential, and Areas D, E, F, G and H will be predominantly transportation or commercial developments. No planned residential or commercial development for Areas C and I were reported. Approximately 25% of Area A and 30% of Area J are impacted by arsenic and lead above Residential PRGs. An option of removing the TPH, lead and arsenic impacted soil from Areas A and J and transferring it to Areas D, E, F, G, H and I, (where it could be capped and covered) would be a convenient and cost effective way of remediating Areas A and J. However, several problems may arise from this approach. Partially contaminated soils from Areas D, E, F, G, H and I would have to be excavated to allow for backfilling of soils from Areas A and J, thereby rehandling some materials. If the soil is spread over the existing grade and capped, monitoring may be needed to evaluate the impact to groundwater from potential COCs. The cap would also have to be inspected and maintained under a long-term management program because of the potential for lead and arsenic exposure to human and biological receptors. If the lead was encapsulated and the soil was stabilized the solubility of lead would decrease, lowering the potential impact to groundwater. No cost estimate for this alternative was prepared. In order to evaluate where soil could be relocated within the site boundaries, a comprehensive development plans for the site is required. In addition, there is uncertainty about regulatory approvals to leave contaminated soil on-site.

4.3. Alternative 3: Excavation and Off-Site Disposal

Excavation and off-site disposal entails physical removal of the soils from the site and transporting those soils to a permitted landfill or treatment facility for disposal. The soil removal and disposal would involve excavation and segregation of soils into stockpiles of clean; contaminated, but non-hazardous; and hazardous soil stockpiles. Composite samples would be collected from the stockpiles, analyzed, and the results would be included on a waste profile form for landfill acceptance. If soil exceeds the landfill acceptance criteria for soluble lead, then soil stabilization (for lead) would reduce concentrations of lead to levels acceptable to the Class II landfills located in either Stockton or Livermore, California. Upon landfill acceptance, the soil stockpiles would be loaded on trucks and transported to the landfill. Costs associated with excavation and off-site disposal would include excavation equipment, soil profiling, soil stabilization (if required), soil removal, transport, and disposal charges. Removal volumes for arsenic impacted soil were not calculated, because soil impacted by elevated arsenic concentrations is in areas where lead impacted soil exists.

The excavation and off-site disposal alternative will effectively reduce health risks from potential exposures to construction worker, residential, and commercial occupants, as well as ecological receptors on site. The contaminated soil will be removed in areas where contamination is above DTSC approved cleanup levels and transported to a permitted landfill. Oxygen releasing compounds (ORCs) will be added to areas where TPH impacted soil is excavated to expedite biodegradation. Disposing of the soil in a permitted landfill will reduce potential future ecological and human health risks associated with contaminated soil. The removal of contaminated soil from the site will also reduce the risk of the contaminant source migrating to groundwater within the site vicinity.

The excavation and off-site disposal alternative is easily implemented because contaminated soil that would need to be excavated and transported off-site could be both loaded and transported off site during excavation activities (pending regulatory approval) or stockpiled in specified areas (that have impacted soils), and removed after the stockpiled soils are characterized. This alternative uses readily available equipment and experienced contractors to

perform work. Adequate transportation capacity exists in the area with numerous licensed hazardous waste haulers available. Entrances and exits can be provided on any of the streets bordering the site to assist truck traffic flow through the site. Several landfills are located within a 20-mile radius of the site for disposal of Class II material. Class I waste can be shipped to southern California or out-of-state, depending on characterization as CAL-HAZ or RCRA waste. Adequate capacity exists at many permitted disposal facilities to provide treatment (if needed) and disposal of the TPH, arsenic and lead impacted soils. Soil that is non hazardous and not impacted with COCs may be used to fill in areas where contaminated soil removal occurred.

4.4. Alternative 4: Bioventing (TPH Impacted Soil)

Bioventing is an in-situ remedial technology in which air and/or nutrients are injected into the vadose zone in areas of soil contamination to oxygenate indigenous microorganisms enhancing biodegradation of petroleum hydrocarbons in subsurface soils. The primary COCs targeted for bioventing remediation on site would be TPH-D and TPH-MO.

Generally, a bioventing system consists of a blower, air sparging wells which are constructed with perforated PVC screen, and horizontal blank PVC pipe, which connects the blower and air sparging wells. Nutrients of oxygen releasing compounds can be added to the system through a nutrient tank and subsurface piping to enhance TPH degredation.

According to the USEPA Manual, Bioventing Principal & Practices, Volumes I and II (USEPA 1995), studies on various sites where bioventing had been utilized indicated that after nine months of bioventing, generally 40% of the TPH constituents, and 90% of BTEX constituents were remediated. Soil should be sufficiently permeable for bioventing to be successful. Because site soils are characterized as silty-sand and sand over much of the site, the bioventing should be effective. This technology should be laboratory bench scale tested using site soils and pilot tested in situ to evaluate adjustments to additives to optimize the time needed to reach remedial action objectives and achieve cleanup goals for site COCs, before attempting to implement a full-scale program.

A bioventing system can be fairly easily implemented, assuming that concrete slab, asphalt surfaces, and subsurface utilities are removed in the area of installation. Site access for system installation and testing is adequate for the equipment needed to install the system. Because bioventing will not remove lead from soils, and lead may be toxic to microorganisms performing bioremediation of PAHs, lead "hot spot" excavation will be performed prior to installing bioventing system equipment. Once the bioventing system is in place and during operations, site disturbance should be limited to avoid potential damage to equipment. Disadvantages of using this alternative include toxicity to bacteria from high metal COC concentrations, low effectiveness for low permeability soils, inability to remediate elevated metal concentrations in the soil, weekly maintenance of the system, and additional testing to confirm that remedial action objectives and cleanup goals can be achieved within the shortest period of time.

5. GROUNDWATER REMEDIATION

On-site soil remediation will remove much of the source of TPH groundwater contamination. Further evaluation of groundwater contamination, however, is needed before remediation costs can be evaluated. Additional evaluation methods include grab groundwater samples and installation of groundwater monitoring wells in sections of Areas A, D, G, F, and J. Free product reported in the north and central section of Area G should be actively remediated by using extraction wells combined with methods of free product extraction to expedite groundwater remediation. Depending on the petroleum hydrocarbon constituent extracted, the free product may be recycled to offset some of the remediation costs.

Groundwater remediation technologies include installation of air sparging wells or chemicals to introduce an oxygen source to the groundwater in order to increase bioremediation activity. Pump and treatment systems could also be used; however the operation and maintenance of these systems are expensive.

6. CONCLUSIONS AND RECOMMENDATIONS

Areas in need of further evaluation on-site include the soil and groundwater in sections of Areas A, B, and J, the groundwater in areas G and F. Soils in the Areas need to be better characterized for TPH, arsenic and lead contamination, and the groundwater needs to be better characterized for TPH contamination. Areas for soil remediation include sections of Areas A and J (Figures 2 and 3). Recommendations for soil remediation include excavation and removal of lead, arsenic and TPH impacted soil that are above proposed cleanup goals. A Human Health Risk Assessment (HHRA) should be conducted to evaluate risk levels for site occupants in a format acceptable to the oversight agency monitoring the site remediation activities.

Excavated soils should be transported to a Class II landfill within 20-milse of the site (either Livermore or Stockton). Soils with COC concentrations that may not meet the landfill requirements should be remediated on-site until the landfill requirements are met. Methods of in situ remediation include soil stabilization of lead and vaporization of TPH by high temperature thermal equipment. If soil stabilization of lead does not remediate the soils to Class II landfill guidelines, the soil should be transported to a Cal-Haz licensed landfill. Costs associated with excavation and removal for lead and TPH remediation, and in-situ bioventing for TPH remediation in soil are presented in Tables 5 and 6. These cost estimates are based on contaminated soil characterized in the two Geocon and one KJ report. Groundwater remediation costs were not prepared because of insufficient groundwater data. Further site characterization, including groundwater monitoring well installation, and grab groundwater sampling to monitoring groundwater contaminant migration and degradation should be conducted in Areas A, B, F, G and J.

7. SELECTED REFERENCES

Cal EPA, 2005 Use of California Human Health Screening Levels (CHHSLs) in Evaluation of Contaminated Properties: dated January.

Geocon, 2005 Phase II Environmental Site Assessment, Proposed Tracy Multimodal Station, San Joaquin, California: dated July.

Geocon, October 2005 Additional Site Investigation Report, Proposed Tracy Multimodal Station, San Joaquin, California: dated October.

Kennedy/Jenks Consultants, 2006 Draft Phase I Remedial Investigation report, Former Tracy Railyard, Tracy, California: dated April.

San Francisco Bay Regional Water Quality Control Board, 2005 Environmental Screening Levels for Residential and Commercial Land Use, dated April.

United States Environmental Protection Agency Region IX, 2004. Preliminary Remediation Goals: updated October.

TABLE 1
SUMMARY OF SITE INVESTIGATION AND REMEDIAL ACTIONS, 1992-2005

Area	Size of Area (acres)	Proposed Use	Physical Features and Areas of Potential Environmental Concern	Previous Investigations	Suspected Constituents of Concern	Highest Concentration of Constituents Detected During Previous Investigations	Constituents Hotspots	Previous Remedial Actions	Regulatory Closures
A	21.6	Residential	Surface areas of potential environmental concern included railroad right of way, railroad maintenance areas, packing sheds, signal repair building, two warehouses, and an unidentified building. Subsurface areas of potential environmental concern included two 8-inch oil pipelines.	ESA (2001), Site Characterizations (2004 and 2005)	TPH-G, TPH-D, TPH-MO, BTEX, Pesticides, Herbicides, SVOCs, and VOCs, Metals, PCBs, Asbestos	Soil: TPH=2,600 mg/kg**2**, BTEX=7,200 mg/kg**3** (2004); Soil: AS=28 mg/kg, Pb=390 mg/kg TPH-D=9,900 mg/kg (2005); GW: TPH-D=290,000 µg/L (2005).	Boring B4 (290,000 µg/L of TPH-D in GW), Trench PTP-5 (purple colored soil containing As, pesticides, and PAHs; Trench PTP-9 (coal, asphalt, and PAHs).	None reported	None reported
B and I	14.4	Residential	Historical surface areas of potential environmental concern included railroad tracks, wheel shops, oiled macadam roads, rail beds, a coal house, refuse pit, and rail welding. Subsurface areas of potential environmental concern included two (500-gallon unleaded gasoline and 1,000 gallon diesel) underground storage tanks (USTs).	Phase II ESA (1992); Soil Sampling Workplan (1993); Workplan for Further Site Characterization (1993);	Metals, TPH-G, TPH-D, BTEX, PAHs, VOCs,	Soil: Pb=2,000 mg/kg, PAH = 0.3 mg/kg, VOCs = 0.01 mg/kg (1992); Soil: Pb=3,120 mg/kg (0.5-1.0 ft bgs, 3,520 mg/kg (1.0 to 1.5 ft bgs), 882 mg/kg (1.5-2.0 ft bgs) (2003).	None reported	Removal of USTs overexcavation of 16 CY of soil (1989), well abandonment (1992). 9,900 CY of lead impacted soil removed from the site (1995). 15,600 CY of lead impacted soil stabilized to less than 1,000 mg/kg TTLC and 5.0 mg/kg STLC (1995)**1**. Four GW Monitoring wells installed (MW-3 through MW-6) and monitored (along with MW-1 and MW-2 installed in 1992) and monitored quarterly, no dissolved lead detected 9/96-3/97.	Possible UST closure, although no record found (1992). Closure requested from RWQCB for wells MW-1 through MW-6. No information on closure found.
C and D	9.3	No Planned Use for C, Parking Lot and Park for D	NA	NA	NA	NA	NA	NA	NA
E, F, G, and H	3.8	Multi-modal Transportation Hub (Commercial)	Surface areas of potential environmental concern included railroad ties and ballasts, a former oil shed, oil filled sumps and soil stockpiles. Subsurface areas of potential environmental concern included oil pipelines.	Subsurface Evaluation (1998); Phase II ESA (2005); Additional Site Investigation report (2005)	TPH-G, TPH-D, TPH-MO, BTEX, Pesticides, Herbicides, PAHs, SVOCs, VOCs, Metals	Soil: AS=67 mg/kg, Pb=2,000 mg/kg (2005); GW: TPH-G=21,000 µg/L, TPH-D=380,000 µg/L, TPH-MO=120,000 µg/L, T=7.0 µg/L, E=13 µg/L, X=8.3 µg/L (2005).	GW in western section of Area G (TPH-G =6,100 µg/L, TPH-D=190,000 µg/L); GW in SW section of Area F (TPH-G=1,500 µg/L, TPH-D=380,000 µg/L); Pb in soil in central and eastern section of Area F(200 mg/kg to 700 mg/kg), NW and eastern section of Area G (1,400 mg/kg to 2,000 mg/kg); As in Area E (43 mg/kg), central and eastern section of Area F (26 mg/kg to 67 mg/kg), NW section of Area G (38 mg/kg).	None reported	None reported
J and I	15.2	Residential for J, no Planned Use for I	Surface areas of potential environmental concern included three ponds filled with soil and concrete debris, one large above ground storage tank (AST) containing oil, an oil pump house, railroad tracks, two railroad roundhouses, a railroad turntable, an engine pit, an oil sump, a tool house, store houses, a lumber shed, an AST with unidentified contents, a power house, and railroad tracks. Subsurface areas of potential environmental concern included several oil pipelines.	None	None reported	None reported	None reported	None reported	None reported

Notes:
1 = Soil was used for backfill in the area of excavation
2 =TPH compound not identified
3 = BTEX constituents not identified
NA = Not applicable , no information was provided for review for these Areas

TABLE 2
SUMMARY OF SITE INVESTIGATION AND REMEDIAL ACTIONS, 2006

Area	Size of Area (acres)	Proposed Use	Historical Physical Features and Areas of Potential Environmental Concern	Suspected Constituents of Concern	Highest Concentration of Constituents Detected During Kennedy/Jenks Investigation (2006)	Constituents Hotspots
A	21.6	Residential	Surface areas of potential environmental concern included railroad right of way, railroad maintenance areas, packing sheds, signal repair building, two warehouses, and an unidentified building. Subsurface areas of potential environmental concern included two 8-inch oil pipelines.	TPH-G, TPH-D, TPH-MO, BTEX, Pesticides, Herbicides, SVOCs, and VOCs, Metals, PCBs, Asbestos	GW: TPH-G/D/MO=3,300 µg/L/ 720,000 µg/L/ 600,000 µg/L,	GW: Elevated concentrations of TPH-G/D/MO in western section of Area A, minor concentrations in northeast section of Area A.
B and I	14.4	Residential	Historical surface areas of potential environmental concern included railroad tracks, wheel shops, oiled macadam roads, rail beds, a coal house, refuse pit, and rail welding. Subsurface areas of potential environmental concern included two (500-gallon unleaded gasoline and 1,000 gallon diesel) underground storage tanks (USTs)	Pb	Soil: Pb=1,200 mg/kg;	North central to NE section of Area I and North central section of Area B (Pb=270 mg/kg to 860 mg/kg); Central section of Area I, NW section of Area B (Pb=200 mg/kg to 1,200 mg/kg).
C and D	9.3	No Planned Use for C, Parking Lot and Park for D	NA	NA	NA	NA
E, F, G, and H	3.8	Multi-modal Transportation Hub (Commercial)	Surface areas of potential environmental concern included railroad ties and ballasts, a former oil shed, oil filled sumps and soil stockpiles. Subsurface areas of potential environmental concern included oil pipelines.	TPH-G, TPH-D, TPH-MO, BTEX, Pesticides, Herbicides, PAHs, SVOCs, VOCs, Metals	Area G and H: (Soil) TPH-D/TPH/MO/Pb = 680 mg/kg/ 2,700 mg/kg/ 410 mg/kg. Area E and F (soil): TPH-D/MO = 560 mg/kg/ 2,300 mg/kg, Pb=240 mg/kg	NE section of Area G, center-south, and center-west area of Area F.
J and I	15.2	Residential, No Planned Use for I	Surface areas of potential environmental concern included three ponds filled with soil and concrete debris, one large above ground storage tank (AST) containing oil, an oil pump house, railroad tracks, two railroad roundhouses, a railroad turntable, an engine pit, an oil sump, a tool house, store houses, a lumber shed, an AST with unidentified contents, a power house, and railroad tracks. Subsurface areas of potential environmental concern included several oil pipelines.	As and Pb, TPH-D, TPH-MO	Soil: Pb=1,400 mg/kg; As=17 mg/kg; TPH-D/MO=7,000/15,000 mg/kg (0.5 ft.), 850/3,100 mg/kg (2 ft), 2,800/8,400 mg/kg (6 ft), 5,400/5,600 mg/kg (11 ft);. GW: TPH-D/MO =2,000/1,900 µg/L., PCE = 0.61 µg/L	Soil: SE section of Area J (Pb=210 mg/kg to 780 mg/kg, As=16 mg/kg, TPH-D/MO=380-5,600 mg/kg to 11 ft). NW section of Area J (Pb=180 mg/kg to 1,400 mg/kg, AS= 12 mg/kg to 17 mg/kg, TPH-D/MO=300/1,400 mg/kg to 11 ft). Western section of Area I (pb=180 mg/kg to 260 mg/kg). Central and northwest section of area J (several TPH-D/MO samples >1,000 mg/kg).GW: Highest concentration of TPH-D/MO plume in NW section of Area J

Notes:
1 = Soil was used for backfill in the area of excavation
2 =TPH compound not identified
3 = BTEX constituents not identified
NA = Not applicable , no information was provided for review for these Areas

TABLE 3
SUMMARY OF DATA GAPS

Area	Size of Area (acres)	Proposed Use	Data Gaps
A	21.6	Residential	• Additional soil sampling in central section is needed. • Further investigation of Lead & Arsenic in S, NW, C and NE portion. • Additional GW characterization for TPH is needed in the S, SE, and SW sections. • Additional GW samples are needed in the residential areas along the western border to evaluate off-site migration of TPH in GW. • Solubility analysis for lead should be conducted on several samples to evaluate waste disposal criteria. • A risk assessment to establish cleanup goals should be performed.
B and I	14.4	Residential in Area B, No Planned Use for I	• Lead characterization needed for the south-central section of Area B and NE section of Area I. • Additional GW samples should be collected throughout Area B and analyzed for TPH and dissolve lead. • A risk assessment to establish cleanup goals should be performed in Area B.
C and D	9.3	None for C, Parking Lot and Park for D	• If a park is constructed in Area D, site characterization and risk assessments should be performed to evaluate health risk factors for a public park. • GW sampling should be conducted in the NE corner of Area D to evaluate potential GW contamination migrating from Area G.
E, F, G, and H	3.8	Multi-modal Transportation Hub (Commercial)	• Collect additional soil samples in Area F where elevated TPH concentrations were reported to evaluate the lateral and vertical extent of TPH. • Collect GW samples in Area F where elevated TPH concentrations were reported to evaluate impact to GW. • Remove oil pipeline to evaluate where leaking may have occurred, and collect soil and GW samples to evaluate extent of contamination.
I and J	15.2	Residential in Area J, No Planned Use for I	• Solubility analysis for lead should be conducted in Area J. • Additional lead sampling and analysis should be performed in the SC, SE, and NE sections of Area J.

Notes:
C = Central, NE = Northeast, NW = Northwest, S = South, SC = South central, SE = Southeast, SW = Southwest
GW = Groundwater
TPH = Total Petroleum Hydrocarbons

TABLE 4
SUMMARY OF PROS AND CONS FOR REMEDIAL ALTERNATIVES

Alternative	Pros	Cons
Alternative 1: No Action	• No Cost • Easily implemented	• Regulatory closure may not be permitted and may limit the redevelopment of the Site. • Exposure to human and ecological receptors to existing soil contamination will continue. • Existing soil contamination could potentially create environmental liabilities and increase health risks to construction workers and residents. • No reduction in the concentration of TPH, lead and arsenic in on-site soil to below their established cleanup levels. • Potential contamination to Groundwater may increase.
Alternative 2: Reusing TPH, Arsenic, and Lead Impacted Soil On-Site	• Cost effective and convenient to remediate Areas A and J. • If lead encapsulated and the soil was stabilized the solubility of lead would be decreased, lowering environmental risk. • Only one-site traffic impacts (between subareas)	• Partially contaminated soils from Areas D, E, F, G, H, and I would have to be moved to excavate to allow for backfilling of soils from Areas A and J, thereby rehandling some materials. • If soil spread over the existing grade and capped, monitoring of the impact to groundwater may be needed. • The cap would have to be inspected and maintained over the long term. • Encapsulated lead and stabilizing the solubility of soil would still not change the human and biological health risk.
Alternative 3: Excavation and Off-Site Disposal	• Contaminated soil will be removed from the Site, reducing the human health and ecological risks. • Reduce risk of contaminated soil migrating to local groundwater.	• Higher costs associated with excavation and off-site disposal. • Potential for short term exposure risks for site workers. • High initial costs • Short term traffic impacts
Alternative 4: Bioventing	• Eliminate short term exposure risks to site workers. • Lower initial costs • No short term traffic/hauling impacts	• Only used for TPH impacted soil. • Bioventing may take many months to work. • Toxicity to bacteria from high metal concentrations • Low effectiveness for low permeability soils • Inability to remediate elevated metal concentrations • Long term operation, maintenance, and monitoring costs. • Weekly maintenance of the system • Additional testing to confirm that remedial action objectives and cleanup goals can be achieved in the shortest period of time.

TABLE 5
SOIL REMEDIATION COST ESTIMATE
LEAD AND TPH IMPACTED SOIL AS NON-HAZARDOUS WASTE

Area[1]	Contamination Type	Soil Volume (Tons)	Non Hazardous Waste Remediation Alternative and Cost[1]			
			Unit Cost/Ton	Total Cost for Residential	Total Cost for Commercial	
A	Pb-Residential	13,360	$80	$1,068,800	--	**a**
	Pb-Commercial	1,856	$80		$148,480	**b**
B	Pb-Residential	4,175	$80	$334,000	--	**c**
	Pb-Commercial	990	$80	--	$79,200	**d**
D	--	--	--	--	--	**e**
E, F, G and H	Pb-Residential	--	--	--	--	**f**
	Pb-Commercial	3,340	$80	--	$267,200	**g**
J_1 (Residential)	Pb	35,000	$80	$2,800,000	--	**h**
	TPH	19,000	$80	$1,520,000	--	**i**
J_2 (Residential)	Pb	35,000	$80	$2,800,000	--	**j**
	TPH	19,000	$168	$3,192,000	--	**k**
J_1 (Commerciall)	Pb	1,500	$80	--	$120,000	**l**
	TPH	16,200	$80	--	$1,296,000	**m**
J_2 (Commercial)	Pb	1,500	$80	--	$120,000	**n**
	TPH	16,200	$168	--	$2,721,600	**o**

Total for remediating site soil to **RESIDENTIAL** cleanup goals using excavation and off-site transport (a+c+h+i).	**$5,720,000**
Total for remediating site soil to **RESIDENTIAL** cleanup goals using excavation and off-site transport for lead and **BIOVENTING** for TPH (a+c+i+k).	**$7,390,000**
Total for remediating site soil to **COMMERCIAL** cleanup goals using excavation and off-site transport (b+d+g+l+m).	**$1,910,880**
Total for remediating site soil to **COMMERCIAL** cleanup goals using excavation and off-site transport for lead and **BIOVENTING** for TPH (b+d+g+n+o).	**$3,336,480**

Notes:

-- = Not applicable

PB = Lead

TPH = Total petroleum hydrocarbons

[1] No costs were calculated for Areas C and I because development for commercial and/or residential use is not proposed at this time.

[2] Costs do not include a 30% contingency.

J_1 =TPH to be disposed of in a as Class II landfill

J_2 =TPH to be remediated via in-situ bioventing

Groundwater remediation costs have not been calculated due to insufficient groundwater data

TABLE 6
SOIL REMEDIATION COST ESTIMATE
LEAD IMPACTED SOIL AS CALIFORNIA HAZARDOUS WASTE, TPH IMPACTED SOIL AS NON-HAZARDOUS WASTE

Area[1]	Contamination Type	Soil Volume (Tons)	Non Hazardous Waste Remediation Alternative and Cost[2]			
			Unit Cost/Ton	Total Cost for Residential	Total Cost for Commercial	
A	Pb-Residential	13,360	$140	$1,870,400	--	**a**
	Pb-Commercial	1,856	$140		$259,840	**b**
B	Pb-Residential	4,175	$140	$584,500	--	**c**
	Pb-Commercial	990	$140	--	$138,600	**d**
D	--	--	--	--	--	**e**
E, F, G and H	Pb-Residential	--	--	--	--	**f**
	Pb-Commercial	3,340	$140	--	$467,600	**g**
J_1 (Residential)	Pb	35,000	$140	$4,900,000	--	**h**
	TPH	19,000	$80	$1,520,000	--	**i**
J_2 (Residential)	Pb	35,000	$140	$4,900,000	--	**j**
	TPH	19,000	$168	$3,192,000	--	**k**
J_1 (Commerciall)	Pb	1,500	$140	--	$210,000	**l**
	TPH	16,200	$80	--	$1,296,000	**m**
J_2 (Commercial)	Pb	1,500	$140	--	$210,000	**n**
	TPH	16,200	$168	--	$2,721,600	**o**

Total for remediating site soil to **RESIDENTIAL** cleanup goals using excavation and off-site transport (a+c+h+i).	**$8,870,000**
Total for remediating site soil to **RESIDENTIAL** cleanup goals using excavation and off-site transport for lead and **BIOVENTING** for TPH (a+c+i+k).	**$10,550,000**
Total for remediating site soil to **COMMERCIAL** cleanup goals using excavation and off-site transport (b+d+g+l+m).	**$2,372,040**
Total for remediating site soil to **COMMERCIAL** cleanup goals using excavation and off-site transport for lead and **BIOVENTING** for TPH (b+d+g+n+o).	**$3,797,640**

Notes:

-- = Not applicable

PB = Lead

TPH = Total petroleum hydrocarbons

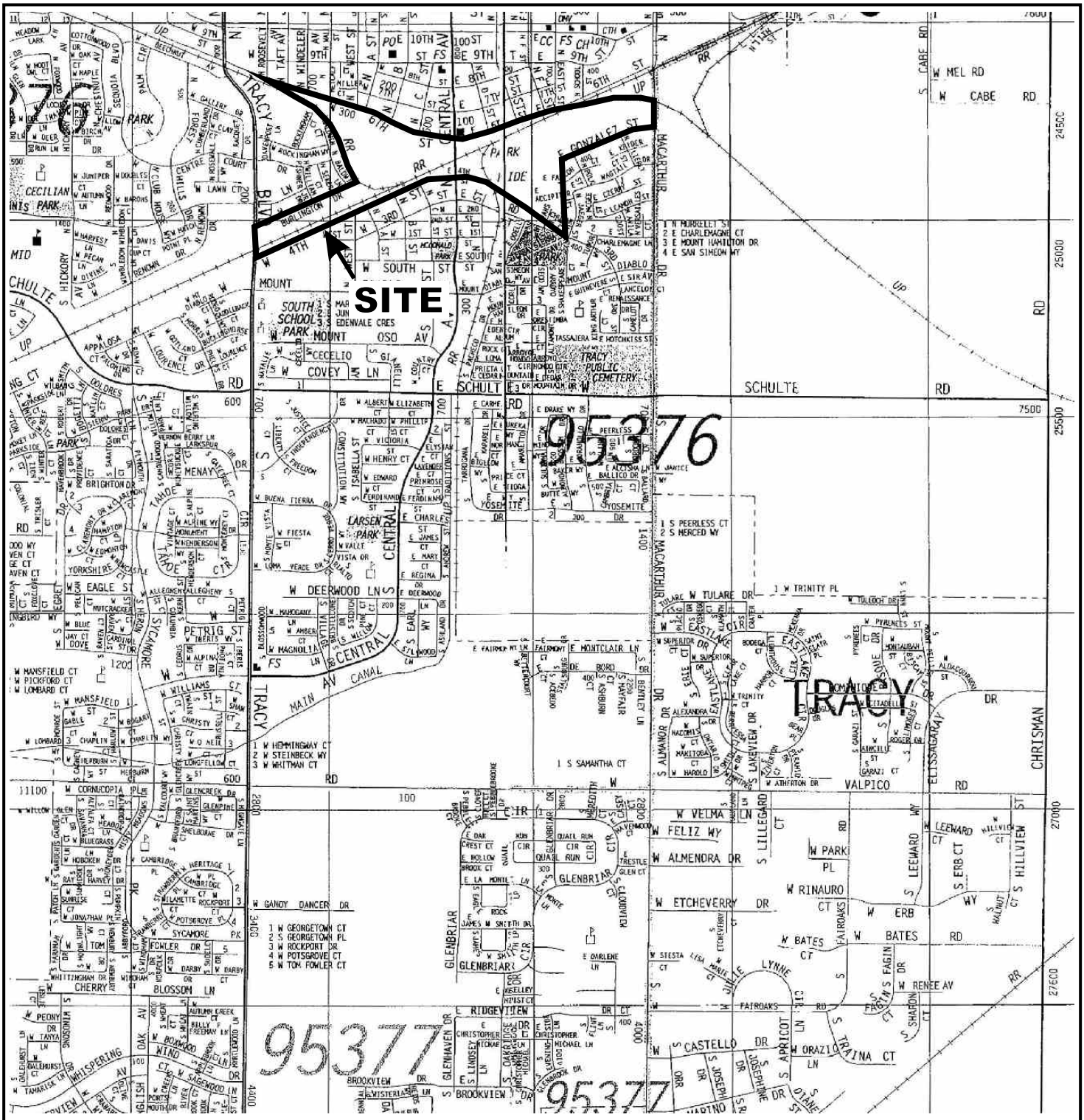
[1] No costs were calculated for Areas C and I because development for commercial and/or residential use is not proposed at this time.

[2] Costs do not include a 30% contingency.

J_1 =TPH to be disposed of in a Class II landfill

J_2 =TPH to be remediated via in-situ bioventing

Groundwater remediation costs have not been calculated due to insufficient groundwater data



401217001 slm fig 1

Ninyo & Moore	SITE LOCATION MAP	FIGURE
PROJECT NO. 401217001 / DATE 8/06	TRACY BOWTIE PROJECT TRACY, CALIFORNIA	1

N

AREA "A" 21.6 AC.±

AREA "B" 10.8 AC.±

AREA "C" 5.8 AC.±

AREA "D" 3.5 AC.±

AREA "E" 0.2 AC.±

AREA "F" 2.5 AC.±

AREA "G" 0.9 AC.±

AREA "H" 0.2 AC.±

AREA "I" 7.3 AC.±

AREA "J" 11.5 AC.±

1' 2' 3' 4'

NINTH STREET

THIRD STREET

FOURTH STREET

CENTRAL AVE.

TRACY BOULEVARD

MAC ARTHUR DR

CENTRE COURT DRIVE

TENNIS LANE

BURLINGTON DRIVE

WILLIAM FISHER DR.

DAVENPORT CT.

BUCKINGHAM WAY

BALDWIN CT.

BALDWIN LANE

SEKERA COURT

RACQUET DR

MILLER CT.

WINDSOR WAY

ROOSEVELT

TAFT

NETCALF CT.

GONZALEZ ST.

KRIDER CT.

FALCON CT.

WAGTAIL DR.

MURRELET CT.

CZERNY ST.

McGEE ST.

LEAMON ST.

ACCIPITER CT.

JAEGER ST.

CHUKAR CT.

CHARLEMAGNE CT.

CHARLEMAGNE LN.

VERSAILLES CT.

AMLA ST.

SAN SIMEON WAY

DALE DUELL DR.

FLOYD SEOO WAY

SHAKESPEARE CT.

MT. DIABLO AVE.

SIR LANCELOT CT.

LEGEND

PROPOSED EXCAVATION AREAS FOR LEAD IMPACTED SOIL

4' PROPOSED DEPTH OF EXCAVATION

APPROXIMATE SCALE

0 400 800 FEET

NOTE: ALL DIMENSIONS, DIRECTIONS AND LOCATIONS ARE APPROXIMATE

REFERENCE: BOWTIE MASTER PLAN, URBAN DESIGN ASSOCIATES, JUNE 2004.

Ninyo & Moore		PROPOSED EXCAVATION AREAS FOR LEAD IMPACTED SOIL	FIGURE
PROJECT NO.	DATE	TRACY BOWTIE PROJECT TRACY, CALIFORNIA	2
401217001	08/2006		

401217001 lead fig 2

N

AREA "A" 21.6 AC.±

AREA "B" 10.8 AC.±

AREA "C" 5.8 AC.±

AREA "D" 3.5 AC.±

AREA "E" 0.2 AC.±

AREA "F" 2.5 AC.±

AREA "G" 0.9 AC.±

AREA "H" 0.2 AC.±

AREA "I" 7.3 AC.±

1' 4' 1' 1' 4' 1' 5' 5' 4' 0.5" 10'

LEGEND

[- - -]	PROPOSED EXCAVATION AREAS FOR TPH IMPACTED SOIL
10'	PROPOSED DEPTH OF EXCAVATION

APPROXIMATE SCALE

0 400 800 FEET

NOTE: ALL DIMENSIONS, DIRECTIONS AND LOCATIONS ARE APPROXIMATE

REFERENCE: BOWTIE MASTER PLAN, URBAN DESIGN ASSOCIATES, JUNE 2004.

Ninyo & Moore	PROPOSED EXCAVATION AREAS FOR TPH IMPACTED SOIL	FIGURE
PROJECT NO. 401217001 / DATE 08/2006	TRACY BOWTIE PROJECT TRACY, CALIFORNIA	3

401217001 TPH fig 3