

**Review of
Southern Pacific Railyard Site
Investigation, Remediation, and Redevelopment**

Prepared by

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EXECUTIVE SUMMARY

Some areas of the Southern Pacific Railyard site (SP site) are known to be contaminated with a variety of potentially hazardous chemicals including lead and other heavy metals, and a variety of organics some of which are known human carcinogens. While SP has signed an enforceable agreement with the Department of Health Services (DHS) to remediate the site under California Bond Expenditure Plan Requirements (state "superfund"), that agreement does not require that all potentially hazardous chemicals be removed from the site. Partial clean-up is accepted remediation at superfund sites, but must be accompanied by constraints on future uses of the site.

The city of Sacramento (the City) contracted for us to act as independent technical advisors to the City to review initial aspects of the remediation of the SP site. We were asked to critically review and comment on the information available on the current degree of contamination, the adequacy of the investigations being conducted and planned to define contamination and its hazards to public health and the environment, the adequacy of past and proposed approaches for remediation of the contamination, and the compatibility of proposed plans for redevelopment with the residual contamination that will exist after the site has been cleaned up to the degree accomplished and proposed - i.e., "remediated." We provided a technical discussion of the results of our review in a technical report to the City Department of Planning and Development. That report provides additional information on the basis of our findings.

This report summarize the conclusions of our review and presents our recommendations to the City for actions and approaches it should consider taking as part of its evaluation of the remediation and redevelopment of the SP site. This executive summary highlights principal findings and recommendation discussed in this report.

Adequacy of Site Remediation

- * The state "superfund" review and remediation process applicable to the SP site may not be adequate to provide for long-term protection of public health (especially children) and environmental quality if the site is redeveloped as currently envisioned. "Superfund" investigations and remediation approaches being used today were not developed to be necessarily adequate for ensuring protection of public health and environmental quality associated with intense public use of "remediated" sites.
- * Remediation that has been accomplished and that is planned for parts of the SP site involve leaving potentially hazardous chemicals in those areas. The constraints on future uses of those areas, such as designating them as commercial/industrial and imposing associated deed restrictions, may not provide adequate protection for users of those areas or surrounding areas.
- * The current personnel in DHS who are responsible for overseeing the investigation and remediation of the SP site appear to be providing diligent implementation of DHS policy and approaches for the SP site.
- * SP's meeting requirements approved by DHS for site investigation and remediation cannot be considered necessarily adequate to provide long-term protection of public health and environmental quality from chemical contaminants derived from SP's activities, or to protect the City's interests associated with the redevelopment of the property.
- * The amount of site investigation and remediation that has been effected thus far at the SP site has provided a limited track record of the adequacy of the design, implementation, and efficacy of the site investigation and remediation that will be accomplished at the site to provide for public protection associated with the envisioned

redevelopment. The approaches adopted thus far do not give us confidence that future site investigation, remediation, and redevelopment will be done in a way to ensure near-term or long-term protection of public health, environmental quality, or the interests of the City given the proposed plans for redevelopment.

- * Potentially significant deficiencies have been found in a number of areas of the SP site investigation including soil-gas migration assessment, remediation of lead-contaminated soils, chemical translocation (uptake from soil by plant roots with deposition in leaves and/or fruit) of lead and other contaminants, and overall characterization of contamination associated with the site.
- * With DHS approval SP has adopted a remediation approach for some areas of the site that involves partial clean-up of potentially hazardous chemicals. This remediation also includes the designation of those areas for commercial/industrial use and the imposition of deed restrictions (which the City must implement) designed to limit activities in those areas. While deed restrictions may provide appropriate protection of public health in isolated, insulated industrial areas that have received partial clean-up (remediation), this approach may not be appropriate or adequate for the commercial/industrial areas of the SP site. This is largely related to the proximity of the commercial/industrial areas, without isolation, from residential and public open-space that is currently being planned, as well as possible uses within commercial/industrial areas that could cause unacceptable exposure of members of the public.
- * If the City chooses to proceed to include plans for residential use, open-space, and other intensive public contact activities at the redeveloped site, it should consider providing significant additional safeguards to address the concerns raised about the adequacy of the investigation and remediation for providing near-term and long-term protection of public health, environmental quality, and the interests of the City.

- * The City should consider developing a comprehensive set of additional safeguards to be implemented associated with any permitting of activities in areas only remediated to levels acceptable for commercial/industrial use.

Groundwater Contamination

- * At least two areas of groundwater contamination (plumes) have been found to have been generated by SP's operations; one plume extends beneath the City from the SP site south to at least O St. The plumes contain highly hazardous chemicals that cause the waters to be unsuitable for use for domestic and some other purposes. The type, degree, and extent of contamination of the groundwater beneath the SP site and off-site underneath the City have not yet been adequately characterized.
- * While it is reported that the groundwaters in the area of the SP site are not now used for domestic purposes, the City should consider requiring that they be remediated to meet state drinking water standards to protect the resource for future users.
- * Potential problems with soil-gas migration of hazardous chemicals from contaminated groundwater have not been adequately addressed.
- * The City should consider requiring an appropriate, in-depth evaluation of the potential for soil-gas migration from the contaminated groundwaters to the basements or other enclosed areas of buildings that exist or could be developed above the groundwater contamination plumes from the SP site.

Stormwater and Sewage Management

- * The current redevelopment plans for the SP site could be significantly impacted by failure of the City to solve its combined sewer overflow problems. The Regional Water Quality Control Board has considered placing a moratorium on future development within the City until those problems are resolved.
- * The City should consider the impact that a moratorium on sewer hook-ups at the SP site could have on the redevelopment of the site. If it is found that there is a significant potential for such a moratorium, then the City should consider the possibility of developing its own domestic wastewater and stormwater management systems, including treatment works for the SP site.

Redevelopment Planning

- * The planning that has been done by the Roma Design Group has provided insight into possibilities for redevelopment of the site and has helped focus our review of the site investigation and remediation on problems that could arise from redevelopment of the site in light of remediation approaches adopted and proposed by SP.
- * The City should consider evaluating the degree of public health and environmental quality protection that should be provided by SP's site investigation and remediation.
- * Before further significant planning for redevelopment is done, the City should consider carefully evaluating the compatibility of the proposed uses, both in the near-term and the long-term, with the remediation being conducted, including the provision to leave potentially significant amounts of hazardous chemicals at the site. The resolution of the various issues raised in this report should be accomplished before significant additional

planning is done.

Overall Recommendation

- * The City should consider becoming a more active participant in decision-making concerning, and oversight on, the site investigation, the remediation of various areas of the SP site, and the appropriateness of redevelopment of the site for certain types of uses. A focus of its participation should be the minimization of the potential for children to be exposed to elevated concentrations of lead and other contaminants through intended and inadvertent use, as well as through plausible misuse of the area.
- * We recommend that the City conduct in-depth reviews of each component of site investigation, remediation, and redevelopment as they are developed and executed to help ensure that the desired level of protection of public health, environmental quality, and its interests will be achieved.
- * To implement these recommendations, an independent, third-party advisor(s) should be retained by the City to provide in-depth evaluation and advice to the City on each aspect of site investigation, remediation, and redevelopment, as each is developed, reviewed by DHS and others, and implemented. The advisor(s) must be knowledgeable, highly active, and adequately funded. The advisor(s) should report to City officials responsible for formulating City policy. If such an advisor were appointed, we would recommend the City proceed, cautiously, with the redevelopment of the SP site.

SUMMARY

Since the mid-1800's, the Southern Pacific Transportation Company (SP) has conducted a variety of locomotive maintenance and repair operations at its Sacramento Railyard (the site). SP has indicated its plan to terminate its activities there, and its interest in selling the site property. The proximity of the site to downtown Sacramento and its location on the Sacramento riverfront make it a desirable site for redevelopment. However, some areas of the SP site are contaminated with a number of potentially hazardous chemicals, including lead and other heavy metals, and a variety of organics some of which are known human carcinogens. The chemical contamination at the site has to be remediated (cleaned-up to an agreed-to degree) according to California Bond Expenditure Plan Requirements (state "superfund") under the direction of the Department of Health Services (DHS) and other regulatory agencies. SP signed an enforceable agreement with DHS that ensures that hazardous chemical contamination at the site will be remediated to a level acceptable to DHS. The agreement and requirements do not, however, require that all potentially hazardous chemicals be removed from the site. Partial clean-up, accompanied by constraints on future uses of the site, is accepted remediation at superfund sites. It is generally the approach being followed by SP for its Sacramento site. SP is now in the process of evaluating the amount and extent of contamination at the site, negotiating the amount of clean-up that will be done and approaches that will be used for remediation, and conducting remediation of chemical contamination under the supervision of the DHS and the Central Valley Regional Water Quality Control Board.

The city of Sacramento (the City) contracted for us to act as independent technical advisors to the City to review initial aspects of the remediation of the SP site. We were asked to critically review and comment on the information available on the current degree of contamination, the adequacy of the investigations being conducted and planned to define contamination and its hazards to public health and the environment, the adequacy of past and proposed approaches for remediation of the contamination, and the compatibility of proposed plans for redevelopment with the residual contamination that will exist after the site has been

remediated - i.e., cleaned up to the degree accomplished and proposed. We provided a technical discussion of the results of our review in a technical report to the City Department of Planning and Development.

This report summarizes the findings of our review and presents our recommendations to the City for actions and approaches it should take as part of its evaluating the remediation and redevelopment of the SP site.

The Adequacy of Requirements

We have found that the "superfund" review and remediation process may not be adequate to provide for long-term protection of public health and environmental quality at the SP site if it is redeveloped as currently envisioned. The provisions of the Superfund evaluation and remediation requirements were developed largely for the protection of uses of adjacent properties, not for long-term protection of public health and environmental quality associated with intensive public re-use of the remediated site. The current personnel in DHS who are responsible for overseeing the investigation and remediation of the SP site appear to be providing diligent implementation of DHS policy and approaches for the SP site. We have also found through this review, however, that SP's meeting requirements approved by DHS for the site investigation and remediation cannot be considered necessarily adequate to provide long-term protection of public health and environmental quality from chemical contaminants derived from SP's activities, or to protect the City's interests associated with the redevelopment of the property.

We recommend that an independent, third-party advisor be retained to provide in-depth evaluation and advice to the City on each aspect of site investigation, remediation, and redevelopment, as each is developed, reviewed by DHS and others, and implemented. Characteristics of such an advisor are described elsewhere in this report. If such an advisor

were appointed, we would recommend that the City proceed, but proceed cautiously, with the redevelopment of the SP site.

Deficiencies in Study Plan and Remediation

We have found that the types of investigations conducted and proposed for the SP site are, with a few omissions, basically those used for Superfund sites. We have also found that the remediation approaches that have been followed and proposed are in keeping with what could be done at a Superfund site. However, plans for use of the SP property after remediation are not similar to those of typical Superfund sites; few Superfund sites are redeveloped to include intensive public activity with residences and public open-space. We have found that a number of areas in which the site investigation and the remediation completed thus far have been inadequate in light of the type of redevelopment that is being planned. Key deficiencies are in the areas of soil-gas assessment, remediation of lead-contaminated soil, chemical translocation (uptake from soil by plant roots with deposition in leaves and/or fruit), and overall characterization of contamination associated with the site.

We recommend that the City consider becoming more active in decision-making concerning, and oversight on, the site investigation, the remediation of various areas of the SP site, and the appropriateness of redevelopment of the site for certain types of uses. A focus of its participation should be the minimization of the potential for children to be exposed to elevated concentrations of lead and other contaminants through intended and unintended use and plausible misuse. We also recommend that the City develop a comprehensive set of additional safeguards that it would require to be implemented associated with any permitting of activities in areas remediated for commercial/industrial use, to significantly reduce the possibility that children could be exposed to elevated concentrations of lead and other contaminants left at the site.

Deed Restrictions

DHS has established a requirement that a deed restriction be placed on the one area of the SP site that has received remediation, the Battery Shop Yard. That area was remediated to meet the limitations for lead in soil in commercial/industrial areas. The purpose of the deed restriction was to prevent future uses of the area that are incompatible with the contamination that was left in the area. Such a restriction is especially important because of the proposed mixed uses of the site involving intensive public activity, and because SP and DHS have allowed hazardous chemicals from SP's operations to remain in that area. There are legitimate concerns about the actual effectiveness and appropriateness of relying on deed restrictions for long-term protection of public health, environmental quality, and the interests of the City from contaminant residues that are left at the site. Those concerns relate to the implementation of the deed restrictions by the City, the interpretation of deed restrictions, and the reliability of deed restrictions for providing public health protection for as long as the contamination remains in the area - forever.

Even with the concerns and inadequacies inherent in the deed restriction approach, we are not aware of other approaches that could be guaranteed to provide adequate long-term protection of public health, environmental quality, or the City's interests from hazardous chemicals left at a site that will be redeveloped as is planned for the SP site. Because of this and other concerns raised in this report, we believe that if the City wishes to proceed to include plans for residential use, open-space, and other intensive public contact activities at the redeveloped site, it should consider providing significant additional safeguards to address these concerns.

We recommend that the City carefully evaluate the protection of public health, environmental quality, and its interests afforded by remediation, involving partial clean-up with deed restrictions, of the type adopted for the Battery Shop Yard area. As part of that evaluation, the City should carefully consider its ability to diligently implement such deed restrictions at the

redeveloped SP site, not only initially but also in the future - forever, in light of the character of the remediated areas and the proposed redevelopment of the site. We also recommend that if the City believes that it may not be able to adequately protect public health, environmental quality, and its interests through the language and implementation of deed restrictions, the City should consider a different approach for remediation and/or redevelopment of the site that would provide for more fail-safe protection.

We also recommend that the City and its technical advisors carefully review the language of the existing deed restriction on the Battery Shop Yard area, and all future proposed deed restrictions, for their adequacy for protection of public health, environmental quality, and the City's interests. That review should go beyond legal review and interpretation to include careful consideration of the risks associated with intended and inadvertent use, as well as for plausible misuse of the area.

On-Site Groundwater Contamination

The type, degree, and extent of contamination of the groundwater beneath the SP site have not yet been adequately characterized. There is a potential problem for redevelopment associated with the vapor-phase migration of certain hazardous chemicals known to be in the on-site groundwater contamination plume, through the soil. That soil-gas, if it develops, could migrate to basements and other confined areas where it could pose a human health problem.

There is also concern about potential impacts of contaminated groundwater extracted during construction and developed-property de-watering, use for cooling purposes, etc. As long as property de-watering, use of groundwater for cooling, etc. are done in such a manner as to prevent significant human and animal contact with the chemicals present in those waters, and appropriate care is taken in managing waters pumped for those uses, and as long as the waters are not used for domestic purposes, the contaminants in the groundwater under the SP site do

not appear to be of significant immediate concern for property redevelopment. However, based on the information we have been provided, it appears that the plans for handling of those waters have not been finalized.

We recommend that the City evaluate the adequacy of the current Regional Water Quality Control Board permit requirements for extraction and disposal of contaminated groundwaters derived from the SP site. Based on the results of that review the City may need to develop additional safeguards to ensure that any extraction of contaminated groundwaters does not represent a significant threat to public health or environmental quality.

The City should require that an appropriate in-depth evaluation be made of the potential for soil-gas migration from the contaminated groundwaters to the basements or other enclosed areas of buildings that could be developed above the groundwater contamination. The City should consider becoming a more active participant in helping to develop those studies, in data collection and review, and in interpretation of results. If the results show that soil-gas migration of hazardous chemicals is of potential significance at the site, the City should require remediation of soil-gas. The City should also require that all construction of buildings and other structures be done in such a way as to prevent entry of soil-gas or at least significantly reduce the amount of hazardous chemicals present in soil-gas that can enter confined areas of buildings.

Off-Site Groundwater Contamination

The potential problems with off-site groundwater contamination from SP's operations are essentially the same as the on-site groundwater contamination concerns. The limited studies that have been conducted thus far have determined that there is a substantial groundwater contamination plume that has migrated from the SP site under the City to the southeast and south of the SP site to at least O Street. That plume contains significant amounts of hazardous

chemicals that, according to current federal and state drinking water standards, would increase the potential for individuals who consume this water over a long period of time to have an additional cancer risk. Since based on the information made available to us, the groundwater in the affected area is not known to be used for domestic water supply purposes at this time, there does not appear to be an existing domestic water supply problem associated with the contamination of off-site groundwaters by SP's past operations at the site. We are highly concerned, however, that at least at this time SP is not committed to cleaning up the off-site contaminated groundwaters. We feel that the City should take appropriate steps to ensure that all off-site groundwater contamination from the SP site is appropriately cleaned up. While the City may have no plans at this time for utilizing off-site groundwaters contaminated by SP-derived chemicals, the water resources available to the City are finite. The quality of those resources should be protected from all contamination. Where contamination is present, such as under and downgradient from the SP site, an appropriate groundwater remediation program should be implemented to preserve the options of future generations for use of that water for domestic or other purposes.

We recommend that the City vigorously pursue off-site groundwater remediation to levels considered safe for domestic water supply use for all contaminants derived from SP's operations.

The City should require that an appropriate in-depth evaluation be made of the potential for soil-gas migration from the contaminated groundwaters off-site to the basements and other areas of buildings above the off-site groundwater contamination plume. If soil-gas migration is occurring in sufficient amounts to be hazardous to public health for occupants of buildings situated above the SP-derived groundwater contamination plume, then the City should work with the occupants of those buildings to provide for increased ventilation and for construction of barriers to prevent hazardous gas migration into confined areas, and to take other steps to protect public health and the environment from excessive exposure to hazardous chemicals derived from the groundwater plume. The City should also require that the soil-gas be remediated by SP.

We recommend that the City require an evaluation of potential impacts associated with groundwater extraction as part of construction and existing building de-watering, and associated with use of off-site groundwaters, to ensure that adequate protection is provided for public health and environmental quality.

Hazards of Groundwater Remediation

Insufficient information is available at this time to determine whether the gas stripping approach that has been mentioned as a possible approach for removal of hazardous chemicals from contaminated groundwaters will represent a threat to public health and the environment. Thus far, the regulatory agencies have not issued a decision on that matter. Based on evaluations made at other, Superfund sites, we believe that air stripping of the hazardous chemicals present in groundwaters under the SP site and off-site can be done without significant threat to public health and the environment.

We recommend that the City become a more active participant in developing approaches for removal of hazardous chemicals from contaminated groundwaters to ensure that the removal process does not result in a significant increase in the potential for public health and environmental quality problems. Those efforts should include a detailed review of the design and operation of such systems, independent sample collection and analysis, and independent evaluation of the performance of those systems as long as they are in operation. It will likely take many tens of years for the remediation of the groundwaters contaminated by SP's former operations, to reduce the concentrations of known contaminants to levels below federal and state drinking water standards.

Asbestos

There is asbestos present in buildings at the SP site and there is the potential for asbestos to be buried in fill at the SP site. Airborne asbestos can be a significant threat to public health because it can cause lung cancer. It is possible to control airborne asbestos as part of site construction and use. However, insufficient information is available to enable us to determine whether the regulatory agencies will require appropriate airborne asbestos control measures and to oversee their use to ensure that significant public health threats do not arise out of SP building demolition, and reconstruction in areas where asbestos may be buried.

We recommend that the City become a more active participant in developing an assessment of the asbestos hazard that may exist at the SP site, formulating approaches for control of any significant hazards that are found, and in conducting an independent third-party sampling for airborne asbestos during building demolition and construction activities.

Urban Stormwater Contaminant Management and Combined Sewer Overflow Problems

The current redevelopment plans for the SP site could be significantly impacted by failure of the City to solve its combined sewer overflow problems. The Regional Water Quality Control Board has considered placing a moratorium on future development within the City until those problems are resolved.

We recommend that the City consider the impact that a moratorium on sewer hook-ups at the SP site could have on the redevelopment of the site. If it is found that there is a significant potential for such a moratorium, then the City should consider the possibility of developing its own domestic wastewater and stormwater management systems, including treatment works for the SP site. The treatment works should include provisions for treatment of contaminants that will be present in the stormwater derived from the SP site as a result of the

infiltration of contaminated groundwater into the storm sewers.

Protection of Public Health and Environmental Quality

The current SP site review, remediation, and redevelopment process may not necessarily result in high degrees of protection of public health and environmental quality. The amount of site investigation and remediation that has been effected thus far at the SP site has provided a limited track record of the adequacy of the design, implementation, and efficacy of the site investigation and remediation that will be accomplished at the site to provide for public protection associated with the envisioned redevelopment. The approaches adopted thus far do not give us confidence that future site investigation, remediation, and redevelopment will be done in such a way to ensure near-term or long-term protection of public health, environmental quality, or the interests of the City given the proposed plans for redevelopment.

We recommend that the City consider evaluating the degree of public health and environmental quality protection that should be required in SP site investigation and remediation. We recommend that the City establish a third-party, independent, knowledgeable, adequately funded, highly active review group to advise the City on the adequacy of each component of the SP site investigation, remediation, and redevelopment for providing the desired degree of protection of public health, environmental quality, and interests of the City.

Rate of Redevelopment vs. Site Remediation

We have identified a number of issues in our review that could have a significant impact on what is included in the redevelopment as well as on the degree of remediation that will be necessary in order to include certain elements or uses in the redevelopment. Resolution of those issues may significantly influence what SP chooses to do with the property. Roma Design

Group has given consideration to major areas of known contamination in its placement of certain structures in the proposed redevelopment. There are questions that remain about the adequacy of those proposed uses and their placement relative to both known, and especially currently unknown areas of contamination at the site. Before further significant planning for redevelopment should be done, the City should carefully evaluate the compatibility of the proposed uses, both in the near-term and in the long-term, with the negotiated remediation, including the two-level approach for site remediation, and leaving significant amounts of hazardous chemicals at the site. The resolution of the various issues raised in our report should be accomplished before significant additional planning is done.

There is a significant lack of information about the hazards that exist at the site and about the adequacy of approaches that have been carried out and proposed for remediation. The redevelopment phasing proposed by Roma Design Group appears to be adequate in light of the timetable SP has developed for site characterization and remediation. It should be understood, however, that because of the large number of unknowns and issues that have to be addressed and resolved by the City, and unknowns about what SP may "negotiate" with DHS and the acceptability of those negotiations to the City in light of its interests, significant changes could be necessary and desirable. Those changes could include significant redesign of the site.

Caution should be exercised in proceeding with significant redevelopment of the site until there is a better understanding of the potential hazards associated with the site and of the approach that the City plans to adopt in permitting the redevelopment of the site in light of the contaminants to be left at the site by SP.

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INTRODUCTION

The Site

Since the mid-1800's the Southern Pacific Transportation Company (SP) has conducted a variety of locomotive maintenance and repair operations at its Sacramento Railyard (the site). In recent years SP has significantly reduced its industrial locomotive yard activities at the site and has indicated that it plans to terminate all of the industrial activities there by the mid-1990's. SP has also indicated its interested in selling the site property. The proximity of the property to downtown Sacramento and its location on the Sacramento riverfront make it a desirable site for redevelopment. In the early-1980's, however, it was found that some areas of the SP site were contaminated with a number of potentially hazardous chemicals. The site is now subject to the California Bond Expenditure Plan Requirements (the state "superfund"). Therefore, the chemical contamination at the site will have to be remediated in accordance with the requirements set forth by the Department of Health Services (DHS) and other regulatory agencies. In June 1988, SP signed an enforceable agreement with DHS that ensures that hazardous chemical contamination at the site will be remediated.

An important concept that is discussed in other sections of this report is that the "clean-up" or "remediation" of a superfund site does not mean that all potentially hazardous chemicals are removed from the site. Those terms typically refer to partial clean-up with restrictions of future uses of the remediated area. At superfund sites, potentially hazardous chemicals may be left at the site but immobilized, detoxified, or reduced in concentration to reduce the hazards they pose to users of the site or adjacent properties. There are degrees of protection, and uncertainty about protection, afforded by those and other "clean-up" approaches.

Remediation of parts of the site, such as the Battery Shop Yard area, is subject to US EPA Region IX RCRA requirements (requirements that control the treatment of hazardous wastes for active facilities). This means that once DHS has approved the remediation for those

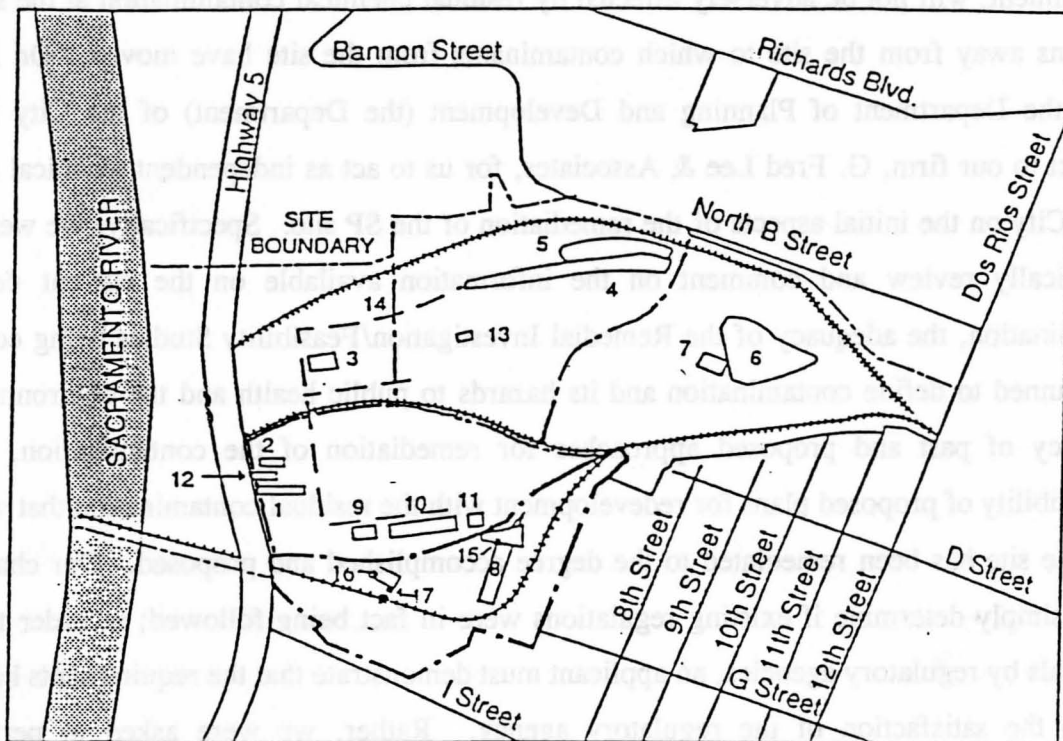
areas, documentation on the remediation is sent to the US EPA Region IX for its review and approval. While this is not US EPA "Superfund" review, it is similar in many respects to such a review. For the purposes of this project and report, we are only considering DHS review since it is applicable to the entire site.

As discussed later in this report, state and applicable federal regulations specify the general approach that must be followed to investigate and remediate a contaminated site, and the reports and other documents that must be filed. For example, early in the process Remedial Investigation/Feasibility Studies (RI/FS's) must be done; their purpose is to determine what chemicals exist at the site, how much contamination there is, potential problems that could be caused by the chemicals, how well the chemicals should be cleaned up based on how the site will be used in the future, potentially applicable remediation technology, etc. The regulations, however, do not specify many details of what needs to be done at any site to investigate the amount of contamination, the amount of remediation needed, the appropriate methods for remediation, etc. Those details are worked out between the applicant, in this case SP, and the regulatory agencies, in this case DHS, the Central Valley Regional Water Quality Control Board, and other agencies, and for some areas, the US EPA.

SP is now in the process of evaluating the amount and extent of contamination at the site, negotiating the amount of remediation and approaches that will be used for remediation, and carrying out remediation of chemical contamination under the supervision of the DHS and the Central Valley Regional Water Quality Control Board. Figure 1 shows the layout of the SP site and areas of contamination known as of January 1990.

Much of the focus on chemical contaminants at the SP site has been on lead, primarily because it is known to exist in certain areas and because the remediation of lead-contaminated soils was the focus of the approved remediation that has taken place at the site. There are other chemicals at the site that represent significant threats to children and others; lead is an example and the one that will receive focus in this report.

Figure 1. SP Site Layout and Areas of Contamination
Known As of January 1990



SOUTHERN PACIFIC SACRAMENTO RAILROAD YARD

LEGEND

- | | |
|---|--|
| 1. Painting Facility Area | 10. Former Forge Shops |
| 2. Locomotive Cleaning Area | 11. Former Battery Shop |
| 3. Former Brass Foundry | 12. Sand Piles |
| 4. Former Ponds and Ditch | 13. Former Drum Storage Area |
| 5. Former Lagoon | 14. — — Industrial Waste Collection System (Trunk Lines) |
| 6. Former Sandblasting Area and Former Painting Sheds | 15. Metals-contaminated Soil |
| 7. Former Car Shop No. 9 | 16. Hydrocarbons-contaminated Soil |
| 8. Former Wheel Foundry | 17. Soil Sampling Unit 23 (SS-23) |
| 9. Sheet Metal Shop and Former Radiator Shop | |

0 500 1000 1500 2000

feet



The Project and Its Objectives

The city of Sacramento (the City) has an important interest in seeing that the SP site is adequately cleaned up to be reasonably confident that future users of the area, and the environment, will not be adversely affected by residual chemical contamination at the site or at locations away from the site to which contaminants from the site have moved. On July 19, 1990, the Department of Planning and Development (the Department) of the City issued a contract to our firm, G. Fred Lee & Associates, for us to act as independent technical advisors to the City on the initial aspects of the remediation of the SP site. Specifically, we were asked to critically review and comment on the information available on the current degree of contamination, the adequacy of the Remedial Investigation/Feasibility Studies being conducted and planned to define contamination and its hazards to public health and the environment, the adequacy of past and proposed approaches for remediation of the contamination, and the compatibility of proposed plans for redevelopment with the residual contamination that will exist after the site has been remediated to the degree accomplished and proposed. Our charge was not to simply determine if existing regulations were in fact being followed; in order to obtain approvals by regulatory agencies, an applicant must demonstrate that the requirements have been met to the satisfaction of the regulatory agency. Rather, we were asked to perform an independent review of the adequacy of what has been done and of what is proposed, for providing protection of public health and environmental quality. That information would be used by the City to help it make its assessment of the redevelopment of the site. As discussed in this report, the fact that regulatory requirements are met does not necessarily mean that adequate protection of public health or environmental quality will be provided.

Our investigation did not include evaluating the reliability of the data that were generated or information presented by SP and its consultants. Rather, it was the adequacy of what was done, under the assumption that it was done correctly, that was subject of this review. We did not conduct any independent sampling or analysis, or observation of the activities as they were conducted at the site. We also did not examine the activities proposed for or conducted at the site for their conformance to and sufficiency for meeting existing applicable regulations. As

noted above, it is DHS's responsibility to ensure that all legal requirements for the site are met. While not a specific area of detailed investigation in our review, we have no reason to believe that regulatory requirements have not been met. Finally, our review of information generated for site evaluation and remediation was terminated in early September due to funding constraints; no information developed since that time is included in our review.

Our contract is administered by the Environmental Services Division of the Department of Planning and Development. H. Keeler is Project Coordinator for the City; G. Tholen is the Project Manager for the City.

The Authors

We have extensive experience in determining the sources and presence of chemical contaminants, in evaluating their environmental-water quality and public health significance, and in developing and applying appropriate treatment technologies for chemical contaminants in aquatic and terrestrial (land) systems. We also have extensive experience in Superfund site investigations, risk assessment and remediation, and in the evaluation and management of chemical contaminants associated with development and redevelopment of property. A summary of our expertise and experience pertinent to this project is included in Attachment A.

The Report

Our contract with the City calls for us to prepare a report of our findings for the City Council and for distribution. This document fulfills that requirement. In order to help the Department staff understand the issues and what we have learned about the site, we also developed a companion, technical report that provides additional detail and background discussion of the issues covered in this report. A copy of the final technical report was provided to the city of Sacramento Department of Planning and Development. The information in these

two reports will be summarized in our presentation to the Sacramento Environmental Commission currently scheduled for October 22, 1990.

Draft versions of both of these reports were provided to the City who gave copies to SP for review and comment by SP and its consultants. We have reviewed and discussed the comments received from the City and SP, and have made modifications in the draft reports where we believed appropriate. In addition, we have provided the City with our responses to SP's comments.

This final report focuses on issues of concern about the SP site, and our recommendations for what the City should consider doing as part of its own assessment of the redevelopment of the site, in light of our findings. The issues and questions covered have arisen either out of the information that we have reviewed. Attachment B provides a description of the materials we were provided for review, the individuals with whom we discussed the activities at the SP site, and other sources of information. Further insight has been provided into this situation by our interactions with researchers and regulators, and our professional experience and expertise.

The format for the report is as follows. An issue is introduced, and one or more questions are raised about that issue. For each question, we provide a brief overall statement of our findings on the issue. Also presented is a brief discussion of points of concern from our findings, based on our review of the information provided to us, our discussions with others as noted in Attachment B, and our best professional judgement. For most issues, an expanded discussion is provided in the technical report. We then make recommendations on actions that the City should consider taking in response to the situation as part of its assessment and evaluation of the redevelopment. Our recommendations represent our best professional judgement based on the technical information made available to us; they are meant only to provide guidance to the City on areas and approaches that we believe should be considered in its formulation of policy governing evaluation of the adequacy of the site investigation and remediation and the appropriateness of redevelopment.

RESULTS OF REVIEW

Issue 1: The Adequacy of Requirements

Is the current "superfund" investigation and remediation process adequate to provide for long-term protection of public health and environmental quality associated with the redevelopment of the SP site?

Findings

The law requires that state "superfund" sites be "remediated," i.e., cleaned up to a level negotiated with the regulatory agencies. "Remediation" does not typically mean the removal of all potentially hazardous chemicals, but rather removal or treatment of the hazardous materials to levels that are believed to pose minimal hazard to people and the environment based on how the area will be used. It is the finding of this review that the "superfund" evaluation and remediation process may not be adequate to provide for near-term or long-term protection of public health and environmental quality at sites that are to be redeveloped for intensive public use such as is proposed for the SP site. The basis for this finding and discussion of specific potential deficiencies in this program as pertinent to the SP site are provided in Attachment C.

Details of the evaluation of the type and degree of contamination, the amount of clean-up needed for subsequent use of the property, and other issues pertinent to superfund site remediation are developed on a site-specific basis. The technical community as a whole, however, has not come to consensus about minimum requirements for these details for a typical insulated superfund site, much less what would be needed for a particular site that is being planned to have intensive public use and residences. There are two components that need to be considered in establishing the site-specific requirements: (a) the degree of public health protection that can and should be afforded both on the remediated site and adjacent to it, and (b) the nature and comprehensiveness of investigation and remediation needed to achieve the given degree of public health protection given the anticipated re-uses of the site. The acceptable degree of public health protection is a subjective assessment and thus typically involves some

degree of negotiation between the applicant, in this case SP, and the regulating agencies, in this case principally DHS. The technical community has not come to consensus about the comprehensiveness of investigation (such as the numbers, types, and locations of samples, and analyses needed), and the amount and type of remediation that are needed to provide any given degree of public health protection. This results in the establishment of a number of important details for site investigation and remediation with somewhat arbitrary or subjective specifications (such as location, numbers, and types of samples to be taken, and analyses to be performed on the samples). While the need for site-specific investigation and requirements is well-recognized, the negotiation process can lead to inadequacies in investigation and remediation as applicants try to minimize expenditures and agencies do their best to require adequate work. A number of specific concerns in this regard about the SP site are discussed in Issue 2 below.

It is the finding of this review that the current personnel in DHS who are responsible for overseeing the investigation and remediation of the SP site appear to be providing diligent implementation of DHS policy and approaches for the SP site. It is also the finding of this review, however, that SP's meeting requirements approved by DHS for the site investigation and remediation cannot be considered necessarily adequate to provide near-term or long-term protection of public health or environmental quality from chemical contaminants derived from SP's activities, or to protect the City's interests associated with the redevelopment of the property. We are concerned about several specific aspects of procedures that have been accepted or approved by DHS for the SP site investigation and remediation, and the adequacy of certain subjective specifications established. We note specific examples in Attachment C and in other sections of this report.

Recommendation

We recommend that an independent, third-party advisor be retained to provide in-depth evaluation and advice to the City on each aspect of site investigation, remediation, and redevelopment, as each aspect is developed, reviewed by DHS and others, and implemented.

Characteristics of such an advisor are described elsewhere in this report. If such an advisor were appointed, we would recommend that the City proceed, but proceed cautiously, with the redevelopment of the SP site.

Issue 2: Deficiencies in Study Plan and Remediation

Is the site investigation that has been done and that is planned for the SP site adequate to ensure long-term protection of public health and environmental quality? Is the remediation that has been conducted and that is proposed at the site adequate to ensure long-term protection of public health and environmental quality?

Findings

We have found that the types of investigations conducted and proposed for the SP site are, with a few omissions, basically those used for Superfund sites. We have also found that the remediation approaches that have been followed and proposed are in keeping with what could be done at a Superfund site. However, as noted above, plans for use of the SP property after remediation are not similar to those of typical Superfund sites; few Superfund sites are redeveloped to include intensive public activity with residences and public open-space. We have found a number of potentially significant deficiencies in the site investigation and in the remediation that has been completed thus far. These areas of concern are listed and briefly discussed below and are discussed in detail in our technical report on file with the city of Sacramento Department of Planning and Development.

Discussion

Discussed below are key areas in which we found deficiencies in investigation and remediation conducted and proposed for the SP site.

a. **Soil-Gas**

Inadequate attention has been given to the potential for hazardous chemicals in groundwaters under the site and under the city to migrate to basements or other structures. It is well-known from work at Superfund sites across the US and in other countries that chemicals of the type that SP has used at the site can and do readily migrate in vapor phase (in gas form) from contaminated groundwaters up through the soil to the surface. If this migration occurs and if the gaseous hazardous chemicals enter a basement or other confined area as can readily happen, sufficient concentrations of the chemicals can accumulate there to be of public health concern to the occupants and/or users of those areas. Soil-gas migration does not always occur. However, because it is not uncommon, soil-gas migration is frequently evaluated as part of Superfund site evaluations to determine whether it is a potentially significant pathway for exposure of the public to hazardous chemicals. We found that soil-gas migration studies of the type needed to properly define whether this problem could be of significance associated with the SP site were not contemplated by either SP or the DHS personnel with whom we discussed the issue. Both now agree that such an investigation should be conducted. At this time, however, there are no assurances that such an investigation will actually be undertaken.

b. **Lead Remediation**

The remediation of the SP site has progressed only to a very limited extent thus far. Since it has focused largely on the remediation of lead-contaminated soils that is the focus of the discussion here. However, much of the concern can be translated to other chemicals that are or could be present at the site as well.

We have found several areas of concern with respect to the negotiated agreements between SP and DHS on the degree of clean-up of lead-contaminated soils at the site. SP and DHS have developed two clean-up levels for lead. One is 950 mg/kg which has been determined by DHS to be protective of workers and occupants of commercial/industrial buildings or other structures in which there is little or no contact with soils. The second is 174 mg/kg for areas in which children could come in contact.

Adult Exposure. There is technical information available that indicates that soil lead levels considerably higher than the 950 mg/kg level could be allowed in low-contact commercial/industrial areas without significant threat to workers or other adult users of the area. DHS has, in fact, reported its belief that an upper limit of 3000 mg/kg would be protective of workers in low-contact commercial/industrial areas. The 950 mg/kg value was established by DHS several years ago, not because of public health or environmental quality protection, but rather because it was just under the level that would cause the soil to be classified as a hazardous waste. Soil containing lead in concentrations greater than 1000 mg/kg would have to be treated as a hazardous waste. From the information we have reviewed, in those areas of the site where remediation has already been conducted, SP has apparently removed from the site all soils that contained more than 950 mg/kg lead. However, SP representatives have made it clear to us that they may not follow that approach in the future.

It is our conclusion, based on the current understanding of the hazards of lead in soils to adults, that the lead removal remediation that has been carried out thus far is adequate to provide a high degree of public health protection for adults in low-contact commercial/industrial areas. However, we are highly concerned about the possibility that SP could negotiate a remediation approach with DHS that would allow soils containing significantly higher concentrations of lead than 950 mg/kg to be left at the site. We are also highly concerned about inadvertent or misuse of commercial/industrial areas that would alter anticipated exposures in those areas. This is discussed further below.

Child Exposure. The second remediation level applicable to lead-contaminated soil at the SP site is 174 mg/kg. DHS has thus far required that SP remediate lead-contaminated soils to that level in all areas where the redevelopment plans anticipate that children could be in contact with the soils, e.g., residential areas and residential open-space areas. It is our finding that the 174 mg/kg level is based on the current understanding of the toxicity of lead to children associated with their eating dirt, and thus is a level that should be protective of children's health from lead poisoning. However, the critical concentrations of lead for human exposure have been changing significantly downward in the past few years and could, as additional information

develops, be further reduced in the future. SP representatives have announced that they feel that children can be exposed to significantly greater amounts of lead in soil than 174 mg/kg without being harmed. SP representatives have stated that they plan to try to negotiate a higher allowable soil-lead level for areas in which children could be exposed. The possibility of DHS's allowing exposure of children to soil-lead levels above 174 mg/kg is of concern to us and should be of major concern to the City.

Soil Veneer. In addition to requiring removal of soil containing concentrations of lead greater than 950 mg/kg in the area that has been remediated, DHS has required that SP cover all soil that contains lead concentrations greater than 174 mg/kg with a veneer of low-lead soil (soil containing less than 174 mg/kg lead). The purpose of that requirement was to reduce the likelihood that higher-lead soils will be blown over the property. In the area of the site where this type of remediation has been provided (Battery Shop Yard area), the low-lead soil veneer was 2 ft deep. As it stands now, a redeveloper can redevelop areas of the SP site that have been remediated to contain 950 mg/kg lead or less and covered with a 2-ft veneer of low-lead soil. However, DHS has required that a deed restriction be placed on areas remediated in that way, to preclude the use of such property for residential, open-space, or certain other uses without first obtaining permission of DHS. Of particular concern is the potential for excavation or other activities that could bring soil that contains 950 mg/kg lead, to the surface.

We attempted to determine what DHS policy and approach would be in reviewing a developer's proposal to develop residential housing, open space, or other uses where the thin veneer of low-lead soil overlies the higher-lead soil. DHS representatives told us that DHS does not have a fixed policy for that situation and that the policy pertinent to a particular development project would be formulated at the time the project is reviewed by DHS. That approach does not give us a high degree of assurance that what a developer and DHS might decide at some time in the future would necessarily provide for a high degree of protection for public health or environmental quality. The issues of deed restrictions are discussed elsewhere in this report.

Child Contact in Commercial/Industrial Areas. An area of our concern about the

remediation that has been carried out thus far on lead-contaminated soils is the potential for children to come in contact with excessive concentrations of lead in the commercial/industrial areas. As noted above, in the one area remediated thus far, the remediation requirement was the removal of soil that contained greater than 950 mg/kg and the covering of remaining soils with a veneer of low-lead soil. The 950 mg/kg level is thought by DHS to represent an excessive exposure for children and hence the deed restriction requirement also imposed on that area. There are several plausible scenarios within that remediation approach that could result in the exposure of children to excessive concentrations of lead. It is conceivable to us that at some time in the future a day care center with an outdoor play yard could be developed within industrial or commercial establishments where the soils have 950 mg/kg of lead within a foot or two of the surface. There is also a real possibility that without physical barriers around commercial/industrial areas, children from nearby residential areas on-site and off-site could play either in "remediated" but not-yet rebuilt lots, or in dirt excavated from areas containing elevated lead during original or future construction, utility repair, future re-remediation, etc. There is no requirement that in the future soil containing 950 mg/kg or less be unexposed in commercial/industrial areas. Thus we feel that there is a potential for children to be exposed to potentially hazardous levels of lead with the lead remediation approach that has been adopted. This concern heightens with decreases in remediation provisions being considered by SP. While the intent of the developers and SP may be to not allow such exposure scenarios to occur, it is prudent public health practice to give due consideration to plausible unintended use as well as misuse especially by children.

It is important to note that the elevated concentrations of lead that are being left at the site by SP in an effort to save money in remediation costs will be present in those soils forever. The City must consider not only the near-term redevelopment of the site, but the long-term redevelopment possibilities that could take place 50, 100, or more years in the future. As discussed below, we are concerned that the deed restriction approach may prove to be ineffective in preventing children from being exposed to significantly elevated concentrations of lead that are now considered by DHS to be hazardous. Further, consideration should be given to the approaches that will be taken if it is learned that the current remediation level for residential use

(174 mg/kg) poses an unacceptable human health risk.

Implications for Public Health Protection. The adoption of two levels of lead remediation by DHS for the SP site and its proposed redevelopment represents an additional cause for concern for public health protection associated with the redevelopment of the site, especially redevelopment at some time in the future. At superfund sites where the property is redeveloped for industrial purposes, an industrial level of contaminant remediation, appropriate fencing, and deed restrictions can be effective in reducing the hazards to the public associated with residual chemicals left at the site. However, in a mixed-use site such as is proposed for the redevelopment of the SP site, where commercial, industrial and residential redevelopment is being planned, there is a significant potential for the deed restrictions and other types of instruments to not provide a high degree of protection of children from exposure to excessive levels of lead or other contaminants. Because of the uncertainty of the outcome of future negotiations of DHS with SP or other developers, the City needs to have additional safeguards associated with any permitting of activities in areas of the SP site remediated for commercial/industrial use to significantly reduce further the possibility that children could be exposed to elevated concentrations of lead or other contaminants left at the site. Attention should be given not only to the potential for excavation and similar activities to bring elevated concentrations of contaminants to the surface, but also to the possibility for plants' and animals' bringing contaminated soils to the surface where children could be exposed to them. Such chemical translocation is discussed below.

c. Chemical Translocation

We found that neither SP nor DHS was considering the possibility of chemical translocation in its approval of the lead remediation level for commercial/industrial areas. Translocation is the process by which chemicals in the soil are taken up by plant (e.g., shrubbery and tree) roots and transported to leaves and fruit. Translocation of some heavy metals and other chemicals is known to occur. It is reasonable to be concerned that such transport of lead and possibly other contaminants left in soils could occur at the site, especially

in the commercial/industrial areas that have only two feet or so of low-lead soil overlying more contaminated soils. This mechanism could bring lead and other contaminants in the soil to the surface where it could pose a hazard to children. This could occur even in areas where, except for the shrubbery and trees, the high-lead soil is covered by pavements, buildings and other structures.

It is concluded that the current SP site investigation and remediation may not provide for adequate near-term or long-term protection of public health and environmental quality.

Recommendation

We recommend that the City consider becoming more active in decision-making concerning the adequacy of site investigation, the adequacy of remediation of various areas of the SP site, and the appropriateness of redevelopment of the site for certain types of uses. Particular attention should be given to the potential for children to be exposed to elevated concentrations of lead and other contaminants through intentional and inadvertent uses, and misuse of the site. A mechanism for this type of involvement and further information on it is provided below. We also recommend that the City develop a comprehensive set of additional safeguards that it requires be implemented associated with any permitting of activities in areas remediated for commercial/industrial use to significantly reduce further the possibility that children could be exposed to elevated concentrations of lead and other contaminants left at the site.

Issue 3: Deed Restrictions

Can deed restrictions be an effective tool for managing exposure to hazardous chemicals left at the site by SP?

Findings

DHS has established a requirement that a deed restriction be placed on the one area of the SP site that has been remediated, the Battery Shop Yard. That area was remediated to meet the soil lead limitations for commercial/industrial use. The purpose of the deed restriction is to prevent future uses of the area that are incompatible with the contamination that has been left in the area. As discussed below, this restriction is especially important because of the proposed mixed uses of the site involving intensive public activity, and because SP and DHS have allowed hazardous chemicals from SP's operations to remain in that area. The language of the deed restriction for the Battery Shop Yard area basically stated that before excavation is done or residential use is made of that area, the permission of DHS must be obtained. It has not been established whether deed restrictions will be required on any other portions of the SP site. It appears at this time that a similar deed restriction will be placed on re-use of the Pond and Ditch Area of the site, although a deed restriction for that area has not been brought to our attention.

In concept, an appropriately worded and diligently enforced deed restriction should prevent uses that are at this time believed to be inappropriate for an area. However, there are legitimate concerns about the actual effectiveness of relying on deed restrictions for long-term protection of public health, environmental quality, and the interests of the City from contaminant residues that are left at the site. We learned from discussing this matter with DHS that according to the California Health and Safety Code Section 25-220d, DHS is empowered to establish deed restrictions but it is the City that has the responsibility for implementing the deed restrictions. Public health and environmental quality will have to be protected from the impacts of chemicals left at the site, forever. Therefore, the deed restriction instrument must be one that will be effective forever.

It is our finding that the language of the deed restriction that was adopted for the Battery Shop Yard area was sufficiently vague that the actions of DHS in response to its enforcement could be subjective. Indeed, as noted above, DHS representatives told us that DHS does not have a fixed policy or approach for reviewing a developer's proposal to develop residential housing, open space, or other uses where a thin veneer of low-lead soil overlies the higher-lead soil but that the policy pertinent to a particular development project would be formulated at the time the project is reviewed by DHS. That approach does not give us a high degree of assurance that what a developer and DHS might decide at some time in the future would necessarily provide for a high degree of public health or environmental quality protection. DHS representatives also informed us, however, that if the City wished to change the language of the deed restriction adopted for the Battery Shop Yard area, it should draft revised language for consideration by DHS.

Discussion

Deed restrictions are being used at some superfund sites across the country where the Principal Responsible Parties (PRP's) and the regulatory agencies agree that potentially hazardous amounts of chemicals can be stabilized and left at the site. As noted previously, however, it is not common practice that superfund sites are redeveloped with the mixing of commercial/industrial, public activity, and residential uses that is currently envisioned for the SP site redevelopment.

The ultimate assurance for long-term protection of public health, environmental quality, and the interests of the City at the SP site would be provided by removing from the site all materials contaminated by hazardous chemicals from SP's operations and other activities at the site. Current practice and regulations allow certain contaminants to remain at a site as long as their concentrations are below designated levels typically related to how the land will be used in the future. There is no assurance, however, that concentrations of chemicals that are now considered acceptable to remain at a site given the intended re-use will be considered acceptable

in the future.

For any area of the SP site where the permitted remediation allows chemical contaminants to remain, there is need to protect public health, the environment, and the City's interests against impact from those contaminants. This protection must be ensured for as long as the contaminants remain at the site since their potential for causing adverse impacts will not diminish significantly with time. Assurance of protection is especially important given the multiple uses, intensive public activity, open-space, and residential use envisioned for the SP site. Such assurance is also especially important because concentrations greater than those that are believed by DHS to be protective of the most sensitive use or users of the site overall (e.g., in the case of lead, children) have been allowed to remain in the one area remediated under approved remediation protocols.

There is legitimate concern about the effectiveness of deed restrictions as the primary instrument for providing long-term protection of public health, environmental quality, and the interests of the City associated with the planned redevelopment of the SP site. While DHS can require and develop deed restrictions, according to the Health and Safety Code it is the City that has the responsibility for implementing deed restrictions. Deed restrictions applicable to the SP site contamination address issues, concerns, and subtleties that may well not be understood or appreciated by a non-technical person; one would not expect that the City personnel in charge of deed restriction implementation would have expertise in those technical areas. Examples of activities that may need restriction or prohibition in areas such as where lead contamination exists under a low-lead soil veneer, include day-care activities in commercial/industrial establishments, planting of trees and shrubbery along the streets, development of water features such as ponds or fountains, open-space in commercial/industrial areas, and future use of subterranean space under buildings, and residential use or establishment of residential areas near commercial/industrial areas. Therefore, it is appropriate for the City to evaluate how effectively the City can implement deed restrictions that would preclude activities from being undertaken in the commercial/industrial part of the SP site that would enable children to be exposed to excessive concentrations of contaminants such as lead. The City will also have to evaluate how

well it can ensure effective implementation in the future - 50, 100, or more years hence. Further, the City needs to consider how it will address issues that develop when deed restrictions or their implementation fail to provide adequate protection.

Even with the concerns and inadequacies inherent in the deed restriction approach, we are not aware of other approaches that could be guaranteed to provide adequate long-term protection of public health, environmental quality, or the City's interests from hazardous chemicals left on a site that will be redeveloped as is planned for the SP site. Because of this and other concerns raised in this report, we believe that if the City wishes to proceed to include plans for residential use, open-space, and other intensive public contact activities at the redeveloped site, it should consider providing significant additional safeguards to address these concerns. While it may be argued that large areas of the site were known not to be sites of SP locomotive repair activities and that those areas should be suitable for intensive public use, at this time insufficient investigative work has been done to demonstrate that there were no spills, dumpages, or burials of materials in those areas. We do not know the nature of investigation and remediation approaches that will be developed for other areas of the SP site. It is our opinion that there are aspects of approaches that SP is proposing and considering (e.g., 400-ft sample grid-spacing and challenging the lead remediation levels) that give reason for concern.

If the City determines that it can, in fact, effectively implement deed restrictions at this time, it should evaluate whether or not it wishes to rely on deed restrictions to provide for long-term protection of public health, environmental quality, and its interests. If the City determines that deed restrictions may not be effective instruments for ensuring this protection, the City may wish to carefully reconsider the appropriateness of high-density, mixed-use proposed for the redeveloped SP site, in which children could be harmed by residual chemicals SP plans to leave at the site. An alternative is to question whether SP should be allowed to leave potentially hazardous amounts of contaminants at the site. It is our view that there are significant questions about the advisability of the proposed redevelopment of the site in light of what has already been allowed for site remediation and is planned for other areas, e.g., 950 mg/kg lead in soil.

Another issue that we believe needs to be considered by the City is the potential impact of the presence of deed restrictions and of residual chemicals left on the site on the attractiveness of the site to redevelopers. As discussed above, in the one remediated area, the Battery Shop Yard area, contaminated soils were left beneath a veneer of low-lead soil and the deed restriction was developed. It appears to us that the redevelopment of that site could be more costly than the redevelopment of an uncontaminated site because of the costs that may be associated with handling the contaminated excavated materials. It is possible that there may be significant reluctance of developers to develop those areas. Should such a situation develop, the redevelopment plans now envisioned may have to be significantly changed.

Recommendations

The City should carefully evaluate the protection of public health, environmental quality, and its interests afforded by remediation, involving partial clean-up with deed restrictions, of the type adopted for the Battery Shop Yard area of the site. As part of this evaluation, the City should carefully consider its ability to diligently implement such deed restrictions at the redeveloped SP site, forever, in light of the character of the remediated areas and the proposed redevelopment of the site. We also recommend that if the City believes that it may not be able to adequately protect public health, environmental quality, and the its interest through the language and implementation of deed restrictions, the City should consider a different approach for remediation and/or redevelopment of the site that would provide for more fail-safe protection. This could include altering the redevelopment plans to prevent children from gaining access to the area subject to deed restriction (at this time, the Battery Shop Yard area) by eliminating provisions for open-space, residential development, and potential day-care centers in and near commercial/industrial areas, etc., and requiring adequate physical barriers to minimize the likelihood that children could enter the commercial/industrial areas. Another alternative is for the City to require that SP provide for removal of all lead and other contaminants from the site that represent a potential threat to children and others who could come in contact with them, down to a level considered at this time to be safe for children's

exposure, e.g., for lead, 174 mg/kg. A provision would also have to be made, however, to require that SP conduct additional remediation should that level be found in the future to be inadequate for the protection of public health or environmental quality.

We also recommend that the City and its technical advisors carefully review the language of the existing deed restriction on the Battery Shop Yard area and all future proposed deed restrictions for their adequacy for protection of public health, environmental quality, and the City's interests. This review should go beyond legal review and interpretation to include careful consideration of the risks associated with intended and inadvertent use, as well as for plausible misuse of the area. A number of activities that should be considered were noted above.

Issue 4. On-Site Groundwater Contamination

What is the significance of the impairment of on-site groundwater quality by hazardous chemicals derived from SP's operations to the redevelopment of the SP site as proposed by the Roma Design Group?

Findings

The type, degree, and extent of contamination of the groundwater beneath the SP site have not yet be adequately characterized. Based on the information available, as discussed elsewhere in this report, there is a potential problem for redevelopment associated with the vapor-phase migration of certain hazardous chemicals known to be in the on-site groundwater contamination plume, through the soil. That soil-gas, if it develops, could migrate to basements and other confined areas where it could pose a human health problem.

There is also concern about potential impacts of contaminated groundwater extracted during construction and developed-property de-watering, use for cooling purposes, etc. Since, based on the information available to us, it appears that the waters under the SP site are not used for domestic purposes, there does not appear to be an immediate threat to public health through

this exposure route that would affect plans for redevelopment. As long as property de-watering, use of groundwater for cooling, etc. are done in such a manner as to prevent significant human and animal contact with the chemicals present in these waters, and appropriate care is taken in managing waters pumped for those uses, and as long as the waters are not used for domestic purposes, the contaminants in the groundwater under the SP site do not appear to be of significant immediate concern for property redevelopment. However, based on the information we have been provided, it appears that the plans for handling of those waters have not been finalized.

Recommendation

The City should evaluate the adequacy of the current Regional Water Quality Control Board permit requirements for extraction and disposal of contaminated groundwaters derived from the SP site. If it is found that those requirements are not adequate or that there is a significant potential for the requirements' not being properly implemented, then the City needs to develop additional safeguards to ensure that any extraction of contaminated groundwaters does not represent a significant threat to public health or environmental quality.

The City should require that an appropriate in-depth evaluation be made of the potential for soil-gas migration from the contaminated groundwaters to the basements or other areas of buildings that could be developed at the SP site. The City should consider becoming an active participant in helping to develop those studies, in data collection and review, and in interpretation of results. If the results show that soil-gas migration of hazardous chemicals is of potential significance at the site, the City should require remediation. The City should also require that all construction of buildings and other structures be done in such a way as to prevent entry of soil-gas or at least significantly reduce the amount of hazardous chemicals present in soil-gas that can enter confined areas of buildings. Construction techniques for this type of situation are readily available today and should be implemented.

Issue 5. Off-Site Groundwater Contamination

What is the significance of the contamination of off-site groundwater by hazardous chemicals derived from SP's operations to the city of Sacramento and its residents and others who live in or otherwise use areas above the contaminated groundwaters?

Findings

The potential problems with off-site groundwater contamination from SP's operations are essentially the same as the on-site groundwater contamination concerns. The limited studies that have been conducted thus far have determined that there is a substantial groundwater contamination plume that has migrated from the SP site under the City to the southeast and south of the SP site down to about O Street. That plume contains significant amounts of highly hazardous chemicals which, according to current federal and state drinking water standards, would increase the potential for individuals who consume this water over a long period of time to have an additional cancer risk. Since, based on the information made available to us, it does not appear that the groundwaters in this area are being used for domestic water supply purposes at this time, there does not appear to be an existing domestic water supply problem associated with the contamination of off-site groundwaters by SP's past operations at the site.

We are highly concerned, however, that at least at this time SP is not committed to remediating the off-site contaminated groundwaters. We feel that the City should take appropriate steps to ensure that all off-site groundwater contamination from the SP site is appropriately remediated. While the City may have no plans at this time for utilizing off-site groundwaters contaminated by SP-derived chemicals, the water resources available to the City are finite. The quality of those resources should be protected from all contamination. Where contamination exists, such as under and downgradient from the SP site, an appropriate groundwater remediation program should be implemented to preserve the options of future generations to use that groundwater for domestic or other purposes. While it has been said by SP representatives that the groundwaters in that part of the City are already contaminated by chemicals derived from natural or other sources, it is our finding that the presence of those

contaminants should not be used as a reason for not remediating the SP-derived contaminants. The impacts and hazards of the naturally occurring chemicals for domestic water supply water quality and other uses are significantly different from those of the industrial contaminants. Their presence does not represent justification for not remediating the highly hazardous chemicals in the groundwaters that have been derived from SP's operations.

Recommendations

The City should vigorously pursue off-site groundwater remediation to levels considered safe for domestic water supply use for all contaminants derived from SP's operations.

The City should also implement the recommendations from Issue 4 above covering on-site groundwater contamination, for off-site groundwater contamination. Potential impacts associated soil-gas migration, groundwater extraction as part of off-site construction and building dewatering, and uses of off-site groundwaters such as for cooling purposes, need to be addressed to ensure that adequate protection is provided for public health and environmental quality.

If soil-gas migration from the off-site SP-derived groundwater contamination plume is occurring in sufficient amounts to be hazardous to public health for occupants of buildings lying above the plume, then the City should work with the occupants of those buildings to provide for increased ventilation, construction of barriers to prevent migration of hazardous gas into confined areas, and to take other steps to protect public health and the environment from excessive exposure to hazardous chemicals derived from the groundwater plume. The City should also require that the soil-gas be remediated by SP.

Issue 6. Hazards of Groundwater Remediation

Is there a significant threat to public health and the environment associated with proposed groundwater remediation using air stripping to remove hazardous chemicals?

Findings

Insufficient information is available at this time to determine whether the gas stripping approach that has been mentioned as a possible approach for removal of hazardous chemicals from contaminated groundwaters will represent a threat to public health and the environment. Thus far, the regulatory agencies have not issued a decision on this matter. Based on evaluations made at other, Superfund sites, we believe that air stripping of the hazardous chemicals present in groundwaters under the SP site and off-site can be done without significant threat to public health and the environment.

Recommendation

We recommend that the City consider becoming an active participant in developing approaches for removal of hazardous chemicals from contaminated groundwaters to ensure that the removal process does not result in a significant increase in the potential for public health and environmental quality problems. Those efforts should include a detailed review of the design and operation of such systems, independent sample collection and analysis, and independent evaluation of the performance of these systems as long as they are in operation. It is important to point out that it will likely take many tens of years for the remediation of the groundwaters contaminated by SP's former operations to reduce the concentrations of known contaminants to levels below federal and state drinking water standards.

Issue 7. Asbestos

Does the asbestos at the SP site represent a threat to public health?

Findings

There is asbestos present in buildings at the SP site and there is the potential for asbestos to be buried in fill at the SP site. Airborne asbestos can be a significant threat to public health because it can cause lung cancer. It is possible to control airborne asbestos as part of site construction and use. However, insufficient information is available to enable us to determine whether the regulatory agencies will require appropriate airborne asbestos control measures and to oversee their use to ensure that significant public health threats do not arise out of SP building demolition, and reconstruction in areas where asbestos may be buried.

Recommendation

The City should become an active participant in developing an assessment of the asbestos hazard that exists at the SP site, formulating approaches for control of any significant hazards that are found and an independent third party sampling for airborne asbestos during building demolition and construction activities.

Issue 8. Management of Urban Stormwater Contaminants and Combined Sewer Overflow Problems

Can the management of contaminants in urban stormwater drainage and the combined sewer overflow problem that exists in the city of Sacramento have a significant impact on the redevelopment of the SP site?

Findings

The city of Sacramento has a significant problem in some parts of the city with combined sewer overflow running into the streets. The Regional Water Quality Control Board has informed the City that those problems must be rectified or a moratorium will be imposed on new construction in the city. Such a moratorium could have a significant impact on redevelopment of the SP site.

While the SP site redevelopment will involve separate sanitary and storm sewerage systems, as planned now those systems will discharge into a combined sewer which has overflow problems. Therefore, the current redevelopment plans for the SP site could be significantly impacted by failure of the City to solve its combined sewer overflow problems in that part of the city.

Recommendation

We recommend that the City consider the impact that a moratorium on sewer hook-ups at the SP site could have on the redevelopment of the site. If it is found that there is a significant potential for such a moratorium, then the City should consider the possibility of developing its own domestic wastewater and stormwater management systems, including treatment works for the SP site. The treatment works should include provisions for treatment of contaminants that will be present in the stormwater derived from the SP site as a result of the infiltration of contaminated groundwater into the storm sewers.

Issue 9. Protection of Public Health and Environmental Quality

How should the City attempt to ensure that a high degree of protection of public health and environmental quality is achieved at the SP site remediation and redevelopment?

Findings

The current SP site review, remediation, and redevelopment process may not necessarily result in high degrees of public health and environmental quality protection.

The amount of site investigation and remediation that has been effected thus far at the SP site has provided a limited track record of the adequacy of the design, implementation, and efficacy of the site investigation and remediation that will be accomplished at the site to provide for public protection associated with the envisioned redevelopment. The approaches adopted thus far do not give us confidence that future site investigation, remediation, and redevelopment will be done in such a way to ensure near-term or long-term protection of public health, environmental quality, or the interests of the City given the proposed plans for redevelopment.

Recommendation

City officials should evaluate the degree of public health and environmental quality protection that should be required in SP site investigation and remediation. Careful consideration needs to be given to whether it is confident that the SP--DHS and other agency "negotiated" "comprise" approaches are adequate to protect the City's interests and the health and welfare of individuals who will live at or use the redeveloped lands and structures at the SP site. We recommend that the City establish a third party, independent, knowledgeable, adequately funded, highly active review group to advise the City on the adequacy of each component of the SP site investigation, remediation, and redevelopment for providing the desired degree of protection of public health, environmental quality, and interests of the City.

The importance of and need for independent, third-party participation is not new to superfund activities. The federal congress recognized the need for this type of review as part of the reauthorization of the Superfund legislation. Congress required that the Principal Responsible Parties for each site fund independent site review including independent sampling, etc.

The individuals conducting the third-party review on behalf of the City should be highly knowledgeable and experienced in the sources, transformation, and behavior of chemical contaminants in terrestrial and aquatic systems and in the impacts of chemicals and their transformation products on public health and the environment. That knowledge should go beyond what is common practice today in site investigation and remediation, and include the latest developments occurring nationally and internationally in these areas. They should also be free of all conflicts of interest arising from past or current work with PRP's on superfund or other site remediations. Individuals or firms that derive a substantial part of their income from work with PRP's could be reluctant to provide the type of in-depth, critical review needed for this project. The third-party reviewers for the City should be adequately funded to enable them to conduct in-depth reviews including independent sample collection and analysis, and site inspection, and to work with the City, DHS, and SP on each step of the evaluation, remediation, and redevelopment process. The funding for this review should be guaranteed at the outset so that no pressure can be exerted on the reviewers to reach a given conclusion, and so that continued funding is controlled only by the quality of the work performed by the reviewer.

Issue 10. Rate of Redevelopment vs. Site Remediation

Has the work on the proposed redevelopment of the site by Roma Design Group proceeded at an appropriate rate in light of the current understanding of the degree of contamination of the site and the remediation of the site?

Can redevelopment take place at the site before the site has been completely evaluated and remediated?

Findings

The Roma Design Group has developed significant overall plans for the redevelopment of the SP site. It appears that Roma Design Group has given consideration to major areas of known contamination in its placement of certain structures in the proposed redevelopment. We feel that the planning that has been done by the Roma Design Group has provided insight into possibilities and problems for redevelopment of the site. It has also helped focus our review of the site investigation and remediation on problems that could arise from redevelopment of the site in light of remediation approaches adopted and proposed by SP. There are questions that remain about the adequacy of those proposed uses and their placement relative to both known, and especially currently unknown areas of contamination at the site. We have identified a number of issues in our review that could have a significant impact on what is included in the redevelopment as well as on the degree of remediation that will be necessary in order to include certain elements or uses in the redevelopment. Resolution of those issues may significantly influence what SP chooses to do with the property.

Before further significant planning for redevelopment should be done, the City should carefully evaluate the compatibility of the proposed uses, both in the short-term and long-term, with the two-level approach for site remediation, and with leaving significant amounts of hazardous chemicals at the site. The resolution of the various issues raised in our report should be accomplished before additional planning is done. It is possible that the City may conclude from reviewing the issues, that elements of SP's approach for site remediation are not in the best

interest of the City and long-term protection of public health and environmental quality. This finding could dictate a significantly different approach to redevelopment than that currently proposed by the Roma Design Group.

There is a significant lack of information about the hazards that exist at the site and about the adequacy of approaches that have been carried out and are proposed for remediation. The redevelopment phasing proposed by Roma Design Group appears to be adequate in light of the timetable SP has developed for site characterization and remediation. It should be understood, however, that because of the large number of unknowns and issues that have to be addressed and resolved by the City, and unknowns about what SP may "negotiate" with DHS and the acceptability of those negotiations to the City in light of its interests, significant changes could be necessary and desirable. Those changes could include significant redesign of the site.

Caution should be exercised in proceeding with significant redevelopment of the site until there is a better understanding of the potential hazards associated with the site and the approach that the City plans to adopt in permitting the redevelopment of the site in light of the contaminants to be left at the site by SP.

Recommendation

Before further work toward refining Roma Design Group's current plans for redevelopment of the site is undertaken, the City should critically review the compatibility of the proposed plans for redevelopment of the site, SP's approach for site investigation and remediation, and the City's interests, in light of what is needed for the desired protection of public health, environmental quality, and the City's interests. The focus of that assessment should be on the ability of the City and its employees to effectively implement deed restrictions and other instruments to provide the desired degree of public health and environmental quality protection. In addition, consideration needs to be directed toward other areas of potential deficiency that we have identified in this report.

List of Abbreviations

CP - Closure Plan

CVRWQCB - Central Valley Regional Water Quality Control Board, Region 5

DHS - California Department of Health Services

FS - Feasibility Study - defines clean-up alternatives for the types of contamination found at a site. Often discussed in conjunction with RI, RI/FS

MCL's -Maximum Contaminant Levels - federal or state limits established for the maximum concentrations of selected contaminants allowed in drinking water

MSL - Mean Sea Level

PAH, PNA - Polynuclear Aromatic Hydrocarbon - organic compounds typically associated with petroleum products and residues and with products of combustion; many are known or suspected human carcinogens

RAP - Remedial Action Plan - plan for remediation of an area

RI - Remedial Investigation - defines degree and extent of contamination of a site

SPTC - Southern Pacific Transportation Company

THM's -Trihalomethanes - chloroform-like compounds commonly present in municipal drinking waters derived from surface water sources; suspected human carcinogens

TTLc's - Total Threshold Limit Concentrations - concentrations of selected chemicals in soil (or other solids) used to classify soils (or other materials) for disposal as "hazardous" or "non-hazardous" waste

VOC's -Volatile Organic Compounds - a group of organic compounds that are highly volatile, including benzene, TCE, and vinyl chloride; many are known or suspected human carcinogens

WET - California Waste Extraction Test - laboratory procedure for leaching contaminants from soil samples as part of the classification process for disposal of materials as "hazardous" or "non-hazardous" waste

Chemical Name Abbreviations

TCE - trichloroethylene

PCE - tetrachloroethylene

1,1 DCA - 1,1-dichloroethane

1,1,1 TCA - 1,1,1-trichloroethane

1,2 DCE - 1,2-dichloroethene

Units of Measure

mg/L - concentration unit, milligrams of contaminant per liter of water; in many applications it is equivalent to "parts per million" (ppm)

ug/L - concentration unit, micrograms of contaminant per liter of water; in many applications it is equivalent to "parts per billion" (ppb)

mg/kg - concentration unit, milligrams of contaminant per kilogram dry weight of solid; equivalent to "parts per million" (ppm)

ATTACHMENT A

BIOGRAPHICAL INFORMATION

G. FRED LEE, Ph.D., P.E. (Texas)

B.A. Environmental Health Sciences, San Jose State University, 1955
M.S.-Public Health, Environmental Sciences, University of North Carolina, 1957
Ph.D. Environmental Engineering/Environmental Sciences, Harvard University, 1960

30 Years University Graduate Teaching and Research

Hazardous Waste Site Remediation, Treatment of Groundwater and Contaminated Soils, Risk Assessment, Water Quality, and Related Areas

Retired from Position as Distinguished Professor of Civil and Environmental Engineering, July 1989

25 Years Part-Time (20 - 30 hrs/wk) Advising/Consulting to Governmental Agencies, Industry, and Others

1 Year Full-Time Consulting

Owner & Principal of G. Fred Lee & Associates

Published More Than 450 Professional Papers and Reports on Sources, Significance, Fate, and Control of Chemicals in Aquatic Systems (Fresh, Marine, and Groundwater)

R. ANNE JONES, Ph.D.

B.S. Biology, Southern Methodist University, 1973

M.S. Environmental Sciences, University of Texas Dallas, 1975

Ph.D. Environmental Sciences, University of Texas Dallas, 1978

12 Years University Graduate Teaching and Research

12 Years Part-Time (10 hrs/wk) Advising/Consulting to Governmental Agencies, Industry, Others

0.5 Year Full-Time Consulting

Co-Owner & Principal of G. Fred Lee & Associates

AREAS OF SPECIALIZATION - G. Fred Lee & Associates

Solid & Hazardous Waste Management, Water & Wastewater Treatment, Water Pollution Control, Water Supply Water Quality, Aquatic Toxicology

Areas of Experience in Hazardous Waste Evaluation and Treatment

Fixation of Waste- and Soil-Associated Contaminants

Groundwater Remediation - Pump and Treat, In-Situ Treatment

Extraction of Contaminants from Soils

Bioremediation of Contaminated Soils and Groundwater

Extensive Experience with Many Contaminants of Concern at SP Site

TCE, Vinyl Chloride, Other Solvents

Heavy Metals

Petroleum Hydrocarbons

PAH's/PNA's

EXAMPLES OF RELATED PROJECT EXPERIENCE

Research and Private Consulting Associated with Landfills and Contaminated Soils since the Mid-1960's.

Several Years Part-Time Staff of Ebasco-Envirosphere of Lyndhurst, NJ as Internal Consultants on Its US EPA REM III Superfund Contract.

- Assisted Project Managers on Special Problems

- Assisted in Planning RI/FS Studies

- Led and Instructed on Interpretation of RI/FS Data

- Assisted in Development of RI/FS Reports

 - Re-wrote Inadequately Prepared Reports

- Provided Guidance on Site Remediation

- Provided Staff Development in Report Preparation, Data Interpretation, Technical Aspects of Site Evaluation and Remediation

Newport City Development

- Evaluation of Hazards Associated with Redevelopment of Former Industrial Site on Hudson River near Jersey City, NJ for Residential/Business Complex

- Advised Jersey City Health Department on Impact of Proposed Clean-Up on Existing Chemical Contamination of Soils and Groundwaters on Future Use of Lands in Newport City Development and on Hudson River Water Quality

Several Governmental Agencies and Industries in Conducting and Reviewing RI/FS and Similar Studies, and in Providing Review/Second Opinion on Conclusions

Advisor to the California Water Resources Control Board Staff in the Development of Subchapter 15 Governing Land Disposal of Wastes, and in the Development of the Long-Range Groundwater Management Strategy for the State. Active at This Time in Helping to Update and Revise Articles of Subchapter 15.

NJ ECRA (Environmental Clean-up Responsibility Act)

- Worked with New Jersey Regulatory Agency Staff and Others in Development of Approaches for Evaluating the Hazards Posed by Chemicals Associated with Structures and Grounds of Industrial Properties

Liberty State Park (NJ) Commission

- Evaluation of Water Quality Impacts of New Harbor Port Liberte Development on Water Quality near Liberty State Park

Worked with Property Developers and Re-Developers and Regulatory Agencies on Impact of Development on Water Quality, and Impact of Existing Land Use on Future Development

- Impact of Commercial and Residential Development on Lake Tahoe Water Quality

- Advised Inland Steel Development Corporation on Impact of Development on Water Quality in Lake Monroe, IN

- Evaluated Potential Water Quality in the Proposed Trinity River Development Reservoir for City of Dallas, TX

- Advised Developer on Impact of Lakeshore Development on Minnesota Lake

- Advised State of Wisconsin and Several Developers on Impact of Septic Wastewater Disposal Systems to Be Used in Proposed Development on Lake Water Quality

- Advised City of Boonton, NJ Health Department on Impact of Septic Tank Wastewater Disposal Systems on Boonton Lake

ATTACHMENT B

INFORMATION COLLECTION

Mark Ransom, formerly of the SPTC, and currently with ERM-West of Walnut Creek, CA, has been designated by SPTC as its project coordinator for the SPTC site remediation. In late June, 1990, G. Fred Lee contacted Mark Dockum of SPTC and requested a copy of all reports that had been developed on the contamination of the site and on site clean-up. Mr. Dockum, in turn, contacted the various contractors who had worked or are currently working on the site and requested that they provide copies of their reports to G. Fred Lee & Associates. By mid-July several feet of reports had been received. At this time G. Fred Lee & Associates has conducted a preliminary review of all documents that have been received through early September, 1990 and has reviewed a number of them in detail. Funding constraints prevented G. Fred Lee & Associates from reviewing documents beyond those received in early September 1990.

Also in late June 1990, Dr. Lee contacted William Kilgore, Project Manager for the Department of Health Services for the site and requested copies of Fact Sheets and other information on the site in DHS files. Kilgore has provided Lee with copies of some written information and, on several occasions, has discussed various aspects of the site with Lee and Jones. He has also provided guidance to others in DHS who should be contacted for background information on DHS policy for clean-up of sites of this type. Lee and Jones have had a number of discussions with various members of the DHS Toxic Substances Control Program staff on the site. In mid-August 1990, Dr. Lee met with Mr. Kilgore and Mr. Tjosvold to discuss the SPTC site investigation and clean-up.

Mel Knight and Robert Knight, both of the Sacramento County Environmental Management Department, Hazardous Materials Division, made the county health department files on the site available to Lee and Jones in late July 1990. The materials in those files have been reviewed by Lee and Jones and were found to be valuable in providing background information on DHS review of the site.

In early August 1990, Alex MacDonald of the Central Valley Regional Water Quality Control Board (Region 5) staff made available the regional board's staff's files on the SPTC site. Lee and Jones have reviewed those files and have discussed various aspects of the site investigation and clean-up with Mr. MacDonald.

Mention was made in various SPTC contractors' reports of certain US EPA and state of California documents that served as bases for approaches followed in the RI/FS and site remediation processes. Copies of those documents have been obtained by G. Fred Lee & Associates and have been reviewed. Discussions have been held with representatives of US EPA Region IX regarding approaches used in Region IX to assess the hazards of chemicals in soil and water. A manual covering Region IX's policies and approaches has been reviewed. Further, Lee has discussed the Region's approach for clean-up of lead-contaminated soils with representatives of US EPA Region IX.

Because of the importance of combined sewers and urban stormwater drainage to the City of Sacramento, and especially to the re-development of the site, Lee attended a Region 5 Water Quality Control Board hearing on June 21, 1990, devoted to those topics. From that hearing it became clear that the management of stormwater and domestic wastewater for the site could become an important factor in its re-development.

To obtain a perspective of overall aspects of development in the Sacramento area, Lee and Jones attended the July 26, 1990, workshop, "Sacramento: Development Challenges for the '90's." Lee has also attended two public meetings organized by the ROMA Design Group (ROMA) at which preliminary plans for re-development of the site were discussed. Lee and Jones have also attended several of the City of Sacramento Department of Planning and Development "site management" meetings at which various aspects of the plans for re-development of the site were discussed. Also at those

meetings, there was some discussion of environmental aspects of the site and the potential impact of existing and residual contamination on the re-development of the site. Lee and Jones have presented a synopsis of their findings as presented in this technical report to the Department's 'Site Management' team where a discussion of these results was conducted.

On August 9, M. Ransom provided Lee, Jones, Tholen, and Boxer with a tour of the SPTC Railyard site in which he discussed his understanding of the current state of information on contamination of each of the areas of the site, and current plans for their remediation.

On August 25, ROMA held a fifth workshop on the re-development of the SPTC site during which M. Ransom presented a summary of the site clean-up activities and the proposed phasing of re-development in light of the anticipated clean-up activities. There was extensive discussion of those issues with members of the public present.

In early September 1990, a draft report, which served as a basis for this technical report, was provided to the City which the Department of Planning and Development reviewed. That Department provided a copy of the draft report to SPTC for review and comment. This technical report was provided to the City as a revised draft in early October 1990, for review and comment. This final technical report considers the comments made by the Department and SPTC in review of the drafts.

ATTACHMENT C

Discussion of Inadequacies of the State Superfund Program for Providing for Long-Term Protection of Public Health and Environmental Quality, and the Interest of the City, Associated with the Redevelopment of the SP Site

The federal Superfund program began as a crash program out of the Love Canal situation, to guide the definition of the hazards associated with industrial areas or areas in which industrial chemicals had been deposited such as landfills. It was also designed to guide the remediation of such contaminated areas so that they would not represent significant threats to uses of adjacent properties. In the beginning the focus of the Superfund program was not the protection for re-use of the site, itself, but rather for the protection of uses of adjacent properties. The program has however been evolving to consider protection needed in order to re-use Superfund properties. For various reasons, only a few of the sites across the country at which significant amounts of hazardous chemicals are present, are listed as federal Superfund sites. States have the responsibility for managing contaminated industrial sites that are not included within the federal Superfund program. States' regulations for their own "superfund" sites are typically patterned after the federal regulations. The SP site is one of California's state "superfund" sites.

The "superfund" review and remediation process requires that the details of the evaluation of the type and degree of contamination, the amount of remediation needed for subsequent use of the property, and other issues, be developed on a site-specific basis. Since the technical community has not come to consensus about minimum requirements for these details, and since the degree of protection of public health and environmental quality that should be assured is subjective, some degree of "negotiation" is involved in establishing what must be done at each particular location. In California, representatives of the applicant make a proposal to DHS to follow a particular approach in site investigation and/or remediation. The DHS reviewers comment on the proposal, indicating deficiencies they perceive in the approaches. The outcome of the "negotiations" is typically highly influenced by the applicant's trying to spend the least amount of money for investigation and remediation and the state's trying to develop appropriate

levels of investigation and clean-up. The position of the state is based to a considerable extent on the understanding that the negotiator(s) has of the hazards that could be present at the site, and of the type and degree of remediation needed to protect future users of the property based on what the applicant states is the intended use.

The members of the technical community - professionals developing and evaluating approaches - are far from coming to agreement on what is adequate for site investigation and about "how clean is clean?" especially for the public re-use of contaminated properties. Many of the details of the studies that need to be done are thus established somewhat arbitrarily. One example is how close together should samples be taken all over the site to be satisfied that all of the contaminated areas are found. Another example is how many and which chemicals should be measured in samples of soil and groundwater at the site and away from the site. A third example is "how clean is clean" for the re-use of the property. Since the degree of public health protection that should be achieved is a subjective assessment, and since the investigative and remediation approaches necessary to achieve any given degree of public health protection are not well-defined, the comprehensiveness of a site investigation, the degree of remediation needed, and the degree of public health protection that is actually provided with the remediation can vary from site to site and within a given site.

There are significant pressures on the personnel of regulatory agencies that can cause less-than-optimum review of a particular site. Regulatory agencies are often significantly underfunded and under-staffed. There is a well-recognized national shortage of adequately trained personnel to conduct the federal and state "superfund" programs. Further, because of the newness of superfund-type investigations and high turn-over rates among agency personnel, and the considerable legislative pressure to demonstrate completion of site remediations given the money being spent, there is opportunity for less-than-optimum site characterization and remediation. There is, therefore, concern about the adequacy of the state and federal "superfund" programs to produce appropriate evaluations of site hazards, and remediation objectives and methodology. There is also concern in the technical community about the appropriateness of intense public re-use of "superfund" sites. We have found through our work

on evaluating the presence of contaminants, the approaches for remediation and remediations effected, that there is ample justification for the national concern about the adequacy of the "superfund" programs as they are being implemented to provide for long-term protection of public health and environmental quality where there is to be intense redevelopment. Just meeting the minimum requirements accepted by DHS for site evaluation or remediation does not necessarily provide assurance that there will be long-term protection of public health or environmental quality associated with the planned redevelopment of the SP site.

One of the major controversies that has existed throughout the federal and state superfund programs is "how clean is clean?" For years, professionals in the field have been struggling with this issue, and the answers are still evolving. As discussed above, the issue has two components, the degree of public health protection that can and should be afforded both on and adjacent to remediated superfund sites, and the nature and comprehensiveness of investigation and remediation needed to achieve a given degree of public health protection. The American Public Health Association held a national conference in early October of this year that included a session, "Superfund: Where Are We Ten Years Later." An International Specialty Conference - "How Clean is Clean?" Clean-up Criteria for Contaminated Soil and Groundwater - is scheduled for early November 1990 in Boston, MA. There is still no general agreement on the degree of investigation necessary, appropriate treatment-remediation technology, and the appropriateness of redeveloping for intense public use so-called "cleaned-up" areas. Generally, the principal responsible parties for superfund sites are trying to do the least possible investigation and remediation in order to save money. The public, on the other hand, who could be affected by residual chemicals left at a site after the "clean-up" generally advocate a more comprehensive investigation, a more effective clean-up, and unequivocal protection from chemicals from the site. The regulatory agencies try to develop compromises on these issues; what they adopt typically provides a high degree of protection of public health and environmental quality for off-site concerns. However, the introduction of intense public use of these sites after "remediation," adds another dimension to the concern about long-term protection of public health and environmental quality. Since redevelopment of the type being considered for the SP site is rare for superfund sites, that additional dimension has not had to have been addressed to the

extent necessary to develop consensus on what should be done to provide adequate protection. Further, there is no long-term experience with such redevelopments from which to draw information on the adequacy of particular approaches to or degrees of remediation.

As noted above, there is a significant number of somewhat arbitrary decisions negotiated in establishing the overall remediation for superfund sites. An example of negotiated compromise that frequently occurs at superfund sites which has relevance to the SP site is the issue of the spacing between soil samples over the site. At this time, SP has used a 400-foot grid spacing for collection of soil samples to look for the presence of contaminants across much of the site where specific sources of contaminants are not known. That means that a distance greater than a football field would exist in any direction between one sampling point and the next. Based on our own experience and based on discussions with numerous other professionals in the field, those sampling points are too far apart for this type of site and its proposed redevelopment. Based on the nature of the site and the types of activities that did and could have taken place over the past 100 years (whether they were recorded in company logs or not), there could well be contamination that would go undetected with that spacing. The actual spacing that will be required will be negotiated; the shorter the distance between sampling points, the lower the probability of not detecting a "hot spot" or contaminated area, the greater the assurance of public health and environmental quality protection, but the greater the cost to SP for sampling and analysis. At this time the spacing that will actually be achieved is uncertain since this issue has not yet been addressed by DHS.

Another concern noted above relates to the policy adopted by DHS regarding which chemicals to measure at the SP site. Of the many hundreds of chemicals that could be present at the SP site, DHS is requiring that only 150 or so - basically those on the list of Priority Pollutants, be determined. However, that list does not represent a comprehensive group of all chemicals that could be present at that site that could be hazardous or detrimental to future uses of the site or on-site and off-site groundwaters; that list was not developed for that purpose. The list of Priority Pollutants was developed under court order and did not receive the scrutiny of the technical community due it. Further, the list was developed to include chemicals that had

been reported in surface waters and to focus on contaminants discharged from industrial and domestic wastewater sources to surface waters. It was not developed based on chemicals that could be in soils or groundwaters at industrial sites. None-the-less, the DHS policy for state "superfund" site investigation, as well as the US EPA policy for federal Superfund sites, is to focus on Priority Pollutants. That policy has evolved out of somewhat arbitrarily established federal legislation governing the Superfund program, and the fact that analytical methods are readily available for the Priority Pollutants. It is well-known that there is a wide variety of other chemicals that can be present at superfund sites, that can be readily measured by other techniques. At this time, neither the federal nor state program is requiring such measurements.

These comments about the negotiation process in establishing site investigation and remediation are not directed toward indicating that DHS and its personnel are not in general adequately performing their responsibilities in the state "superfund" work at the SP site. However, it is likely that few DHS personnel would not admit that if they had more time and resources to devote to each superfund site project, and most importantly, if there were more information available on the approaches that should be adopted to provide a high degree of reliability in finding "hot spots" of hazardous chemicals at superfund sites and in providing adequate remediation for re-use, they could provide for increased public health and environmental protection.