

Redevelopment of Remediated Superfund Sites:  
Problems with Current Approaches in Providing Long-Term Public Health Protection

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Abstract

The normal primary objective of Superfund site remediation is the control of hazardous chemicals so that they do not represent a significant threat to public health and the environment on adjacent properties. The remediation of many federal and state Superfund sites involves leaving potentially significant amounts of hazardous chemicals in the soil and groundwaters of the area. This approach has significant long-term public health implications for redevelopment of a remediated site. With the completion of scheduled remediation of a number of federal and state Superfund sites or parts of sites, questions are being raised about the appropriateness of the remediation practiced by the responsible party(s) and allowed by the regulatory agencies compared to possible redevelopment of the remediated area concerning the possibility of the public being exposed at some time in the future to residual hazardous chemicals present at the site. A situation of this type is the potential problems associated with the degree of investigation and remediation compared to proposed plans for redevelopment of the Southern Pacific Railyard site located near downtown Sacramento, California. This 220 acre site's soils are contaminated with lead and other heavy metals, PNAs, and petroleum hydrocarbons. The groundwaters are contaminated by chlorinated solvents, some of which have been converted to vinyl chloride. Because of its location in downtown Sacramento in the waterfront area, the site is a prime candidate for redevelopment. Plans have been developed for intensive redevelopment involving commercial and residential uses. This paper discusses a number of potential redevelopment problems for this Superfund site as an example of problems that could occur with the redevelopment of many Superfund sites and suggests approaches that should be considered in developing deed and other restrictions on future property use for those properties that were contaminated by Priority Pollutants and remediated in accord with current Superfund guidelines.

Introduction

Since the mid-1800's the Southern Pacific Transportation Company (SPTC) has conducted a variety of locomotive maintenance and repair operations at its Sacramento Railyard. Recently, SPTC has indicated that it plans to terminate all of the industrial activities at the site by the mid-1990's and sell the site property; its proximity to downtown Sacramento and its location on the Sacramento riverfront make it a desirable site for redevelopment. Plans call for redeveloping the site for residential, commercial, public open areas and office complexes (Roma Design Group 1990).

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In the early-1980's, it was found that some areas of the Sacramento Railyard site were contaminated with several potentially hazardous chemicals. This site is now part of the California Bond Expenditure Plan Requirements. It is not a federal Superfund site. For the purposes of this paper, it shall be considered as a state "superfund" site. Any redevelopment of the site, therefore, will require that the existing chemical contamination be appropriately remediated in accord with State of California requirements. These requirements are, in general, as restrictive and frequently more restrictive than federal Superfund site remediation guidelines.

In June 1988, SPTC signed an enforceable agreement with the California Department of Health Services (DHS) covering the remediation of hazardous chemical contamination at the site. SPTC is now in the process of investigating and remediating chemical contamination resulting from past industrial operations, under the supervision of the DHS and the Central Valley Regional Water Quality Control Board.

This paper is based on an investigation by Lee and Jones (1990a,b) commissioned by the City Council of Sacramento of the adequacy of the site investigation and remediation compared to the proposed redevelopment plans for the site. While the site is contaminated by a variety of potentially hazardous chemicals including heavy metals especially lead, chlorinated solvents and their transformation products especially vinyl chloride, diesel fuel-derived petroleum hydrocarbons, and polynuclear aromatics, this paper focuses only on the potential problems associated with the lead contaminated soils and the redevelopment of these areas. Information on the other problems and additional information on the lead contamination issues is provided by Lee and Jones (1990a,b).

The SPTC site is somewhat unique among "superfund" sites in that coincident with conducting the site investigation and remediation for various parts of the site detail planning of plausible redevelopment of the site has been undertaken by SPTC and the City of Sacramento. This situation enables a comparison to be made between the degree of investigation and remediation with the proposed redevelopment of the site.

#### Relationship between Presence of Residual Contamination and Redevelopment

DHS in its analysis of the safe concentrations of lead in surface soils that would be left in residential areas has concluded that 174 mg/kg presents little risk to children. DHS has also established that 950 mg/kg lead in soil is a safe concentration for workers and other non-residential, non-children-related activities. The 950 mg/kg lead is a somewhat arbitrarily-established concentration which is not related to potential human health impacts. DHS (1989) concluded that workers can be exposed to soils containing on the order of 3000 mg/kg lead with little risk of developing excessive blood concentrations of lead. However, 1000 mg lead/kg is the arbitrarily established DHS Total Threshold Limit Concentration; soils containing higher concentrations of lead are classified as "hazardous waste." Therefore, DHS chose 950 mg lead/kg as the remediation level for lead in soils at the SPTC site except in those areas where children could come in contact with the lead-containing soil. These areas have to be remediated to 174 mg/kg lead.

SPTC and DHS are conducting a phased investigation and remediation of various parts of the site. At this time, this work has progressed to the point where there are DHS-approved

hazardous chemical closure plans for several parts of the SPTC Railyard site. DHS has approved the closure of the Battery Shop Yard that was contaminated with lead. The remediation of that area included removal of all soil containing lead in concentrations greater than 950 mg/kg to a hazardous waste disposal site. Since SPTC has classified the Battery Shop Yard area as "commercial/industrial" future use, DHS has allowed SPTC to leave in the area soils that contain lead in concentrations up to 950 mg/kg. In order to minimize the possibility of those soils becoming scattered over the site by wind, DHS required that a 2-ft veneer of soil containing less than 174 mg/kg lead be placed above all soils in the Battery Shop Yard that contain lead concentrations greater than 174 mg/kg. DHS has also required that a deed restriction be placed on that area of the site that limits its use for residential, open-space, and other purposes that could result in the exposure of the public to elevated concentrations of lead.

The 2-tiered soil lead level remediation approach creates concern about the effectiveness of deed restrictions in intensively redeveloped areas, such as proposed for the Southern Pacific Railyard site, in which commercial, industrial and residential development will be side-by-side without any isolation (fencing or other barriers as proposed in the current redevelopment plans). Concern should be raised about the long-term public health implications of the remediation program that was undertaken and approved at the Battery Shop Yard area. There are areas within that region in which soils below the 2-ft depth have significantly elevated concentrations of lead which, if brought to the surface, could represent a hazard to children, based on DHS criteria.

There are a variety of activities that could cause lead-contaminated soils beneath the 2 ft low-lead soil veneer to be brought to the surface. Excavation in the area, such as that associated with digging holes for fence posts, shrubbery, large shade-trees, etc., and trenching could result in contamination of surface soils with lead and other contaminants. One of the lead transport processes of concern is the translocation of lead through plant roots that take up lead and, for that matter, other soil-associated contaminants and expel them through the leaves or fruit. Neither the US EPA nor DHS includes this mechanism of contaminant transport in their respective "Superfund" guidance manuals; it is therefore not evaluated in the typical "Superfund" site RI/FS. Translocation may be a relatively unimportant transport mechanism for the typical "Superfund" site on which only shallow-rooted vegetation is planted, and at which there is little human contact after closure. However, it could be a significant transport mechanism at the SPTC site which will not only likely have more deeply rooted vegetation but also have intense human activity and long-term contact.

The basic issue that has to be resolved is whether the deed restriction for this area as developed in accord with DHS requirements provides for adequate public health protection of children to exposure to elevated concentrations of lead. While DHS is responsible for developing a deed restriction, according to the State Health and Safety Code, it is the City that is responsible for its administration. This situation should be of concern to the City since the adequacy of administration of the deed restriction by City employees will be a major factor in determining the public health and environmental protection as well as protection of the City's interests and in particular its liabilities associated with the redeveloped property in those areas where a thin veneer of low-lead soil exists over soils that contain concentrations of lead currently considered by DHS as potentially hazardous to children.

A variety of scenarios exist in which 950 mg/kg lead in soils could be brought to the surface by individuals without their even being aware of the deed restriction or the fact that at one time the area was a "superfund" site and that the site has elevated levels of a variety of contaminants remaining in the soils. It is very important to note that the lead in the soils will be there forever. It has little tendency to migrate and while it is possible to control land uses associated with the initial property redevelopment, there will be considerably less consciousness about the residual contaminants, such as lead, left at the site by SPTC as part of the site remediation during re-redevelopment 50, 100, or more years hence. It appears that most of the focus of SPTC and DHS is on the initial redevelopment-associated hazards. Longer term hazards should also be considered, especially in light of the fact that SPTC is choosing, with the approval of DHS, not to remediate the site to levels of contaminants that are considered by DHS as safe for unlimited human exposure.

The City, through its administration of deed restrictions and permitting of various types of land use activities, including issuing of building permits, remodeling permits, business licenses, day-care facilities use permits, etc., could find itself with considerable liabilities for having approved a situation in which children become exposed to excessive amounts of lead or other contaminants at concentrations above those considered safe by DHS. As discussed above, there are a number of plausible scenarios where the safeguards that the City might impose as part of its regulatory functions could be circumvented through employee negligence in failing to implement deed restrictions, etc., where the City could be judged by the courts to have assumed some responsibility for the exposure of children to excessive concentrations of lead. It is important to emphasize that those problems will not likely occur as part of the initial redevelopment of the SPTC Railyard site, but could become important 50 or 100 years in the future when the fact that this was a former "superfund" site has long been forgotten.

Fundamentally, the bottom line issue that officials in the City of Sacramento must face as part of approving the redevelopment of the SPTC site is whether there are significant hazards to children that can arise out of the fact that SPTC is doing only a partial clean-up of the site. While the use of these areas with the elevated lead concentrations will initially be restricted to commercial and industrial purposes, a reasonable question to ask is whether there are plausible scenarios where leaving 950 mg/kg lead in the surface soils covered by a thin veneer of low-lead soil, would represent a hazardous situation at some time in the future. To construction workers or occasional users, passers-by, and so forth, this does not appear to represent a highly hazardous situation since as noted above concentrations of several thousand mg/kg would be allowed for adult exposure. However, is it possible that children could be exposed to the 950 mg/kg lead-containing surface soils in a commercial or industrial setting? Certainly with the increased day-care activities in commercial and industrial facilities it is fairly easy to envision a plausible scenarios where 10, 20, 50, or so years from now, a commercial or industrial establishment decides to or is forced to provide day-care facilities for employees' children. The building superintendent or supervisor could decide that this could be done by converting an existing office area and adjacent patio area into a day-care facility. While the establishment would likely have to get a permit for this purpose, it is possible that the day-care facility permit inspector would not be aware of or understand the deed restrictions on the property. Since little or no remodeling is being done, the establishment would not require a city building inspector's inspection and therefore it is possible that children could be exposed to 950 mg/kg lead-containing soils in the

courtyard area of the commercial or industrial establishment under the condition where a thin veneer of low-lead soil covers soils containing up to 950 mg/kg lead. This type of situation is one of the reasons there is concern about only partial clean-up of the SPTC site, and the imposition of future-use restrictions.

Another plausible scenario for children exposure to excessive lead is one in which children from residential areas within the redeveloped site or from residential areas adjacent to the SPTC property could gain access to soils on "commercial/industrial" property that have lead at the surface that are potentially hazardous to children. This situation raises serious questions about any redevelopment plans for a "superfund" site where potentially significant amounts of residual hazardous chemicals exist at the site and there is not fencing or other adequate safeguards which could keep children from gaining access to "commercial/industrial" remediated property.

The current DHS SPTC site project staff have indicated to the authors that it would be their intent to require further clean-up of all areas, such as court-yards and other open spaces in order to significantly reduce the potential for the public to be exposed to elevated concentrations of lead in these areas. While those DHS staff have indicated that it would be their policy to require additional remediation, there are no assurances that future/other staff would address the situation in the same manner.

#### Suggested Approaches for Minimizing Hazards of Residual Chemicals

One of the important issues that should be assessed by the City in evaluating the appropriateness of the SPTC approach for site remediation of attempting to restrict in perpetuity children's access to 950 mg/kg lead-containing soils is what would be the additional cost of cleaning up all soils to a depth of 5 ft or some other greater depth so that there would be at least a 5-ft barrier between the children contact area and the 950 mg/kg lead-containing soils. While the highest levels of soil lead contamination at the site are typically in the upper few feet of soil, there are areas in which it extends deeper. A 5-ft layer of low-lead soil above soils containing elevated lead concentrations provides a significantly greater degree of public health protection in those areas to which children have access to surface soils or vegetation, than a 2-ft or so veneer of low-lead soil.

Consideration should be given in developing a deed restriction to making it explicit that remediation of all open-space areas in "commercial/industrial" areas will be required to 174 mg/kg lead at any locations where there is a potential for public exposure to the surface soils. All lead-contaminated soils left in "commercial/industrial" areas at the SPTC site should be covered by buildings, pavement, or other structures. Adoption of that approach would significantly reduce the likelihood of the public, and especially children, being exposed to elevated lead in surface soils in "residential" and "commercial/industrial" areas as a result of the 2 ft of low-lead soil veneer.

#### Conclusion and Recommendations

The current federal and State of California "superfund" guidelines for site remediation have been found to have significant long-term potential public health and environmental problems associated with "commercial/industrial" residual contaminant level remediated

property and "residential" contaminant level remediated property. The "piece meal" (phased investigation and remediation) approach used by some "superfund" regulatory agencies in evaluating the adequacy of a proposed remediation program can result in "commercial/industrial" contaminant level remediated properties being immediately adjacent to "residential" contaminant level remediated properties or other residential areas without isolation of the two property uses. This situation could readily allow for children to "go across the street" and be exposed to excessive concentrations of residual hazardous chemicals.

Further, within the "commercial/industrial" level remediated properties there are significant long-term potential problems with the ability of property owners and the administrators of deed restrictions such as city employees to properly implement the deed restrictions ad infinitum to ensure high degrees of public health and environmental protection. It is clear that greater attention needs to be paid in developing "superfund" remediation guidelines to consider, not only the proposed initial use of a remediated property, but also the potential long-term uses and the ability of regulatory agencies to administer property use restrictions ad infinitum.

Lee and Jones (1990a) have recommended that the City of Sacramento utilize third party independent reviewers of SPTC site investigation and the degree of remediation of all or parts of the site compared to proposed possible uses of the site in the immediate and long-term future to advise the City on the potential public health and environmental problems associated with the site redevelopment. With this type of information, the City Council can determine whether a proposed remediation and redevelopment plan are compatible and can develop approaches for significantly reducing the City's liability and administration of land uses in the redeveloped properties.

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#### Appendix - References

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