ANALYSIS OF BROWNFIELD CLEANUP OBJECTIVES
Preliminary Evaluation
Prepared by the City of Emeryville

City of Emeryville Star Intersection Affordable Housing Project
3706 San Pablo Avenue, Emeryville, California

1.0 Introduction and Background

The purpose of this preliminary Analysis of Brownfield Cleanup Alternatives (ABCA) is the evaluation of site conditions and possible remedial alternatives. This evaluation will be expanded, modified if necessary, and incorporated into the final Site Cleanup Plan for review by the community, project partners, the regulatory oversight agency and the EPA.

1.1 Site Location

The Star Intersection Affordable Housing Project (the Project) property is located at 3706 San Pablo Avenue in Emeryville, CA (this is the address of one of several parcels that make up the property assemblage). The site is approximately one acre in size, and is located along the primary urban north-south route through Emeryville and Oakland (see attached figure for site location).

1.2 Ownership and Previous Site Use

The property is presently vacant, though was historically occupied by automobile service, light industrial and commercial businesses. Based on a review of available historical data, the Subject Property was developed prior to 1902, starting with a residence along 37th Street and a small building at the corner of 37th Street and San Pablo Avenue.

Between 1902 and 1912, a series of retail shops were constructed along San Pablo Avenue. Two of the three warehouse buildings currently occupying the Subject Property were built before 1931, while the third was built between 1946 and 1951.

1.3 Site Assessment Findings

The City of Emeryville evaluated the project property prior to a 2011 acquisition in accordance with the EPA All Appropriate Inquiries Rule (AAI). Specifically, based on a competitive bidding process, the City retained The Source Group, Inc. (SGI) for the purposes of preparing a Phase I Environmental Site Assessment in accordance with AAI and the ASTM E 1527-05 standard for conducting environmental due diligence.

The ESA identified potential Recognized Environmental Conditions (RECs) associated with historic property tenants and uses. These findings and the results of the physical

investigation that was commissioned to investigate the RECs is described below. The SGI site plan showing layout and investigation elements is attached.

Phase I ESA
From the SGI ESA:

The Subject Property is comprised of three warehouse style buildings, a small concrete paved parking lot and a large open lot with mixed paving and dirt covering. The first warehouse style building (Building 1) is located along San Pablo Avenue. The building is wooden framed with brick walls on a concrete foundation. The interior of the building has been subdivided into seven retail shop areas. Building 1 is currently empty. Building 2 is wooden framed with concrete block walls on a concrete foundation. The interior is open inside with the exception of a several small rooms in the southwest corner. Building 3 was built parallel to MacArthur Boulevard. It appears to be wooden framed with brick walls on a concrete foundation.

The historical records show that businesses known to use hazardous materials (i.e. auto repair, manufacturing and machine shop facilities) have been located on the Subject Property. Thus, the possibility exists that undocumented releases of hazardous materials have occurred.

The City retained SGI to conduct post-ESA physical testing in order to determine the presence of historic use-related environmental impact.

Physical Testing
Three individual episodes of targeted physical testing were completed in 2010 following and based on the Phase I ESA. During the first, SGI collected grab soil and groundwater samples from areas of prior operations for the purposes of evaluating general environmental conditions. Results showed the presence of the halogenated solvent TCE, a substance commonly utilized in the auto service and manufacturing business, in site soil and groundwater.

A second phase of testing was conducted for the purposes of evaluating the potential source of contamination. Results of analysis showed the presence of higher concentrations of TCE in soil and groundwater samples collected next to a floor drain and distressed concrete flooring.

A final phase of testing was conducted to assess groundwater quality in areas not previously explored and to calculate the local direction of groundwater movement.

Chlorinated solvents were measured in groundwater at concentrations up to 440 parts per billion (ppb). The sample point showing the highest concentration of TCE is boring

SB-4, which was advanced immediately adjacent to a floor drain and distressed concrete.

It is plausible to interpret the data as indicating a common source of TCE contamination for the impact measured in the respective sampling points. The in-building drain adjacent to SB-4 is clearly a source area. Under the single common source interpretation, groundwater impact is greatest near the SB-4 drain and extends beneath most of the rest of the building footprint in concentrations declining with distance from the source area.

1.4 Project Goal

The Project property is zoned mixed use (commercial/residential). While the redevelopment is still in the preliminary stages, the acquisition was made using housing funds, ensuring the majority of the property will be programmed for affordable housing. A storefront commercial component may be incorporated for the frontage along San Pablo Avenue.

2.0 Applicable Regulations and Cleanup Standards

2.1 Cleanup Oversight Responsibility

In Emeryville, these regulations are implemented by one of three agencies – the Department of Toxic Substances Control (DTSC), the Regional Water Quality Control Board – San Francisco Bay Region (RWQCB), or the Alameda County Department of Environmental Health (ACEH). The City of Emeryville has a memorandum of understanding with these agencies that permits the City, through an outside Environmental Manager, to be self-directed on a task by task basis. Ultimate regulatory authority and approval of decisions by the Environmental Manager, is retained by the respective agencies. Depending on the nature of the case and the contaminants of concern, either the DTSC or the RWQCB is the ultimate overseeing agency. The ACEH is involved in Brownfield cleanup projects in Emeryville to a less substantial degree.

2.2 Cleanup Standards for Major Contaminants

Cleanup endpoints vary in California and are typically based either on site-specific risk assessments or regulatory guidance documents such as the Environmental Screening Levels (ESL) developed by the RWQCB or the California Human Health Screening Levels (CHHSL) developed by the DTSC. For groundwater where it is relied upon for a drinking water resource, Maximum Contaminant Levels (both California and EPA) may be used as a regulated cleanup endpoint. The City promulgated a well ordinance prohibiting the use of City groundwater for consumption. MCLs are therefore relied upon less frequently for City Brownfield projects.

ESLs and CHHSLs will both be used as guidance or cleanup endpoints for site remediation.

2.3 Laws and Regulations Applicable to the Cleanup

The investigation and remediation of hazardous substances and petroleum in California are governed primarily by regulations promulgated under the California Water Code and the Health and Safety Code. Other laws and regulations applicable to this cleanup include the Federal Small Business Liability Relief and Brownfields Revitalization Act and the Federal Davis-Bacon Act. As with all Emeryville projects that receive Federal funding, Federal, state and local laws regarding procurement of contractors, equal opportunity and the participation of small, woman and minority-owned businesses will be followed.

3.0 Evaluation of Brownfield Cleanup Alternatives

3.1 Cleanup Action Objectives

The results of testing have confirmed the presence of a solvent source in the vicinity of the SB-4 interior drain. The soil column beneath this drain contains TCE, as does the groundwater at and emanating from this source area. The primary threat posed by the unabated contaminant is to construction workers (contact with contaminated soil during construction) and to future site occupants (vapor intrusion/inhalation risk).

The contaminants are also a proven threat to groundwater quality, though Emeryville's well ordinance to a degree protects against this exposure pathway. The ordinance, however, is not a comprehensive regulatory cure. It is anticipated that a degree of source removal and groundwater cleanup will be required by the regulatory agencies.

3.2 Identification and Evaluation of Cleanup Alternatives

Four potentially feasible cleanup alternatives were identified based on Emeryville's experience with similar sites. These alternatives include:

1. No action.
2. Construction of an impermeable barrier.
3. Excavation and disposal.
4. In-situ treatment.

Evaluation criteria include effectiveness, implementability, and cost. The evaluation for effectiveness considers the appropriateness of the alternative with respect to long- and short-term satisfaction of cleanup goals and comprehensiveness in terms of protection to human and environmental health/safety. Implementability addresses the technical and administrative feasibility of the remedial alternative. Cost evaluates the short- and long-term costs associated with remedy implementation.

Alternative 1 – No Action
Under the no action alternative, impacted media would remain in place without treatment.

Effectiveness – This alternative would not lower concentrations of contaminants known to pose a risk to future site occupants and construction workers. For this reason, the no-action alternative would not be effective with respect to the protection of human health.

Implementability – This alternative is easily implemented.

Cost – No costs would be incurred during the implementation of this alternative.

Alternative 2 – Construction of an impermeable barrier
This action would entail the incorporation of an impermeable barrier, likely a membrane-based technology, into the foundation of the residential structure. Impermeable vapor membranes are commonly utilized at Brownfield redevelopment sites where contaminant removal is impossible or prohibitively expensive. These constructed barriers prevent volatile organic compounds, such as the chlorinated solvents present at the Project, from infiltrating the occupied spaces of constructed structures. The membranes do nothing to remove or reduce the concentration of contaminants in the subsurface.

Effectiveness – This alternative is protective in terms of the protection of human health and safety of site residents. It is not protective to construction workers, and any work in and around the contaminated area during site construction would have to be closely monitored. Protective measures would likely be required for certain workers. The vapor barrier should not be considered protective for future redeveloped uses. Any future redevelopment of all or part of the Project property would likely have to be accompanied by contaminant source removal, effectively requiring an investment in protective measures be made twice. The presence of the unremediated contaminant would be noticed by way of a deed restriction or protective covenant.

Implementability – The vapor barrier is readily implemented using commonly available technology.

Cost – Based on experience with similar projects and vendor estimates, costs for the construction of a vapor barrier would be on the order of $4 per square foot of structure. Assuming the Project building will have a footprint of 25,000 square feet; costs for emplacement are estimated at $100,000. Based on experiences with similar projects, costs associated with barrier design and the regulatory review and approval process for a project of this size and complexity are estimated to be $75,000. Vapor barriers also

require maintenance and monitoring for assurance of integrity and enduring protection. Monitoring frequency is greatest in the 2-3 years following construction, generally being scaled back to annually thereafter. Using a 10-year monitoring period as a general guide, costs for monitoring would total $100,000.

Total cost for a protective solution utilizing a vapor barrier would be approximately $275,000. Costs for subsequent removal are not included (refer to following alternatives for an approximation of this ultimate additional expense).

Alternative 3 – Excavation and disposal

This alternative would involve the physical removal of contaminated soil to several feet below the surface of the underlying water table. This removal action would target VOC-containing sediments in the source area (the drain), the soil column beneath the source area, and the wetted sediments at and below the unconfined water table. Groundwater that collects in the excavation would be removed by vacuum truck. Both the extracted groundwater and the excavated soil would be transported off-site for disposal at an appropriately licensed treatment/disposal facility. The excavation would be backfilled and compacted with clean material suited for the construction project to follow.

Effectiveness – Excavation will completely remove VOC-impacted sediments from the shallow subsurface, eliminating the threat from dermal contact (primarily to construction workers) and vapor intrusion. Some concentration of VOCs may remain in groundwater following excavation and dewatering, but it is anticipated the concentration will be sufficiently low so as to not pose any residual risk. As Emeryville has prohibited the construction of water supply wells, and as the contamination at the Project property is restricted on-site, low levels of residual groundwater contamination (that will attenuate over time) is an acceptable remedial endpoint.

Implementability – The current site structures will be demolished in early 2012 in preparation for redevelopment and to eliminate an attractive nuisance. With the structures removed the area around the former drain will be easily accessed. The Project property is sufficiently large for soil stockpiling and staging; access to streets and freeways is easy with no component through a residential neighborhood. This alternative is easily implemented.

Cost – Based on experience with similar projects, it is estimated that costs for planning, permitting and pre-excavation waste profiling will total $25,000. Excavation and disposal of 500 tons of soil (for the purposes of this estimate soil is assumed to be suitable for Class II disposal) is estimated to be $100,000, including consultant oversight, site security, dust control and traffic control. Excavation dewatering and off-site treatment/disposal is estimated to be $25,000. Backfilling and compaction is estimated to total $20,000. A year of post-excavation groundwater monitoring is expected to be

required, and will cost $50,000. The total approximated cost for the excavation and disposal alternative is $220,000.

Alternative 4 – Extraction and treatment

The extraction and treatment alternative involves the removal of the VOC mass from the sediment column by vapor extraction and the removal of the mass/lowering of the water table by pumping. Given the fine-grained nature of the sediments beneath the Project site, it is anticipated that a high-vacuum dual-phase vacuum approach would be utilized, likely with a liquid ring pump and water knockout for entrained vapor. This induced vacuum would lower the water table, exposing previously water-saturated sediments and enabling the recovery of contaminants in the vapor phase. Extracted water and vapor would be treated by activated carbon. Treated water would be discharged to the sanitary or storm sewer; treated air would be vented to the atmosphere.

Effectiveness – Dual-phase extraction and treatment has been demonstrated as an effective remedy at similar projects. Properly constructed and monitored, a dual-phase system is capable of removing a large percentage of the residual VOC contaminant mass in soil and groundwater, resulting in a property remediated to a standard compatible with unrestricted reuse.

Implementability – Using dual-phase extraction equipment, soil vapor and groundwater are extracted from the subsurface by way of constructed wells. The wells are typically 2-inch diameter PVC and are completed either above grade or at grade in manhole boxes. Based on the nature and extent of the contaminant mass at the Project site, it is anticipated that five 20-foot deep extraction wells would be required.

As all site structures will be demolished prior to the commencement of remedial action and as the site will be secured by fencing, free access will be available to install wells in optimal locations and stage extraction equipment and carbon treatment vessels. This alternative, therefore, is easily implemented.

Cost – This alternative can be implemented using readily available personnel and equipment. Based on experience with similar projects, costs for planning, permitting and regulatory review would be approximately $20,000. The five extraction wells and above-ground piping from the wells to the treatment compound would cost and additional $40,000 (including decommissioning). It is anticipated that the extraction event would be six months in duration, followed by a period of equilibration and a final, shorter (three months) duration additional extraction episode. Treatment equipment would be leased, and would cost approximately $75,000. Carbon vessels and two carbon change-outs would cost approximately $50,000. Labor for system operation and maintenance would cost $40,000. A one-year period of confirmation monitoring would cost $40,000. The total estimated cost for extraction and treatment is $265,000.

3.2 Comparison of Alternatives

The no action alternative would meet none of the protective criteria for this project and is therefore dismissed without additional evaluation. Of the three remaining alternatives, all are protective in the short term. Alternative 2 is not protective for the extended term, and additional remediation would likely be required at some point in the future to ensure the complete protection of user/construction worker health and safety. As the site is accessible and complete contaminant removal possible for the expenditure of a comparable sum, it is clear that Alternative 2 is not the most practical remedial alternative for this Project.

Alternatives 3 and 4 are comparable in that they both are completely protective. Costs for Alternative 4 are higher than for Alternative 3, but not inordinately so. The accuracy of estimation, however, is much greater for Alternative 3 than Alternative 4. As the dimensions of the excavated area can be calculated using existing data, the costs associated with excavation, transportation and disposal are estimated with relative certainty. The costs for Alternative 4, however, are less reliably calculated. Even with the collection of performance (pilot) data, the operational duration of the extraction and treatment cannot be accurately determined until the system is constructed and turned on. The duration estimated (six months followed by three months) is reasonable, though it is not unreasonable for operational periods to double what was conceptually estimated.

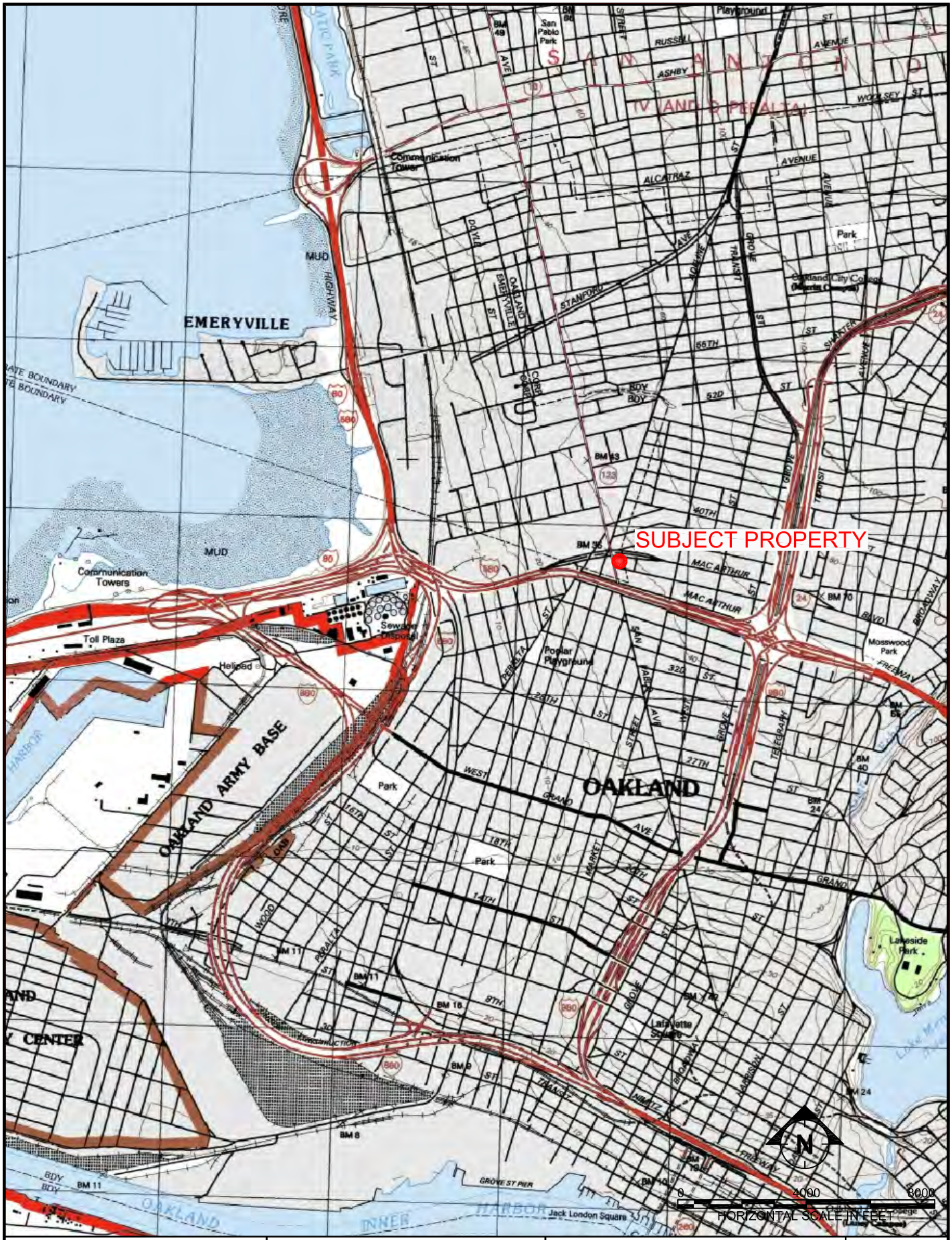
Extraction and treatment remedial methodologies are typically deployed in circumstances where structures or other business/residential operational constraints make a more direct form of contaminant removal (such as excavation) difficult or impossible. Extractive technologies, for instance, can remove contaminants from beneath a building; excavation cannot. In the case of the subject site, there will be no such structural constraints to excavation as the buildings will be demolished before the cleanup begins. Further, the contaminant mass is located in the shallow subsurface and is easily removed by excavation. Given these physical circumstances and the analysis of the conceptual cost breakdown, remediation by physical removal (excavation and disposal) is clearly the most expedient and cost-appropriate alternative.

3.3 Recommended Cleanup Alternative

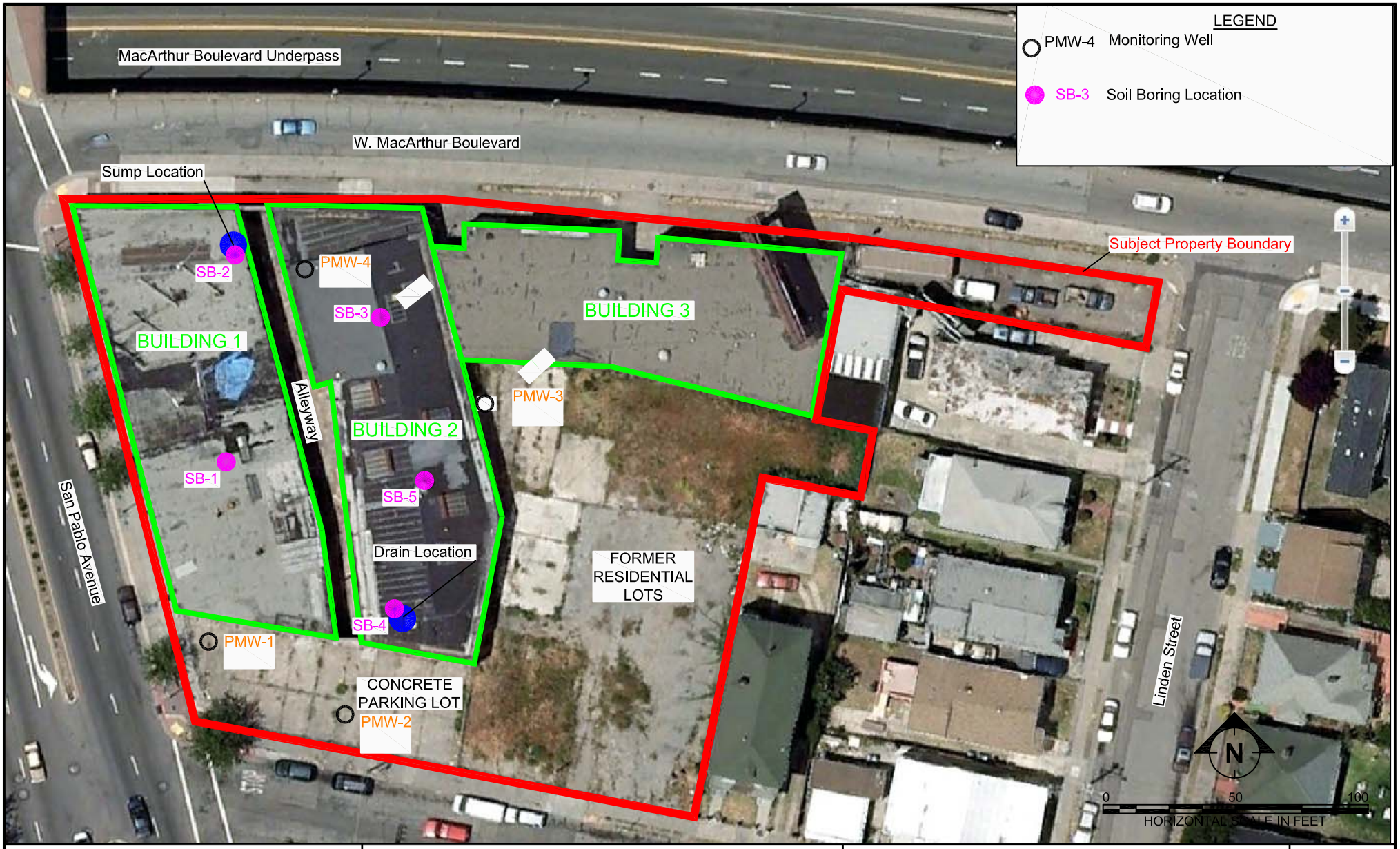
Based on the analysis of effectiveness, implementability and cost, Alternative 3, Excavation and Disposal, is the most suitable cleanup alternative for the Project site.

This alternative provides complete contaminant removal, as opposed to the shorter term solution provided by Alternative 2 and the complete lack of protection associated with Alternative 1. Costs associated with excavation and disposal can be predicted with greater certainty than the costs associated with Alternative 4. Alternative 3 is additionally initially more cost-effective than alternative 4.

This concludes the Analysis of Brownfield Cleanup Alternatives for the Star Intersection Affordable Housing Project.



SGI environmental THE SOURCE GROUP, INC. 3451-C VINCENT ROAD PLEASANT HILL, CA 94523	EMERYVILLE REDEVELOPMENT PROJECT AREA EMERYVILLE, CALIFORNIA				**SUBJECT PROPERTY LOCATION**	**FIGURE 1**
	PROJECT NO.	DATE	DR.BY:	APP. BY:		
	01-COE-001	11/11/09	JP	AZ		



SGI environmental
THE SOURCE GROUP, INC.
3451-C VINCENT ROAD
PLEASANT HILL, CA 94523

EMERYVILLE REDEVELOPMENT
PROJECT AREA
EMERYVILLE, CALIFORNIA

PROJECT NO.	DATE	DR.BY:	APP. BY:
01-EMER-001	9/30/10	KT	AZ

SITE MAP WITH FORMER BORING AND MONITORING WELL LOCATIONS

FIGURE
1