2. Site History and Enforcement Activities

Figures 2-1, 2-2 and 2-3 show many of the features discussed in this text. Most major sources of contamination at the former Montrose and Del Amo plant properties, as well as minor sources between these major sources, are shown on Figure 2-3a. Areas of known or highly suspected non aqueous phase liquids (NAPL) are shown on Figure 2-3b. Section 2 of the JGWFS (1988), the Montrose Remedial Investigation Report (1988), and the Del Amo Groundwater Remedial Investigation Report (1988) each contain more detail on contaminant sources. See Section 7 of this ROD, Summary of Site Characteristics, for more details and conclusions about contaminant distributions.

2.1 Former Montrose Chemical Corporation Plant

Montrose Chemical Corporation operated a technical grade dichloro-diphenyltrichloroethane (DDT) pesticide manufacturing plant at 20201 S. Normandie Avenue in Los Angeles, California from 1947 to 1982. The 13-acre former plant property lies just outside the City of Torrance, in the Harbor Gateway (See Section 1 and Figures 1-1 and 1-2). Historical documents from the time of the plant's operations refer to the plant as "the Torrance plant," and the former plant property has a Torrance mailing address, despite the fact that it was not formally located within the boundaries of the City of Torrance. The layout of the former Montrose plant property is depicted in Figure 2-1.

DDT was one of the most-widely used pesticides in the world until 1972, when the use of DDT was banned in the United States for most purposes. After 1972, Montrose continued producing DDT at the former plant to be sold in other countries. In 1982-1983, the plant ceased operations, was dismantled, and all buildings were razed. Since 1985 there is a temporary asphalt covering over the former plant property, which is otherwise fenced and vacant.

During its 35 years of operation, the Montrose plant released hazardous substances, pollutants or contaminants, into the surrounding environment, including surface soils, surface drainage and storm water pathways, sanitary sewers, the Pacific Ocean, and groundwater. The primary raw materials Montrose used for making the pesticide DDT were ***monochlorobenzene*** (hereafter, "chlorobenzene") and ***trichloroacetaldehyde***, known as "chloral." Montrose placed these in batch reactors in the presence of a powerful sulfuric acid catalyst called oleum. The resulting chemical reaction produced DDT. Chlorobenzene and DDT are two of the primary contaminants found in the environment at the Montrose Chemical Site today. DDT does not significantly dissolve in water but will readily dissolve in chlorobenzene. When in its pure form, chlorobenzene is a dense non-aqueous phase liquid (DNAPL).

An unwanted by-product of DDT manufacture at the Montrose chemical plant was the highly water-soluble compound ***para-chlorobenzene sulfonic acid***, or pCBSA. This compound was created when chlorobenzene was directly sulfonated by sulfuric acid in Montrose's operations. To EPA's knowledge, pCBSA occurs in industry only in connection with DDT manufacture. There are no chronic toxicity data, and virtually no acute toxicity data for this compound. There are no promulgated health standards for pCBSA, which is found extensively in groundwater at the Montrose and Del Amo Superfund Sites. Additional information about pCBSA is provided in later sections of this ROD, including Section 8, Summary of Groundwater-Related Risks, and Section 12, Summary of Comparative Analysis of Alternatives and Rationale for Selected Alternative.

Montrose operations included a series of trenches used to convey wastes and a waste disposal pond (impoundment) which received wastewaters, DDT, and chlorobenzene. This pond also received caustic liquors and acid tars. Activities at the plant caused discharges of chemicals to the ground surface and to the waste pond. The soils under the Central Processing Area of the former Montrose plant contain large quantities of chlorobenzene in DNAPL form, as well as chlorobenzene dissolved in groundwater. The DNAPL occurs both above and below the water table. Data collected during the remedial investigation suggest that this DNAPL is a primary continuing source of groundwater contamination.

There were also periodic discharges of contamination from the Montrose plant into the storm water pathway leading from the Montrose plant. The evolution of this pathway and the discharges of wastes into it are described in detail in Chapter 1 of the *Remedial Investigation Report for the Montrose Superfund Site* (Montrose Site RI Report) (EPA, 1998). Some of these discharges may have resulted in standing contaminated water of significant quantity and over sufficient time that groundwater could have become newly or additionally contaminated by recharge from the ground surface.

Chapter 1 of the final Montrose Site RI Report gives additional details on the Montrose operating history. Section 7 of this ROD provides a more-detailed discussion of contaminant distribution; the most detailed description of contaminant distribution can be found in the Montrose Site RI Report, the Del Amo Groundwater RI Report (Dames & Moore, 1988), and the Joint Groundwater Feasibility Study (JGWFS), Section 2 (EPA, 1998). References for these documents are provided in Section 5 of this ROD.

2.2 Enforcement Activities Related to the Montrose Superfund Site

In 1982, EPA conducted an inspection of the Montrose property and determined that DDT was present in surface drainages leading from the Montrose property. In 1983, EPA and the California Regional Water Quality Control Board issued a enforcement orders to Montrose, requiring them to cease and desist their discharge of hazardous wastes to the storm drain and surface water drainages. On October 15, 1984, the Montrose Superfund Site was proposed for the National Priorities List, or NPL. The Site was listed final on the NPL on October 4, 1989. EPA began a remedial investigation of the Montrose Chemical Site under the Comprehensive Environmental Response, Compensation and Liability Act of 1980, as amended (CERCLA). Montrose demolished the former plant and graded the site in 1984 and 1985 without the prior approval of EPA. Montrose covered the entire property, except for an area in the southeastern corner, with an asphalt cap. On February 19, 1988, EPA issued a unilateral administrative order to Montrose requiring Montrose to cover the uncovered portion of the southeastern portion of the site with asphalt (EPA Docket No. 88-10). Montrose ultimately complied with this request.

On October 28, 1985, Montrose and EPA entered into an Administrative Order on Consent (AOC) (EPA Docket No. 85-04) which obligated Montrose to perform a remedial investigation and feasibility study (RI/FS) of the entire Montrose Chemical site. This AOC was subsequently amended twice, once in 1987 and again in 1989. The AOC required that Montrose evaluate the nature and extent of contamination at Montrose under EPA oversight and subject to EPA approval, including surface and deep soils at and surrounding the former plant site, surface soils in neighborhoods, groundwater, sanitary sewers, and surface water pathways. It also required that Montrose perform a feasibility study, subject to EPA oversight and approval, of alternatives for addressing the contaminants in all of these areas.

Montrose installed groundwater monitoring wells in four separate hydrostratigraphic units, installed onsite NAPL wells, drilled and sampled from soil borings on and near the former plant property, and performed a number of other investigation-related tasks. Montrose generated drafts of the remedial investigation report as well as several drafts of feasibility studies related to screening and evaluating alternatives for soils and groundwater. However, Montrose did not modify any of these drafts adequately, nor did Montrose address EPA's comments on these documents sufficiently, such that EPA could approve and finalize the RI or FS documents. In January 1998, pursuant to the provisions of the AOC, EPA took back from Montrose the work to complete the RI Report and EPA completed it using EPA staff and contractor resources.

See discussion below about the JGWFS for further information about enforcement activities after the initiation of the joint remedial effort for groundwater.

2.3 The Former Del Amo Synthetic Rubber Plant

The United States War Assets Administration (this former federal agency was succeeded by the U.S. General Services Administration [GSA]), owned a synthetic rubber manufacturing facility in Harbor Gateway, between the cities of Torrance and Carson, beginning in 1942. The War Assets Administration entered into operating agreements with Shell Oil Company (Shell), Dow Chemical Company, and several other companies, to operate the plant and to produce synthetic rubber for the United States during World War II. In 1955, Shell purchased the facility and began operating it directly. Shell operated the facility until 1972, at which time operations ceased, the plant was dismantled, and the plant buildings were razed. The plant property has been entirely redeveloped with light industrial and commercial enterprises, with the exception of the area at the south-central border of the former plant property, which is owned by Shell and is the location of the "Del Amo Waste Pits" (see below). The site did not take on the name "Del Amo" until later. The former Del Amo synthetic rubber plant property covered 270 acres, roughly 21 times the size of the neighboring Montrose plant property.

The layout of the former Del Amo plant property is depicted in Figure 2-2. The Del Amo plant had three sub-plants within it, commonly called "plancors." The styrene and butadiene plancors produced styrene and butadiene, respectively, and the rubber plancor chemically combined styrene and butadiene to make synthetic rubber. Of the three plancors, it has been shown that the majority of the contamination (there are exceptions) is found in the area of the former styrene plancor, in which large quantities of liquid benzene and ethylbenzene were stored and used. Over the years of its operation, the Del Amo plant released hazardous substances, pollutants, or contaminants into the surrounding environment. There are, at a minimum, eleven areas at the former Del Amo plant, nine of which are in the styrene plancor, which are under investigation as sources of benzene NAPL to the subsurface (See Figure 2-3a, Item Nos.2, 3, 4, 5, 6, 7, 8, 9, 10, 11, and 12; and also Figure 2-3b). In some of these areas, the evidence of NAPL is conclusive because NAPL has been directly encountered. In the other areas, the evidence of NAPL presence is very strong, but based on deduction from indirect indicators. These areas remain under further investigation by Shell Oil Company and Dow Chemical Company under the oversight of EPA.

All of these NAPL sources lie within or close to the distribution, or "footprint", of the observed groundwater contamination. The "MW-20 area," so-named because it is near monitoring well MW-20, lies near a former benzene storage tank of at least a half-million gallons capacity (Item No.3 on Figure 2-3a; also shown on Figure 2-3b). South of MW-20 is a tank farm which stored benzene and ethylbenzene (Item No. 6 on Figure 2-3a; also shown on Figure 2-3b).

At the southern boundary of the former Del Amo plant property are the unlined "waste pits," in which both tarry and aqueous wastes were discharged, including wastes containing benzene, ethylbenzene, and naphthalene (Item No.10 on Figure 2-3a; also shown on Figure 2-3b). The

waste pits also received surfactants which may account for unusual contaminant migration patterns under the pits. While the pits have a thick soil cover, there is still 55,000 cubic yards of viscous waste remaining in the pits underground. In September 1997, EPA signed a ROD for an operable unit remedy for the waste pits. Pursuant to that selected remedy, an engineered impervious cap complying with requirements of the Resource, Conservation and Recovery Act (RCRA) will be constructed over the waste, which will be left in place. In addition, soil vapor extraction (SVE) will be performed on the soils under the waste. This remedial action is currently in the remedial design phase.

On the eastern end of the former rubber plant lies another area with extensive benzene contamination in soils and groundwater (Item No.12 on Figure 2-3a; also shown on Figure 2-3b). Plant history indicates the presence of laboratories, above-ground pipelines, chemical storage and processing areas, and wastewater treatment areas. All of these have been the subject of the Superfund remedial investigation effort, and some remain under investigation. Enough information is known, however, to select the remedial actions set out in the ROD for groundwater.

In the southeastern area of the former Del Amo plant site, directly east of the waste pits, is another area with confirmed benzene NAPL contamination (Item No.11 on Figure 2-3a; also shown on Figure 2-3b). The source of this benzene is not immediately apparent, though there was a major pipeline in this area while the plant was in operation.

2.4 Enforcement Activities Related to the Del Amo Superfund Site

On May 7, 1992, EPA, Shell Oil Company (Shell), and Dow Chemical Corporation (Dow) entered into an Administrative Order on Consent (AOC) (EPA Docket No. 92-13) which required Shell and Dow, acting as "the Del Amo Respondents," to perform a remedial investigation and feasibility study for the Del Amo site, including the entire 270-acre former plant site. Among the requirements of this AOC was that the Del Amo Respondents perform a 2-phase remedial investigation, a feasibility study, and several focused investigations, including the NAPL near well MW-20, as well as a focused investigation/feasibility study for the Del Amo Waste Pits. To date the Del Amo Respondents have produced a draft Phase I remedial investigation report, a final groundwater remedial investigation report (see below), a final focused feasibility study for the waste pits area, a series of reports and documents related to its investigation of the NAPL at MW-20 and a pilot NAPL hydraulic extraction test (treatability study) for that area, a report on NAPL near monitoring well P-1 and the transmission pipelines, and numerous other satellite documents. The Phase 1 RI report was never finalized by the Respondents, with the agreement that EPA's comments on that document would be addressed in the final RI and that the draft Phase I RI would not be referenced. Phase II work is now in progress.

When the joint groundwater work was initiated, EPA acknowledged that a separate remedial investigation report would be needed for the Del Amo Site which addressed groundwater only, while all remaining aspects of the remedial investigation would need to be documented in a separate report which would be issued later. The Del Amo Respondents voluntarily agreed to produce a "Del Amo Groundwater Remedial Investigation Report," which was completed to EPA's satisfaction in May of 1998.

2.5 Enforcement History Related to the Joint Groundwater Remedial Effort

Because the investigation of the Montrose Chemical Site had begun earlier than that for the Del Amo Site, originally there had been insufficient data to determine (1) the degree to which groundwater contamination from the Montrose and Del Amo Sites were commingled, and (2) the degree to which contamination from the Montrose Chemical Site might be affected by remedial actions that were being considered in feasibility studies for groundwater at the Montrose Chemical Site. The Montrose remedial investigation had identified the existence of extensive Del Amo-related groundwater contamination, but initially the remedial investigation at the Del Amo Site had not progressed to the point that this contamination was adequately defined. Accordingly, EPA considered selecting limited interim groundwater remedies for the Montrose Chemical Site until these factors could be resolved.

However, by late 1995, sufficient data had been obtained from the Del Amo groundwater investigation to determine that (1) the groundwater contamination from the two sites was commingled, and (2) the evaluation of remedial alternatives related to groundwater contamination at one site was inseparable from the same evaluation at the other site. Groundwater contamination at both sites had to be considered together in order to properly evaluate and select groundwater alternatives for the two sites (See Section 4, Context, Scope and Role of the Remedial action, in this ROD).

In late 1995 and early 1996, EPA informed and opened a dialogue with Montrose Chemical and the Del Amo Respondents (Shell Oil Company and Dow Chemical Company) that EPA intended to unite the remedial selection processes with respect to groundwater, thereby leading to a single feasibility study and a dual-site groundwater ROD. EPA initiated a process to generate a single feasibility study, called a Joint Groundwater Feasibility Study (JGWFS) to provide analysis for this ROD. While the separate AOC documents did not directly discuss a JGWFS, the parties agreed to proceed with the joint work as envisioned by EPA on a voluntary basis.

In March of 1996, a joint groundwater modeling effort was initiated. This technical effort was intensely overseen by EPA and was carried out by technical consultants to both parties. A series of meetings occurred from one to three times per month for six months in which a sophisticated

groundwater flow and contaminant transport model was developed. The model was run and results compiled in late 1996. Summary details, results, and limitations of this model are discussed in a later section of this document. Those wishing technical or complete detail are referred to the Joint Groundwater Feasibility Study (EPA, 1998).

While the draft JGWFS was due on March 10, 1997, the joint parties did not submit the draft document to EPA until May 20, 1997. Upon reviewing this document, EPA found it highly deficient and misleading in numerous respects (*See* A.R. No. 4742; EPA DCN 0639-03730). EPA formally took over the work to complete the JGWFS on August 14, 1997. EPA found that while the modeling effort was technically sound and usable, the draft JGWFS report required wholesale revision. EPA took over the work and rewrote the JGWFS, and released the public comment draft on June 26, 1998. The JGWFS is considered final with the issuance of this ROD.

In January, 1998, EPA took over the effort to complete the Montrose Site RI Report after Montrose did not produce an acceptable draft after almost a decade of multiple iterations of Montrose drafts and comments by EPA. EPA completed its revision to this draft document on June 26, 1998. This was referred to as the "Public Comment Draft."

The Del Amo Respondents completed the Groundwater Remedial Investigation Report pertaining to the Del Amo Site on May 18, 1998, in accordance with EPA's comments and EPA has approved that document.

Both Montrose Chemical and the Del Amo Respondents completed the *Joint Groundwater Risk Assessment* in accordance with EPA comments in February, 1998. This document was approved by EPA as amended by EPA's *Supplement to Joint Groundwater Risk Assessment* (EPA, 1988).

2.6 Contaminant Sources Other Than the Montrose Chemical and Del Amo Plants

Within the Joint Site (See Section 6 for formal definition of Joint Site), there are several actual or potential sources of benzene and chlorinated solvents in addition to the former Montrose Chemical plant and former Del Amo plant. Montrose Chemical is the only known source of chlorobenzene, DDT, and pCBSA to groundwater at the Joint Site. As part of the Joint Site, these sources are by definition either entirely within the current area of groundwater contamination from the Montrose Chemical and Del Amo Sites, partly within it, or sufficiently close that contamination will have to be addressed as part of the remedial action selected in this ROD (See Section 6 of this ROD for definition of the term, "Joint Site."). *This section is intended for the purposes of providing background and does not necessarily identify all such sources.* The sources are listed below with the likely primary contributing contaminant in parentheses (). Other contaminants may also be present in each case, as identified by Section 7

of this ROD and the remedial investigation reports for this remedial action, as referenced in Section 5 of this ROD.

- **Petroleum transmission pipelines (benzene).** A series of petroleum transmission pipelines, unrelated to the former Montrose and Del Amo plants, have been and still are used to transfer petroleum products from the port to the refineries in the area (Figure 2-3a, Items "K," "M," and "N"). There are several locations directly under these pipelines where groundwater concentrations are indicative of the likely presence of benzene NAPL and which may be related to these pipelines. The pipelines occur in separate bundles. Most of these bundles run in an east-west direction just south of both the former Montrose Chemical and Del Amo plant properties. One suspect location along this pipeline is south of Montrose along the pipeline, and east of the Jones Chemicals facility (See below for discussion of Jones). Another bundle is a feeder line that runs in a north-south direction into the east-west transmission line, parallel to Berendo Avenue south of the former Del Amo plant. Petroleum NAPL containing benzene has been directly observed along this feeder line near historical groundwater monitoring well P-1.

- **Stauffer Chemical (benzene).** A potential source of benzene in groundwater near the former Montrose plant is Stauffer Chemical, which historically operated a chemical plant on the Montrose property that manufactured benzene hexachloride (BHC), another pesticide. BHC manufacture requires benzene as a feedstock. In the process, benzene is chlorinated to form BHC. The gamma isomer of BHC is known as lindane.

- **Montrose (benzene).** A potential source of benzene in groundwater near the former Montrose plant is the benzene that occurred in raw chlorobenzene, most likely at a rate of less than 1%. Because of the copious quantities of chlorobenzene released, this could account for some of the benzene contamination in groundwater.

- **The Jones Chemicals, Inc. plant (TCE, PCE, DCE, and benzene).** This plant manufactures bleach and sells other chemical products in bulk and has been in operation immediately south of the former Montrose plant since the mid-1950s (Items "J" and "L" on Figure 2-3a). Based on investigations by EPA and the State of California, Jones Chemicals, Inc. is known to have discharged chlorinated solvents to a dry well on their property. Likewise, there are fuel tanks which may have leaked petroleum products into the subsurface. Jones also stored PCE on its property in bulk, packaged PCE in drums, and sold PCE for a number of years. Jones also operated a drum washing facility which was also a likely source of chlorinated aliphatic solvents released to the subsurface.

- **Solvent-handling Facilities (TCE, PCE)** There are facilities near 196th Street at the western border of the former Del Amo plant which have handled chlorinated solvents and

have soils with significant concentrations of these solvents (Item No. 2 on Figure 2-3a; also shown on Figure 2-3b). The operations at these facilities occurred or continue to occur subsequent to the closure of the Del Amo plant.

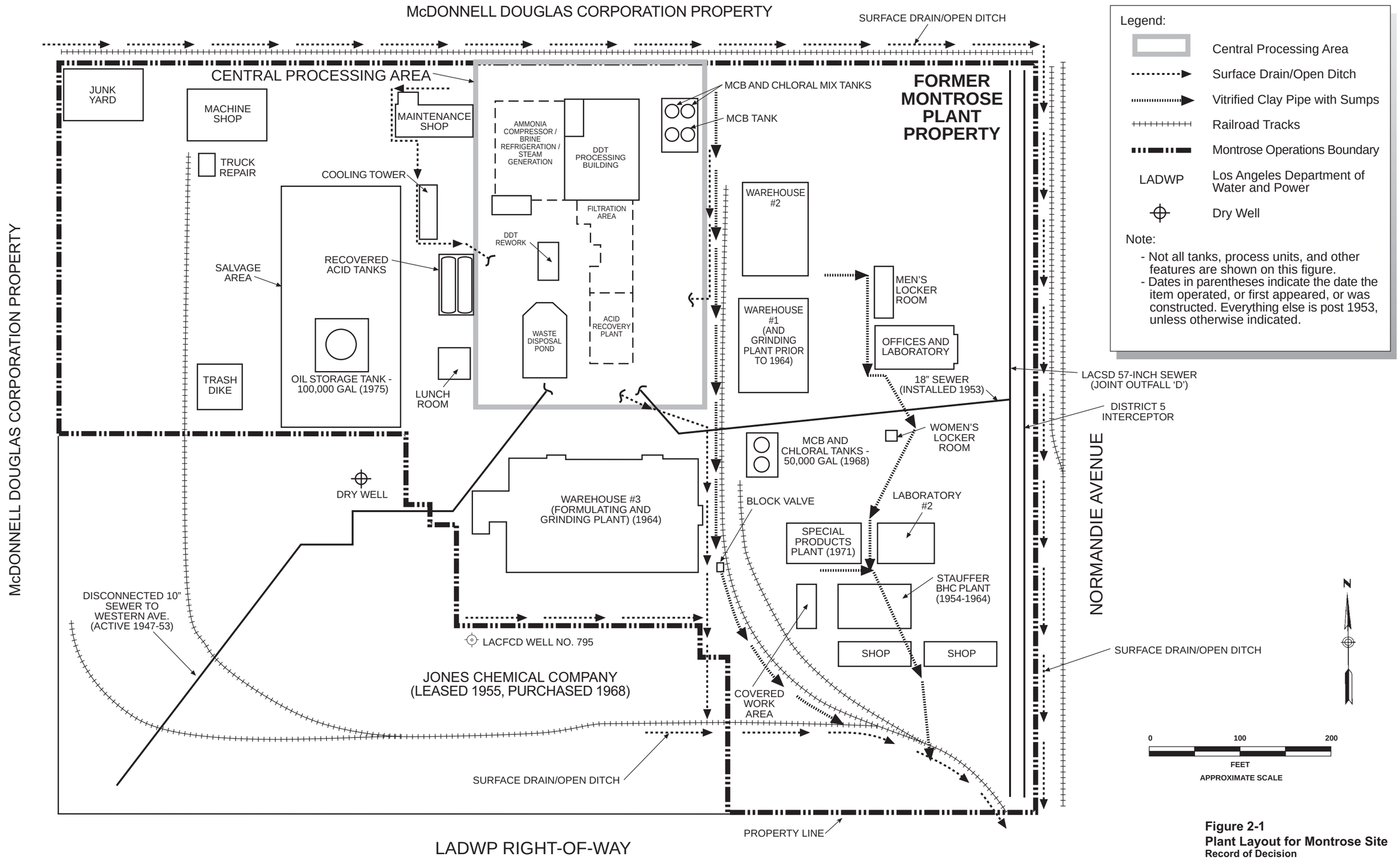


Figure 2-1
Plant Layout for Montrose Site
Record of Decision
Dual Site Groundwater Operable Unit
Montrose and Del Amo Superfund Sites

EPA US EPA Region IX

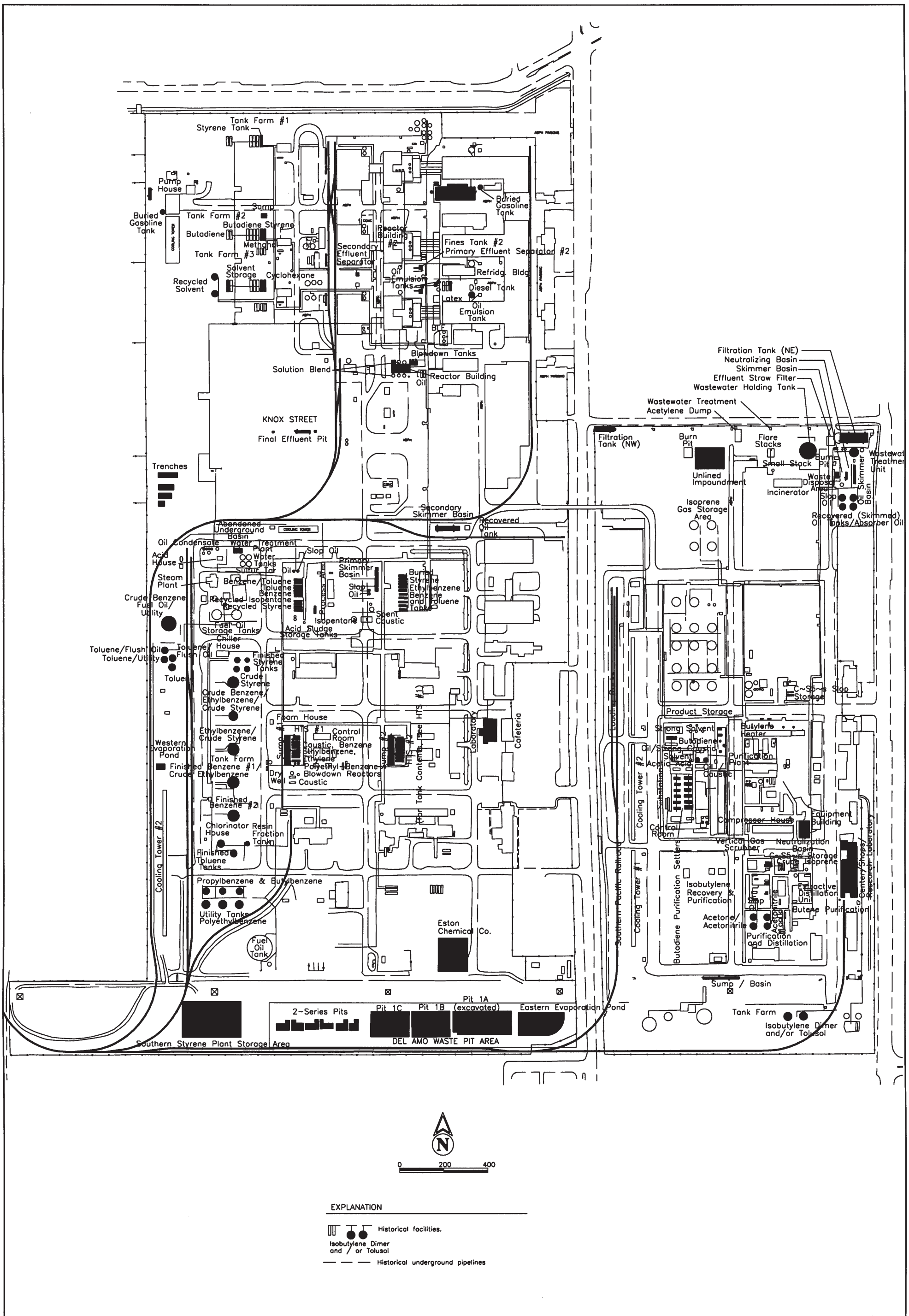
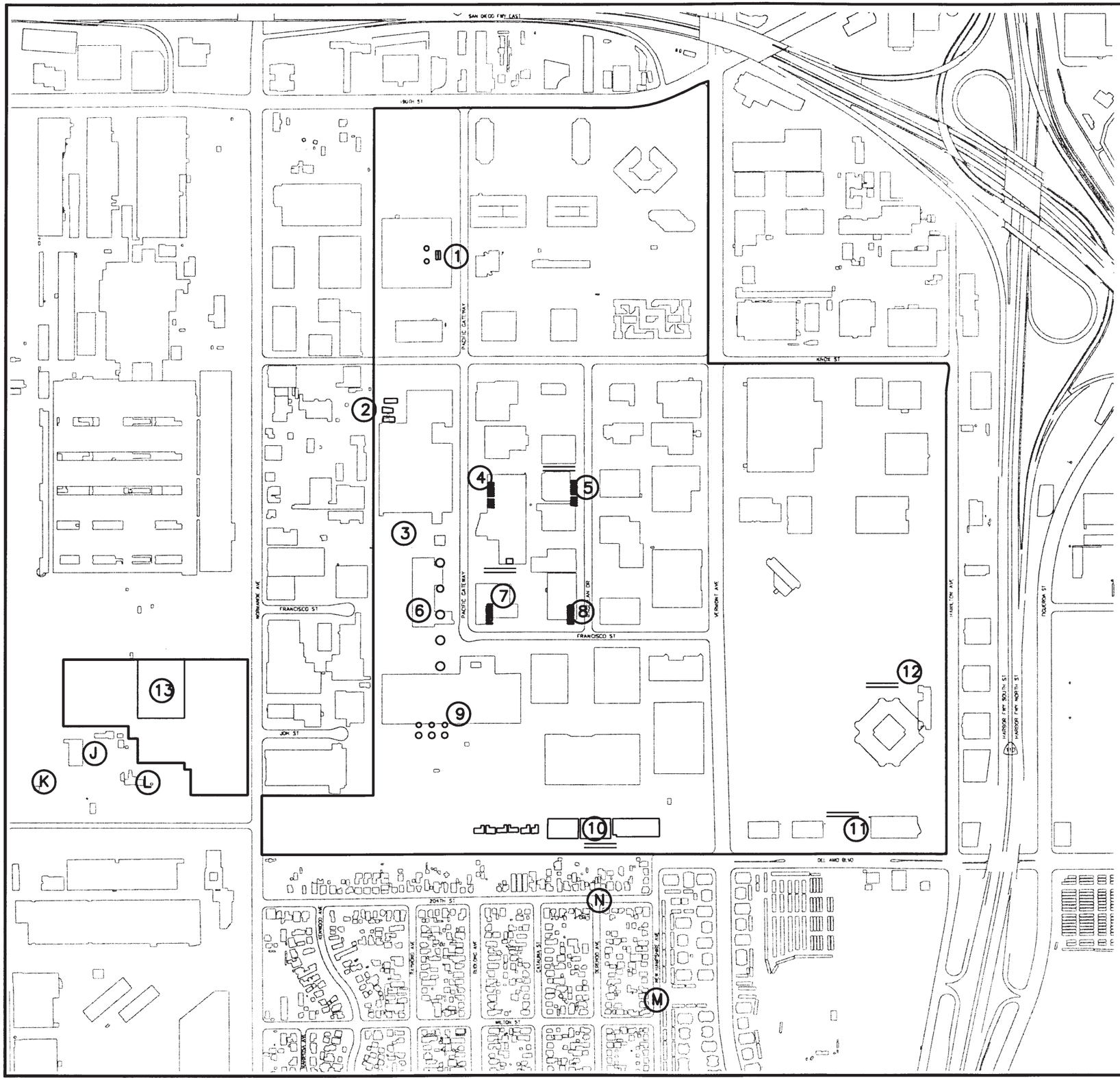


Figure 2-2

Historical Facilities
for Former Del Amo Plant Property
Record of Decision
Dual Site Groundwater Operable Unit
Montrose and Del Amo Superfund Sites

US EPA Region IX



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EXPLANATION

(9) Approximate location of groundwater contamination source areas

Source Area Number	Suspected Former Source Facility	VOCs with Elevated Concentrations in Groundwater
1	Former Del Amo Plant Property cyclohexane tanks	cyclohexane
2	Former Del Amo Plant Property pits and trenches and/or solvent facility	TCE PCE chloroform
3	Former Del Amo Plant Property XMW-20 LNAPL (benzene tank and/or pipeline)	benzene (LNAPL) toluene ethylbenzene
4	Former Del Amo Plant Property VOC tanks in styrene finishing/benzene purification unit	benzene ethylbenzene cyclohexane
5	Former Del Amo Plant Property VOC tanks and/or underground pipelines in styrene finishing unit	BTEX styrene naphthalene
6	Former Del Amo Plant Property tank farm (VOC storage)	benzene ethylbenzene
7	Former Del Amo Plant Property VOC storage tanks at ethylbenzene production unit #1	benzene ethylbenzene
8	Former Del Amo Plant Property VOC storage tanks at ethylbenzene production unit #2	benzene ethylbenzene phenol
9	Former Del Amo Plant Property "utility tanks"	benzene toluene
10	Former Del Amo Plant Property Waste Pit Area and underground petroleum product pipelines	BTEX naphthalene phenol
11	Former Del Amo Plant Property underground benzene pipeline	benzene phenol(?)
12	Former Del Amo Plant Property laboratory, underground pipelines (?)	BTEX styrene cyclohexane naphthalene
13	Former Montrose Plant Property (DNAPL) central process area	chlorobenzene (DNAPL) benzene
N	Pipelines	benzene naphthalene
K	Pipelines	BTEX 1.1-DCA
J, L	Jones Chemical	TCE, PCE, 1,1-DCE, 1,1-DCA, benzene
M	SBL102 LNAPL	petroleum hydrocarbons

FIGURE 2-3a

Former Montrose and Del Amo Plant Properties Groundwater Contamination Source Areas

Record of Decision
Dual Site Groundwater Operable Unit
Montrose and Del Amo Superfund Sites

US EPA Region IX

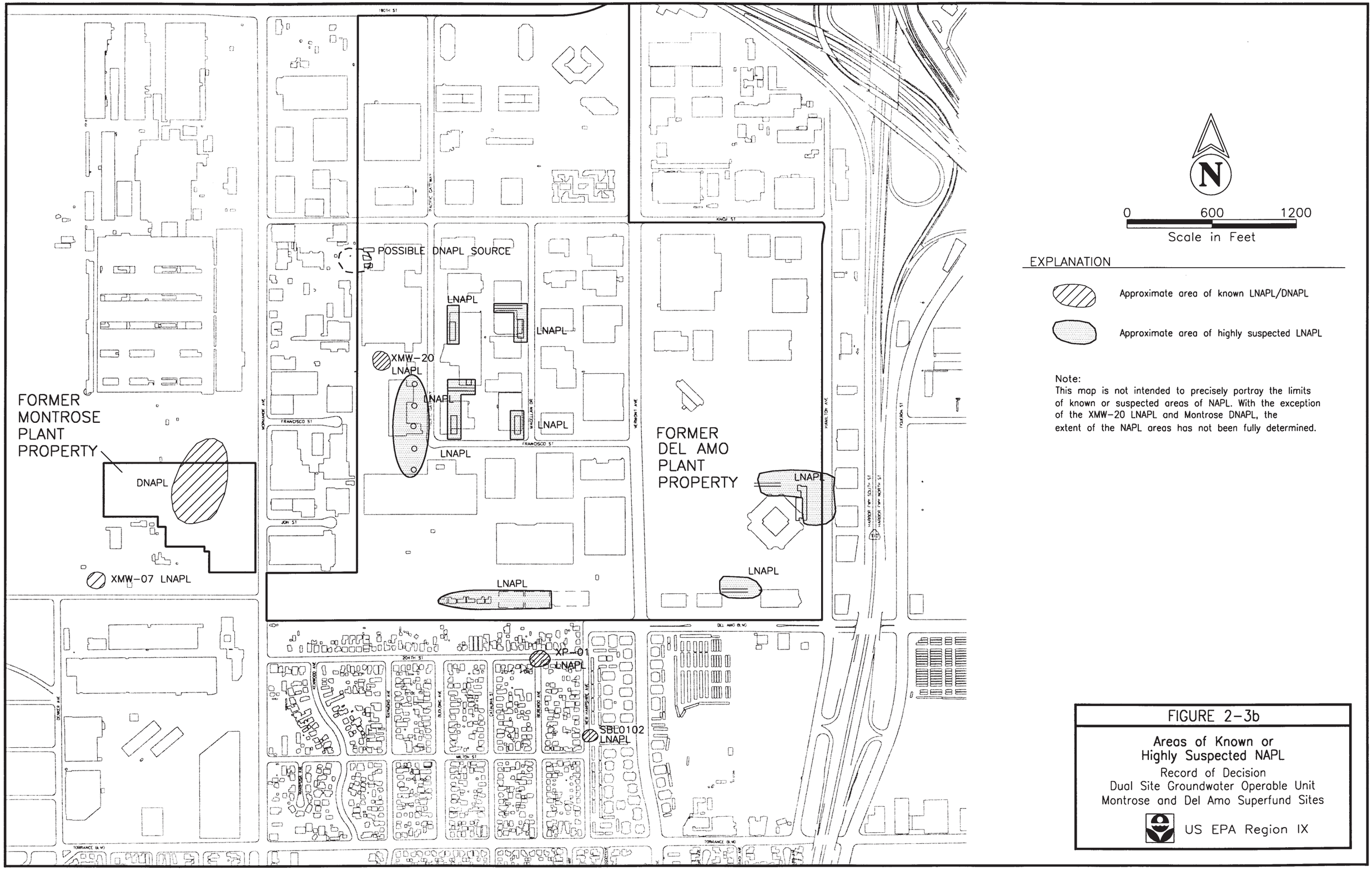

FIGURE 2-3b

Areas of Known or Highly Suspected NAPL

Record of Decision
Dual Site Groundwater Operable Unit
Montrose and Del Amo Superfund Sites

US EPA Region IX