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Golder Associates
CONSULTING GEOTECHNICAL AND MINING ENGINEERS

FINAL REPORT TO
STATE OF WASHINGTON DEPARTMENT OF ECOLOGY

PHASE I REMEDIAL INVESTIGATION OF THE NORTH MARKET STREET SITE SPOKANE, WASHINGTON

VOLUME I

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1. INTRODUCTION

This report addresses the Phase I Investigation of the North Market Street site undertaken by Golder Associates, Inc., (GAI) for the Washington State Department of Ecology (WDOE). The general scope of work is given in Work Assignment NMSS 1 (North Market Street Area - Spokane Work Assignment I - Amendment No. 1).

The objective of this investigation is to collect and review information relevant to the physical and cultural environment in the near vicinity of the site area, and to identify potential impacts from soil and groundwater contamination. The information obtained is used as the basis for recommendations to WDOE for further action.

Included in this report are eight sections and two appendices, as follows:

1. Introduction
2. Physical Environment
3. Cultural Setting
4. Potentially Responsible Parties
5. Public Utilities
6. Well Inventory
7. Soil and Groundwater Impacts
8. Recommendations and Conclusions

Appendix A: Well Logs Included in the Well Inventory (Volume II)

Appendix B: Water Quality Data (Volume II)

Plates (Volume III)

Detailed information has been generated in this investigation through literature research and personal communication with public and private agencies, potentially responsible parties (PRP's) and persons living within the study area. It has been organized and is available upon request from GAI's project files.

1.1 Site Description

The North Market Street site is located approximately 1-1/2 miles north of Spokane, Washington and 2-1/2 miles south of Mead, Washington in eastern Washington. Sixteen potentially responsible parties, all of which, are or have been located within approximately one mile of the intersection of North Market Street and Freya Street/Regal Street (see Figure 1.1), have been identified.

From the early 1920's to date, various activities associated with oil product refining, recycling, storage, disposal, transportation and retail have taken place. As a result of these activities and/or other operations in the area, potential soil and groundwater contamination by hydrocarbons has occurred.

1.2 Chronology of Events

The following is the chronology of events leading to the investigation of the North Market Street site.

- On February 9, 1978, the U.S. EPA designated the Spokane Valley - Rathdrum Prairie Aquifer as a "sole source aquifer" for the Spokane - Coeur d' Alene area (U.S. EPA 1978).

- In 1978, Dale Draper of Draper Tractor Company located on N. 8525 Freya Street (see Plate 4.7 for location), called WDOE's Eastern Regional Office (ERO) to complain of oil product disposed on his land. He claimed he could not support tractors on the land and asked for direction from WDOE as to treating this problem.

- In response to Mr. Draper's claim, WDOE-ERO made a personal visit to Draper Tractor Company and to Draper's neighbors, Chevron Pipeline Company located on N. 8523 Freya Street, and Tosco Corporation located on E. 3225 Lincoln Road (see Plate 4.7). The purpose of the visit was to determine property ownership history, past activities, and to help Mr. Draper with his problem.

- Soil removal was suggested by WDOE-ERO to Mr. Draper and when asked where to dispose of the soil, Colbert Landfill in Colbert, Washington was suggested by WDOE-ERO. Property ownership history and past activities were undetermined or not recorded.

- A short time after the WDOE-ERO visit, Tosco Corporation moved approximately 8000 cubic yards of soil from the southeasternmost corner of its property to backfill exposed oil lagoons located in the northwesternmost corner of its property.

- Also, a short time after the WDOE-ERO visit, Mr. Draper moved approximately 1000 cubic yards of oily soil to Colbert Landfill by the recommendation of WDOE-ERO. However, the soils on Draper's property were still reported to be contaminated despite the amount of soil removed.

- In 1981, the North Market Street site was added to the Emergency Remedial Response Information System by the request of WDOE-ERO.

- In September of 1981, Tosco Corporation found it expedient to complete a hydrogeologic study of their site. The report was prepared by Earth Sciences Associates, Inc., of Palo Alto, California, and included: a description of the facilities, the hydrogeologic setting, the relationship of old waste ponds to the aquifer and a bibliography.

- In May of 1984, R.A. Hanson Company drilled a well on its property leased to the U.S. Bureau of Mines (USBM) located on Magnesium Road and North Market Street (see Figure 7.1 for well location). After continuously pumping the well for several weeks, Sam Pangerl of USBM called WDOE-ERO to complain about the contaminated groundwater. He said the water in their toilet was red and had a diesel fuel odor.

- On July 9, 1984, in response to the USBM complaint, WDOE-ERO collected water samples from the R.A. Hanson well and the A to Z Rental well located on N. 8000 Market Street (see Figure 7.1). Volatile organic analysis was performed on the water samples and benzene, toluene, and xylene, etc., all by-products of oil product, were found in each sample. (See Appendix B for water quality analysis).

- Mid-summer of 1984, JRB Associates completed a preliminary assessment on Tosco Corporation for WDOE.

- On April 22, 1985, (b) (6) called WDOE-ERO to complain of the smell of petroleum in his well water. The well is located on N. 8520 Freya Street just north of Draper Tractor Company's property (see Figure 7.1).

- On March 25, 1985, WDOE-ERO collected a second set of water samples from the R.A. Hanson well, the A to Z Rental well, the Fasmart well and the Washington Water and Power well. Volatile organic analysis was performed on the water samples and benzene, toluene, and xylene were found in the R.A. Hanson and the A to Z Rental, well samples. The other water samples fell below the minimum attainable detection limit for each compound tested. (See Appendix B for water quality analysis.)

- On April 24, 1985, WDOE-ERO visited the (b) (6) well to verify claims of petroleum odor in the well water.

- In May of 1985, JRB Associates completed a preliminary assessment on Midget Oil Company and Draper Tractor Company for WDOE.

- On May 14, 1985, Golder Associates, Inc., received authorization from WDOE to prepare a work plan for the North Market Street Site Investigation.

2. PHYSICAL ENVIRONMENT

2.1 Site Location and Topography

The North Market Street site area includes portions of sections 15, 16, 21, 22, 23, 26, 27, and 28 in T 26 N, R 43 E (see Figure 1.1). The majority of the site is located over the Hillyard Trough and is relatively flat, varying between elevations 2,000 and 2,040 feet. The northwest portion of the site is comprised of low hills rising to a maximum elevation of approximately 2,340 feet.

2.2 Climate

The Spokane River Valley has a generally mild climate with summer temperatures ranging from 80 to 90° F during the day to 45 to 60° F at night. Summer temperature extremes of around 110° F occur occasionally. Winter daytime temperatures range from 25 to 40° F during the day to 15 to 25° F at night with extremes around - 45° F on rare occasion (U.S. Army, Corps of Engineers, 1976).

Mean annual precipitation in the Spokane area ranges from 17 inches in the lower elevations to over 45 inches on Mount Spokane. Maximum precipitation occurs during the winter months. Most precipitation during the months of December through February occurs as snow, which averages about 50 inches per year throughout the area (U.S. Army, Corps of Engineers, 1976).

2.3 Geology

The oldest rocks within the site area are pre-Cambrian metamorphic rocks of the Prichard Formation. These rocks occur in a few isolated outcrops at the base of the highlands to the northeast of the site (Figure 2.1). Tertiary age basalts of the Columbia River Group are exposed in the highlands in the northeastern portion of the site.

These rocks probably form the bedrock bottom and sides of the Spokane Valley. Included with the basalts of the Columbia River Group is the Latah Formation. This formation occurs as interbeds of siltstone, claystone, sandstone, and minor amounts of conglomerate within the basalt. The remainder of the site is composed of Pleistocene glaciofluvial deposits, recent alluvium, and eolian deposits.

The hydrogeologic conditions of the area are dominated by deposits from the most recent glacial period, which occurred from 13,000 to 25,000 years ago. During this glacial period, the Cordilleran ice sheet, which originated in western Canada, advanced southward covering much of northern Washington. One lobe of the ice sheet, the Okaanogan lobe, temporarily blocked the ancestral Columbia River near Grand Coulee creating Glacial Lake Columbia which extended eastward into much of the Spokane Valley area (Waitt and Thorson, 1983). Within this glacial lake, lacustrine sand, silt, and clay were deposited upon either bedrock or older glacial deposits. During this period, eolian deposits of silt, clay, and fine sand (Palpuse Formation) were deposited in the Spokane area. These sediments form the Palouse Formation. The Palouse Formation was generally deposited upon the Columbia River Group Basalts and Latah Formation. Today the Palouse Formation mantles the mesas and highlands of the Spokane area, having been stripped and eroded from the lowlands by subsequent glacial erosion. He is uncertain as to the southernmost extent of the Cordilleran ice sheet in the Spokane area. The general concensus indicates it to be some distance north in the Newport and Milan, Washington areas (Waitt and Thorson, 1983; Conners, 1976; and Weis and Richmond, 1965). As the glacier retreated northward, large quantities of glaciofluvial recessional outwash were deposited over the Glacial Lake Columbia sediments. Interstratified with the recessional deposits are glacial flood deposits from the Missoula floods which occurred when an ice dam at the mouth of the Clark Fork River in northern Idaho was breached.

2.3.1 Stratigraphy

The stratigraphy of the site consists of four major units:

- Bedrock.
- Older glacial deposits.
- Glaciolacustrine deposits.
- Glacial recessional outwash and Missoula flood deposits (see Figures 2.1, 2.2, and 2.3).

Bedrock

The bedrock units consists of pre-Cambrian gneiss and Tertiary basalts of the Columbia River Group. As stated previously, the gneiss and basalt probably form the bottom and sides of Spokane Valley. The Columbia River Group basalts and the interbedded Latah Formation outcrop in the highlands to the northeast of the site.

Older Glacial Deposits

These deposits represent older glacial drift sediments deposited within the ancestral Spokane Valley prior to the impoundment of glacial Lake Columbia. Little is known about these deposits as they are not penetrated by many wells and do not outcrop in the immediate site vicinity. These older glacial deposits probably consist of dense, over consolidated silt, sand, and gravel.

Glaciolacustrine Deposits

These deposits consists mainly of stratified and well sorted sand, silt, and clay with some interbeds of fluvial gravel. These sediments were deposited in Glacial Lake Columbia. According to Cline (1969), these deposits are probably up to 300 feet thick in the Spokane Valley

area. Figures 2.2 and 2.3 indicate the glaciolacustrine deposits are about 80 feet thick in the western portions of the site and appear to pinch out to the east near the center of the site.

Glaciofluvial Outwash and Missoula Flood Deposits

The glaciofluvial deposits consist mainly of bedded sand and gravel with minor amounts of silt, clay and boulders. According to Cline (1969) these deposits range in thickness from 0 to over 700 feet. The greatest known thickness occurs in a 780 foot deep well in the Hillyard Trough, which never penetrated the full thickness of the deposits. Overlying and/or interbedded with the glaciofluvial recessional deposits in Spokane Valley are Missoula flood deposits consisting of poorly sorted, clean, rounded gravel with varying amounts of sand, cobbles, and boulders. An east-west oriented seismic refraction profile in Hillyard Trough was run by Newcomb et al., in 1953. The eastern end of this profile is located approximately one third of a mile west of the site. The thickest portion of the deposit is located near the center of Hillyard Trough with an indicated thickness of 868 feet. The bottom of the deposit occurs at approximate elevation 1,168 feet. The seismic profile shows the bedrock/glaciofluvial contact rising very rapidly to the surface at the east end of the profile. Figures 2.2 and 2.3 show that the glaciofluvial deposits vary considerably in the immediate vicinity of the site. The deposits thin from about 300 feet thick west of the site to about 45 feet thick near the base of the highlands east of the site. These deposits comprise the major aquifer of the area commonly known as the Spokane Valley - Rathdrum Prairie Aquifer.

2.3.2 Hydrogeologic Units

The hydrostratigraphy of the site area reflects the lithostratigraphy. The regional aquitard is the bedrock units of the pre-Cambrian metamorphic rocks, Tertiary intrusive rocks, and the Columbia River Group Basalt/Latah Formation.

The pre-Tertiary rocks contain water in their uppermost zones where they are fractured and weathered. This saturated zone is generally no more than a few tens of feet thick (Cline 1969). Yields of wells from these rocks range from negligible to 35 gpm.

The Columbia River Group Basalt/Latah Formation yield water at about the same level as the fractured and weathered portion of the bedrock. Within the basalt, water moves through vertical joints, cross fractures, and along flow tops. According to Cline (1969), well yields at the top of the basalt vary from negligible to a maximum of 35 gpm. Since the Latah Formation is comprised primarily of fine grained sediments, adequate water supplies are difficult to obtain from this formation. However, yields of less than 35 gpm are obtained from thin interbeds of coarse sand and gravel.

The water yield of the glaciolacustrine deposits varies greatly from 5 gpm to 600 gpm (Cline 1969). The higher yields are obtained from sand and gravel horizons.

The largest ground-water yields are obtained from the glaciofluvial outwash and Missoula Flood Deposits. This aquifer is known as the Spokane Valley - Rathdrum Prairie Aquifer. Yields of several hundred to several thousand gpm are common with much higher yields occurring locally. The most productive portions of the aquifer underlie Spokane Valley and the Hillyard Trough according to Cline (1969).

2.4 Hydrology

2.4.1 Surface Water

The major surface water drainages in the Spokane region are the Spokane River, Little Spokane River, and Hangman Creek. These rivers and their associated drainage basins combine to form an area of 5,900 square miles to contribute water available for recharge to the Spokane Valley - Rathdrum Prairie Aquifer (SVRP). The mean annual discharges of the major surface water drainages at selected gaging stations are listed in Table 2.1.

2.4.2 Groundwater

The SVRP aquifer is recharged by percolation of surface water runoff, underflow from adjacent highlands, percolation of precipitation, seepage from the Spokane River, and percolation of irrigation water diverted from surface water sources (Drost and Seitz, 1978). Plate 2.1 shows locations and rates of recharge to and discharge from the SVRP. All of the recharge sources combine for a total rate of recharge of about 1,320 feet cubic feet per second.

Areas of discharge from the SVRP aquifer include loss to:

- The Spokane River.
- Little Spokane River.
- The downstream end of the aquifer near Nine Mile Falls, Washington.
- Irrigation, domestic and industrial uses.

The total of these average discharges is about 1,320 cubic feet per second (Drost and Seitz, 1978) which is equal to the estimated recharge indicating the SVRP aquifer is roughly in balance.

Plate 2.2 shows the SVRP aquifer boundary, water level elevations, and generalized flow directions. The general groundwater flow direction is to the west and southwest down Spokane Valley. The one exception is at Five Mile Prairie, an outlier of Columbia River Group basalt and pre-Tertiary intrusions. The groundwater flow bifurcates at this point as a portion of water flows to the north through the Hillyard Trough and the remainder to the northwest along the western extension of Spokane Valley. The steepest groundwater gradients in the SVRP aquifer are located in portions of the Hillyard Trough where gradients of more than 60 feet/mile occur (Drost and Seitz, 1978). Based on Drost and Seitz (1978) data, the depths to the water table around the North Market Street site are between 140 to 150 feet below the ground surface. The seismic refraction profile by Newcomb et al., (1953) through the Hillyard Trough confirms this, as it indicates the groundwater at 150 to 175 feet below ground surface.

The transmissivity and velocities of the SVRP aquifer are generally high. Plate 2.3 is from Drost and Seitz (1978) and shows their calculated distribution of transmissivities in the SVRP aquifer. Transmissivities range from as low as 0.13×10^6 feet^2/day at the west end of the aquifer to as high as 11×10^6 feet^2/day near Twin Lakes, Idaho. The Hillyard Trough portion of the aquifer, located within the study area, has an estimated transmissivity of 0.40×10^6 feet^2/day. In the Hillyard Trough, Drost and Seitz (1978) calculated a groundwater velocity of 46 feet/day. This calculation is based on the following assumed parameters:

- Saturated Thickness 160 feet
- Transmissivity 0.4×10^6 feet^2/day
- Water Table Gradient 0.01
- Porosity 0.30

Using the same assumed parameters, Drost and Seitz (1978) calculated a ground-water flow rate through the Hillyard Trough at 350 cubic feet per second. A previous investigation by the U.S. Army Corps of Engineer (1976) calculated 200 cubic feet per second for the Hillyard Trough area.

3. CULTURAL SETTING

3.1 Demographics

The North Market Street site is located approximately 5 miles north of downtown Spokane, Washington, 1-1/2 miles north of the Spokane corporate boundary and 2-1/2 miles south of Mead, Washington, in eastern Washington State, less than 20 miles from the Washington-Idaho border.

The population of Spokane County is estimated at 341,835 and the population of the City of Spokane is estimated at 171,300; Mead, Washington has a population of about 1200 (1982 Rand McNally Road Atlas). The number of people living within a 3-mile radius of the Kaiser Mead plant, located approximately 1-1/2 miles north of the site, is estimated to be about 10,000. This was estimated by identifying 2700 buildings within a 3-mile radius of the Kaiser-Mead plant and an assumed 3.8 persons per building (Kaiser-Mead, Documentation Records for HRS, 6-28-82).

The nearest residential area to the North Market Street site is the Morgan Acre's community, about 1/4 mile southwest of the site. The population of this community is estimated at 2770, based on 729 water district service hookups and an assumed 3.8 persons per home.

3.2 Land Use

The land in the vicinity of the North Market Street site is used for industrial, commercial, residential and recreational purposes. In the comprehensive plan for Spokane County, all the potentially responsible parties (PRP's) are located within the industrial land use district with the exception of Midget Oil Company, located in a suburban land use district (Spokane County Planning Department, 1981). The locations of various land use areas are shown on Figure 3.1.

The PRP's are also located on land zoned as a "manufacturing zone" which allows for manufacturing and processing activities of all types with the exception of Midget Oil Company. Midget Oil is located on land zoned as a "commercial zone", which provides an area for wholesale and retail sales and services of all types (Spokane County Planning Department, 1985) (see Figure 3.2).

The North Market Street site is located in the Hillyard Trough area of the Spokane Valley - Rathdrum Prairie Aquifer, which has been designated by the U.S. EPA as a "sole source aquifer" water supply for the Spokane-Coeur d' Alene area (U.S. EPA, 1978). The entire Spokane Valley -Rathdrum Prairie Aquifer is estimated to supply approximately 340,000 people with water for domestic use and is virtually the sole domestic water source for the Metropolitan Spokane area (Spokane Aquifer Water Quality Management Plan, 1979). Thus, an Aquifer Sensitive Overlay Zone (ASA) has been established (see Plate 3.1) which provides for control of waste water disposal, storage of "critical materials", and uses which impact aquifer water quality (Spokane County Planning Department, date unknown). All of the potentially responsible parties are located within the ASA.

As previously mentioned, Morgan Acre's community is located within approximately three miles of the site area as well as several other residential districts in the cities of Spokane and Mead. Also a number of schools are located within approximately three miles of the North Market Street site, including: Arlington School, St. Thomas More School, John Shaw Junior High School, Rogers High School, Whitman School, Linwood School, Whitworth College, Farwell School, Farwell Junior High School, Liderwood School and Continuation High School.

Commercial activities within approximately one mile of the North Market Street site include: sand and gravel quarries, an equipment manufacturing business, electrical substations and transmission lines, water tanks, a cemetery, and various other businesses entities.

Two decommissioned landfills are located within approximately three miles of the site. They include:

- Mead Township Dump - It is located due north of the town of Mead, Washington. The dump operated from the late 1930's to 1974.

- Cunningham Sand and Gravel Dump - It is located on the southernmost point of Five Mile Prairie on the north end of the city of Spokane, Washington. This dump operated in the early 1970's, however, it is uncertain as to when it stopped operations.

The dumps are located over or near the Spokane Valley - Rathdrum Prairie Aquifer, however, both are hydrologically down gradient from the North Market Street site on the basis of groundwater levels and known generalized flow directions from previous reports (see Plate 2.2).

The recreational areas near the site include: Morgan Acres Park, Mt. Vista Park and a golf course.

4. POTENTIALLY RESPONSIBLE PARTIES (PRP'S)

This section describes the operations of businesses, past and present, who may have caused soil and groundwater contamination within a three mile radius of the intersection of Freya/Regal Street and North Market Street. These entities are therefore identified as Potentially Responsible Parties (PRP's). Previous to the Phase I Investigation, WDOE identified four PRP's (Tosco Corporation, Midget Oil Company, Draper Tractor Company and Chevron Pipeline Company). An additional 12 PRP's have been identified in the course of this investigation. Title search information included other PRP's, although to satisfy the schedule of this report, these parties will be summarized in the decade maps introduced in Section 4.0. Additional research to fill data gaps associated with ownership history has been suggested in Section 8.0 - Recommendations and Conclusions.

4.1 Montana Headlight Oil Company

Montana Headlight Oil Company purchased property within the site area in approximately November of 1939 (see Plate 4.2). Little is known about the engineered facilities or operations of the company, however, according to D.F. Dykens of Tosco Corporation, it operated as a retail outlet for stove oil and various other household oil products (see Table 4.1). Title search information does not show hard dates of divestiture, however, an estimated date is November of 1947.

4.2 Inland Empire Refineries, Inc.

In approximately August of 1938, Inland Empire Refineries, Inc., purchased property to start an oil refinery business (see Plate 4.2 for location). Little information exists as to the size of the refinery, however, photographs taken in approximately 1949 show it to be a relatively large facility. If the facility existed as it did

upon purchase by Wasatch Oil Company in 1948, many engineered facilities and waste oil disposal practices may have contributed to soil and groundwater contamination. Table 4.1 summarizes potential facilities that may have existed throughout the Inland Empire Refinery ownership history.

The refinery was known to dispose of waste oil into several lagoons located on site. Also, photographs taken in approximately 1949 show oil waste and trash disposal areas.

4.3 Wasatch Oil Company

In July of 1948, Wasatch Oil Company purchased Inland Empire Refineries, Inc., and continued to operate the refinery until November of 1949 (see Plate 4.3). According to a report produced by Wasatch Oil Company in June of 1949, approximate charge and yields from the refinery follow:

Charge	Barrels/Day
Crude Oil	7,000
Yields	
Straight Run Gasoline	1,869
Cracked Gasoline	1,332
Reformed Gasoline	480
Naphtha	336
Stove Oil	339
Diesel Fuel	665
Asphalt Base	412
Fuel Oil	732
Gas	1,331
TOTAL	7,496

In summary, approximately 7,500 barrels per day of oil products were produced. Detailed engineering drawings included in the report show numerous underground pipelines connecting storage tanks to transportation depots. Table 4.1 summarizes facilities known to exist at the

plant. As mentioned in Section 4.2, photographs taken in approximately 1949 show open oil waste and trash disposal areas. Although Wasatch Oil Company only owned the facility for approximately one year, operation history shows the potential for waste oil disposal practices and potential soil and groundwater contamination.

4.4 Phillips Petroleum Company

In November of 1949, Phillips Petroleum Company (PPC) purchased the oil refinery from Wasatch Oil Company (see Plate 4.3). PPC operated the refinery until December of 1953, at which time, Petroleum Terminal Company, a subsidiary of PPC, purchased the property and decommissioned the refinery. The plant may have operated at production levels equal to or greater than their predecessor, Wasatch Oil Company, however, little data exists to support this assumption. In 1953, the refinery was completely decommissioned, removed and sold to Time Oil Company in Tacoma, Washington. The tank farm was left intact and continued to operate. Table 4.1 summarizes facilities known to exist while PPC and Petroleum Terminal Company operated the plant. In approximately 1976, Petroleum Terminal Company sold the tank farm to Tosco Corporation.

4.5 Washington Chief Refinery

No record is available on the Washington Chief Refinery. Title search information did not show the existence of such a facility. However, according to D.F. Dykens of Tosco Corporation, Washington Chief Refinery did operate in the late 1940's. The facility was said to be just south of A to Z Rental, north of Lincoln road and east of North Market Street (Washington Chief Refinery may have been mistaken for Spokane Oil and Refining Company shown on Plate 4.2).

4.6 Burlington Northern Railroad (BNRR)

Little is known about the past operations at BNRR, however, underground storage, pipelines, and a creosote treatment facility are known to have existed. See Facility Characterization on Table 4-1. No contact with BNRR has been made to date (see Plate 4.7 for location).

4.7 Shell Oil Company

In approximately 1957, Shell Oil Company purchased property shown on Plate 4.4. Shell Oil is not known to have operated any facilities throughout their ownership history of 1957 to 1959, although, information afforded by the PPC map shows ownership of property known to house the Montana Headlight Oil Company. Also, ownership occurs during a known period of oil disposal practices, and thus, Shell is included as a PRP.

4.8 Midget Oil Company

In October, 1975, John and Rudy Chanzek purchased Payne's Midget Oil Company from Art Payne (see Plate 4.6). On May 30, 1985, a potential hazardous waste site preliminary assessment of Midget Oil Company was completed. According to the assessment, waste oil in unknown quantities were spilled or dumped at this one-acre site. Operations at the site ceased at the end of 1978. (Engineered facilities are shown in Table 4.1). Filter clay refuse was known to be disposed on the site, however, John Chanzek reported that the material was removed on a daily basis by miscellaneous clients. The plant processed approximately 500 gallons of oil per week and stored the product in above-grade storage tanks. The Chanzek's currently own the property and maintain construction equipment in a separate warehouse.

4.9 Chevron Pipeline Company

In approximately December of 1953, Salt Lake Pipeline Company purchased property and obtained easements for operation of an oil pipeline (see Plate 4.4). In the 1980's, the Salt Lake Pipeline property (plot 16) became the property of Chevron Pipeline Company. The products line enters the project site from the east yet begins in Salt Lake City, Utah with principal terminals in Pasco and Spokane, Washington. (The engineered facilities are shown in Table 4.1). Average production is approximately 15,000 barrels (bbs) of product per day. The capacity of the pipeline from Pasco to Spokane is about 47,000 bbs of product. It has been noted that the pipeline has been completely evacuated and then filled with water. "Pigs" and "scrapers" are also inserted into the line to free any existing debris. As much as 30,000 bbs of this cleaning water has been known to be disposed on the Chevron Pipeline Company property. According to Bill Harman of Chevron Pipeline Company, the lines are cleaned every five years. Also, during this process a hydrostatic test is performed. Test data have been requested, although none have been received by GAI.

Clay is used to filter some of the product. This clay has been disposed on their property for the last 20 years, however, a cement holding pit is used as an evaporation facility. Once all the product has evaporated, the clay is disposed on the property. The 5,000 pounds of clay in the filter system is replaced one to four times each year. It was reported by D.F. Dykens of Tosco Corporation that Chevron Pipeline Company has had several spills or ruptured pipeline valves, although this information has not been verified.

4.10 Yellowstone Pipeline Company

Yellowstone Pipeline Company (YPC), adjacent and due south of Chevron, operates an additional pipeline to that of Chevron (not shown on Plates). Little is known about the history of operation of the YPC,

however, the pipeline is directly connected to Chevron Pipeline Company's facility and Tosco Corporation. This pipeline enters the project site from the east (see Table 4.1).

4.11 Conoco (Time Oil)

In approximately 1958, Time Oil Company purchased property to operate a bulk storage tank farm (see Plate 4.4). The engineered facilities known to exist are shown in Table 4.1. The facility is presently in operation to date and is reported to have had some spill history, according to D.F. Dykens of Tosco Corporation.

4.12 Washington Water and Power Company

Washington Water and Power Company (WWP) Company constructed a bulk storage tank farm southwest of the intersection of Magnesium Road and North Market Street sometime in the late 1970's and is presently in operation to date (not shown on Plates). Little is known about the operation history of this facility, however, Table 4.1 includes facilities that potentially exist on their property. A pipeline connects the WWP tank farm with the Chevron Pipeline Company Terminal, according to Bill Harman of Chevron. No known spills, oil waste disposal practices or leaks have been reported for this facility. WWP Company own a well which is included in the detailed well inventory. This well has been sampled, however, no hydrocarbon contamination has been found in this well to date.

4.13 Tosco Corporation

In 1976, Tosco Corporation purchased property from Petroleum Terminal Company, a subsidiary of PPC. Tosco is a bulk storage tank farm for petroleum products. Formerly this site was the location of an oil refinery as reported in the Potential Hazardous Waste Site Preliminary Assessment (PA) completed in September (see Plate 4.7). (Engineered

facilities are shown in Table 4.1). Hydrostatic test data on existing bulk storage tanks do not exist, however past product spills and leakage has occurred during the operation of the Tosco facility. It is undetermined as to the extent of soil and groundwater contamination that may have occurred. Contaminated soil is known to exist on the site, although it is apparent that this material may be the result of oil waste disposal practices by previous owners. Earth Sciences Associates, Inc. were commissioned by Tosco Corporation in 1981 to study the "Hydrogeology of the Spokane Terminal Near Hillyard, Washington." The report concluded that soil contamination has occurred on the Tosco property and could potentially be leaching down into the groundwater system (Earth Sciences Associates, 1981). Recently, no known oil waste disposal practice, leakage, or spills have taken place.

4.14 Draper Tractor Company

In approximately 1978, Dale Draper of Draper Tractor Company purchased property from Standard Oil Company (See Plate 4.7). Engineered facilities existing on site are shown in 4.1. The property comprises approximately nine acres of land which is primarily used to park various types of tractor equipment. Typical operations include vehicle maintenance and equipment rental. Contaminated soil is known to exist on the property, as summarized in Section 1.2 - Chronology of Events. Also, three wells were drilled on site, two of which, were abandoned due to "oil-contaminated water." The other well showed indications of contamination (i.e. "smelled like diesel") however, upon drilling deeper into granite, the drillers could no longer smell diesel odors and the well was installed at that depth. Draper Tractor Company continues to use their well as a drinking water source. A Potential Hazardous Waste Site Preliminary Assessment was completed, in

May of 1985, and concluded that soils and groundwater are contaminated, but contamination is not from current site activities. It also reports that approximately 1,000 cubic yards of oily soil were excavated and hauled to the Colbert Landfill for disposal.

Additional information associated with Draper Tractor Company is included in Section 1.2 - Chronology of Events.

4.15 A to Z Rental

Milt Neuman of A to Z Rental purchased property in 1979 (see plate 4.6) and is still in operation to date. The facility is known to have underground storage of gasoline and diesel fuel (see Table 4.1). Little is known about past operational history, which may have contributed to oil waste disposal, spills, or leakage. (A to Z Rental currently owns a well known to be contaminated by hydrocarbons and is included in the detailed well inventory.)

4.16 Fasmart Gas Station

Fasmart Gas Station was not represented in the title search information although it is presently located on property shown to be owned by Logan on Plate 4.7. The engineered facilities included in the company operation are shown in Table 4.1. Little is known about past operational history which may have contributed to oil waste disposal, spills or leakage.

4.17 Other PRP's

The following parties have been identified by the title search as owning or having owned property in the study area.

- (b) (6)
- Great Northern Railway Co.

- Hursh-Sinclair Refining Co.
- (b) (6) [redacted]
- Spokane Oil and Refining Co.
- (b) (6) [redacted]
- BR & B, Inc.
- Discount Lumber & Building Supply
- (b) (6) [redacted]
- Gunning Builders
- (b) (6) [redacted]
- Larson, Reld & McKinley
- (b) (6) [redacted]
- Mac's Metal
- North Spokane Irrigation District #8
- Pacific Northwest Pipeline Co.
- Radiology Assoc.
- Rynd
- (b) (6) [redacted]
- St. Joseph Church
- Schmidt and Weaver
- Standard Oil of California
- (b) (6) [redacted]
- T.D. Partnership

- (b)(4) copyright [redacted]
- Triangle Facilities, Inc.
- Tri-Amis
- (b) (6) [redacted]
- Washington/Idaho Laborers Employers Training Trust
- Washington Trust Bank
- (b) (6) [redacted] of
- Continental Oil Co.
- (b) (6) [redacted]
- Milfab Co.
- Northern Oil Terminal Co.
- (b) (6) [redacted]
- Spokane County
- Salt Lake Pipeline Co.
- (b) (6) [redacted]
- Lion Oil Co.
- E.C. Mullen, M. Hurdle, F.C. Curran
- Blasingame & Dawson
- (b) (6) [redacted]

- (b) (6) [redacted]
- Times Tiny Tot Foundation
- (b) (6) [redacted]

5. PUBLIC UTILITIES

This section contains information related to public utilities that could potentially impact soil and groundwater quality or influence groundwater conditions. Also, it includes a description and location of the various purveyors (water suppliers) located within a three-mile radius of the site.

5.1 Sewer Systems

One major sewer system exists within a one-mile radius of the site. This system, shown in Figure 5.1, is part of the city of Spokane sanitary sewer system and includes sanitary, storm and combined systems and drywells.

No sanitary or storm sewer systems exist north of the corporate boundaries of the city of Spokane, which is 1-1/2 miles from the site. Individual septic systems, drywells, drainfields and cess pools are most frequently used. However, the R.A. Hanson plant, as well as other major industrial facilities within the area, may have their own sewer systems. Septic systems, etc., operated by selected potentially responsible parties are shown in Table 5.1.

5.2 Other Utilities

Location and historical record of other utilities, such as electrical, gas, and telephone, etc., have not been researched as the potential groundwater impacts associated with these utilities is relatively low.

5.3 Purveyors

Presently, nine water supply districts exist within a three-mile radius of the site. The names and locations of these districts are shown in Figure 5.2. Table 5.2 summarizes wells owned by each district and data associated with each of these wells.

6. WELL INVENTORY

The initial scope of work was to develop a well inventory within a one mile radius of the North Market Street site. However, after an initial examination of well log data and review of the Spokane Valley - Rathdrum Prairie Aquifer characteristics generated in previous reports, it was agreed with WDOE that the scope should be expanded to include wells within a three mile radius of the site.

Well logs collected from WDOE-ERO, the Spokane County Health District, and the Water Supply Bulletin No. 27 (USGS, 1969) are indexed and included in Appendix A. Approximately 230 wells are included in the list, of which, 36 wells were selected for detailed investigation based on groundwater levels and flow directions known from previous studies. Detailed well inventory information includes: location, ownership, depth, static water levels, etc., and is summarized in Table 5.2. Location of all the wells included in the general well inventory are shown on Plate 6.1.

Upon completion of the detailed well inventory, approximately 3 wells of the 36 wells visited by GAI personnel are conducive to water level measurements. Thus, the vertical control survey will not be included in this phase of activities.

7. SOIL AND GROUNDWATER IMPACTS

7.1 Soil Contamination

Soil contamination may potentially exist at several locations within the study area. These locations are shown in Figure 7.1. One exploratory borehole was drilled (see Figure 7.1) in April of 1981 for Tosco Corporation and shows evidence of oil-saturated soil. No log of the boring exists, although 14 samples, preserved in transparent, sealed plastic casing have been retained by Tosco (visually examined by J. Roberts, June 20, 1985). According to Earth Sciences Associates, a consultant firm commissioned by Tosco to study the Spokane terminal area, "Oil contamination can be observed in the samples to a depth of at least 16 feet." Depth to the boring and the sampling techniques are unknown and there is no record of chemical analysis of the soil.

Additional evidence for potential soil contamination is afforded by a property map produced by Phillips Petroleum Company (PPC) in 1953. Unlined oil lagoons, covered approximately four acres of their property (see Section 4. for related ownership information). These are shown on Figure 7.1 based on the PPC information. Air photographs of the North Market Street site, generated by the Department of Natural Resources (DNR) and Walker Associates in 1967, 1971 and 1974 show the existence of the same lagoons, although the size of these lagoons are much smaller than those indicated on the PPC map. As noted in Section 1.2 of this report, soil removal and backfilling have taken place on the site. These activities have removed topographic features of past oil-product disposal practices as evidenced in air photographs produced by DNR and Walker Associates in 1978, 1979, and 1980.

Direct risk to the general public apparently exists as a result of contaminated soils. Most of the contaminated soil is located within a fence-enclosed area of the Tosco and Draper Tractor Company properties and is, therefore, inaccessible to the general public. However, there

is a continuing risk to the public from groundwater contamination potentially caused by the leaching of contaminated soil. (Additional information associated with soil contamination may be found in Section 4. of this report.)

7.2 Water Quality Data

As noted in Section 2.4.2 the site is located over the Hillyard Trough of the Spokane Valley - Rathdrum Prairie Aquifer. The general groundwater flow direction is north-northwesterly, as shown in Figure 7.1. Water quality data are available on most of the wells included in the detailed well inventory (see Table 5.2) and the location of these tested wells are shown on Plate 6.1. However, this data is primarily used to characterize the aquifer water chemistry over a large area. Thus, three distinct groups of water quality data exists. One is water quality data generated for the Spokane County '208' Aquifer Office. The second is water quality data generated for the Spokane County Health District (SCHD). Parameters typically tested for these two entities include:

- Inorganics - ('208' Aquifer).
- Volatile organics - a scan of approximately 12 compounds ('208' Aquifer).
- Bacteria analysis (SCHD).

(See Appendix B)

Although this data is significant, no conclusions as to the extent of groundwater contamination at the site can be drawn.

The third group of water quality data was generated by WDOE-ERO from selected wells in the proximity of the site. Parameters tested for included a total volatile organic scan. This data was generated in two separate water sampling programs in response to a complaint made in May of 1984 to WDOE-ERO (see Section 1.2 for the chronology of events).

The first samples were collected on July 9, 1984 by WDOE-ERO. The wells sampled included:

- R.A. Hanson/U.S. Bureau of Mines well (No. 52).
- A to Z Rental well (No. GA3).

(see Figure 7.1 for locations).

A well log exists for the R.A. Hanson well (see Appendix A) but not for the A to Z Rental well. The results of the analyses indicated hydrocarbons in the form of benzene, toluene and xylene as well as other compounds (see Appendix B).

The second samples were collected on March 25, 1985 by WDOE-ERO. The wells sampled included:

- Fasmart well (No. GA2).
- A to Z Rental well (No. GA3).
- Washington Water Power - WWP (No. 51).
- R.A. Hanson/U.S.B.M. (No. 52).

Well logs exist for the WWP and R.A. Hanson well, but not for the Fasmart or A to Z Rental wells (see Figure 7.1 for well locations). The results of the analyses again indicated hydrocarbons in the form of benzene, toluene and xylene as well as other compounds in the A to

Z Rental well and the R.A. Hanson well, however, no detectable concentration of these compounds were found in the other wells (see Appendix B).

7.3 Hazardous Compounds

This section presents health effects of the contaminants of concern. The major contaminants of concern include benzene, toluene and xylene. The U.S. Environmental Protection Agency (EPA) and the State of Washington have not promulgated drinking water standards for these contaminants. Numerous researches and health advisory groups have recommended standards. Currently, the EPA is reviewing the researchers and is expected to promulgate standards in the near future.

7.3.1 Benzene

Benzene is an aromatic hydrocarbon. Under standard conditions it is a colorless liquid with a very characteristic odor. It is highly flammable and volatile. Benzene is relatively soluble in water and miscible with a variety of organic solvents. The vapors of benzene are nearly three times heavier than air causing them to settle in low places if the ambient air is relatively still.

Since benzene is broken down rapidly by bacteria in non-chlorinated water, the levels reported in individual samples may grossly underestimate the actual amount present as a result of decomposition due to sunlight or storage.

Short-term exposure to relatively high-levels of benzene produces central nervous system effects. Such effects include dizziness, giddiness, exhilaration, nausea, vomiting, headache, drowsiness, staggering, loss of balance, narcosis, coma and death.

In conclusion, Benzene at high levels is extremely toxic to the central nervous system.

7.3.2 Toluene

Toluene is an aromatic hydrocarbon and occurs as a clear colorless liquid with a benzene-like odor. It is soluble in water and in organic solvents. It is likely to volatilize from the surface of any open water.

Toluene is typically produced in the oil refining process. The chemical is used as a benzene-toluene-xylene reformate to blend gasoline.

Exposure to toluene usually occurs by inhalation in experimental or occupational settings or during episodes of intentional abuse. The principal health effect occurring in both humans and animals is depression of the central nervous system after acute exposure to high levels of the compound.

(U.S. EPA - Office of Drinking Water Health Advisory Program; Drinking Water Recommended Standards, March, 1985.)

7.3.3 Xylenes

Xylenes are petrochemical deriviatives with many uses as solvents, detergent, and other household or industrial products. It is both water and organic solvent soluble.

Xylenes produce central nervous system disturbances as reflected in changes on reaction time, short-term memory, etc. Much higher concentrations effect the liver.

Very limited data are available concerning the removal of xylenes from drinking water. However, it is apparent that both granular activated carbon and (to a lesser extent) aeration may be effective in reducing certain xylene isomers. Aeration may have some limited effectiveness in reducing ortho-xylene (o-xylene).

7.3.4 Other Hazardous Compounds

Other hazardous compounds found in water samples collected at the North Market Street site are:

- 1,2 dichloroethane
- Tetrachloroethylene
- Trichloroethylene
- 1,1,1, trichloroethane

7.4 Groundwater Impacts

As indicated in the water quality data summarized in Section 7.2, groundwater contamination exists at the site. Although it is difficult to ascertain whether or not more than one source is causing groundwater contamination, the water quality data does indicate a potential for more than one source of analysis. The R.A. Hanson well, located down gradient from the A to Z Rental well, indicates complicated benzene compounds that are most typically found in gasoline. However, the A to Z Rental well water quality data indicates compounds that are most typically found in crude oil or waste oil product.

Regardless, evidence of past site history shown in the previous sections of this report, indicate many potential sources of groundwater contamination. To ascertain which source or sources are the sole contributors to the problem is premature. Additional groundwater water analysis and other activities must be performed before any assumption can be made.

8. RECOMMENDATIONS AND CONCLUSIONS

8.1 Review of Past Actions and Phase I Remedial Investigation

In 1978, WDOE-ERO responded to a complaint of oil contaminated soil at the North Market Street site. In 1984, WDOE-ERO responded to a second complaint in regards to groundwater contamination. A limited groundwater sampling program was established by WDOE-ERO to characterize the contamination. The sampling program identified a potential plume of hydrocarbon-contaminated groundwater possibly originating at the North Market Street Site. Thus, in May of 1985, GAI received a work assignment from WDOE to investigate the North Market Street site (see Section 1.2 for the complete chronology of events).

The Phase I investigation by GAI included:

- Work Plan Development.
- Initial Meetings and Site Trip.
- Property, Land Uses and Geodetic Surveys.
- Operations and Enforcement History.
- Geology and Hydrology Review.
- Well Inventory.
- Engineering Activities Investigation.

A significant amount of information and data related to the site was collected. These data, which include: personal contact memoranda, title search information, maps, groundwater sample analyses, photographs, etc., are contained in GAI project files.

8.2 Rationale for Further Action

Based upon data collected in Phase I of this investigation, a list of tasks perceived to be appropriate to complete a remedial investigation/feasibility study (RI/FS) is as follows:

Currently, groundwater contamination at the site could potentially be a risk to the general public. Widespread use of domestic and industrial wells exist within a three mile radius of the site. The Schmidt (No. 50), the Draper Tractor (No. 24) and R.A. Hanson (No. 52) wells all were drilled for domestic use. The Draper Tractor Company well is the only well known to be currently used for drinking water purposes.

Additional wells exist on the well inventory map that were not visited by GAI. These wells could be used as domestic wells for drinking water purposes, and thus, exist as potential receptors of contaminated groundwater. Additional efforts must be made to locate these wells.

1. Prepare a work plan for Phase II.
2. Fill Phase I data gaps.
3. Prepare a Health and Safety Plan for continued activities.
4. Prepare a QA/QC plan for continued activities.
5. Design a water sampling program to include 20 to 25 wells.
6. Obtain consent forms from property owners for additional engineering activities.
7. Collect water samples.
8. Complete laboratory analysis of water samples.
9. Prepare a work plan for Phase III.
10. Design and complete an exploratory boring program (if necessary).
11. Install additional groundwater monitoring wells (if necessary).
12. Complete the remedial investigation report.
13. Prepare a work plan for Phase IV.
14. Complete an environmental/risk assessment.
15. Complete the feasibility study.

Tasks 1 through 12 are included in the remedial investigation. The feasibility study includes tasks 13 through 15 and will be further subdivided as alternatives are developed.

These above tasks can be completed in three additional phases:

- Phase II - Task 1 through 8.
- Phase III - Tasks 9 through 12.
- Phase IV - Tasks 13 through 15.

8.3 Scope of Work

8.3.1 Phase II Work Plan Development - Task 1

This task involves:

- Attendance at meetings with WDOE to design scope of work for the Phase II RI.
- Preparation of work plan and submission of draft to WDOE for review.
- Meet with WDOE to discuss proposed work plan.
- Preparation and submission of final work plan.

8.3.2 Phase I Data Gaps - Task 2

Significant data gaps exist in regards to PRP's identified in the course of this investigation. Interviews, title search information, ownership maps, etc., indicate the potential for hydrocarbon soil and groundwater contamination by various activities. However, historical ownership, engineering activities and operations need more definition.

Also, almost all the PRP's have operated assorted underground storage facilities or underground pipelines. Hydrostatic test data has been requested from a few PRP's, yet additional test data is necessary to more accurately assess the impacts potentially caused by each of these facilities.

Although an extensive well inventory has been completed for a three mile radius of the site, many wells shown on Plate 6.1 have not been located. Thus, it is recommended to locate any wells which may potentially become contaminated based on known groundwater levels and flow directions from previous reports. This will limit potential health and environmental risks.

8.3.3 Preparation of QA/QC and Health and Safety Plans - Tasks 3 and 4.

A QA/QC plan will be designed to include all activities performed at the site. Principal sections included in the QA/QC plan follow:

- Project Description
- Project Organization and Responsibilities
- Objectives for Measurement Data
- Sampling and Measurement Procedures
- Sample Custody
- Calibration Procedures and Frequency
- Analytical Procedures
- Data Reduction, Validation, and Reporting
- Internal Quality Control Checks
- Performance and System Audits
- Preventive Maintenance
- Specific Routine Procedures Used to Assess Data, Precision, Accuracy and Completeness
- Corrective Action
- QA Reports to Management
- References
- Appendix A: Glossary of Terms
- Appendix B: Technical Procedures
- Appendix C: Laboratory QA Plan

A Health and Safety plan will be prepared for the site for the scope of work anticipated for the remainder of the RI/FS.

8.3.4 Water Sampling Program - Tasks 5 and 7

The water sampling program will be designed to include 20 to 25 wells. These wells will be selected for sampling on the basis of location, depth, aquifer characteristics, etc. QA/QC will be included in the design of the water sampling program.

8.3.5 Permission - Task 6

This task includes obtaining signed agreements from selected local residents within the study area to enter their property for water sampling, water level measurements, drilling (if necessary) as well as other potential engineering activities.

8.3.6 Laboratory Analysis - Task 8

Laboratory analysis will be performed on each sample collected in the water sampling program. An EPA approved laboratory will test for the following parameters:

- Volatile organic analysis on all water samples.
- Total priority pollutant scan on three selected water samples (samples will not be tested for pesticides).

QA/QC will be maintained throughout the water sampling program.

8.3.7 Phase III Work Plan Development - Task 9

This task involves:

- Attendance at meetings with WDOE to design a scope of work for Phase III RI.
- Preparation of work plan and submission of draft to WDOE for review.

- Meet with WDOE to discuss work plan.
- Preparation and submission of final work plan.

8.3.8 Exploratory Boring Program and Groundwater Monitoring Well Installation - Tasks 10 and 11

The purposes of the exploratory boring program are:

- To locate trenches, pits, lagoons and contaminated soils, etc.
- To define the site specific soil stratigraphy.

A systematic sampling grid and soil sample compositing technique will be included in the design of the soil sampling program.

The purpose of the groundwater monitoring well installations will be:

- To further define the direction of groundwater movement to and from the site.
- To determine groundwater quality.
- To further define the stratigraphy at the site.

QA/QC will be maintained throughout both of these tasks.

8.3.9 Remedial Investigation Report - Task 12

The RI final report will summarize site characterization data generated in all phases of the RI to include:

- Literature Search and Site History.
- Water Quality Data.
- Exploratory Boring/Monitoring Well Installation Data.
- Recommendations and Conclusions.

8.3.10 Phase IV Work Plan Development - Task 13

This task involves:

- Attendance at meetings with WDOE to design a scope of work for Phase IV FS.
- Preparation of work plan and submission of draft to WDOE for review.
- Meet with WDOE to discuss work plan.
- Preparation and submission of final work plan.

8.3.11 Environmental/Risk Assessment

Based on the results of the field investigations and data evaluation, an Environmental/Risk Assessment will be conducted. These assessments will be used to determine the effectiveness of each viable remedial action alternative.

8.2.12 Feasibility Study - Task 15

The feasibility study will provide an evaluation of remedial alternatives developed throughout the course of the study. This phase will be further subdivided into tasks as alternatives are developed.

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GOLDER ASSOCIATES

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TABLE 2.1

MEAN ANNUAL DISCHARGES OF MAJOR SURFACE WATER DRAINAGE AREAS

Location	Mean Annual Discharge (ft^3/sec)
• Spokane R. at Post Falls, Idaho	6,345
• Hangman Creek at Spokane, WA	259
• Spokane R. above Seven Mile Bridge near Spokane, WA	7,860
• Little Spokane River near Dartford, WA	627
• Spokane River at Longlake, WA	8,145

Data from Drost, B.W. and Seitz, H.R. (1978)

TABLE 4.1

POTENTIALLY RESPONSIBLE PARTIES - FACILITIES CHARACTERIZATION

PRP'	Oil Recycling	Oil Refinery	Tank Farm	Pipe-lines	Under-ground Storage	Above Grade Storage	Ware-house Storage	Treatment Facilities	Containment Dikes	Water Disposal Area
A to Z Rental					X		X			
Burlington Northern Railroad				X	X			X		
Chevron Pipeline Co. (Salt Lake City Pipeline)				X						
Draper Tractor Co.					X		X			
Fasmart Gas Station					X					
Headlight Oil Plant		X	X	X	X	X			X	
Inland Empire Oil Refinery		X	X	X	X	X			X	X
Midget Oil Co.	X				X	X				X
Phillips Petroleum Co.		X	X	X	X	X			X	X
Shell Oil Co.										
Time Oil			X	X	X				X	
Tosco Corporation			X	X	X				X	
Wasatch Oil Co.		X	X	X	X	X			X	X
Washington Chief Refinery		X								
Washington Water and Power			X	X						
Yellowstone Pipeline				X						

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TABLE 5.1

POTENTIALLY RESPONSIBLE PARTY	SEPTIC TANK	DRAIN FIELD	DRYWELL	INSTALLATION DATE
Tosco Corporation 3225 E. Lincoln Road	1500 gal.	300 l.f.		10/31/80 ?
Formerly Inland Empire Refineries	2000 gal.			4/3/48
Chevron Pipeline for Salt Lake Pipeline on Phillips 66 Property	500 gal.	100 l.f.		7/23/53
CONOCO Northern Oil Terminal Co. Time Oil Co.	 750 gal. 500 gal.	 150 l.f.	 500 gal.	 12/9/59 6/29/59
Draper Tractor 8525 N. Freya	750 gal.	150 l.f.		10/5/76
Washington Water Power N. 8300 Regal	750 gal.	150 l.f.		4/10/85
A to Z Rental N. 8000 Market Street Precast Concrete Products	 900 gal. 900 gal.	 180 l.f. 180 l.f.		 5/21/71 9/12/79
Fasmart N. 8213 Market Formerly BR&B Inc.	1000 gal.	240 l.f.		9/15/78

TABLE 5.2
DETAILED WELL INVENTORY

OWNER	GAI WELL NO.	OWNER'S WELL NO.	Use[s]	LAND ELEVATION (feet above m.s.l.)	WELL ELEVATION (feet above m.s.l.)	DEPTH OF WELL (feet)	DEPTH TO SWL (feet)	WATER YIELDING UNIT[a,1]	PUMP TYPE[u]	PUMPAGE RATE (GPM)	WATER QUALITY DATA AVAILABLE
Spokane Suburban[t]	(6330R)	3-1	D	1970[h]	-	293[b]	228.8[b]	-	T[b]	900	X
Spokane Suburban[t]	(6320N)	3-2	D	2040[h]	-	238[i]	208[i]	Qyg/Qyf;s,g	T[i]	950	X
Spokane Suburban[t]	(6310K)	3-13	D	1910[h]	-	100[a]	90[a]/100.0[e]/92[f]	Qyg/Qyf;s,g	T[i]	275	X
Spokane Suburban[t]	(6308B0	3-5	D	1765[h]	-	89.5[a]	38[i]	Qyg/Qyf/Qsl;s,si	T[i]	30[p]	X
Spokane Suburban[t]	92(6303P)	3-6	D	1890[h]	-	201[a]	145[a]/152[e]	Qyg/Qyf/Qsl/;s,g,c	T[a]	325	X
Spokane Suburban[t]	93(6303N)	3B-7	D	1870[h]	-	180[a]	116.2[a]/143.0[e]	Qsl/Qog;c,s,g	T[a]	1250	X
Spokane Suburban[t]	GA19	3-8	D	1600[h]	-	204[a]	13[e]/16.5[f]	Qsl;s,g,c	-	380	-
Spokane Suburban[t]	84(6310L)	3B-4	D	1900[a]	-	116[a]	92[a]/92.5[e]	Qyg/Qyf;s	-	0	X
Whitworth[t]	149(6307G)	Test Well	D	1790[h]	-	160[a]	100[a]	Qyg/Qyf;s,g	-	0	X
Whitworth[t]	136(6320D)	2A	D	1950[h]	-	286[a]/288[d]	152[a]/155[d]	Qyg/Qyf;s,g	T[i]	850	X
Whitworth[t]	144	2	D	1936[h]	-	163[a]/163[d]	137[a]/146.8[d]	Qyg/Qyf;g	T[i]	0	-
Whitworth[t]	150(6307P)	3	D	1780[h]	-	134[a]	46[a d]	Qyg/Qyf/Qsl,s,g,si	T[i]	350[q]	X
Whitworth[t]	(6307K01)	3A	D	-	-	163[d]	76.5[d]	-	-	750	X
Whitworth[t]	GA70	3B	D	1780[h]	-	200[d]	110[d]	-	-	3000[p]	-
N.Spokane.Irg.Dst.[t]		1	D	2032[h]	2031.3[cm]	258.5[c]	190[c]	-	-	600	-
N.Spokane.Irg.Dst.[t]	7	2	D	2031[h]	2032.7[cm]	255[c]	188[c]	Qyg/Qyf;s,g	T[i]	1300	-
N.Spokane.Irg.Dst.[t]	39	3	D	2020[h]	2031.3[cm]	257[c]	190[c]	-	T[a]	825	-
N.Spokane.Irg.Dst.[t]	6	4	D	2030[h]	2031.5[cm]	274[c]	190[c]	Qsl;s,si,c	-	1200	-
City of Spokane[t]	119[k]	Cen.Ave.1	D	2081[h]	-	270[i]	225	Qyg/Qyf,g,s,si	S[i]	6500[r]	-
City of Spokanet	GA20[k]	Cen.Ave.2	D	2081[h]	-	270[i]	225	-	S[i]	-	-
City of Spokane[t]	GA14[j]	Hoff.Ave.1	D	2068.00[g]	2055.75[gm]	216.44[g]	181.44[g]	-	T[g]	900[r]	X
City of Spokane[t]	GA21[j]	Hoff.Ave.2	D	2068.00[g]	2055.75[gm]	231.00[g]	181.44[g]	-	T[g]	-	X
Wash. Water Power	51	WWP #1	D,I	2020[h]	-	280[a]	170[a]	Qsl/Qog;g,s,c,	-	-	X
A to Z Rental	GA3	N/A	D,I	2000[h]	-	-	-	-	-	-	-

TABLE 5.2 (Continued)

OWNER	GAI WELL NO.	OWNER'S WELL NO.	Use[s]	LAND ELEVATION (feet above m.s.l.)	WELL ELEVATION (feet above m.s.l.)	DEPTH OF WELL (feet)	DEPTH TO SWL (feet)	WATER YIELDING UNIT[a]	PUMP TYPE[u]	PUMPAGE RATE (GPM)	WATER QUALITY DATA AVAILABLE
Mead School	88	N/A	A	1830[h]	-	146[a]	79.5[a]	Qsl;s,si,c	T[i]	-	-
Whitworth College	56	N/A	D	1915[h]	-	197[a]/240[dl]	157[a]	Qsl;s,c	T[i]	-	-
Cunningham S&G	25	N/A	I	1970[a]	-	244[a]	193[a]	Qyg/Qyf;s,g	-	-	-
Ray Turf Farms	2	N/A	A	2050[h]	-	207[a]	-	-	-	-	-
(b) (6)	50	N/A	D	2000[h]	-	260[a]	190[a]	Qyg/Qyf;s,g	T[a]	-	-
	9(2327E)	N/A	D	2000[a]	-	280[a]	-	pT;granite	-	-	X
	(6327H)	N/A	D	1995[h]	-	-	-	-	-	-	X
(R.A. Hanson)	52	N/A	D	1900[a]	-	238[a]	-	pT;granite	-	-	X
Bureau of Mines Fasmart	GA2	N/A	D	1985[h]	-	-	-	-	S[d]	-	X
Kaiser-Mead[t]	49(6321F)	South	I	1990[a]	-	206[a]	180.8	-	-	-	X
Kaiser-Mead	160	N/A	I	1936.4[m]	1936.4	170[a]	157.5[a]	-	N	-	-
Kaiser-Mead	161	N/A	I	-	-	162.5[a]	1519[a]	-	N	-	-

FOOTNOTES:

[a](Driller's Log); [b](Pump Installation Report); [c](North Spokane Irrigation District Report); [d](Personal Contact by J. Roberts, GAI, 1985); [e](Measured by J. Roberts, GAI, 7-9-85); [f](Pump Test Report); [g](Vertical Control of City of Spokane Datum); [h](Interpolated from USGS 7.5 Minute Topographic Map); [i](Washington Water Supply Bulletin 27, 1969); [j](Golder Well Numbers GA14 & GA21 May Be Reversed); [k](Well Numbers 119 and GA20 May Be Reversed); [l](Well Deepened); [m](Surveyed Elevation); [p](Summer Months); [q](Emergency Well); [r](Annual Average for Both Wells); [s](A - Agricultural, D - Domestic, I - Industrial); [t](Purveyor Well); [u](T-Turbine, S-submersible, N-None)

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