Public Health Assessment for

QUEEN'S 41ST AUTO SALVAGE
(a/k/a QUEENS 41 AUTO)
LAND O'LAKES, PASCO COUNTY, FLORIDA
EPA FACILITY ID: FL0001909712
SEPTEMBER 30, 2002

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
PUBLIC HEALTH SERVICE
Agency for Toxic Substances and Disease Registry

PUBLIC HEALTH ASSESSMENT

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(a/k/a QUEENS 41 AUTO)

LAND O'LAKES, PASCO COUNTY, FLORIDA

EPA FACILITY ID: FL0001909712

Prepared by:

Florida Department of Health
Bureau of Environmental Epidemiology
Under a Cooperative Agreement with the
Agency for Toxic Substances and Disease Registry

THE ATSDR PUBLIC HEALTH ASSESSMENT: A NOTE OF EXPLANATION

This Public Health Assessment was prepared by ATSDR pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA or Superfund) section 104 (i)(6) (42 U.S.C. 9604 (i)(6)), and in accordance with our implementing regulations (42 C.F.R. Part 90). In preparing this document, ATSDR has collected relevant health data, environmental data, and community health concerns from the Environmental Protection Agency (EPA), state and local health and environmental agencies, the community, and potentially responsible parties, where appropriate.

In addition, this document has previously been provided to EPA and the affected states in an initial release, as required by CERCLA section 104 (i)(6)(H) for their information and review. The revised document was released for a 30-day public comment period. Subsequent to the public comment period, ATSDR addressed all public comments and revised or appended the document as appropriate. The public health assessment has now been reissued. This concludes the public health assessment process for this site, unless additional information is obtained by ATSDR which, in the agency's opinion, indicates a need to revise or append the conclusions previously issued.

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FOREWORD

The Agency for Toxic Substances and Disease Registry, ATSDR, was established by Congress in 1980 under the Comprehensive Environmental Response, Compensation, and Liability Act, also known as the *Superfund* law. This law set up a fund to identify and clean up our country's hazardous waste sites. The Environmental Protection Agency, EPA, and the individual states regulate the investigation and clean up of the sites.

Since 1986, ATSDR has been required by law to conduct a public health assessment at each of the sites on the EPA National Priorities List. The aim of these evaluations is to find out if people are being exposed to hazardous substances and, if so, whether that exposure is harmful and should be stopped or reduced. If appropriate, ATSDR also conducts public health assessments when petitioned by concerned individuals. Public health assessments are carried out by environmental and health scientists from ATSDR and from the states with which ATSDR has cooperative agreements. The public health assessment program allows the scientists flexibility in the format or structure of their response to the public health issues at hazardous waste sites. For example, a public health assessment could be one document or it could be a compilation of several health consultations the structure may vary from site to site. Nevertheless, the public health assessment process is not considered complete until the public health issues at the site are addressed.

Exposure: As the first step in the evaluation, ATSDR scientists review environmental data to see how much contamination is at a site, where it is, and how people might come into contact with it. Generally, ATSDR does not collect its own environmental sampling data but reviews information provided by EPA, other government agencies, businesses, and the public. When there is not enough environmental information available, the report will indicate what further sampling data is needed.

Health Effects: If the review of the environmental data shows that people have or could come into contact with hazardous substances, ATSDR scientists evaluate whether or not these contacts may result in harmful effects. ATSDR recognizes that children, because of their play activities and their growing bodies, may be more vulnerable to these effects. As a policy, unless data are available to suggest otherwise, ATSDR considers children to be more sensitive and vulnerable to hazardous substances. Thus, the health impact to the children is considered first when evaluating the health threat to a community. The health impacts to other high risk groups within the community (such as the elderly, chronically ill, and people engaging in high risk practices) also receive special attention during the evaluation.

ATSDR uses existing scientific information, which can include the results of medical, toxicologic and epidemiologic studies and the data collected in disease registries, to determine the health effects that may result from exposures. The science of environmental health is still developing, and sometimes scientific information on the health effects of certain substances is not available. When this is so, the report will suggest what further public health actions are needed.

Conclusions: The report presents conclusions about the public health threat, if any, posed by a site. When health threats have been determined for high risk groups (such as children, elderly, chronically ill, and people engaging in high risk practices), they will be summarized in the conclusion section of the report. Ways to stop or reduce exposure will then be recommended in the public health action plan.

ATSDR is primarily an advisory agency, so usually these reports identify what actions are appropriate to be undertaken by EPA, other responsible parties, or the research or education divisions of ATSDR. However, if there is an urgent health threat, ATSDR can issue a public health advisory warning people of the danger. ATSDR can also authorize health education or pilot studies of health effects, fullscale epidemiology studies, disease registries, surveillance studies or research on specific hazardous substances.

Community: ATSDR also needs to learn what people in the area know about the site and what concerns they may have about its impact on their health. Consequently, throughout the evaluation process, ATSDR actively gathers information and comments from the people who live or work near a site, including residents of the area, civic leaders, health professionals and community groups. To ensure that the report responds to the community's health concerns, an early version is also distributed to the public for their comments. All the comments received from the public are responded to in the final version of the report.

Comments: If, after reading this report, you have questions or comments, we encourage you to send them to us.

Letters should be addressed as follows:

Attention: Chief, Program Evaluation, Records, and Information Services Branch, Agency for Toxic Substances and Disease Registry, 1600 Clifton Road (E60), Atlanta, GA 30333.

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1.0 SUMMARY

The Queen's 41st Auto Salvage site (the site) is at 6600 Land O' Lakes Boulevard, Land O' Lakes, Pasco County, Florida. In March 1997, a neighboring property owner reported that the Queen's 41st Auto Salvage business had dumped oil products and antifreeze into a sinkhole on the Queen's property. He also charged that this dumping had contaminated his private well. In response, local, state, and federal environmental agencies sampled the potable well on the Queen's property and two nearby residential wells. Water from the on-site well contained chlorinated solvents at concentrations that exceed Florida drinking water standards. Water from the two nearby residential wells contained similar contaminants, but not at levels exceeding the Florida drinking water standards. To better characterize the nature and extent of contamination, the Florida Department of Environmental Protection and the Environmental Protection Agency collected additional soil, sediment, and ground water samples on- and off-site.

The site is categorized as an indeterminate public health hazard from past exposures. However, because the length of time the on-site drinking water well was contaminated prior to 1997 is unknown, the Florida Department of Health (Florida DOH) cannot estimate the public health risk from using this well in the past. Past use of water from nearby, off-site drinking water wells, however, is unlikely to have caused illness.

For current exposures, the site is categorized as a no apparent public health hazard. The on-site drinking water well is equipped with a filter and use of off-site ground water is unlikely to cause illness.

This site may be categorized as a public health hazard in the future. Future use of on-site ground water without a filter may increase the risk of illness. In the future, lifetime drinking and showering with tetrachlorotheylene-contaminated ground water from on the site could cause a "low" to "moderate" increased risk of cancer. Nearby, off-site drinking water wells should be monitored to ensure that they do not become a health hazard in the future.

Environmental agencies did not detect elevated levels of any of the contaminants in on- or off-site surface soil. However, subsurface soils (2 to 8 feet below ground) contain levels of arsenic that exceed the ATSDR comparison value. Because humans do not regularly contact subsurface soil, Florida DOH concludes that exposure to arsenic in subsurface soil is unlikely. Like the subsurface soil, sediment samples from the drainage ditch also contained detectable concentrations of arsenic. Ingestion of arsenic in sediment would not result in a dose that would cause illness. Neither surface nor subsurface soil contained any of the organic contaminants at levels that exceed the ATSDR comparison value. Therefore, these contaminants in soil are unlikely to cause illness.

The Florida DOH recommends unfiltered ground water from the site not be used for drinking or showering. Furthermore, the movement of contaminated ground water should be monitored by regularly testing the on- and off-site monitoring wells and the nearby off-site drinking water wells.

2.0 PURPOSE

In this Public Health Assessment (PHA), Florida DOH, in cooperation with the Agency for the Toxic Substances and Disease Registry (ATSDR)[1], assesses the public health threat from exposure to chemicals in the environment at and around the Queen's 41st Auto Salvage site. Florida DOH estimates which groups of people may be at risk under past, current, and future conditions. Florida DOH then estimates if these exposures may have caused illness in the past, could be causing illness now, or could cause illness in the future. Finally, Florida DOH recommends actions to reduce or prevent these exposures and therefore, the illnesses.

3.0 BACKGROUND

3.1 Site Description and History

The five acre Queen's 41st Auto Salvage site (the site) is at 6600 Land O' Lakes Boulevard, Land O' Lakes, Pasco County, Florida. It is at the intersection of Carricker Road and Treasure Lane, one block northeast of Land O' Lakes Boulevard (a.k.a. U.S. Hwy. 41) (Figure 1, Appendix A) (EPA, 2000a). Two businesses share the property. The Queen's 41st Auto Salvage business occupies most of the property, while Queen's Motors, a used car business, occupies the western corner (Figure 2, Appendix A). The auto salvage business consists of a garage/office building, a storage shed, and semi trailers used for storage (Figure 2, Appendix A). The caretaker of the salvage yard lives in a mobile home on the west side of the property. The property is bounded to the southwest, northwest and west by Treasure Lane, Carricker Road, and the intersection of these roads (Figure 2, Appendix A). Across both Treasure Lane and Carricker Road are light woods with a few private residences. The nearest residence lies immediately south-southeast of the property. To the east, north and northeast are largely vacant areas with light woods and a few residences. A drainage ditch runs along the southeast border of the property and carries surface run-off to a wetland across Land O' Lakes Blvd. (Figure 2, Appendix A).

The property has been a salvage yard for more than 30 years. Little information exists about the business and waste operations before 1990, when the current owners purchased the property. Currently, the Queen's 41st Auto Salvage business employs two individuals and conducts operations similar to the activities of the previous owner, but on a smaller scale. To reduce pollution and contamination, the workers reportedly remove the engine, the fuel tank, and the oil from the automobile before crushing. The engines are stored on a covered, concrete area. The batteries are disposed of off-site and gasoline is either reused or stored in 75-gallon above-ground tanks. Used oil and antifreeze are stored in 55-gallon drums in one of the semi trailers. Waste containers are appropriately labeled and all wastes are disposed of off-site, in accordance with local, state and federal regulations (FDEP, 1997; 1998; EPA, 2000a).

In March 1997, a neighboring property owner reported that Queen's 41st Auto Salvage dumped oil products and antifreeze into a sinkhole and charged that this dumping had contaminated his private well. The neighbor also reported that the owners put down clean fill on the site. In response to these reports, the U.S. Environmental Protection Agency (EPA), the Florida

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[1]The Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA) authorizes ATSDR to conduct PHAs of hazardous waste sites. ATSDR, located in Atlanta, Ga., is a federal agency within the U.S. Department of Health and Human Services and provides financial support for this project.

Department of Environmental Protection (FDEP), and the Pasco County Health Department (CHD) collected and analyzed water samples from the potable and irrigation wells of the neighboring property owner. These agencies also collected and analyzed a sample from the potable well on the Queen's property. Both EPA and FDEP detected benzene, tetrachlorotheylene, methyl-tertiary-butyl-ether, and xylene in the neighboring residential drinking water well, at concentrations below the Maximum Contaminant Level (MCL) (FDEP, 1998; EPA, 2000a). The MCL is the highest level of a contaminant that is allowed in drinking water (EPA, 2000b). In contrast, ground water from the potable well on the Queen's property contained tetrachlorotheylene and trichloroethylene at concentrations well in excess of the MCL. The Queen's property owners have since installed a filtering system on the potable well and the private well at the neighboring residence is no longer used for potable water (FDEP, 1998).

3.2 Site visit

On October 19th 1999, Davis Daiker and Randy Merchant of the Florida DOH, Bureau of Environmental Epidemiology, visited the site and the surrounding areas. They saw that unauthorized access to the sales office is possible but that access to the salvage yard is restricted by a metal privacy fence.

3.3 Demographics, Land Use and Natural Resource Use

3.3.1 Demographics

Based on 1990 census information, approximately 400 residents live within 1 mile of the site (Table 1, Appendix B), 110 are under the age of 17. Of this population, 92% are white, 1% are black, and 7% are Hispanic or from other racial/ethnic groups (U.S. Census, 1990). The number of persons residing around the site decreases to approximately 100 when the radius is reduced to 0.5 miles.

3.3.2 Land Use

Land use in the area is a mix between light commercial (e.g., Queen's 41st Auto Salvage) and low-density residential. Surrounding the site is a sparse distribution of residences among wooded areas. The nearest school is a high school and is slightly less than 1 mile to the northwest just off of U.S. Hwy 41. A senior citizen care center is within 0.5 miles of the site.

3.3.3 Natural Resource Use

This region of Florida has both the surficial and Floridan aquifers. The top of the surficial aquifer can be first encountered from just below the ground surface during the rainy season, to up to 10 feet below the ground surface during the dry season. The surficial aquifer extends to a depth of approximately 32 feet, where a semi-permeable clay layer, 6 to 10 feet thick, separates the surficial aquifer from the Floridan aquifer. Because this clay layer is semi-permeable, contaminants of the surficial aquifer may migrate slowly down into the Floridan aquifer. The Floridan aquifer lies beneath the clay layer and extends several hundred feet down. The ground water in the surficial aquifer reportedly flows west, toward Lake Wisteria, approximately 0.5 mile away. The ground water in the Floridan aquifer reportedly flows to the south (EPA, 2000a).

In 1998, FDEP reported several private and public supply wells within a 1 mile radius of the site (FDEP, 1998). These wells may be drilled into either aquifer, but most potable wells are completed in the upper portion of the Floridan aquifer. Two municipal water companies also supply drinking water to much of the area. The municipal water is derived from several Floridan aquifer wells more than 3 miles from the site. This site will, therefore, not likely affect the municipal water.

4.0 DISCUSSION

PHAs use wide safety margins when setting health-related threshold values. The assumptions, interpretations, and recommendations made throughout this PHA err in the direction of protecting public health.

4.1 Environmental Contamination

We used the following ATSDR standard comparison values (ATSDR 1992a; 1999a), in order of priority, to select potential contaminants of concern at this site:

1. *CREG (Cancer Risk Evaluation Guide)*—CREG is calculated from EPA's cancer slope factor and is the contaminant concentration estimated to result in no more than one excess cancer per one million persons exposed over a lifetime.

2. *EMEG (Environmental Media Evaluation Guide)*—EMEG is derived from ATSDR's Minimal Risk Level (MRL) using standard exposure assumptions, such as ingestion of 2 liters of water per day and body weight of 70 kg for adults. MRLs are estimates of daily human exposure to a chemical generally for 1 year or longer likely to be without an appreciable risk of noncancerous illnesses.

3. *RMEG (Reference Dose Media Evaluation Guide)*—RMEG is derived from EPA's Reference Dose (RfD) using standard exposure assumptions. RfDs are estimates of daily human exposure to a chemical likely to be without an appreciable risk of noncancerous illness, generally for 1 year or longer.

4. LTHA *(Lifetime Health Advisory)*—LTHA is EPA's estimate of the concentration of a drinking-water contaminant at which illnesses are not expected to occur over lifetime exposure. LTHAs provide a safety margin to protect sensitive members of the population.

5. SCTL or GWCTL *(Soil Clean-up Target Level* or *Ground water Clean-up Target Level)*— These are determined by FDEP. This value is used only when no values exist for #1 through #4.

We use ATSDR standard comparison values to select chemicals for further consideration, not for determining the possibility of illness. Identification of a contaminant of concern (COC) in this section does not mean that exposure will cause illness. If a contaminant is detected at a concentration that exceeds the medium-specific comparison value, that chemical is chosen as a COC. Identifying COCs helps narrow the focus of the PHA to those contaminants that are most important to public health. When we select a COC in one medium (i.e., soil), we report that contaminant in all other media (i.e., ground water). We evaluate the COC in subsequent sections and estimate whether exposure is likely to cause illness. Florida DOH evaluated all available documents in identifying the COCs. The environmental data are presented in Tables 2 through 5 (Appendix B). For this health assessment, Florida DOH considers the surficial and Floridan aquifers a single source of ground water because the clay layer that separates the aquifers is semi-permeable.

4.1.1 On-Site Contamination

For this PHA, "on-site" refers to the property within the boundaries of Queen's Motors and Queen's 41st Auto Salvage, as shown in Figure 2 (Appendix A). FDEP and EPA collected soil samples from the surface (top 12 inches) and the subsurface (2 to 8 feet below ground), and ground water samples from both the surficial and Floridan aquifer. This sampling was done to identify a possible source of contamination and to define the extent of contamination (FDEP, 1998; EPA, 2000a).

Five of the seven surface soil samples and six of the 12 subsurface soil samples contained tetrachlorotheylene (Table 2, Appendix B). One on-site subsurface sample also contained trichloroethylene. In general, soil samples from north of the Queen's 41st Auto Salvage shop contained the highest levels of tetrachlorotheylene (Sample I.D. 06-SBB, Figure 5, Appendix A), but contaminants were found site-wide. The concentrations of these organic compounds, however, do not exceed the ATSDR soil comparison value. Therefore, based on soil data, Florida DOH did not choose these compounds as COC. In contrast, two on-site subsurface soil samples contained arsenic concentrations that exceed the ATSDR comparison value. However, arsenic was not chosen as a COC based on its presence in subsurface soil because humans do not regularly contact subsurface soil. Table 2 (Appendix B) is a summary of the data for on-site soil.

FDEP and EPA collected on-site ground water samples by (1) sampling the existing on-site well, (2) installing monitoring wells, and (3) using direct-push technology. Direct-push technology allows the environmental agencies to collect ground water from multiple depths at the same sample location. This helps to determine the vertical extent of contamination. On-site ground water contained tetrachlorotheylene, trichloroethylene, benzene, chromium, and arsenic at concentrations above their respective ATSDR ground water comparison value. Ground water from the areas of junk car storage contains tetrachlorotheylene, trichloroethylene, and benzene at concentrations that exceed the ATSDR ground water comparison value ([Sample I.D. 04-GW 06-GW, 10-GW, and DP-7], (Figures 4 and 5, Appendix A). The on-site potable well contained tetrachlorotheylene and trichloroethylene at concentrations that exceed the ATSDR ground water comparison value. More importantly, contamination of this potable well indicates that the contaminants have migrated into the Floridan aquifer. In addition to the solvent contamination, 3 of the 11 ground water samples contained arsenic concentrations that exceed the ATSDR comparison value. The arsenic concentrations, however, are within the bounds of what can typically be found in the surficial aquifer. Florida DOH chose arsenic, chromium, benzene, tetrachlorotheylene, and trichloroethylene as COCs based on their presence in ground water. Table 3 (Appendix B) summarizes the data for on-site ground water.

4.1.2 Off-site Contamination

For this PHA ,off-site refers to the area surrounding the property boundaries of Queen's Motors and Queen's 41st Auto Salvage, as shown in Figure 2 (Appendix A). FDEP and EPA collected surface (top 12 inches) and subsurface (2 to 8 feet below) soil samples, sediment samples, and ground water samples, to identify the extent of contamination off-site (FDEP, 1998; EPA, 2000a).

FDEP and EPA collected soil samples from the surface (top 12 inches) and the subsurface (2 to 8 feet below ground), and sediment samples from the drainage ditch on the southeast border of the property (Figures 2 and 3, Appendix A). In 1998, sediment samples collected from the drainage ditch contained tetrachlorotheylene at a concentration well below the ATSDR soil comparison value (FDER, 1998). More recent sediment samples from this ditch did not contain detectable levels of tetrachlorotheylene (EPA, 2000a). Of the 10 sediment samples collected from the drainage ditch, 2 contained arsenic concentrations that exceed the ATSDR soil comparison value. Only one off-site subsurface sample contained a concentration of arsenic above the ATSDR comparison value. Table 4 (Appendix B) summarizes the COCs for off-site soil, the frequency of detection of each COC, and the highest concentration of each COC.

Six of 11 off-site ground water samples contained chromium at concentrations that exceed the respective ATSDR comparison value. In addition, one sample, collected from a monitoring well to the south, contained arsenic and lead at concentrations that exceed the respective ATSDR comparison value (QN-14-GWC, Figure 5, Appendix A). The only off-site ground water sample that contained tetrachlorotheylene at a concentration exceeding the ATSDR ground water is ground water from the irrigation well at the nearby residence (41APW02, Figure 3, Appendix A). However, the potable well at this same residence contained none of the COCs at levels that exceed the ATSDR comparison value (EPA, 2000a). Table 5 (Appendix B) lists the COCs for off-site ground water, the frequency of detection, and the highest concentration detected. The presence of the organic contaminants in the residential wells south of the site suggests that the contamination may be migrating south with ground water flow.

4.1.3 Contaminants of Concern

Florida DOH chose benzene, tetrachlorotheylene, and trichloroethylene as COCs for this site based on the presence of these contaminants in on- and off-site ground water. Arsenic, lead, and chromium were chosen as COCs due to their presence in either ground water or soil.

4.2 Quality Assurance and Quality Control

Florida DOH has reviewed the data and the quality assurance and quality control measures that were taken in the gathering of the referenced data. Florida DOH believes that the data is sufficient to support the conclusions made in this document. Appropriate chain-of-custody and data reporting procedures were followed and appropriate laboratory, equipment, and sample controls were analyzed. The completeness and reliability of the referenced information determine the validity of the analyses and conclusions drawn in this PHA.

4.3 Physical Hazards

Mr. Daiker and Mr. Merchant did not observe any on- or off-site physical hazards during the October 19, 1999 site visit.

4.4 Pathway Analysis

To estimate whether nearby residents have been or are likely to be exposed to contaminants migrating from the site, we evaluated the environmental and human components of exposure pathways. Exposure pathways consist of five elements: 1) a source of contamination (e.g., chemical spill), 2) an environmental medium (e.g., ground water), 3) a point of exposure (e.g., tap water), 4) a route of human exposure (e.g., oral), and 5) a receptor population (e.g., area residents).

We eliminate an exposure pathway if at least one of the five elements is missing and will never be present. Exposure pathways that we do not eliminate are either completed or potential. With completed pathways, all five elements exist and exposure to a contaminant has occurred, is occurring, or will occur. A pathway is classified as potential if at least one of the five elements is missing, but may be present in the future. For both complete and potential pathways, Florida DOH estimates the likely dose of each COC and this dose serves as the basis of a toxicological evaluation.

4.4.1 Complete Exposure Pathways (Table 6, Appendix B)

Florida DOH identified three completed exposure pathways at this site. The completion of an exposure pathway does not mean that illness is likely; it means that exposure was or is probable. Florida DOH considers the incidental ingestion of on-site soil or sediment from the drainage ditch under past, current, and future time-frames as a completed exposure pathway. We also consider the use of the on-site well and the use of the potable well at a nearby residence as completed pathways in the past.

4.4.2 Potential Exposure Pathways (Table 7, Appendix B)

Florida DOH evaluated two potential exposure pathways in this PHA: (1) the use of on-site ground water by future residents and (2) the domestic use of off-site ground water in the future time-frame. These pathways are considered potential because either no exposure point exists or no receptor population exists. Currently, the on-site well is fitted with a filter and the nearby residential well is no longer used for potable water.

4.4.3 Eliminated Exposure Pathways

Because surface soil contained no contaminants at concentrations that exceed the ATSDR soil comparison values, Florida DOH eliminated the incidental ingestion of on- and off-site soil by trespassers or area residents. In this PHA, Florida DOH assumes that persons can readily contact only the top 6 inches of soil.

4.5 Public Health Implications

In this section, we calculate the dose of a chemical which both adults and children could potentially receive by all likely routes of exposure. We then review the ATSDR Toxicological Profile for each COC and determine if the estimated dose could cause illness. For this site, we calculated potential doses from exposure to soil and ground water, both on- and off-site (Tables 8 through 11, Appendix B).

4.5.1 Toxicological Evaluation

In this section, we discuss illnesses that could occur following exposure to COCs at this site. To evaluate the risks of illness, ATSDR has developed Minimal Risk Levels (MRLs) for contaminants commonly found at hazardous waste sites. An MRL is a conservative estimate of daily human exposure to a contaminant below which noncancerous illnesses are unlikely to occur. The calculation of the MRL is based on animal and human studies, when available. It is calculated very conservatively because the goal of the MRL is to protect public health. MRLs exist for each route of exposure, such as ingestion and inhalation, and for different lengths of exposure, such as acute (less than 14 days), intermediate (15 to 364 days), and chronic (greater than 365 days). ATSDR presents these MRLs in Toxicological Profiles. Toxicological Profiles are chemical-specific and provide information on the health effects, environmental transport, human exposure, and regulatory status of a specific chemical.

To apply the MRL, we estimate the daily dose for each of the COCs using standard exposure parameter estimates (e.g., average volume of water consumed per day, average shower time). Using these parameters, we estimate the number of milligrams of contaminant ingested per day (mg/day) and then divide these by the average human body weight. The dose is expressed as the number of milligrams of chemical per kilogram of body weight per day (mg/kg/day). In calculating the potential dose, we assume people are exposed to the maximum concentration detected for each contaminant in each medium. In Tables 8 through 11 (Appendix B), we summarize the estimated dose for each contaminant for each exposure pathway using the maximum COC concentration (bold text indicates that the estimated dose exceeds the MRL). Because MRLs are conservatively calculated to protect public health, a dose that exceeds the MRL does not necessarily mean that it will cause illness. A dose that does not exceed the MRL, however, is not likely to cause noncancerous illness.

The exposure parameters that we used to estimate the daily doses for each exposure scenario are given below the tables. The values used are standard values for this type of analysis (EPA, 1991; 1997). For ground water, we estimated the dose of chemical that could be ingested from drinking, absorbed through the skin during showering, and the air concentration that could be inhaled during showering. For soil exposures, we estimated the dose from incidental ingestion of soil and the dose from breathing contaminated dust.

4.5.1.1 Arsenic

Neither on-site nor off-site surface soil contained arsenic at concentrations that exceed the ATSDR soil comparison value. Therefore, incidental ingestion of arsenic in surface soil is unlikely to cause illness. The concentration of arsenic in the ditch sediment, however, does exceed the ATSDR comparison value. Florida DOH estimated that incidental ingestion of sediment would deliver a dose of arsenic to children and adults that is less than the oral MRL and therefore, unlikely to cause illness (Tables 8 and 10, Appendix B).

Florida DOH estimates that ingestion of on-site ground water could deliver a dose of arsenic to a child or adult that would exceed the MRL (Tables 9, Appendix B). Florida DOH, however, does not anticipate illness from ingestion of arsenic in ground water. Studies have shown no deleterious effects of comparable doses of arsenic from drinking water over an exposure period of up to 45 years (ATSDR, 1998a; Tseng et al., 1968; Southwick et al., 1981). In addition, other studies reported that a dose over 14-times higher than the doses estimated for this site is required to cause illness in humans (Tseng et al., 1968). Ingestion of off-site ground water would deliver a dose of arsenic that does not exceed the oral MRL (Table 11, Appendix B) and is, therefore, not likely to cause illness.

Arsenic is a known human carcinogen based on the association of lung cancer with inhalation exposure to arsenic. Skin, bladder, lung, and liver cancers have also been associated with ingestion of arsenic in ground water. In studies where arsenic is associated with skin cancer, the exposure periods were at least 14 years and the dose was at least 9-times greater than the highest dose estimated for this site (Zaldivar et al., 1981; ATSDR, 1998a). Florida DOH considers arsenic exposure from ground water or soil unlikely to cause cancer because of the low concentrations present and the unlikelihood of a prolonged exposure.

4.5.1.2 Benzene

Neither on- nor off-site soil contained benzene. Therefore, exposure to benzene by incidental ingestion of soil is unlikely to cause illness.

Exposure to benzene by ingestion of on-site ground water by children or adults would not likely cause illness. The lowest dose of benzene shown to cause illness in experimental animals is 1,000 times higher than the highest possible oral dose estimated for this site (Table 9, Appendix B) (Hsieh et al., 1988; ATSDR, 1997).

Florida DOH estimated that the use of on-site ground water for showering could produce an air concentration of benzene that would exceed the inhalation MRL. However, Florida DOH does not anticipate this inhalation exposure to cause illness because of the low air concentration and the short-term duration of the shower exposure. Benzene air concentrations of at least 10-fold higher and exposures of longer duration (i.e., 8 hours) have been associated with alterations in the immune system in humans (Xia et al., 1995; ATSDR, 1997). Little evidence, however, exists to suggest that short-term exposure to the low concentration at this site would cause illness.

Benzene is classified as a "human carcinogen." In experimental animals, both inhalation and oral exposure to high levels of benzene have been associated with cancer. The lowest oral dose in animal studies shown to cause cancer, however, is more than 1,000 times higher than the highest dose estimated at this site. Little evidence exists to suggest that oral exposure to these levels of benzene would cause cancer in humans (ATSDR, 1997). Florida DOH also does not anticipate an increased risk of cancer due to inhalation exposure to benzene in shower air. The potential exposures would be of a shorter duration than the occupational exposures that suggested that inhalation exposure to benzene could cause leukemia (Ott et al., 1978).

4.5.1.3 Chromium

None of the soil samples analyzed contained chromium at a concentration that exceeds the ATSDR soil comparison value. Therefore, Florida DOH does not anticipate incidental ingestion of chromium in soil to cause illness.

Both on- and off-site ground water contain chromium at concentrations that exceed the ATSDR ground water comparison value. Slightly higher doses than those estimated for this site have been shown to exacerbate previous skin abnormalities due to chronic, contact exposure to chromium (Tables 9 and 11, Appendix B)(Goitre et al., 1982; Kaaber and Veien, 1977; ATSDR, 1998b). Florida DOH concludes that because of the low concentrations present in ground water, chromium ingestion is unlikely to cause illness.

Inhalation exposure to chromium has been associated with cancer in humans. However, few studies have shown that ingestion of chromium causes cancer (ATSDR, 1998b).

4.5.1.4 Lead

Neither on- nor off-site soil contained a level of lead that exceeds the FDEP cleanup level for lead. Therefore, incidental ingestion of lead in soil is unlikely to cause illness.

One ground water sample contained lead at a concentration that exceeds the FDEP ground water comparison value. This sample was collected from near the residence immediately southeast of the site. Florida DOH does not anticipate ingestion of lead in drinking water to cause illness. The lowest dose studied in humans caused no deleterious effects and is 10-times higher than the dose that could result from ingestion of off-site ground water (Table 11, Appendix B) (ATSDR, 1999). In addition, the private well that is closest to where this sample was collected is reportedly not used for drinking water. In addition, recent sampling of this private well detected a lead concentration well below the MCL.

Currently lead is classified as a "possible human carcinogen." No studies have demonstrated the cancer-causing effect of lead in humans. In animal studies, lead was shown to be carcinogenic at doses at least 200 times the estimated doses for this site (ATSDR, 1999). Therefore, it is unlikely that lead ingestion will cause cancer.

4.5.1.5 Tetrachlorotheylene

On- and off-site soil and off-site sediment did not contain tetrachlorotheylene at concentrations that exceed the ATSDR soil comparison value. Therefore, exposure to tetrachlorotheylene in soil or sediment is unlikely to cause illness.

Past use of off-site ground water is unlikely to have caused illness. EPA, FDEP and the Pasco County Health Department (CHD) detected no MCL violations in past sampling of the neighboring private well.

Because the length of time the on-site drinking water well was contaminated prior to 1997 is unknown, Florida DOH is unable to estimate the public health risk from using this well in the past. Currently this well is equipped with a filter that removes the tetrachlorotheylene. Future use of on-site ground water without a filter may increase the risk of illness.

On-site ground water contains a tetrachlorotheylene concentration well in excess of ATSDR comparison values. The effect in humans of drinking tetrachlorotheylene-contaminated ground water at concentrations found on-site, however, is not known. Drinking unfiltered on-site ground water would deliver a dose that exceeds the ATSDR oral MRL (Table 9, Appendix B). The study used to establish the MRL found that repeated exposure to a dose 50-times higher than that estimated at this site caused hyperactivity in adult mice when treated as pups (ATSDR, 1997b; Fredriksson, 1993). Florida DOH estimates that use of on-site ground water for showering could produce an air concentration of tetrachlorotheylene that exceeds the ATSDR inhalation MRL.

Tetrachlorotheylene is classified as a "probable human carcinogen" (ATSDR, 1997b). In the future, lifetime drinking and showering with tetrachlorotheylene-contaminated ground water from on the site could cause a "low" to "moderate" increased risk of cancer.

4.5.1.6 Trichloroethylene

On- and off-site soil did not contain trichloroethylene at concentrations that exceed the FDEP soil comparison value. Therefore, exposure to trichloroethylene in soil is unlikely to cause illness.

The dose of trichloroethylene that a child or adult could receive from ingestion of on- or off-site ground water does not exceed the oral MRL (Tables 9 and 11, Appendix B). Therefore, ingestion of trichloroethylene-contaminated ground water is unlikely to cause illness.

Use of on-site ground water for showering could produce an air concentration that would exceed the inhalation MRL. Florida DOH, however, does not anticipate this inhalation exposure to cause illness because of (1) the short duration of shower exposure, (2) the low air concentration and, (3) the conservative nature in which the MRL is calculated. The lowest air concentration shown to canse any effect in animals is over 10 times greater than the air concentration estimated by Florida DOH (Aranyi et al., 1986; ATSDR, 1997).

Trichloroethylene is classified as a possible human carcinogen. In animal studies, doses up to 1,000 times those estimated at this site increased kidney and liver tumors. No conclusive evidence exists, however, to suggest that consumption of these doses of trichloroethylene at this site would cause cancer.

4.5.1.7 Mixtures

The literature on the effects of exposure to mixtures focuses on high doses and reports that doses well in excess of typical environmental concentrations are required to produce the effects associated with mixtures. Except for tetrachlorotheylene, the concentrations of all of the contaminants at this site are far below levels known to produce adverse health effects. Therefore, the effect of exposure to a mixture of these contaminants is not likely to be of public health concern.

4.5.2 Children and Other Unusually Susceptible Populations

The unique vulnerabilities of infants and children demand special emphasis in communities faced with the contamination of their environment. Children are at a greater risk than adults from certain kinds of exposure to hazardous substances emitted from waste sites. They are more likely to be exposed because they play outdoors and because they often bring food into contaminated areas. They are shorter than adults, which means they breathe dust, soil, and heavy vapors close to the ground. Children are also smaller, resulting in higher doses of chemical exposure per body weight. In addition, the developing body systems of children can sustain permanent damage if toxic exposures occur during critical growth stages. Most important, children depend completely on adults for risk identification and management decisions, housing decisions, and access to medical care. The consideration of children regarding this site is important because children (1) may absorb metals (i.e., arsenic) from the intestine more efficiently than adults, (2) may be more sensitive to the toxicity of chlorinated solvents (i.e., tetrachlorotheylene) and (3) are the likely population to contact the sediments in the drainage ditch. Because of the small number of residences in the areas surrounding the site, Florida DOH does not anticipate a child population being exposed to ditch sediments or ground water.

5.0 COMMUNITY HEALTH CONCERNS

The only known community health concerns were expressed in March 1997, when a neighbor reported that Queen's Auto Salvage discharged oil products and antifreeze into a sinkhole. The neighbor also charged that this dumping contaminated the private potable and irrigation wells. Based on the low contaminant concentrations and the absence of any MCL violations, Florida DOH does not anticipate ingestion of water from this private well to have caused illness in the past nor increased the risk of cancer from past exposures. Currently, this well is no longer used for potable purposes.

6.0 CONCLUSIONS

The site is categorized as an indeterminate public health hazard from past exposures. Because the length of time the on-site drinking water well was contaminated prior to 1997 is unknown, Florida DOH is unable to estimate the public health risk from using this well in the past. **For current exposures,** the site categorized **as a no apparent public health hazard**. The on-site drinking water well is equipped with a filter and use of off-site ground water is unlikely to cause illness. This site may be categorized as a public health hazard, however, in the future. Future use of on-site ground water without a filter may increase the risk of illness.

1. Although the site is not currently categorized as a public health hazard, future use of contaminated **on-site** ground water without a filter may increase the risk of illness. In the future, lifetime drinking and showering with tetrachlorotheylene-contaminated ground water from on the site could cause a "low" to "moderate" increased risk of cancer.

2. Past use of water from nearby **off-site** drinking water wells is unlikely to have caused illness. Nearby **off-site** drinking water wells should be monitored, however, to insure that they do not become a health hazard in the future.

3. Incidental ingestion of contaminants in both surface soil and ditch sediment are unlikely to cause illness.

7.0 RECOMMENDATIONS

1. Do not use unfiltered ground water from the site for drinking or showering.

2. EPA and /or FL DEP should monitor movement of the contamination ground water by regular testing of on- and off-site monitoring wells and nearby, **off-site** drinking water wells.

8.0 PUBLIC HEALTH ACTION PLAN

This section describes what ATSDR and/or Florida DOH plan to do at this site. The purpose of a Public Health Action Plan is to reduce any existing health hazards and to prevent any from occurring in the future. ATSDR and/or Florida DOH will do the following:

1. Florida DOH, Bureau of Environmental Epidemiology, will inform nearby residents about the findings of this report by circulating a fact sheet.

2. Florida DOH, Bureau of Environmental Epidemiology, will continue to work with EPA and FDEP to ensure that any site cleanup activities protect public health.

9.0 SITE TEAM/AUTHORS

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APPENDIX A. FIGURES

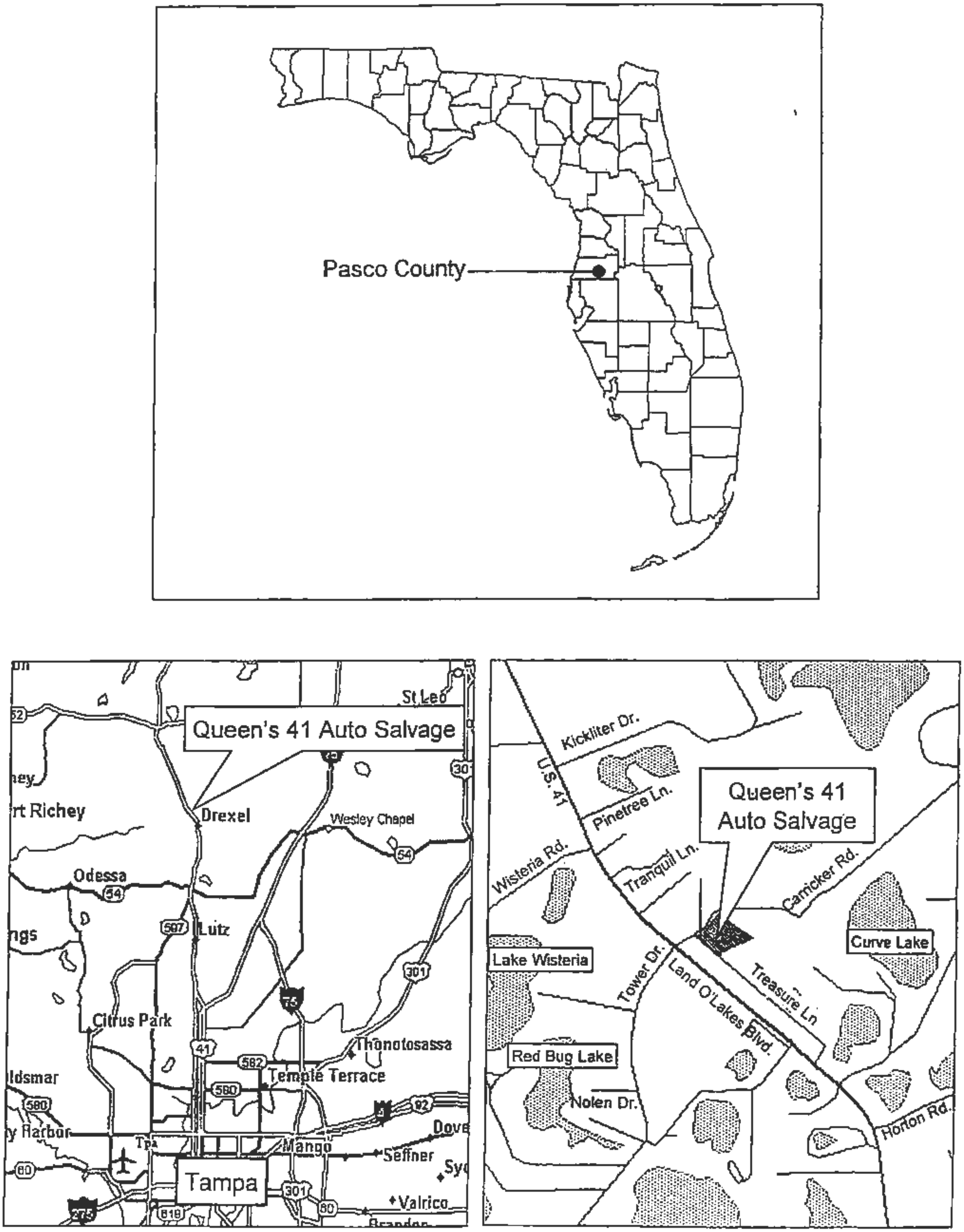

Figure 1. Site Location in Florida

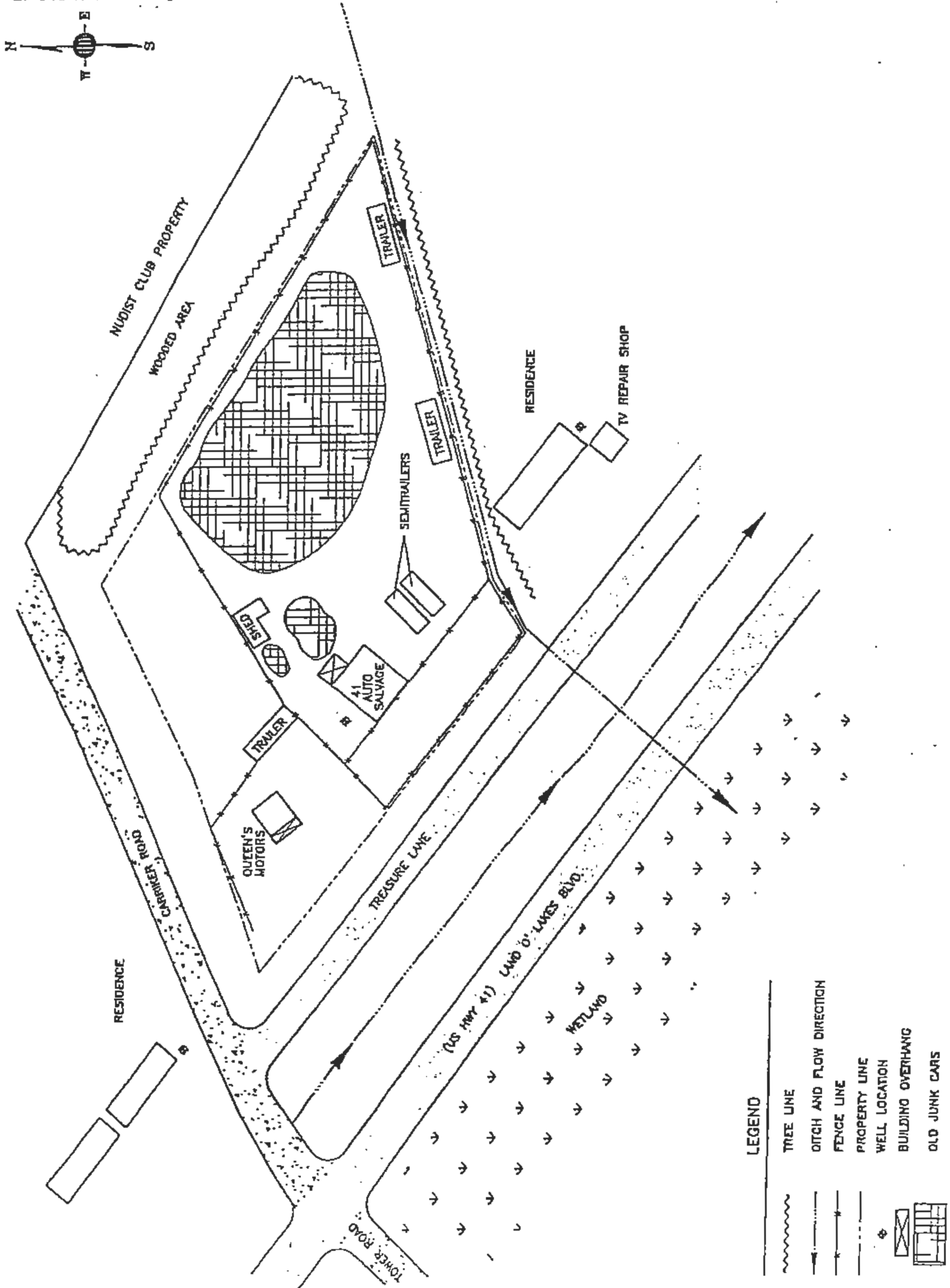

Figure 2. Site Layout

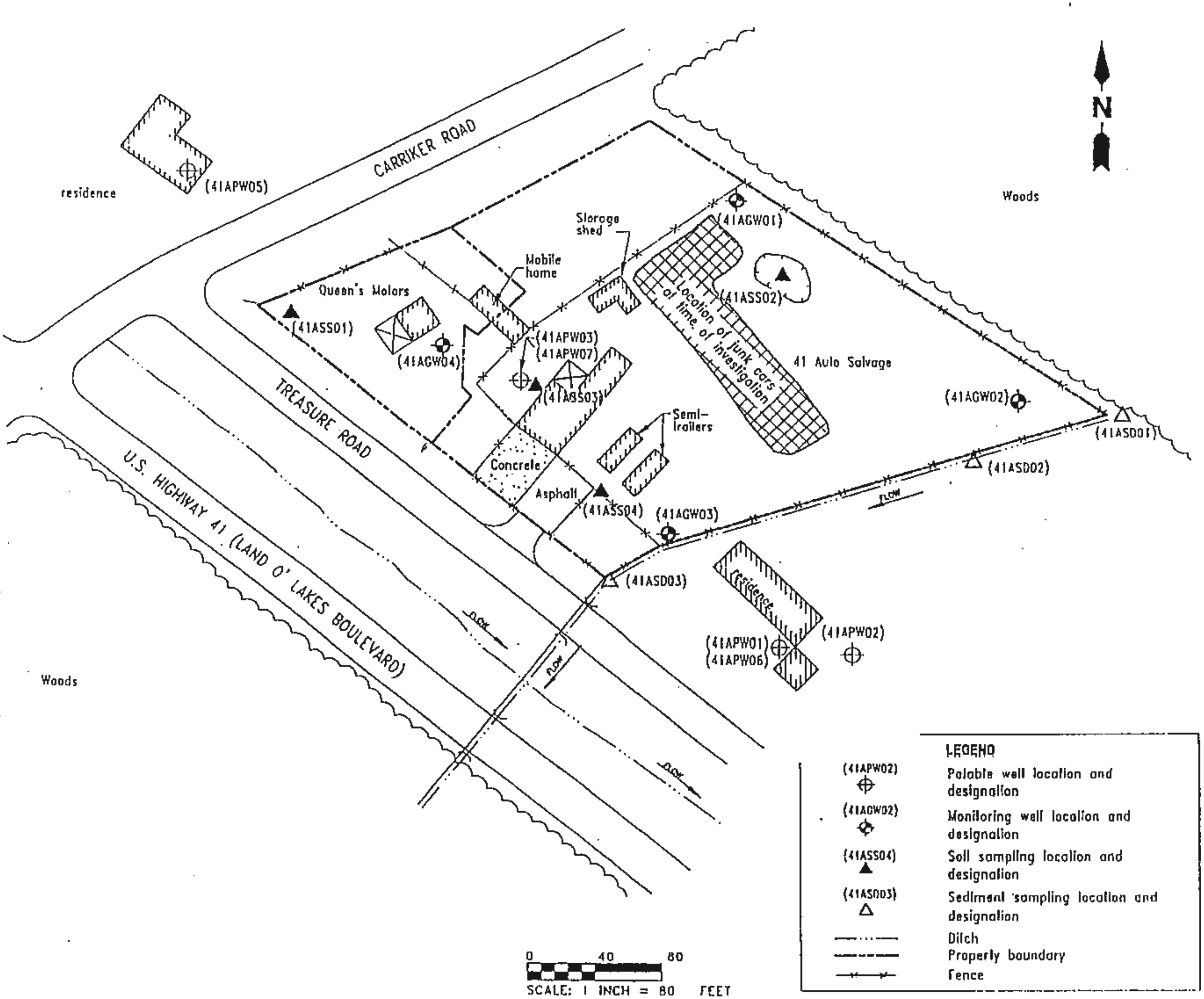

Figure 3. FDEP Sample Locations (FDEP, 1998)

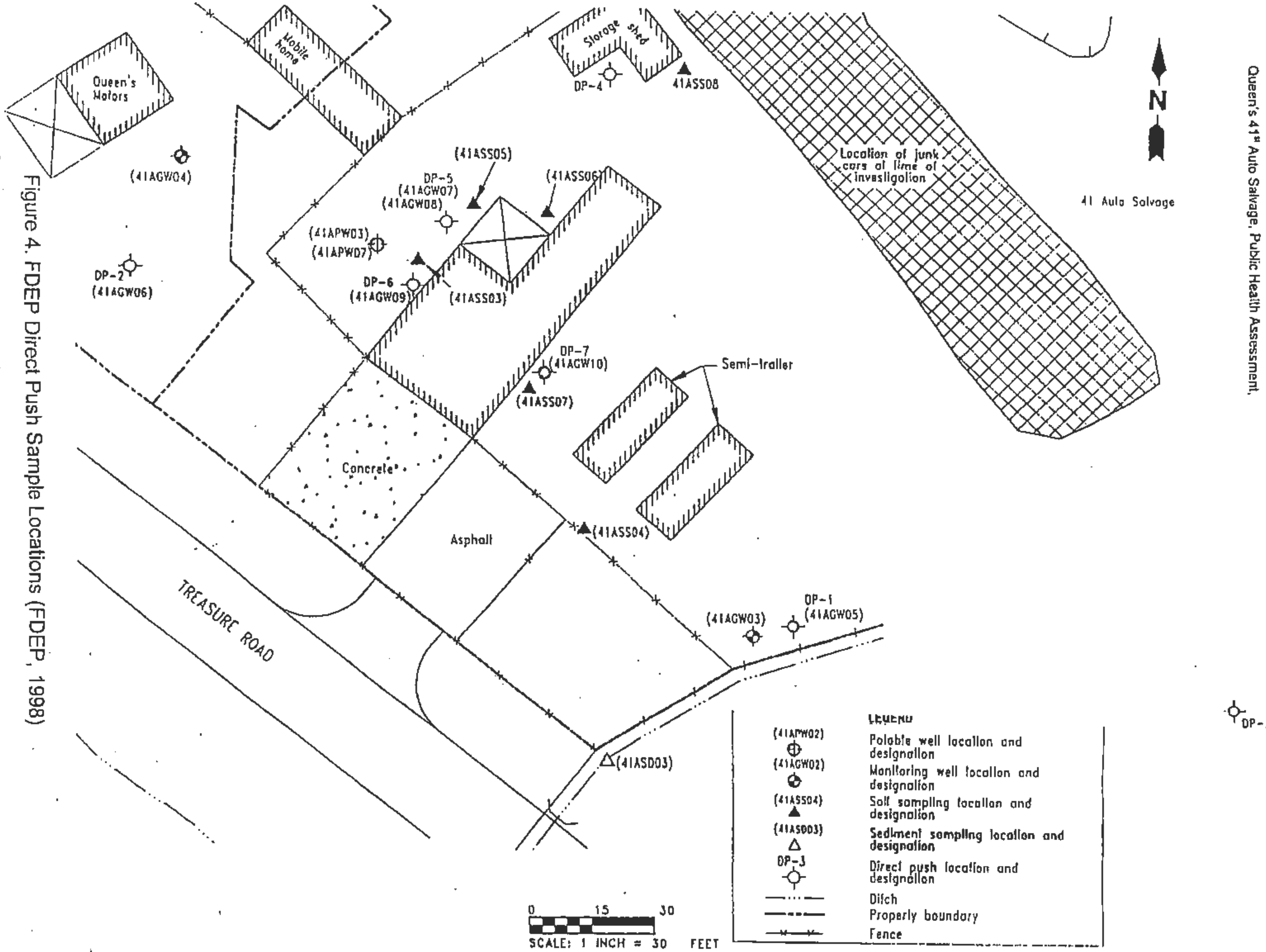

Figure 4. FDEP Direct Push Sample Locations (FDEP, 1998)

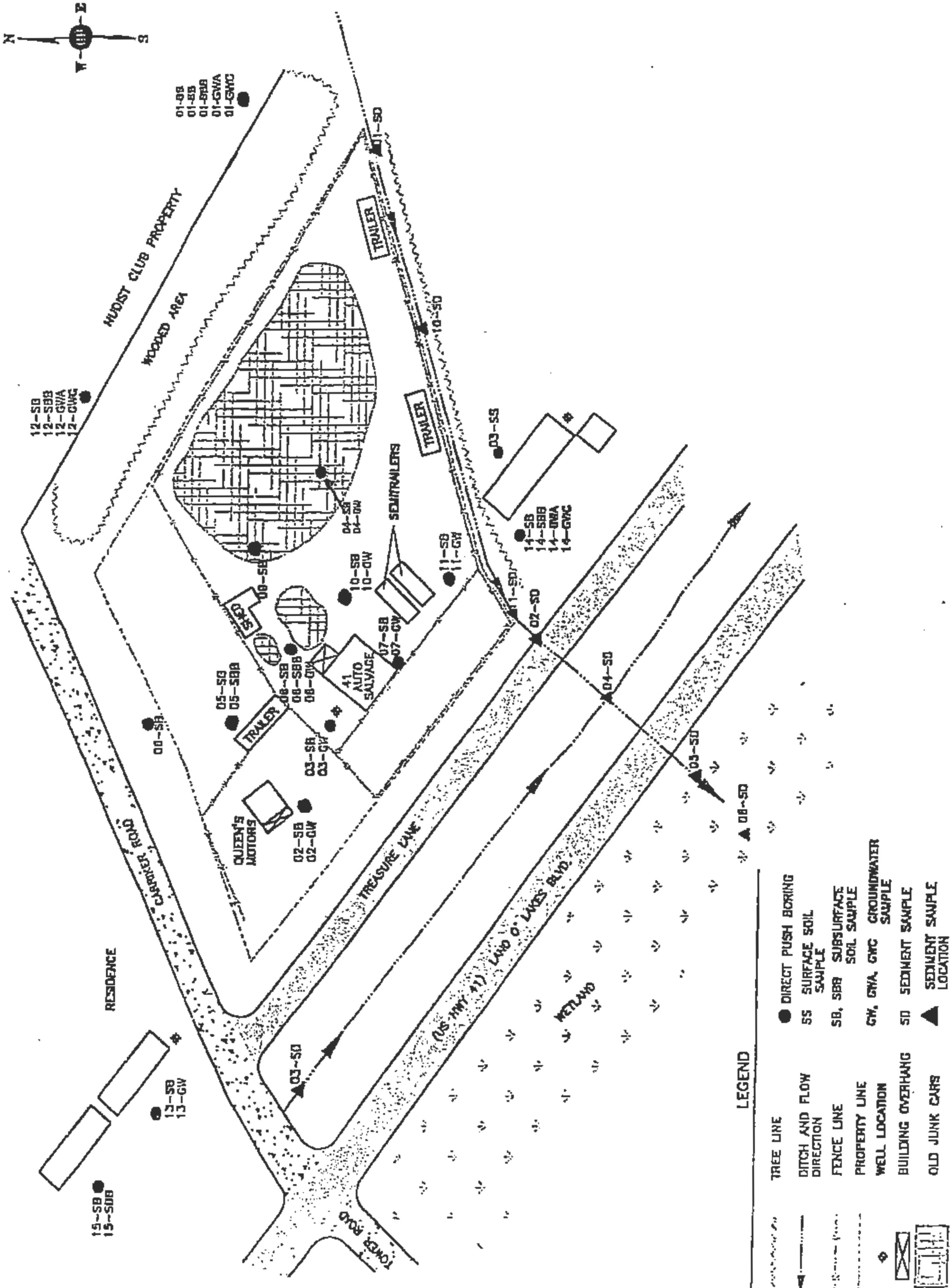

Figure 5. EPA Sample Locations (EPA, 2000)

APPENDIX B. TABLES

Table 1. Total Exposed Population Estimation Table

Pathway Types	Estimated Total Population in Potential Exposure Pathways	Minimum Population	Maximum Population
Potential Pathways On-site	0	0	0
Potential Pathways Off-site	400	0	51–500
Total Potential On- and Off-site	**400**	**0**	**51–500**
Completed Pathways On-site	2	0	1–50
Completed Pathways Off-site	0	0	0
Total Completed On- and Off-site	**2**	**2**	**1–50**
Potential and Completed Pathways On-site	2	0	1–50
Potential and Completed Pathways Off-site	400	0	51–500
Total Potential and Completed On- and Off-site	**402**	**2**	**51–500**

Table 2. Maximum Concentrations of Contaminants in On-site Soil

Contaminants of Concern (COC)	Maximum Concentration (mg/kg)	Sample ID containing maximum	# Greater Than Comparison Value/ Total # of Samples	Comparison Value*	
				(mg/kg)	Source
Arsenic	**2.2**	**QN-04-SB**	**2/14**	0.5 (CREG)	ATSDR 2000
Benzene	N.D.	---	0/19	20 (CREG)	ATSDR 2000
Chromium	4.1	41ASS02	0/14	200 (Ch. RMEG)	ATSDR 2000
Lead	100	QN-06-SB	0/14	400 (SCTL)	FDEP 2000
Tetrachlorotheylene	190	QN-06-SBB	0/19	500 (Ch. RMEG)	ATSDR 2000
Trichloroethylene	0.013	QN-06-SBB	0/19	6 (SCTL)	FDEP 2000

* Comparison values used to select chemicals for further scrutiny, not for determining the possibility of illness.
mg/kg = milligrams per kilogram of soil.
SS = soil sample taken from top 12 inches of soil.
SB = soil sample taken 2 to 4 feet below the surface.
SBB = soil sample taken 4 to 8 feet below the surface.
N.D. = Not detected.

Table 3. Maximum Concentrations of Contaminants in On-site Ground water

Contaminants of Concern (COC)	Maximum Concentration (mg/L)	Sample I.D. containing maximum	# Greater Than Comparison Value/ Total # of Samples	Comparison Value*	
				(mg/L)	Source
Arsenic	17	QN-11-GW	3/11	0.02 (CREG)	ATSDR 2000
Benzene	79	DP-5	3/25	1 (CREG)	ATSDR 2000
Chromium	53	QN-10-GW	4/11	30 (Ch. RMEG)	ATSDR 2000
Lead	N.D.	---	0/11	15 (GWCTL)	FDEP 2000
Tetrachlorotheylene	1600	QN-04-GW	7/25	0.7 (CREG)	ATSDR 2000
Trichloroethylene	170	Potable	6/25	3 (GWCTL)	FDEP 2000

* Comparison values used to select chemicals for further scrutiny, not for determining the possibility of illness.
mg/L = micrograms per liter of ground water.
DP = Sample collected by direct-push technology.
N.D. = Not detected.

Table 4. Maximum Concentrations of Contaminants in Off-site Soil

Contaminants of Concern (COC)	Maximum Concentration (mg/kg)	Sample I.D. containing maximum	# Greater Than Comparison Value/ Total # of Samples	Comparison Value*	
				(mg/kg)	Source
Arsenic	**1.9**	**QN-11-SD**	**3/20**	0.5 (CREG)	ATSDR 2000
Benzene	N.D.	---	0/23	20 (CREG)	ATSDR 2000
Chromium	25	41ASD02	0/20	200 (Ch. RMEG)	ATSDR 2000
Lead	99	QN-11-SD	0/20	400 (SCTL)	FDEP 2000
Tetrachlorotheylene	0.087	41ASD03	**0/23**	500 (Ch. RMEG)	ATSDR 2000
Trichloroethylene	N.D.	---	0/23	6 (SCTL)	FDEP 2000

* Comparison values used to select chemicals for further scrutiny, not for determining the possibility of illness.
mg/kg = milligrams per kilogram of soil.
SD = sample colleted from drainage ditch on southeast side of property (Figure 2, Appendix A).
N.D. = Not detected.

Table 5. Maximum Concentrations of Contaminants in Off-site Ground water

Contaminants of Concern (COC)	Maximum Concentration (mg/L)	Sample I.D. containing maximum	# Greater Than Comparison Value/ Total # of Samples	Comparison Value*	
				(mg/L)	Source
Arsenic	**4.4**	**QN-14-GWC**	**1/11**	0.02 (CREG)	ATSDR 2000
Benzene	N.D.	---	0/13	1 (CREG)	ATSDR 2000
Chromium	**81**	**QN-14-GWC**	**6/11**	30 (Ch. RMEG)	ATSDR 2000
Lead	20	**QN-14-GWC**	1/11	15 (GWCTL)	FDEP 2000
Tetrachlorotheylene	**1.7**	**41APWO2**	**1/13**	0.7 (CREG)	ATSDR 2000
Trichloroethylene	1.3	41APW01	0/13	3 (GWCTL)	FDEP 2000

* Comparison values used to select chemicals for further scrutiny, not for determining the possibility of illness.
mg/L = micrograms per liter of ground water.
41APW01 is the potable well at a nearby residence.
41APW02 is the irrigation well at a nearby residence.
N.D. = Not detected.

Table 6. Completed Exposure Pathways

Pathway Name	Exposure Pathway Elements					Time
	Source	Environmental/ Exposure Media	Point of Exposure	Route of Exposure	Exposed Population	
On-site Ground water	Contaminated On-Site Soil	Ground water	On-site well/ Tap water	Ingestion/ Inhalation	Caretaker of on-site businesses	1985-1988
On-site Soil	Contaminated On-Site Soil	Surface Soil	On-site property	Ingestion/ Inhalation	Caretaker of on-site businesses	1985-Current
Off-site Sediment	Contaminated On-Site Surface Water	Sediment in the Drainage Ditch	Sediments in the Ditch	Ingestion	Residents of the surrounding area	Past, present, future
Off-site Ground water	Contaminated On-Site Soil	Ground water	On-site well/ Tap water	Ingestion/ Inhalation	Nearby residents	1997-1998

Table 7. Potential Exposure Pathways

Pathway Name	Exposure Pathway Elements: Source	Environmental/ Exposure Media	Point of Exposure	Route of Exposure	Exposed Population and land use	Time
On-site Ground water	Contaminated On-Site Soil	Ground water	On-site wells/ Tap water	Ingestion, skin absorption and inhalation	On-site residents	Future
Off-site Ground water	Contaminated On-Site Soil	Ground water	Off-site wells/ Tap water	Ingestion, skin absorption and inhalation	Off-site residents	Future

Table 8. Estimated Dose from Exposure to On-site Soil

Contaminant of Concern (maximum concentration)	Oral MRL (mg/kg/day)	Soil/dust-Ingestion (mg/kg/day)		Soil/dust-Dermal (mg/kg/day)		Inhalation MRL (mg/m^3)	Soil/dust-Inhalation (mg/m^3)	
		Child	Adult	Child	Adult		Child	Adult
Arsenic (2.2 mg/kg)	0.0003	0.00003	0.000003	N.S.	N.S.	N.A.	N.S.	N.S.
Benzene (N.D.)	N.A.	---	---	---	---	0.013	---	---
Chromium (N.S.)	N.A.	N.S.	N.S.	N.S.	N.S.	0.0005	N.S.	N.S.
Lead (N.D.)	N.A.	---	---	---	---	N.A.	---	---
Tetrachlorotheylene (N.S.)	0.05	N.S.	N.S.	N.S.	N.S.	0.27	N.S.	N.S.
Trichloroethylene (N.S.)	0.2	N.S.	N.S.	N.S.	N.S.	0.55	N.S.	N.S.

These doses were calculated using Risk Assistant software and standard values for ground water consumption, shower inhalation exposure and dermal exposure parameters (EPA, 1991).
N.A. = Not available.
N.D. = Not detected.
N.S. = Not significant.
The above doses were calculated using the following values and an average shower time of 0.2 hours:

Adult body weight-	70 kg	Child body weight-	15 kg
Adult soil ingestion-	100 mg/day	Child soil ingestion-	200 mg/day
Adult skin surface area-	23,000cm^2	Child skin surface area-	7,200cm^2

mg/kg/day = milligram of contaminant per kilogram body weight per day.
mg/m^3 = milligram of contaminant per cubic meter air.

Table 9. Estimated Dose from Use of On-site Ground water

Contaminant of Concern (maximum concentration)	Oral MRL (mg/kg/day)	Ground water-Ingestion (mg/kg/day)		Ground water-Dermal (mg/kg/day)		Inhalation MRL (mg/m^3)	Ground water-Inhalation (mg/m^3)	
		Child	Adult	Child	Adult		Child	Adult
Arsenic (0.017 mg/L)	0.0003	**0.001**	**0.0005**	0.000002	0.000001	N.A.	N.S.	N.S.
Benzene (0.079 mg/L)	N.A.	0.005	0.002	0.0005	0.0003	0.013	**0.79**	**0.79**
Chromium (0.053 mg/L)	N.A.	0.004	0.002	0.000005	0.000003	0.0005	N.S.	N.S.
Lead (N.D.)	N.A.	—	—	—	—	N.A.	—	---
Tetrachlorotheylene (1.6 mg/L)	0.05	**0.1**	0.05	0.04	0.03	0.27	**16**	**16**
Trichloroethylene (0.17 mg/L)	0.2	0.01	0.005	0.001	0.0008	0.55	**1.7**	**1.7**

These doses were calculated using Risk Assistant software and standard values for ground water consumption, shower inhalation exposure and dermal exposure parameters (EPA, 1991). Bold text indicates an estimated dose exceeds the appropriate MRL.
N.A. =Not available.
N.D. =Not detected.
N.S. = Not significant.
The above doses were calculated using the following values and an average shower time of 0.2 hours:

Adult body weight-	70 kg	Child body weight-	15 kg
Adult water consumption-	2 liters/day	Child water consumption-	1 liter/day
Adult skin surface area-	$23,000cm^2$	Child skin surface area-	$7,200cm^2$

mg/kg/day = milligram of contaminant per kilogram body weight per day.
mg/m^3 = milligram of contaminant per cubic meter air.

Table 10. Estimated Dose from Exposure to Off-site Soil or Sediment

Contaminant of Concern (maximum concentration)	Oral MRL (mg/kg/day)	Soil/dust-Ingestion (mg/kg/day)		Soil/dust-Dermal (mg/kg/day)		Inhalation MRL (mg/m^3)	Soil/dust-Inhalation (mg/m^3)	
		Child	Adult	Child	Adult		Child	Adult
Arsenic (1.9 mg/kg)	0.0003	0.00003	0.000003	N.S.	N.S.	N.A.	0.0001	0.0001
Benzene (N.D.)	N.A.	---	---	---	---	0.013	---	---
Chromium (N.S.)	N.A.	N.S.	N.S.	N.S.	N.S.	0.0005	N.S.	N.S.
Lead (N.S.)	N.A.	N.S.	N.S.	N.S.	N.S.	N.A.	N.S.	N.S.
Tetrachlorotheylene (N.S.)	0.05	N.S.	N.S.	N.S.	N.S.	0.27	N.S.	N.S.
Trichloroethylene (N.D.)	0.2	---	---	---	---	0.55	---	---.

These doses were calculated using Risk Assistant software and standard values for ground water consumption, shower inhalation exposure and dermal exposure parameters (EPA, 1991).
N.A. = Not available.
N.D. = Not detected.
N.S. = Not significant.
The above doses were calculated using the following values and an average shower time of 0.2 hours:

Adult body weight-	70 kg	Child body weight-	15 kg
Adult soil ingestion-	100 mg/day	Child soil ingestion-	200 mg/day
Adult skin surface area-	23,000cm^2	Child skin surface area-	7,200cm^2

mg/kg/day = milligram of contaminant per kilogram body weight per day.
mg/m^3 = milligram of contaminant per cubic meter air.

Table 11. Estimated Dose from Use of Off-Site Ground Water

Contaminant of Concern (maximum concentration)	Oral MRL (mg/kg/day)	Ground water-Ingestion (mg/kg/day)		Ground water-Dermal (mg/kg/day)		Inhalation MRL (mg/m^3)	Ground water-Inhalation (mg/m^3)	
		Child	Adult	Child	Adult		Child	Adult
Arsenic (0.0044 mg/L)	0.0003	0.0003	0.0001	N.S.	N.S.	N.A.	N.S.	N.S.
Benzene (N.D.)	N.A.	N.D.	N.D.	N.D.	N.D.	0.013	N.D.	N.D.
Chromium (0.081 mg/L)	N.A.	0.005	0.002	0.0000088	0.000005	0.0005	N.S.	N.S.
Lead (0.02 mg/L)	N.A.	0.001	0.0006	0.000002	0.000001	N.A.	N.S.	N.S.
Tetrachlorotheylene (0.0017 mg/L)	0.05	0.0001	0.00005	0.00005	0.00003	0.27	0.017	0.017
Trichloroethylene (N.S.)	0.2	N.S.	N.S.	N.S.	N.S.	0.55	N.S.	N.S.

These doses were calculated using Risk Assistant software and standard values for ground water consumption, shower inhalation exposure and dermal exposure parameters (EPA, 1991).
N.A. = Not available.
N.D. = Not detected.
N.S. = Not significant.
The above doses were calculated using the following values and an average shower time of 0.2 hours:

Adult body weight-	70 kg	Child body weight-	15 kg
Adult water consumption-	2 liters/day	Child water consumption-	1 liter/day
Adult skin surface area-	23,000cm^2	Child skin surface area-	7,200cm^2

mg/kg/day = milligram of contaminant per kilogram body weight per day.
mg/m^3 = milligram of contaminant per cubic meter air.

APPENDIX C. RISK OF ILLNESS, DOSE RESPONSE/THRESHOLD, AND UNCERTAINTY IN PHAs

Uncertainties are inherent in the public health assessment process. These uncertainties fall into four categories: 1) science is never 100% certain, 2) the inexactness of the risk assessment process, 3) the incompleteness of the information collected thus far, and 4) differences in opinion as to the implications of the information (NJDEP, 1990). These uncertainties are addressed in PHAs by using worst-case assumptions when estimating or interpreting health risks.

Risk of Illness

In this PHA, the risk of illness is the chance that exposure to a hazardous contaminant is associated with a harmful health effect or illness. The risk of illness is not a measure of cause and effect; only an in-depth health study can identify a cause and effect relationship. Instead, we use the risk of illness to decide if a follow-up health study is needed and to identify possible associations.

The greater the exposure to a hazardous contaminant (dose), the greater the risk of illness. The amount of a substance required to harm a person's health (toxicity) also determines the risk of illness. Exposure to a hazardous contaminant above a minimum level increases everyone's risk of illness. Only in unusual circumstances, however, do many people become ill.

Information from human studies provides the strongest evidence that exposure to a hazardous contaminant is related to a particular illness. Some of this evidence comes from doctors reporting an unusual incidence of a specific illness in exposed individuals. More formal studies compare illnesses in people with different levels of exposure. However, human information is very limited for most hazardous contaminants, and scientists must frequently depend upon data from animal studies. Hazardous contaminants associated with harmful health effects in humans are often associated with harmful health effects in other animal species. There are limits, however, in only relying on animal studies. For example, scientists have found some hazardous contaminants are associated with cancer in animals, but lack evidence of a similar association in humans. In addition, humans and animals have differing abilities to protect themselves against low levels of contaminants, and most animal studies test only the possible health effects of high exposure levels. Consequently, the possible effects on humans of low-level exposure to hazardous contaminants are uncertain when information is derived solely from animal experiments.

Dose Response/Thresholds

The focus of toxicological studies in humans or animals is identification of the relationship between exposure to different doses of a specific contaminant and the chance of having a health effect from each exposure level. This dose-response relationship provides a mathematical formula or graph that we use to estimate a person's risk of illness. There is one important difference between the dose-response curves used to estimate the risk of noncancerous illnesses and those used to estimate the risk of cancer: the existence of a threshold dose. A threshold dose is the highest exposure dose at which there is no risk of a noncancerous illness. The dose-response curves for noncancerous illnesses include a threshold dose that is greater than zero. Scientists include a threshold dose in these models because the human body can adjust to varying amounts of cell damage without illness. The threshold dose differs for different contaminants and different exposure routes, and we estimate it from information gathered in human and animal studies. In contrast, the dose-response curves used to estimate the risk of cancer assume there is no threshold dose (or, the cancer threshold dose is zero). This assumes a single contaminant molecule may be sufficient to cause a clinical case of cancer. This assumption is very conservative, and many scientists believe a threshold dose greater than zero exists for the development of cancer.

Uncertainty

All risk assessments, to varying degrees, require the use of assumptions, judgements, and incomplete data. These contribute to the uncertainty of the final risk estimates. Some more important sources of uncertainty in this PHA include environmental sampling and analysis, exposure parameter estimates, use of modeled data, and present toxicological knowledge. These uncertainties may cause risk to be overestimated or underestimated to a different extent. Because of the uncertainties described below, this
PHA does not represent an absolute estimate of risk to persons exposed to chemicals at or near Queen's 41st Auto Salvage.

Environmental chemistry analysis errors can arise from random errors in the sampling and analytical processes, resulting in either an over- or under-estimation of risk. We can control these errors to some extent by increasing the number of samples collected and analyzed and by sampling the same locations over several different periods. The above actions tend to minimize uncertainty contributed from random sampling errors.

There are two areas of uncertainty related to exposure parameter estimates: (1) the exposure-point concentration estimate and (2) the estimate of the total chemical exposures. In this assessment we used maximum detected concentrations as the exposure point concentration. We believe using the maximum measured value to be appropriate because we cannot be certain of the peak contaminant concentrations, and we cannot statistically predict peak values. Nevertheless, this assumption introduces uncertainty into the risk assessment that may over- or under-estimate the actual risk of illness. When selecting parameter values to estimate exposure dose, we used default assumptions and values within the ranges recommended by the ATSDR or the EPA. These default assumptions and values are conservative (health protective) and may contribute to the over-estimation of risk of illness. Similarly, we assumed the maximum exposure period occurred regularly for each selected pathway. Both assumptions are likely to contribute to the over-estimation of risk of illness.

There are also data gaps and uncertainties in the design, extrapolation, and interpretation of toxicological experimental studies. Data gaps contribute uncertainty because information is either not available or is addressed qualitatively. Moreover, the available information on the interaction among chemicals found at the site, when present, is qualitative (that is, a description instead of a number) and we cannot apply a mathematical formula to estimate the dose. These data gaps may tend to underestimate the actual risk of illness. In addition, there are great uncertainties in extrapolating from high-to-low doses, and from animal-to-human populations. Extrapolating from animals to humans is uncertain because of the differences in the uptake, metabolism, distribution, and body organ susceptibility between different species. Human populations are also variable because of differences in genetic constitution, diet, home and occupational environment, activity patterns, and other factors. These uncertainties can result in an over- or under-estimation of risk of illness. Finally, there are great uncertainties in extrapolating from high to low doses, and controversy in interpreting these results. Because the models used to estimate dose-response relationships in experimental studies are conservative, they tend to overestimate the risk. Techniques used to derive acceptable exposure levels account for such variables by using safety factors. Currently, there is much debate in the scientific community about how much we overestimate the actual risks and what the risk estimates really mean.

APPENDIX D. ATSDR PLAIN LANGUAGE GLOSSARY OF ENVIRONMENTAL HEALTH TERMS REVISED -15 DEC 99

Absorption: How a chemical enters a person's blood after the chemical has been swallowed, has come into contact with the skin, or has been breathed in.

Acute Exposure: Contact with a chemical that happens once or only for a limited period of time. ATSDR defines acute exposures as those that might last up to 14 days.

Additive Effect: A response to a chemical mixture, or combination of substances, that might be expected if the known effects of individual chemicals, seen at specific doses, were added together.

Adverse Health Effect: A change in body function or the structures of cells that can lead to disease or health problems.

Antagonistic Effect: A response to a mixture of chemicals or combination of substances that is less than might be expected if the known effects of individual chemicals, seen at specific doses, were added together.

ATSDR: The Agency for Toxic Substances and Disease Registry. ATSDR is a federal health agency in Atlanta, Georgia that deals with hazardous substance and waste site issues. ATSDR gives people information about harmful chemicals in their environment and tells people how to protect themselves from coming into contact with chemicals.

Background Level: An average or expected amount of a chemical in a specific environment. Or, amounts of chemicals that occur naturally in a specific environment.

Biota: Used in public health, things that humans would eat – including animals, fish and plants.

CAP: See Community Assistance Panel.

Cancer: A group of diseases which occur when cells in the body become abnormal and grow, or multiply, out of control

Carcinogen: Any substance shown to cause tumors or cancer in experimental studies.

CERCLA: See Comprehensive Environmental Response, Compensation, and Liability Act.

Chronic Exposure: A contact with a substance or chemical that happens over a long period of time. ATSDR considers exposures of more than one year to be *chronic*.

Completed Exposure Pathway: See Exposure Pathway.

Community Assistance Panel (CAP): A group of people from the community and health and environmental agencies who work together on issues and problems at hazardous waste sites.
Comparison Value: (CVs)Concentrations or the amount of substances in air, water, food, and soil that are unlikely, upon exposure, to cause adverse health effects. Comparison values are used by health assessors to select which substances and environmental media (air, water, food and soil) need additional evaluation while health concerns or effects are investigated.

Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA): **CERCLA** was put into place in 1980. It is also known as **Superfund**. This act concerns releases of hazardous substances into the environment, and the cleanup of these substances and hazardous waste sites. ATSDR was created by this act and is responsible for looking into the health issues related to hazardous waste sites.

Concern: A belief or worry that chemicals in the environment might cause harm to people.

Concentration: How much or the amount of a substance present in a certain amount of soil, water, air, or food.

Contaminant: See **Environmental Contaminant.**

Delayed Health Effect: A disease or injury that happens as a result of exposures that may have occurred far in the past.

Dermal Contact: A chemical getting onto your skin. (see **Route of Exposure**).

Dose: The amount of a substance to which a person may be exposed, usually on a daily basis. Dose is often explained as "amount of substance(s) per body weight per day".

Dose / Response: The relationship between the amount of exposure (dose) and the change in body function or health that result.

Duration: The amount of time (days, months, years) that a person is exposed to a chemical.

Environmental Contaminant: A substance (chemical) that gets into a system (person, animal, or the environment) in amounts higher than that found in **Background Level**, or what would be expected.

Environmental Media: Usually refers to the air, water, and soil in which chemicals of interest are found. Sometimes refers to the plants and animals that are eaten by humans. **Environmental Media** is the second part of an **Exposure Pathway.**

Environmental Protection Agency (EPA): The federal agency that develops and enforces environmental laws to protect the environment and the public's health.

Epidemiology: The study of the different factors that determine how often, in how many people, and in which people will disease occur.

Exposure: Coming into contact with a chemical substance.(For the three ways people can come in contact with substances, see **Route of Exposure**.)

Exposure Assessment: The process of finding the ways people come in contact with chemicals, how often and how long they come in contact with chemicals, and the amounts of chemicals with which they come in contact.

Exposure Pathway: A description of the way that a chemical moves from its source (where it began) to where and how people can come into contact with (or get exposed to) the chemical.

ATSDR defines an exposure pathway as having 5 parts:

1. Source of Contamination
2. Environmental Media and Transport Mechanism,
3. Point of Exposure,
4. Route of Exposure, and
5. Receptor Population.

When all 5 parts of an exposure pathway are present, it is called a **Completed Exposure Pathway**. Each of these 5 terms is defined in this Glossary.

Frequency: How often a person is exposed to a chemical over time; for example, every day, once a week, twice a month.

Hazardous Waste: Substances that have been released or thrown away into the environment and, under certain conditions, could be harmful to people who come into contact with them.

Health Effect: ATSDR deals only with **Adverse Health Effects** (see definition in this Glossary).

Indeterminate Public Health Hazard: The category is used in Public Health Assessment documents for sites where important information is lacking (missing or has not yet been gathered) about site-related chemical exposures.

Ingestion: Swallowing something, as in eating or drinking. It is a way a chemical can enter your body (See **Route of Exposure**).

Inhalation: Breathing. It is a way a chemical can enter your body (See **Route of Exposure**).

LOAEL: Lowest Observed Adverse Effect Level. The lowest dose of a chemical in a study, or group of studies, that has caused harmful health effects in people or animals.

Malignancy: See **Cancer.**

MRL: Minimal Risk Level. An estimate of daily human exposure – by a specified route and length of time -- to a dose of chemical that is likely to be without a measurable risk of adverse, noncancerous effects. An MRL should not be used as a predictor of adverse health effects.

NPL: The National Priorities List. (Which is part of **Superfund.**) A list kept by the U.S. Environmental Protection Agency (EPA) of the most serious, uncontrolled or abandoned hazardous waste sites in the country. An NPL site needs to be cleaned up or is being looked at to see if people can be exposed to chemicals from the site.

NOAEL: No Observed Adverse Effect Level. The highest dose of a chemical in a study, or group of studies, that did not cause harmful health effects in people or animals..

No Apparent Public Health Hazard: The category is used in ATSDR's Public Health Assessment documents for sites where exposure to site-related chemicals may have occurred in the past or is still occurring but the exposures are not at levels expected to cause adverse health effects.

No Public Health Hazard: The category is used in ATSDR's Public Health Assessment documents for sites where there is evidence of an absence of exposure to site-related chemicals.

PHA: Public Health Assessment. A report or document that looks at chemicals at a hazardous waste site and tells if people could be harmed from coming into contact with those chemicals. The PHA also tells if possible further public health actions are needed.

Plume: A line or column of air or water containing chemicals moving from the source to areas further away. A plume can be a column or clouds of smoke from a chimney or contaminated underground water sources or contaminated surface water (such as lakes, ponds and streams).

Point of Exposure: The place where someone can come into contact with a contaminated environmental medium (air, water, food or soil). For examples: the area of a playground that has contaminated dirt, a contaminated spring used for drinking water, the location where fruits or vegetables are grown in contaminated soil, or the backyard area where someone might breathe contaminated air.

Population: A group of people living in a certain area; or the number of people in a certain area.

PRP: Potentially Responsible Party. A company, government or person that is responsible for causing the pollution at a hazardous waste site. PRP's are expected to help pay for the clean up of a site.

Public Health Assessment(s): See **PHA**.

Public Health Hazard: The category is used in PHAs for sites that have certain physical features or evidence of chronic, site-related chemical exposure that could result in adverse health effects.

Public Health Hazard Criteria: PHA categories given to a site which tell whether people could be harmed by conditions present at the site. Each are defined in the Glossary. The categories are:

Urgent Public Health Hazard
Public Health Hazard
Indeterminate Public Health Hazard
No Apparent Public Health Hazard
No Public Health Hazard

Receptor Population: People who live or work in the path of one or more chemicals, and who could come into contact with them (See **Exposure Pathway**).

Reference Dose (RfD): An estimate, with safety factors (see **safety factor**) built in, of the daily, life-time exposure of human populations to a possible hazard that is not likely to cause harm to the person.

Route of Exposure: The way a chemical can get into a person's body. There are three exposure routes:

- breathing (also called inhalation),
- eating or drinking (also called ingestion), and
- or getting something on the skin (also called dermal contact).

Safety Factor: Also called **Uncertainty Factor**. When scientists don't have enough information to decide if an exposure will cause harm to people, they use "safety factors" and formulas in place of the information that is not known. These factors and formulas can help determine the amount of a chemical that is not likely to cause harm to people.

SARA: The Superfund Amendments and Reauthorization Act in 1986 amended CERCLA and expanded the health-related responsibilities of ATSDR. CERCLA and SARA direct ATSDR to look into the health effects from chemical exposures at hazardous waste sites.

Sample Size: The number of people that are needed for a health study.

Sample: A small number of people chosen from a larger population (See **Population**).

Source (of Contamination): The place where a chemical comes from, such as a landfill, pond, creek, incinerator, tank, or drum. Contaminant source is the first part of an **Exposure Pathway**.

Special Populations: People who may be more sensitive to chemical exposures because of certain factors such as age, a disease they already have, occupation, sex, or certain behaviors (like cigarette smoking). Children, pregnant women, and older people are often considered special populations.

Statistics: A branch of the math process of collecting, looking at, and summarizing data or information.

Superfund Site: See NPL.

Survey: A way to collect information or data from a group of people (**population**). Surveys can be done by phone, mail, or in person. ATSDR cannot do surveys of more than nine people without approval from the U.S. Department of Health and Human Services.

Synergistic effect: A health effect from an exposure to more than one chemical, where one of the chemicals worsens the effect of another chemical. The combined effect of the chemicals acting together are greater than the effects of the chemicals acting by themselves.

Toxic: Harmful. Any substance or chemical can be toxic at a certain dose (amount). The dose is what determines the potential harm of a chemical and whether it would cause someone to get sick.

Toxicology: The study of the harmful effects of chemicals on humans or animals.

Tumor: Abnormal growth of tissue or cells that have formed a lump or mass.

Uncertainty Factor: See **Safety Factor**.

Urgent Public Health Hazard: This category is used in ATSDR's Public Health Assessment documents for sites that have certain physical features or evidence of short-term (less than 1 year), site-related chemical exposure that could result in adverse health effects and require quick intervention to stop people from being exposed.

CERTIFICATION

This Queen's 41st Auto Salvage site PHA was prepared by the Florida Department of Health under a cooperative agreement with the Agency for Toxic Substances and Disease Registry (ATSDR). It is in accordance with approved methodology and procedures existing at the time the health assessment was begun.

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The Division of Health Assessment and Consultation, ATSDR, has reviewed this health consultation, and concurs with its findings.

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