

III. POTENTIAL SOURCES OF GROUNDWATER CONTAMINATION

The goal of this element is to identify existing and potential sources of contamination within the previously determined WHPA. Contamination has several possible pathways to reach groundwater including direct spills, interior floor drains which discharge to the ground, septic systems, leaking underground storage tanks, storm water runoff, or dry and abandoned wells. In certain hydrogeologic settings, even very small amounts of a hazardous substance can contaminate large areas of groundwater.

The federal Safe Drinking Water Act also requires that a WHP plan "...will identify within each wellhead protection area all potential anthropogenic sources of contaminants which may have any adverse effect on the health of persons". An anthropogenic source is any activity, performed by or caused by human actions, that is, or potentially can be a source of contamination to groundwater, including human actions affecting natural contaminants. The releases can be either from *point* sources, such as leaking tanks or impoundments, or from *non-point* sources, such as the application of agricultural chemicals or releases from areas containing septic tank/leachfield systems.

A contaminant is defined in this WHPP as an organic, inorganic or microbiological substance that is regulated under Federal, State or local environmental programs.

Applicable Federal and State-related environmental laws and hazardous material regulations to control the use of potential contaminants generally include the Resource Conservation and Recovery Act (RCRA), Comprehensive Environmental Response Compensation and Liability Act (CERCLA or "Superfund"), Safe Drinking Water Act (SDWA), Clean Water Act (CWA), Toxic Substances Control Act (TSCA), and the Federal, Insecticide, Fungicide and Rodenticide Act (FIFRA). Although these regulations have imposed controls on a wide range of industries and hazardous material treatment, storage and disposal practices, they have tended to focus only on the larger manufacturing industries which manage the majority of hazardous wastes and hazardous materials in this country. Other smaller industries and businesses are not as stringently controlled (if controlled at all) either because the Federal and State statutes focus on industries that manage wastes or materials above a threshold amount, or because the materials managed by the smaller industries are not considered "hazardous". As a result, materials and wastes that are not generally regarded or regulated as "hazardous" still have the potential to contaminate groundwater supplies.

Identifying the location and types of potential sources of contamination is essential in the development and implementation of effective management and public education strategies within the local wellhead protection program.

A. CATEGORIES OF POTENTIAL CONTAMINATION SOURCES

As part of this WHP Plan, categories of sources or activities having the potential to contaminate groundwater have been identified in Table 1. The table is intended to provide a general overview of environmental risks associated with various activities. The categories have been grouped according to the type of activity (i.e. agricultural, residential, governmental, commercial and industrial) with which the source is commonly associated. The type(s) of contaminant(s) commonly associated with the various types of sources and the relative risk to groundwater quality are also provided.

TABLE 1
CATEGORIES OF POTENTIAL SOURCES OF GROUNDWATER CONTAMINATION

AGRICULTURAL SOURCES (K)⁵

TYPE OF SOURCE	HEALTH, ENVIRONMENTAL, OR AESTHETIC CONTAMINANT^{1,2,3}
Animal feedlots (0006) ⁴ and burial areas (0007)	Livestock sewage wastes; nitrates; phosphates; chloride; chemical sprays and dips for controlling insect, bacterial, viral, and fungal pests on livestock; coliform ⁶ and noncoliform bacteria; viruses
Manure spreading areas (0008) and storage pits (0009)	Livestock sewage wastes; nitrates
Livestock waste disposal areas (0010)	Livestock sewage wastes; nitrates
Crop areas and irrigation sites (0011)	Pesticides; ⁷ fertilizers; ⁸ gasoline and motor oils from chemical applicators
Chemical storage areas and containers (0012)	Pesticide ⁷ and fertilizer ⁸ residues
Farm machinery areas (0013)	Automotive wastes; ⁹ welding wastes
Agricultural drainage wells (0014) and canals (0015)	Pesticides; ⁷ fertilizers; ⁸ bacteria; salt water (in areas where the fresh-saltwater interface lies at shallow depths and where the water table is lowered by channelization, pumping, or other causes)

RESIDENTIAL SOURCES (D)

TYPE OF SOURCE	HEALTH, ENVIRONMENTAL, OR AESTHETIC CONTAMINANT^{1,2,3}
Common household maintenance and hobbies (0016)	<u>Common Household Products:</u> ¹⁰ Household cleaners; oven cleaners; drain cleaners; toilet cleaners; disinfectants; metal polishes; jewelry cleaners; shoe polishes; synthetic detergents; bleach; laundry soil and stain removers; spot removers and dry cleaning fluid; solvents; lye or caustic soda; household pesticides; ¹¹ photochemicals; printing ink; other common products; <u>Wall and Furniture Treatments:</u> Paints; varnishes; stains; dyes; wood preservatives (creosote); paint and lacquer thinners; paint and varnish removers and deglossers; paint brush cleaners; floor and furniture strippers; <u>Mechanical Repair and Other Maintenance Products:</u> Automotive wastes; ⁹ waste oil; diesel fuel; kerosene; #2 heating oil; grease; degreasers for driveways and garages; metal degreasers; asphalt and roofing tar; tar removers; lubricants; rustproofers; car wash detergents; car waxes and polishes; rock salt; refrigerants
Lawns and gardens (0017)	Fertilizers; ⁷ herbicides and other pesticides used for lawn and garden maintenance ¹²
Swimming pools (0018)	Swimming pool maintenance chemicals ¹³
Septic systems (0019), cesspools (0020), and sewer lines (0021)	Septage; coliform and noncoliform bacteria; ⁶ viruses; nitrates; heavy metals; synthetic detergents; cooking and motor oils; bleach; pesticides; ^{11, 12} paints; paint thinner; photographic chemicals; swimming pool chemicals; ¹¹ septic tank/cesspool cleaner chemicals; ¹⁴ elevated levels of chloride, sulfate, calcium, magnesium, potassium, and phosphate
Underground storage tanks (0022)	Home heating oil
Apartments and condominiums (0023)	Swimming pool maintenance chemicals; ¹³ pesticides for lawn and garden maintenance and cockroach, termite, ant, rodent, and other pest control; ^{11,12} wastes from on-site sewage treatment plants; household hazardous wastes ¹⁰

**TABLE 1 (cont.)
CATEGORIES OF POTENTIAL SOURCES OF GROUNDWATER CONTAMINATION**

GOVERNMENT SOURCES (E)

TYPE OF SOURCE	HEALTH, ENVIRONMENTAL, OR AESTHETIC CONTAMINANT^{1,2,3}
Schools (0024) and government offices and grounds (0025)	Solvents; pesticides; ^{11,12} acids; alkalis; waste oils; machinery/vehicle servicing wastes; gasoline and heating oil from storage tanks; general building wastes ¹⁵
Park lands (0026)	Fertilizers; ⁸ herbicides; ¹² insecticides ¹¹
Public and residential areas infested with mosquitoes, gypsy moths, ticks, ants, or other pests (0027)	Pesticides ^{7,11}
Highways, road maintenance depots, and deicing operations (0028)	Herbicides in highway rights-of-way; ^{7,12} road salt (sodium and calcium chloride); road salt anticaking additives (ferric ferrocyanide, sodium ferrocyanide); road salt anticorrosives (phosphate and chromate); automotive wastes ⁹
Municipal sewage treatment plants and sewer lines (0029)	Municipal wastewater; sludge; ¹⁶ treatment chemicals ¹⁷
Storage, treatment, and disposal ponds, lagoons, and other surface impoundments (0030)	Sewage wastewater; nitrates; other liquid wastes; microbiological contaminants
Land areas applied with wastewater or wastewater byproducts (0031)	Organic matter; nitrate; inorganic salts; heavy metals; coliform and noncoliform bacteria; ⁶ viruses; nitrates; sludge; ¹⁶ nonhazardous wastes ¹⁸
Storm water drains and basins (0032)	Urban runoff; gasoline; oil; other petroleum products; road salt; microbiological contaminants
Combined sewer overflows (municipal sewers and stormwater drains) (0033)	Municipal wastewater; sludge; ¹⁶ treatment chemicals; ¹⁷ urban runoff; gasoline; oil; other petroleum products; road salt; microbial contaminants
Recycling/reduction facilities (0034)	Residential and commercial solid waste residues
Municipal waste landfills (0035)	Leachate; organic and inorganic chemical contaminants; wastes from households ¹⁰ and businesses; ¹⁵ nitrates; oils; metals
Open dumping and burning sites (0036), closed dumps (0037)	Organic and inorganic chemicals; metals; oils; wastes from households ¹⁰ and businesses ¹⁵
Municipal incinerators (0038)	Heavy metals; hydrocarbons; formaldehyde; methane; ethane; ethylene; acetylene; sulfur and nitrogen compounds
Water supply wells, monitoring wells, older wells, domestic and livestock wells (0039), unsealed and abandoned wells (0040), and test hole/wells (0041)	Surface runoff; effluents from barnyards, feedlots, septic tanks, or cesspools; gasoline; used motor oil; road salt
Sumps and dry wells (0042)	Storm water runoff; spilled liquids; used oil; antifreeze; gasoline; other petroleum products; road salt; pesticides; ⁷ and a wide variety of other substances
Drainage wells (0043)	Pesticides; ^{11,12} bacteria
Well pumping that causes interaquifer leakage, induced filtration, landward migration of sea water in coastal areas; etc. (0044)	Saltwater; excessively mineralized water
Artificial groundwater recharge (0045)	Storm water runoff; excess irrigation water; stream flow; cooling water; treated sewage effluent; other substances that may contain contaminants, such as nitrates, metals, detergents, synthetic organic compounds, bacteria, and viruses

**TABLE 1 (cont.)
CATEGORIES OF POTENTIAL SOURCES OF GROUNDWATER CONTAMINATION**

COMMERCIAL SOURCES (C)

TYPE OF SOURCE	HEALTH, ENVIRONMENTAL, OR AESTHETIC CONTAMINANT^{1,2,3}
Airports (0046), abandoned airfields (0047)	Jet fuels; deicers; diesel fuel; chlorinated solvents; automotive wastes; ⁹ heating oil; building wastes ¹⁵
Auto repair shops (0048)	Waste oils; solvents; acids; paints; automotive wastes; ⁹ misc. cutting oils
Barber and beauty shops (0049)	Perm solutions; dyes; miscellaneous chemicals contained in hair rinses
Boat yards and marinas (0050)	Diesel fuels; oil; septage from boat waste disposal areas; wood preservative and treatment chemicals; paints; waxes; varnishes; automotive wastes ⁹
Bowling alleys (0051)	Epoxy; urethane-based floor finish
Car dealerships (especially those with service depts.) (0052)	Automotive wastes; ⁹ waste oils; solvents; miscellaneous wastes
Car washes (0053)	Soaps; detergents; waxes; miscellaneous chemicals
Camp grounds (0054)	Septage; gasoline; diesel fuel from boats; pesticides for controlling mosquitoes, ants, ticks, gypsy moths, and other pests; ^{7,11} household hazardous wastes from recreational vehicles (RVs) ¹⁰
Carpet stores (0055)	Glues and other adhesives; fuel from storage tanks if forklifts are used
Cemeteries (0056)	Leachate; lawn and garden maintenance chemicals ¹²
Construction trade areas and materials (plumbing, heating and air conditioning, painting, paper hanging, decorating, drywall and plastering, acoustical insulation, carpentry, flooring, roofing and sheet metal, wrecking and demolition, etc.) (0057)	Solvents; asbestos; paints; glues and other adhesives; waste insulation; lacquers; tars; sealants; epoxy waste; miscellaneous chemical wastes
Country clubs (0058)	Fertilizers; ⁸ herbicides; ^{7,12} pesticides for controlling mosquitoes, ticks, ants, gypsy moths, and other pests; ¹¹ swimming pools chemicals; ¹³ automotive wastes
Dry cleaners (0059)	Solvents (perchloroethylene, petroleum solvents, Freon); spotting chemicals (trichloroethane, methylchloroform, ammonia, peroxides, hydrochloric acid, rust removers, amyl acetate)
Funeral services and crematories (0060)	Formaldehyde; wetting agents; fumigants; solvents
Furniture repair and finishing shops (0061)	Paints; solvents; degreasing and solvent recovery sludges
Gasoline services stations (0062)	Oils; solvents; miscellaneous wastes
Hardware/lumber/parts stores (0063)	Hazardous chemical products in inventories; heating oil and fork lift fuel from storage tanks; wood-staining and treating products such as creosote
Heating oil companies, underground/above ground storage tanks (0064)	Heating oil; wastes from truck maintenance areas ⁹
Horticultural practices, garden nurseries, florists (0065)	Herbicides, insecticides, fungicides, and other pesticides ¹²
Jewelry/metal plating shops (0066)	Sodium and hydrogen cyanide; metallic salts; hydrochloric acid; sulfuric acid; chromic acid
Laundromats (0067)	Detergents; bleaches; fabric dyes
Medical institutions (0068)	X-ray developers and fixers; ¹⁹ infectious wastes; radiological wastes; biological wastes; disinfectants; asbestos; beryllium; dental acids; miscellaneous chemicals
Office buildings and complexes (0069)	Building wastes; ¹⁵ lawn/garden maintenance chemicals; ¹² gasoline; motor oil

**TABLE 1 (cont.)
CATEGORIES OF POTENTIAL SOURCES OF GROUNDWATER CONTAMINATION**

COMMERCIAL SOURCES (C) - continued

TYPE OF SOURCE	HEALTH, ENVIRONMENTAL, OR AESTHETIC CONTAMINANT^{1,2,3}
Paint stores (0070)	Paints; paint thinners; lacquers; varnishes; other wood treatments
Photography shops, photo processing laboratories (0072)	Biosludges; silver sludges; cyanides; miscellaneous sludge
Print shops (0073)	Solvents; inks; dyes; oils; photographic chemicals
Railroad tracks and yards (0074)	Diesel fuel; herbicides for rights-of-way; creosote for preserving wood ties
Research laboratories (0075)	X-ray developers and fixers; ¹⁹ infectious wastes; radiological wastes; biological wastes; disinfectants; asbestos; beryllium; solvents; infectious materials; drugs; disinfectants (quaternary ammonia, hexachlorophene, peroxides, chlornexade; bleach); miscellaneous chemicals
Scrap and junk yards (0076)	Any wastes from businesses ¹⁵ and households; ¹⁰ oils
Sports and hobby shops (0077)	Gunpowder and ammunition; rocket engine fuel; model airplane glue
Aboveground and underground storage tanks (0078)	Heating oil; diesel fuel; gasoline; other petroleum products; other commercially used chemicals
Pharmacies (0071)	Spilled and returned products
Transportation services for passenger transit (local and interurban) (0079)	Waste oil; solvents; gasoline and diesel fuel from vehicles and storage tanks; fuel oil; other automotive wastes ⁹
Veterinary services (0080)	Solvents; infectious materials; vaccines; drugs; disinfectants (quaternary ammonia, hexachlorophene, peroxides, chlornexade, bleach); x-ray developers and fixers ¹⁹

INDUSTRIAL SOURCES (B)

TYPE OF SOURCE	HEALTH, ENVIRONMENTAL, OR AESTHETIC CONTAMINANT^{1,2,3}
Material stockpiles (coal, metallic ores, phosphates, gypsum) (0081)	Acid drainage; other hazardous and nonhazardous wastes ¹⁸
Waste tailing ponds (commonly for the disposal of mining wastes) (0082)	Acids; metals; dissolved solids; radioactive ores; other hazardous and nonhazardous wastes ¹⁷
Transport and transfer stations (trucking terminals and rail yards) (0083)	Fuel tanks; repair shop wastes; ⁹ other hazardous and nonhazardous wastes ¹⁷
Aboveground and underground storage tanks and containers (0084)	Heating oil; diesel and gasoline fuel; other petroleum products; hazardous and nonhazardous materials and wastes ¹⁸
Storage, treatment, and disposal ponds, lagoons, and other surface impoundments (0085)	Hazardous and nonhazardous liquid wastes; ¹⁸ septage; sludge ¹⁶
Chemical landfills (0086)	Leachate; hazardous and nonhazardous wastes; ¹⁸ nitrates
Radioactive waste disposal sites (0087)	Radioactive wastes from medical facilities, power plants, and defense operations; radionuclides (uranium, plutonium)
Unattended wet and dry excavation sites (unregulated dumps) (0088)	A wide range of substances; solid and liquid wastes; oil-field brines; spent acids from steel mill operations; snow removal piles containing large amounts of salt
Operating and abandoned production and exploratory wells (for gas, oil, coal, geothermal, and heat recovery); test hole wells; monitoring and excavation wells (0089)	Metals; acids; minerals; ¹⁸ sulfides; other sulfides; other hazardous and nonhazardous chemicals ¹⁸
Dry wells (0090)	Saline water from wells pumped to keep them dry
Injection wells (0091)	Highly toxic wastes; hazardous and nonhazardous industrial wastes; ¹⁸ oil-field brines
Well drilling operations (0092)	Brines associated with oil and gas operations

**TABLE 1 (cont.)
CATEGORIES OF POTENTIAL SOURCES OF GROUNDWATER CONTAMINATION**

INDUSTRIAL PROCESSES (B) (PRESENTLY OPERATED OR TORN-DOWN FACILITIES)²⁰

TYPE OF SOURCE	HEALTH, ENVIRONMENTAL, OR AESTHETIC CONTAMINANT^{1,2,3}
Asphalt plants (0093)	Petroleum derivatives
Communications equipment manufacturers (0094)	Nitric, hydrochloric, and sulfuric acid wastes; heavy metal sludges; copper-contaminated etchant (e.g., ammonium persulfate); cutting oil and degreasing solvent (trichloroethane, Freon, or trichloroethylene); waste oils; corrosive soldering flux; paint sludge; waste plating solution
Electric and electronic equipment manufacturers and storage facilities (0095)	Cyanides; metal sludges; caustics (chromic acid); solvents; oils; alkalis; acids; paints and paint sludges; calcium fluoride sludges; methylene chloride; perchloroethylene; trichloroethane; acetone; methanol; toluene; PCBs
Electroplaters (0096)	Boric, hydrochloric, hydrofluoric, and sulfuric acids; sodium and potassium hydroxide; chromic acid; sodium and hydrogen cyanide; metallic salts
Foundries and metal fabricators (0097)	Paint wastes; acids; heavy metals; metal sludges; plating wastes; oils; solvents; explosive wastes
Furniture and fixtures manufacturers (0098)	Paints; solvents; degreasing sludges; solvent recovery sludges
Machine and metalworking shops (0100)	Solvents; metals; miscellaneous organics; sludges; oily metal shavings; lubricant and cutting oils; degreasers (TCE); metal marking fluids; mold-release agents
Mining operations (surface and underground) (0101)	Mine spoils or tailings that often contain metals; acids; highly corrosive mineralized waters; metal sulfides
Unsealed abandoned mines used as waste pits (0102)	Metals; acids; minerals; sulfides; other hazardous and nonhazardous chemicals ¹⁸
Paper mills (0103)	Metals; acids; minerals; sulfides; other hazardous and nonhazardous chemicals; ¹⁸ organic sludges; sodium hydroxide; chlorine; hypochlorite; chlorine dioxide; hydrogen peroxide
Petroleum production and storage companies, secondary recovery of petroleum (0104)	Hydrocarbons; oil-field brines (highly mineralized salt solutions)
Industrial pipeline (0105)	Corrosive fluids; hydrocarbons; other hazardous and nonhazardous materials and wastes ¹⁸
Photo processing laboratories (0106)	Cyanides; biosludges; silver sludges; miscellaneous sludges
Plastics materials and synthetics producers (0107)	Solvents; oils; miscellaneous organics and inorganics (phenols, resins); paint wastes; cyanides; acids; alkalis; wastewater treatment sludges; cellulose esters; surfactant; glycols; phenols; formaldehyde; peroxides; etc.
Primary metal industries (blast furnaces, steel works, and rolling mills) (0108)	Heavy metal wastewater treatment sludge; pickling liquor; waste oil; ammonia scrubber liquor; acid tar sludge; alkaline cleaners; degreasing solvents; salt; metal dust
Publishers, printers, and allied industries (0109)	Solvents; inks; dyes; oils; miscellaneous organics; photographic chemicals
Public utilities (phone, electric power, gas) (0110)	PCBs from transformers and capacitors; oils; solvents; sludges; acid solution; metal plating solutions (chromium, nickel, cadmium); herbicides from utility rights-of-way
Sawmills and planers (0111) and gluing wastes	Treated wood residue (copper quinolate, mercury, sodium bazide); tanner gas; paint sludges; solvents; creosote; coating
Stone, clay, and glass manufacturers (0112)	Solvents; oils and grease; alkalis; acetic wastes; asbestos; heavy metal sludges; phenolic solids or sludges; metal-finishing sludge
Welders (0113)	Oxygen, acetylene
Wood preserving facilities (0114)	Wood preservatives; creosote

TABLE 1 (cont.)
CATEGORIES OF POTENTIAL SOURCES OF GROUNDWATER CONTAMINATION

Key to footnotes

¹In general, groundwater contamination stems from the misuse and improper disposal of liquid and solid wastes; the illegal dumping or abandonment of household, commercial, or industrial chemicals; the accidental spilling of chemicals from trucks, railways, aircraft, handling facilities, and storage tanks; or the improper siting, design, construction, operation, or maintenance of agricultural, residential, municipal, commercial, and industrial drinking water wells and liquid and solid waste disposal facilities. Contaminants also can stem from atmospheric pollutants, such as airborne sulfur and nitrogen compounds, which are created by smoke, flue dust, aerosols, and automobile emissions, fall as acid rain, and percolate through the soil. When the sources listed on this table are used and managed properly, groundwater contamination is not likely to occur.

²Contaminants can reach groundwater from activities occurring on the land surface, such as industrial waste storage; from sources below the land surface but above the water table, such as septic systems; from structures beneath the water table, such as wells; or from contaminated recharge water.

³This table lists most common wastes, but not all potential wastes. For example, it is not possible to list all potential contaminants contained in storm water runoff or research laboratory wastes.

⁴Contaminant WHPP Number.

⁵Facility WHPP Code.

⁶Coliform bacteria can indicate the presence of pathogenic (disease-causing) microorganisms that may be transmitted in human feces. Diseases such as typhoid fever, hepatitis, diarrhea, and dysentery can result from sewage contamination of water supplies.

⁷Pesticides include herbicides, insecticides, rodenticides, fungicides, and avicides; many are highly toxic and quite mobile in the subsurface. An EPA survey found that the most common pesticides found in drinking water wells were DCPA (dacthal) and atrazine (EPA, 1990b), which EPA classifies as moderately toxic (class 3) and slightly toxic (class 4) materials, respectively (Meister Publishing Company, 1991).

⁸The EPA National Pesticides Survey (EPA, 1991) found that the use of fertilizers correlates to nitrate contamination of groundwater supplies.

⁹Automotive wastes can include gasoline; antifreeze; automatic transmission fluid; battery acid; engine and radiator flushes; engine and metal degreasers; hydraulic (brake) fluid; and motor oils.

¹⁰Toxic or hazardous components of common household products are noted on the attached table (EPA 1990c).

¹¹Common household pesticides for controlling pests such as ants, termites, bees, wasps, flies, cockroaches, silverfish, mites, ticks, fleas, worms, rats, and mice can contain active ingredients including naphthalene, phosphorus, xylene, chloroform, heavy metals, chlorinated hydrocarbons, arsenic, strychnine, kerosene, nitrosamines, and dioxin.

¹²Common pesticides used for lawn and garden maintenance (i.e., weed killers, and mite, grub, and aphid controls) include such chemicals as 2,4-D; chlorpyrifos; diazinon; benomyl; captan; dicofol; and methoxychlor.

¹³Swimming pool chemicals can contain free and combined chlorine; bromine; iodine; mercury-based, copper-based, and quaternary algaecides; cyanuric acid; calcium or sodium hypochlorite; muriatic acid; sodium carbonate.

¹⁴Septic tank/cesspool cleaners include synthetic organic chemicals such as 1,1,1 trichloroethane, tetrachloroethylene, carbon tetrachloride, and methylene chloride.

¹⁵Common wastes from public and commercial buildings include automotive wastes (see above definition); rock salt; and residues from cleaning products that may contain chemicals such as xlenols, glycol esters, isopropanol, 1,1,1-trichloroethane, sulfonates, chlorinated phenols, and cresols.

**TABLE 1 (cont.)
POTENTIAL SOURCES OF GROUNDWATER CONTAMINATION**

Key to footnotes (cont.)

¹⁶Municipal wastewater treatment sludge can contain organic matter; nitrates; inorganic salts; heavy metals; coliform and noncoliform bacteria (see above definition); and viruses.

¹⁷Municipal wastewater treatment chemicals include calcium oxide; alum; activated alum, carbon, and silica; polymers; ion exchange resins; sodium hydroxide; chlorine; ozone; and corrosion inhibitors.

¹⁸The Resource Conservation and Recovery Act (RCRA) defines a hazardous waste as a solid waste that may cause an increase in mortality or serious illness or pose a substantial threat to human health and the environment when improperly treated, stored, transported, disposed of, or otherwise managed. A waste is hazardous if it exhibits characteristics of ignitability, corrosivity, reactivity, and/or toxicity. Not covered by RCRA regulations are domestic sewage; irrigation waters or industrial discharges allowed by the Clean Water Act; certain nuclear and mining wastes; household wastes; agricultural wastes (excluding some pesticides); and small quantity hazardous wastes (i.e., less than 220 pounds per month) discharged from businesses.

¹⁹X-ray developers and fixers may contain reclaimable silver, glutaldehyde, hydroquinone, phenedone, potassium bromide, sodium sulfite, sodium carbonate, thiosulfates, and potassium alum.

²⁰This table lists potential groundwater contaminants from many common industries, but it does not address all industries.

Source: Wyoming Department of Environmental Quality

B. CONTAMINATION SOURCE INVENTORY

An initial inventory was completed in February 2003 to develop and confirm a list of existing and potential sources of contamination within the WHPA. As summarized in Table 2 below, several database sources were used to identify and locate existing sites of contamination. The identification of existing sources of contamination have been compiled using information from various state agencies and programs which include Sites of Environmental Contamination (under Part 201 of Michigan Act 451), the Underground Storage Tank list (under Part 211, Act 451), and the Leaking Underground Storage Tank Site list (under Part 213 of Act 451).

For this WHPP, '*existing*' sources are those which are known to have caused, or threaten to cause groundwater contamination; regulatory agencies may have information pertaining to existing sources. '*Potential*' sources are those which may or may not have caused groundwater contamination, but have the potential to do so; regulatory agencies may, or may not have knowledge and/or information available relating to potential sources.

Environmental Data Resources, Inc. (EDR) was retained to conduct a search of federal and state environmental records to identify existing or potential sources of contamination within the WHPA. A copy of EDR's resulting report is included in Attachment A. The search identified two sites of contamination, or sites that are documented as using hazardous or polluting materials during facility operations, within or immediately adjacent to the WHPA.

No sites of existing or known contamination were identified as located within the 10-year capture zone for the municipal wells.

**TABLE 2
DATABASE SOURCES FOR CONTAMINATION INFORMATION**

Database (Source)	Information Provided
LUST: Leaking Underground Storage Tanks (MDEQ)	State's inventory of confirmed releases from underground storage tanks. Open denotes a site that is still being remediated. Closed denotes a site that has met MDEQ criteria for protecting human health and the environment.
NPL: Natural Priority List "Superfund" sites (EPA)	EPA's Superfund cleanup sites.
Delisted NPL: Natural Priority List Deletions (EPA)	The National Oil and Hazardous Substance Pollution Contingency Plan (NCP) establishes the criteria that the EPA uses to delete sites from the NPL. In accordance with 40 CFR 300.425.(e), sites may be deleted from the NPL where no further response is appropriate.
NPL: Natural Priority List Lines (EPA)	Under the authority granted the USEPA by the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) of 1980, the USEPA has the authority to file liens against real property in order to recover remedial action expenditures or when the property owner receives notification of potential liability. USEPA compiles a listing of filed notices of Superfund Liens.
NPL: Proposed Natural Priority List sites (EPA)	Proposed sites.
CERCLIS: Comprehensive Environmental Response, Compensation and Liability Information System (EPA)	Sites either proposed to or on National Superfund (NPL) List.
NFRAP: CERCLIS sites where "No Further Remedial Action Planned" (EPA)	Sites where investigations revealed impacts not significant to be placed on Superfund site (NPL sites).
CORRACTS: RCRA Corrective Action Activity (EPA)	Sites where corrective action has occurred under the Federal Resource Conservation and Recovery Act, RCRA.
RCRIS: Resource Conservation and Recovery Act (EPA)	Sites that generate, store, treat or dispose of hazardous waste. CESQG - Conditionally exempt small quantity generator SQG - Small quantity generator LQG - Large quantity generator TRANS - Transporter NFD - No further details
PADS: PCB Activity Database (EPA)	Sites that generate, transport, commercial storers and/or brokers and disposers of PCB's.
TRIS: Toxic Chemical Release Inventory System (EPA)	Sites that release toxic chemicals to the air, water, and land in reportable quantities under SARA Title III, Section 3.3.
ERNS: Emergency Response Notification System (USCG)	Sites that have had a reported release of oil and/or hazardous substances.
CONSENT: Superfund (CERCLA) Consent Database (EPA)	Sites that have major legal settlements that establish responsibility and standards for cleanup at NPL sites.
TSCA: Toxic Substances Control Act (EPA)	Facilities that manufacture and import chemical substances on the TSCA Chemical Substance Inventory List.
MLTS: Material Licensing Tracking System (NRC)	Sites that possess or use radioactive materials and which are subject to NRC licensing requirements.
MINES: Mines Master Index File (Department of Labor)	Mines

TABLE 2 (Continued)
DATABASE SOURCES FOR CONTAMINATION INFORMATION

Database (Source)	Information Provided
FINDS: Facility Index System (EPA)	Federally owned and operated hazardous waste treatment, storage, or disposal facilities.
BRS: Biennial Reporting System (EPA)	National reporting system administered by the EPA that collects data on the generation and management of hazardous waste. BRS captures detailed data from two groups: Large Quantity Generators and Treatment, Storage and Disposal Facilities.
FFTS: FIFRA/TSCA Tracking System (EPA)	System tracks administrative cases and pesticides enforcement actions and compliance activities related to federal insecticide, fungicide and rodenticide Act (FIFRA) and Toxic Substance Control Act (TSCA) and Emergency Planning and Community Right-to-know Act (EPCRA)..
FFTS INSP: FIFRA/TSCA Tracking System (EPA)	System tracks federal insecticide, fungicide and rodenticide Act (FIFRA) and Toxic Substance Control Act (TSCA) Sites.
RAATS: RCRA Administrative Action Tracking System (EPA)	System contains records based on enforcement actions issued under RCRA pertaining to major violators and includes administrative and civil actions brought by the EPA prior to September 30, 1995.
UST: Underground Storage Tank (MDEQ)	Property includes an Underground Storage Tank (UST) that is registered with the State of Michigan. Current denotes a UST is currently present at the property. Removed denotes a UST was historically present at the property.
AST: Aboveground storage tanks (MDEQ)	Property includes an Above Ground Storage Tank (AST) that is registered with the State of Michigan. Current denotes an AST is currently present at the property. Removed denotes an AST was historically present at the property.
SHWS: Contaminated Sites (MDEQ)	Priority sites planned for cleanup using state funds are identified along with sites where cleanup will be paid for by potentially responsible parties.
BEA: Baseline Environmental Assessment Database (MDEQ)	Tracks sites with completed Baseline Environmental Site Assessments (BEAs).
SSTS: Section Seven Tracking System (EPA)	Tracks registration of all pesticide-producing establishments and tracks types, amounts and active ingredients sold or distributed.
Former Manufactured Gas Sites (EDR)	Tracks the existence and location of Coal Gas sites.
SWF/LF: Solid Waste Facilities Database (MDEQ)	Sites listed by the MDEQ to be active or inactive solid waste landfills.
GWD (MDEQ): Groundwater Discharge (MDEQ)	Sites listed by the MDEQ to discharge treated water to the ground or groundwater.
OGC (MDEQ): Oil & Gas Contamination Sites (MDEQ)	Sites listed by MDEQ as being contaminated by Oil & Gas production operations.
O&G: Oil and Gas Well Sites (MDEQ)	Oil and Gas wells and associated soil borings.
HMRIS: Hazardous Materials Information Reporting System (USDOT)	Sites that have had hazardous material spill incidents reported to USDOT.
ROD: Records of Decision	ROD documents mandate a permanent remedy at an NPL site containing technical and health information to aid in the cleanup.
Misc: Windshield Survey & Local Knowledge	Information provided by Local Wellhead Protection Team Members.

C. TRANSPORTATION ROUTES

No interstate highways are not present within the City's WHPA. However, state highway M-119 runs west-east through the southern, downgradient end of the WHPA, near the well fields. Groundwater quality degradation may occur as the result of significant and sudden releases or spills of hazardous or polluting materials during transit along M-119.

D. SURFACE WATER SOURCES

The primary surface water source near the City's wells is a number of small creeks. Surface water quality degradation within these surface water bodies can occur through both non-point and point source discharges. Groundwater quality degradation may occur when surface water of lesser quality recharges the aquifer by means of infiltration through the pond/lake/creek beds.

With point source discharges, the contaminant threat is dependent on the volume of the release, the chemical/physical properties of the contaminant, and the surface water velocity. Non-point source contaminants are usually seasonally derived, resulting from the release of fertilizer and pesticide applications in agricultural portions of the watershed and/or storm water runoff from urban areas.

E. ABANDONED WELLS

Abandoned wells can pose a potential impact to groundwater. Wells which are not properly closed can provide a direct conduit for surface run-off and contaminants to easily reach the groundwater. Abandoned wells may be from oil and gas drilling, water wells, irrigation wells, or dry wells.

The Michigan Department of Agriculture Groundwater Stewardship Program and the MDEQ offer technical and financial assistance in educating the public, especially farmers, in the importance of properly abandoning and plugging wells.

F. SENSITIVITY ANALYSIS

The 1996 amendments to the federal Safe Drinking Water Act requires that states analyze the "sensitivity" and determine "susceptibility" of a community's source of drinking water to potential sources of contamination.

Sensitivity is determined from the natural setting of the source water (raw water to the City's wells), and indicates natural protection afforded the source water. Information from the Wellhead Protection Area delineation indicates that the aquifer from which the City's wells obtain groundwater is "leaky confined." This means the overlying drift and depth of the City's wells provide some protection from polluting materials that may be released to the ground surface. As such, MDEQ has determined the City's geologic sensitivity to be "moderate."

G. SUSCEPTIBILITY DETERMINATION

Susceptibility identifies factors within the community's wellhead protection area that may pose a risk to the water supply. The susceptibility determination provides information with respect to listed facilities and land areas within the wellhead protection area that should be given greater priority and oversight in implementing a wellhead protection program. After review of the Contaminant Source Inventory information included in this plan, a susceptibility determination will be made by MDEQ.

The susceptibility determination will categorize the City wells (e.g. moderately susceptible, highly susceptible, or very highly susceptible) to contamination. It is important to understand that a system can have low sensitivity relative to some conditions (e.g., wells located a significant distance from potential contamination sources), and high susceptibility because of other conditions (e.g., the type of contaminant).

H. CONTAMINANT SOURCE INVENTORY MAINTENANCE

All data management systems require some sort of periodic maintenance. Data maintenance for the City's Contaminant Source Inventory was initiated when the preliminary list of sites was compiled. Specifically, the preliminary site names and mapped locations were confirmed by members of the Team.

Future maintenance of the Contaminant Source Inventory will include updating the existing information and adding any new sites. The simplest way to complete this may be re-inventorying the Harbor Springs area at periodic intervals. The City plans to complete a re-inventory every three years. Additionally, the updates will consider the following items:

- 1) Identification of new categories
- 2) Identification of new sources
- 3) Change in the status of previously inventoried sources.

It is anticipated that future verification and updating of the information will result in additional modifications to increase the effectiveness and efficiency of the system for data retrieval and analysis. This may include merging the information with a County wide Contaminant Source Inventory database, or providing information to limited individuals by internet access.