Water Security Agency

Saskatchewan Ministry of Environment

Wellhead Protection

EPB 299

June 2015

Note: As of October 1, 2012 The Water Security Agency and Saskatchewan Ministry of Environment share responsibility and authority for the administration of The Environmental Management and Protection Act, 2010, and The Waterworks and Sewage Works Regulations as pertaining to prescribed waterworks or sewage works in Saskatchewan. Therefore, all material contained within this document applies to waterworks or sewage works governed by the Water Security Agency or the Saskatchewan Ministry of Environment in accordance with their assigned responsibility.

"There should be no man or woman dare to wash any unclean linen, wash clothes...nor rinse or make clean any kettle, pot, or pan, or any suchlike vessel within twenty feet of the old well or new pump. Nor should anyone aforesaid, within less than a quarter mile of the forte, dare to do the necessities of nature, since by these unmanly, slothful, and loathsome immodesties, the whole forte may be choked and poisoned."

Governor Gates of Virginia
Proclamation for Jamestown, Virginia, 1610

Definitions

Aquifer: a geologic formation, portion thereof, or group of formations (including overlying unconsolidated material) which contains and is capable of yielding a sufficient quantity of groundwater to serve as a domestic or public water supply or other use.

Department: Saskatchewan Environment or the department of the Provincial Government of Saskatchewan that is responsible for the regulation of drinking water.

Groundwater: any waters occurring below the surface of the ground not contained by artificial barriers.

Wellhead Protection Area: the surface and subsurface area surrounding a waterwell, wellfield or spring supplying a public water system, through which contaminants are reasonably likely to move toward and reach such water well, wellfield or spring.

Introduction

The purpose of a Wellhead Protection program is to provide an organized approach to effectively protect groundwater drinking water supplies from contamination. Protection of groundwater sources for public water supplies will help to ensure safe sources of drinking water into the future and prevent costs due to contamination. Completing a Wellhead Protection Plan will identify concerns and lead a waterworks owner to understand how best to protect their own groundwater sources. The purpose of the plan described in this document is to determine a Wellhead Protection area, identify all potential sources of contaminants that may have any adverse effect on water quality and prepare a program to prevent contamination from occurring. Assistance completing the Wellhead Protection Plan can be received from the waterworks local Environmental Project Officer. The requirements specified are considered minimum requirements and should not prevent a waterworks from taking additional steps as desired to protect its wells, springs or wellfields. In addition to this plan, waterworks are encouraged to participate in a detailed source water protection planning process that could involve many of the users of the groundwater from their aquifer(s).

Waterworks Categories

For the purposes of a Wellhead Protection Plan, all waterworks fall into one of two categories: small or large. Suggested methodologies to adhere to while setting up a Wellhead Protection Plan are different based on the size of waterworks.

A “Small Waterworks” is a waterworks that:

- serves less than 1,000 permanent residents; or
- is deemed to be a small waterworks by the department for the purposes of this document.

A “Large Waterworks” is a waterworks with:

- serves 1,000 or more permanent residents; or
- is deemed to be a large waterworks by the department for the purposes of this document.

Wellhead Protection Panning Tasks

Each waterworks using a groundwater source should perform the following tasks, in accordance with their category specific requirements as further set forth in this document.

Task 1: Field Measurements/Photographs

Each waterworks should take photographs and perform field measurements, pursuant to the appropriate size category, in the delineation of their Wellhead Protection area (Zones 1 and 2 below).

Task 2: Area Delineation

Each waterworks should designate two zones of protection for their groundwater source. “Wellhead Protection Zone” (Zone 1) - the zone adjacent to the well or spring where the waterworks well or spring actively draws the water which supplies the well or spring, where contamination could enter the aquifer alongside the well casing or be drawn into the cone of depression of the well. Initially, the distance for this zone should be a fixed radius set forth in this document. This zone may be later modified to reflect hydrogeologic conditions using the same methods acceptable for the Wellhead Management Zone. Zone 1 requires the highest level of protection.

“Wellhead Management Zone” (Zone 2) - the zone surrounding the Wellhead Protection Zone which is delineated on the basis of groundwater flow direction and recharge, where contamination is reasonably likely to move toward and reach the well or spring. However, the Wellhead Management Zone for Small Waterworks should be a fixed radius of 225 metres.

The Wellhead Management Zone (Zone 2) for Small Waterworks should be designated as the area encompassed from the 75 metre radius (Zone 1) to a 225 metre radius. For Large Waterworks, Zone 2 should be as set forth using an appropriate methodology.

When the waterworks is delineating the Wellhead Management Zone, SE should be contacted regarding the methodology used. SE must be notified prior to dye traces being run which may impact a public water system. The plan must include the date of the test, the duration of the test, the dye to be injected and possibly other information required for evaluation of the test. Dye trace results should also be submitted to the Department.

Task 3: Contaminant Source Inventory

Each waterworks should perform a Potential Contaminant Source Inventory within its designated Wellhead Protection and Wellhead Management Zones to identify all potential contaminant sources located within those zones. For the purposes of this task, a potential contaminant source should be defined as any facility, structure, enterprise, function or activity occurring or present within a Wellhead Protection or Management Zone which may, as a result of either the normal or abnormal operation thereof, release to the groundwaters any pollutant, material or contaminant substance. Examples of land uses and activities that could be considered to be potential contaminant sources are further described in Appendix A.

Updates regarding potential contaminant source inventories should be performed at least every three years or when significant new potential sources are discovered. The revisions should address any changes in the hydrogeology, delineation of the protection areas, potential contamination sources, and land management strategies. Saskatchewan Environment (SE) may request an update to the Plan due to change in hydrogeologic conditions (including increased pumping rates) or changes in potential contamination sources which may increase the risk of contamination of the groundwater.

Task 4: Wellhead Protection Plan

Each waterworks should include a Wellhead Protection Plan. Plans should consider items such as hazardous chemical use and storage within Zone 1. In addition, plans should include public education and participation, proposed local bylaws, proposed zoning changes and other institutional controls. The Plans should also include provisions for periodic updating.

As the Wellhead Protection Plan is implemented, the waterworks should document any land management strategies that have been employed. Documents may include, but are not limited to the following: bylaws, codes, permits, memoranda of understanding, and public education programs.

A change within the Wellhead Protection area (Zone 1) will require an updated Plan. A significant increase in average daily production rates (greater than 25%) and significant new potential contamination sources should require alteration of the Plan.

Task 5: Contingency Plan

The waterworks should prepare a plan to deal with contamination issues, spill response notifications, and emergency response plans.. Specifically, how drinking water will be supplied in the event of contamination occurring and procedures for dealing with a contamination event should be completed.

The Contingency Plan should include a procedure for notifying SE of any condition which may impact the provisions of the Wellhead Protection Plan or water supply. The waterworks should establish a procedure for notifying the owner or operator of any potential contaminant source which is believed to be discharging substances which may endanger the water supply of the waterworks. This notification should cite any local bylaws which implement or support the Wellhead Protection Plan. Such notification to the owner or operator should also request the owner or operator to abate the activity or discharge. A copy of such notification should be submitted to SE.

Category-Specific Requirements

Small Waterworks
Appendix B can be filled out by Small Waterworks to meet all the Category-specific and general requirements for a Small Waterworks.

Photographs: Small Waterworks systems should provide clear photographs of the spring/wellhead and photographs taken North, Northeast, East, Southeast, South, Southwest, West and Northwest from the spring/well vantage point (facing outward from the spring or well). If the well or spring is enclosed in a building, the photographs should be taken at a point as near as possible to the well/spring that allows a view of the surrounding property.

Area Delineation: The minimum Zone 1 area for Small Waterworks should be set as a 75 metres (250 feet) radius of the well or spring. The minimum Zone 2 area should be set as the area from the 75 metre radius to a 225 metre (750 feet) radius of the well or spring. If in the waterworks determines these radii do not provide sufficient protection, these Zones may be enlarged or modified.

Contaminant Source Inventory: Small Waterworks are required to perform a potential contaminant source inventory (See Appendix A for a list of possible contaminants) within Zones 1 and 2. These sources are to be indicated on a topographic map or other suitable map. The wellhead/spring and Zones 1 and 2 must be clearly marked, along with an inventory of sources in tabular form.

Wellhead Protection Plan: The Plan to be provided by Small Waterworks should consist of the required photographs, Zone 1 and 2 marked on the topographic map, the contaminant source inventory, and the steps the waterworks is taking to protect the area within Zone 1. The steps should include plans for hazardous chemical storage on the property, hazardous chemical use within Zone 1 and may include posting as a Wellhead Protection area in the immediate vicinity of the well or spring. Other provisions may also be included.

Contingency Plan: No information should be included for the Contingency Plan if Wellhead Protection issues are considered as part of the Quality Assurance and Quality Control (QA/QC) plan and the Emergency Response plan (ERP), which are required to be completed by waterworks regulated by Saskatchewan Environment. If Wellhead Protection issues are not considered as part of the QA/QC and ERP, then “Large Waterworks” contingency plan should be completed.

Large Waterworks
Field Measurements/Photographs: Large Waterworks are required to collect water level elevation data from area wells to determine local groundwater flow directions, water table slope (hydrologic gradient) and local groundwater recharge basins. Large Waterworks are required to provide the same photographs as set forth for Small Waterworks. In addition, Large Waterworks are required to provide aerial photographs of the well/wellfield or spring for Zones 1 and 2.

Area Delineation: The minimum Zone 1 area for large waterworks should initially be set as a 225 metre (750 feet) radius of the well or spring. Zone 2 is the area (inclusive of the Zone 1) that takes in the recharge basin upgradient of the wellhead/spring and should include direct recharge points to the aquifer such as sinkholes and stormwater runoff wells. Many methods could be used to delineate Zone 2 this such as a dye trace, the calculated 10 year Time-of-Travel (TOT), or a number of other hydrogeological models/methods.

Contaminant Source Inventory: Large waterworks are required to perform a potential contaminant source inventory within the Wellhead Management Zone (Zone 2) and Wellhead Protection Zones (Zone 1).

Wellhead Protection Plan:
The Plan to be provided by large waterworks should consist of:

- the required photographs,
- Zones 1 and 2 marked on a topographic map,
- the contaminant source inventory;
- and the steps the waterworks is taking to protect/manage the Wellhead Protection area, at least, including;
    - plans for hazardous chemical storage on the property,
    - hazardous chemical use within Zones 1 and 2; and
    - proposed local bylaws in cooperation with the city or local municipal government.

The Plan should also include procedures for reviewing, modifying, and updating the Plan. It should also establish procedures to eliminate or minimize the risk to the waterworks from potential contaminant sources.

A waterworks owner should educate and notify the public of the Wellhead Protection program. A waterworks owner should submit information in a daily newspaper of general circulation in the area served by the system, two (2) times per calendar year. If the area served by the waterworks is not served by a daily newspaper of general circulation, notice should be given by circulation in a weekly newspaper of general circulation serving the area. Other methods of public education may also be used. The information provided to the local newspaper should include, at a minimum:

- the types of activities which may result in contamination of the groundwater in the Wellhead Protection area;
- methods to protect the designated area;
- a request for the public to report activities that may result in groundwater contamination;
- the importance of groundwater protection; and

a map of the designated Wellhead Protection area.

Contingency Plans
All waterworks should prepare a Contingency Plan to be submitted with the Wellhead Protection Plan. The contingency plan should include at a minimum:

- A listing of all sources of drinking water currently available to the Public Water Supply;
- An estimate of the quantity of water available from currently connected sources;
- Identification of additional water supplies that will meet future needs;
- Identification of any actions that have been taken by local governments to protect designated future water supplies;
- References to the Wellhead Protection Plan that detail protection plans for designated future water supplies;
- A schedule for incorporation of designated future water supplies into the water system;
- An estimation of the resources (authority, consulting expenses, capital expenses) necessary to incorporate designated future water supplies into the water system and associated schedule;
- Spill response notification procedures for spills in Zone 1; and
- Identification of the financial resources available to incorporate designated future water supplies into the water system.

Reference made to the waterworks' approved Emergency Response Plan will be sufficient for those items listed above which are addressed in the emergency response planning process.

Appendix A
Potential Sources of Groundwater Contamination

Source	***Health, Environmental or Aesthetic Contaminant***
Naturally Occurring Sources	
Rocks and soils	Aesthetic Contaminants: Iron and iron bacteria; manganese; calcium and magnesium (hardness) Health and Environmental Contaminants: Arsenic; asbestos; metals; chlorides (fluorides, sulfates); sulfate-reducing bacteria; other microorganisms
Water	Excessive sodium; bacteria; viruses; low pH (acid) water
Decaying organic matter, Bacteria	Bacteria, viruses, organics, contaminants, nutrients.
Geological radioactive gas	Radionuclides (radon, etc.)
Natural hydrogeological events and formations	Salt-water/brackish water intrusion (or intrusion of other poor quality water)
Agricultural Sources	
Animal feedlots and burial areas	Livestock sewage wastes; nitrates; phosphates; chloride; chemical sprays and dips for controlling insect, bacterial, viral and fungal pests on livestock; coliform and noncoliform bacteria; viruses
Manure spreading areas and storage pits	Livestock sewage wastes; nitrates
Livestock waste disposal areas	Livestock sewage wastes; nitrates
Crop areas and irrigation sites	Pesticides; fertilizers;gasoline and motor oils from chemical applicators
Chemical storage areas and containers	Pesticide and fertilizer residues
Farm machinery areas	Automotive wastes; welding wastes
Agricultural drainage wells and canals	Pesticides; fertilizers; bacteria
Residential Sources	
Swimming pools	Swimming pool maintenance chemicals

Common household maintenance and hobbies	Household Products: Household cleaners, oven cleaners, drain cleaners, toilet cleaners, disinfectants, metal polishes, jewelry cleaners, shoe polishes, synthetic detergents, bleach, laundry soil an stain removers, spot removers and dry cleaning fluid, solvents, lye or caustic soda, household pesticides, photochemicals, printing ink and other common products Wall and Furniture Treatments: Paints, varnishes, stains, dyes, wood preservatives (creosote), paint and lacquer thinners, paint and varnish removers and deglossers; paint brush cleaners, floor and furniture strippers Mechanical Repair and Other Maintenance Products: Automotive wastes, 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	Fertilizers; herbicides and other pesticides used for lawn and garden maintenance
Septic systems, cesspools, and sewer lines	Septage; coliform and noncoliform bacteria; viruses; nitrates; heavy metals; synthetic detergents; cooking and motor oils; bleach; pesticides; paints; paint thinner; photographic chemicals; swimming pool chemicals; septic tank/cesspool cleaner chemicals; elevated levels of chloride, sulfate, calcium, magnesium, potassium and phosphate
Underground storage tanks	Home heating oil
Apartments and condominiums	Swimming pool maintenance chemicals; Pesticides for lawn and garden maintenance and cockroach, termite, ant, rodent and other pest control; wastes from on-site sewage treatment plants; household hazardous wastes
Government Sources	
Schools and government offices and grounds	Solvents; pesticides; acids; alkalis; waste oils; machinery/vehicle servicing wastes; gasoline and heating oil from storage tanks; general building wastes
Park lands	Fertilizers; herbicides; insecticides
Public and residential areas infested with mosquitoes, gypsy moths, ticks, ants or other pests	Pesticides
Highways, road maintenance depots, and deicing operations	Herbicides in highway rights-of-way; road salt (sodium and calcium chloride); road salt anticaking additives (ferric ferrocyanide, sodium ferrocyanide); road salt anticorrosives (phosphate and chromate); automotive wastes
Municipal sewage treatment plants and sewer lines	Municipal wastewater; sludge; treatment chemicals
Storage, treatment, and disposal ponds, lagoons, and other surface impoundments	Sewage wastewater; nitrates; other liquid wastes; microbiological contaminants
Land areas applied with wastewater or wastewater byproducts	Organic matter; nitrate; inorganic salts; heavy metals; coliform and noncoliform bacteria; viruses; nitrates; sludge; nonhazardous wastes
Storm water drains and basins	Urban runoff; gasoline; oil; other petroleum products; road salt; microbiological contaminants

Combined sewer overflows (municipal sewers and stormwater drains)	Municipal wastewater; sludge; treatment chemicals; urban runoff; gasoline; oil; other petroleum products; road salt; microbial contaminants
Recycling/reduction facilities	Residential and commercial solid waste residues
Municipal waste landfills	Leachate; organic and inorganic chemical contaminants; wastes from households and businesses; nitrates; oils; metals
Open dumping and burning sites, closed dumps	Organic and inorganic chemicals; metals; oils; wastes from households and businesses
Municipal incinerators	Heavy metals; hydrocarbons; formaldehyde; methane; ethane; ethylene; acetylene; sulfur and nitrogen compounds
Water supply wells, monitoring wells, older wells, domestic and livestock wells, unsealed and abandoned wells, and test hole/wells	Surface runoff; effluents from barnyards, feedlots, septic tanks, or cesspools; gasoline; used motor oil; road salt
Sumps and dry wells	Storm water runoff; spilled liquids; used oil; antifreeze; gasoline; other petroleum products; road salt; pesticides; and a wide variety of other substances
Drainage wells	Pesticides; bacteria
Well pumping that causes interaquifer leakage, induced filtration; etc.	Saltwater; excessively mineralized water
Artificial ground-water recharge	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
Commerical Sources	
Airports, abandoned airfields	Jet fuels; deicers; diesel fuel; chlorinated solvents; automotive wastes; heating oil; building wastes
Auto repair shops	Waste oils; solvents; acids; paints; automotive wastes; miscellaneous cutting oils
Barber and beauty shops	Perm solutions; dyes; miscellaneous chemicals contained in hair rinses
Boat yards and marinas	Diesel fuels; oil; septage from boat waste disposal areas; wood preservative and treatment chemicals; paints; waxes; varnishes; automotive wastes
Bowling alleys	Epoxy; urethane-based floor finish
Car dealerships (especially those with service departmens)	Automotive wastes; waste oils; solvents; miscellaneous wastes

Car washes	Soaps; detergents; waxes; miscellaneous chemicals
Camp grounds	Septage; gasoline; diesel fuel from boats; pesticides for controlling mosquitoes, ants, ticks, and other pests; household hazardous wastes from recreational vehicles
Carpet stores	Glues and other adhesives; fuel from storage tanks if forklifts are used
Cemetreies	Leachate; lawn and garden maintenance chemicals
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.)	Solvents; asbestos; paints; glues and other adhesives; waste insulation; lacquers; tars; sealants; epoxy waste; miscellaneous chemical wastes
Country clubs	Fertilizers; herbicides; pesticides for controlling mosquitoes, ticks, ants, and other pests; swimming pools chemicals; automotive wastes
Dry cleaners	Solvents (perchloroethylene, petroleum solvents, Freon); spotting chemicals (trichloroethane, methylchloroform, ammonia, peroxides, hydrochloric acid, rust removers, amyl acetate)
Funeral services and crematories	Formaldehyde; wetting agents; fumigants; solvents
Furniture repair and finishing shops	Paints; solvents; degreasing and solvent recovery sludges
Gasoline services stations	Oils; solvents; miscellaneous wastes
Golf courses	Fertilizers; herbicides; pesticides for controlling mosquitoes, ticks, ants and other pests
Hardware/lumber/parts stores	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	Heating oil; wastes from truck maintenance areas
Horticultural practices, garden nurseries, florists	Herbicides, insecticides, fungicides, and other pesticides
Jewelry/metal plating shops	Sodium and hydrogen cyanide; metallic salts; hydrochloric acid; sulfuric acid; chromic acid
Laundromats	Detergents; bleaches; fabric dyes

Medical institutions	X-ray developers and fixers; infectious wastes; radiological wastes; biological wastes; disinfectants; asbestos; beryllium; dental acids; miscellaneous chemicals
Office buildings and office complexes	Building wastes; lawn and garden maintenance chemicals; gasoline; motor oil
Paint stores	Paints; paint thinners; lacquers; varnishes; other wood treatments
Pharmacies	Spilled and returned products
Photography shops, photo processing laboratories	Biosludges; silver sludges; cyanides; miscellaneous sludge
Print shops	Solvents; inks; dyes; oils; photographic chemicals
Railroad tracks and yards	Diesel fuel; herbicides for rights-of-way; creosote for preserving wood ties
Research laboratories	X-ray developers and fixers; 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	Any wastes from businesses and households; oils
Sports and hobby shops	Gunpowder and ammunition; rocket engine fuel; model airplane glue
Aboveground and underground storage tanks	Heating oil; diesel fuel; gasoline; other petroleum products; other commercially used chemicals
Transportation services for passenger transit (local and interurban)	Waste oil; solvents; gasoline and diesel fuel from vehicles and storage tanks; fuel oil; other automotive wastes
Veterinary services	Solvents; infectious materials; vaccines; drugs; disinfectants (quaternary ammonia, hexachlorophene, peroxides, chlornexade, bleach); x-ray developers and fixers
Industrial Sources (B)	
Material stockpiles (coal, metallic ores, phosphates, gypsum)	Acid drainage; other hazardous and nonhazardous wastes
Waste tailing ponds (commonly for the disposal of mining wastes)	Acids; metals; dissolved solids; radioactive ores; other hazardous and nonhazardous wastes
Transport and transfer stations (trucking terminals and rail yards)	Fuel tanks; repair shop wastes; other hazardous and nonhazardous wastes
Aboveground and underground storage tanks and containers	Heating oil; diesel and gasoline fuel; other petroleum products; hazardous and nonhazardous materials and wastes

Storage, treatment, and disposal ponds, lagoons, and other surface impoundments	Hazardous and nonhazardous liquid wastes; septage; sludge
Chemical landfills	Leachate; hazardous and nonhazardous wastes; nitrates
Radioactive waste disposal sites	Radioactive wastes from medical facilities, power plants and defense operations; radionuclides (uranium, plutonium)
Unattended wet and dry excavation sites (unregulated dumps)	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	Metals; acids; minerals; sulfides; other sulfides; other hazardous and nonhazardous chemicals
Dry wells	Saline water from wells pumped to keep them dry
Injection wells	Highly toxic wastes; hazardous and nonhazardous industrial wastes; oil-field brines
Well drilling operations	Brines associated with oil and gas operations
Industrial Processes (Presently operated or torndown facilities)	
Asphalt plants	Petroleum derivatives
Communications equipment manufacturers	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	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	Boric, hydrochloric, hydrofluoric, and sulfuric acids; sodium and potassium hydroxide; chromic acid; sodium and hydrogen cyanide; metallic salts
Foundries and metal fabricators	Paint wastes; acids; heavy metals; metal sludges; plating wastes; oils; solvents; explosive wastes
Furniture and fixtures manufacturers	Paints; solvents; degreasing sludges; solvent recovery sludges
Machine and metalworking shops	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)	Mine spoils or tailings that often contain metals; acids; highly corrosive mineralized waters; metal sulfides
Unsealed abandoned mines used as waste pits	Metals; acids; minerals; sulfides; other hazardous and nonhazardous chemicals
Paper mills	Metals; acids; minerals; sulfides; other hazardous and nonhazardous chemicals; organic sludges; sodium hydroxide; chlorine; hypochlorite; chlorine dioxide; hydrogen peroxide
Petroleum production and storage companies, secondary recovery of petroleum	Hydrocarbons; oil-field brines (highly mineralized salt solutions)
Industrial pipeline	Corrosive fluids; hydrocarbons; other hazardous and nonhazardous materials and wastes[18]
Photo processing laboratories	Cyanides; biosludges; silver sludges; miscellaneous sludges
Plastics materials and synthetics producers	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)	Heavy metal wastewater treatment sludge; picking liquor; waste oil; ammonia scrubber liquor; acid tar sludge; alkaline cleaners; degreasing solvents; slat; metal dust
Publishers, printers, and allied industries	Solvents; inks; dyes; oils; miscellaneous organics; photographic chemicals
Public utilities (phone, electric power, gas)	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 and gluing wastes	Treated wood residue (copper quinolate, mercury, sodium bazide); tanner gas; paint sludges; solvents; creosote; coating
Stone, clay, and glass manufacturers	Solvents; oils and grease; alkalis; acetic wastes; asbestos; heavy metal sludges; phenolic solids or sludges; metal-finishing sludge
Welders	Oxygen, acetylene
Wood preserving facilities	Wood preservatives; creosote

Appendix B Wellhead Protectionn Checklist for Small Waterworks

Complete all parts of this checklist. Enter "N/A" if an answer is unknown or if an item is not applicable.

General Information

1. Waterworks System Name: _____
2. System Mailing Address: _____

_____
_____

3. Phone: (306) _____-_____
4. Primary Contact: (person responsible for water quality) _____
5. Directions to your location: _____

_____
_____

Well or Spring Information

6. Number of wells or springs: _____
7. Approximate year drilled: _____
8. Driller's name: _____
9. Depth of each well: _____
10. Number of people served by wells or springs: _____
11. Estimate the amount of water used each month: _____
12. How is the water used? _____
13. Location of well (latitude and longitude or Township Range Meridian): _____
    _____
14. Are well logs available for the wells? YES _____ NO _____

If yes, include a copy(ies) as part of this report.

15. Is the well inside a wellhouse? YES _____ NO _____
16. Is fertilizer or weedkiller used in the vicinity of the wells? YES _____ NO _____

If yes, list all which apply: _____
_____ ___

17. Are any chemicals or gasoline stored inside the wellhouse? YES _____ NO _____

If yes, list all which apply: _____
_____

18. Is the area immediately around the well prone to flooding? YES _____ NO _____
19. Are there any abandoned wells on the property? YES _____ NO _____

If yes, indicate their present condition (sealed, capped, etc.): _____

Wellhead Protection Zones

20. How were Zone 1 (250 ft. radius) and Zone 2 (750 ft. radius) measured (tape, pacing, other)?
    _____
21. Are septic tanks buried in the vicinity of the well/spring? YES _____ NO _____

If yes, indicate the following: _____
_____
Number of tanks: _____
Age of tanks: _____
Distance to nearest well/spring: _____

22. Is heating oil, engine oil or gasoline stored within Zones 1 or 2? YES _____ NO _____

If yes, is there evidence of leaking tanks? YES _____ NO _____

23. What was the land used for before the establishment of the system? _____

_____

24. Are there environmental concerns in the area? YES _____ NO _____

If yes, describe: _____

25. How are the grounds maintained (mowed, other)? _____

26. Are pesticides used within the Wellhead Protection zone (Zone 1)? YES _____ NO _____

If yes, are they stored within the zone? _____

27. Has raw water quality testing shown any positive bacterial results or chemical detections?

YES ___ NO ___
If yes, describe: _____

28. What is the nearest surface water to the well(s) or spring(s)? _____

Distance to the nearest surface water: _____

29. In which direction does surface water run-off flow from the well site(s)? _____

30. Does the well/spring water get cloudy or muddy after heavy rains? YES _____ NO _____

Potential Contaminant Source Inventory

31. Land use within Zones 1 and 2 (See Appendix A for potential source of groundwater contamination and for assistance in determining types of activities that may cause contamination)

Agricultural (crop or livestock): _____
Animal Waste Lagoons/Barns: _____
Industrial/Commercial Operations (gas stations/mechanics, manufacturing facilities, paint shops, machine shops, salvage yards, etc.): _____
_____
Is there a cemetrey on the property? YES _____ NO _____
If yes, how far is the cemetrey from the well(s) or spring(s)? _____
Landfills/Dumps: _____
_____
Other: _____
_____

32. Geologic Settings

Gravel Pits: _____
Sloughs: _____
Disappearing Streams: _____

33. Transportation

Major Highway(s), Railroad(s) or Airport(s): _____
Sketch and Photographs of Wells/Spring

34. Include a detailed sketch of the area. (Example is attached.)

35. One (1) photograph should be taken of the well or spring and eight (8) photographs be taken of the area around each well or spring. Use a magnetic compass to determine the 8 directions around the well/spring (i.e., N, NE, E, etc.). Pictures should show the well/spring in the foreground (bottom of the picture) with the focus on what is behind and beyond the well/spring. Use the attached template for the photographs.

Zone 1 Protection Plan

36. Attach a document outlining the steps the waterworks is taking to protect the area within Zone 1. The steps must include plans for hazardous chemical storage on the property, hazardous chemical use within Zone 1, plans for spill response and may include posting as a Wellhead Protection area in the immediate vicinity of the well or spring, etc.

If you have questions concerning this checklist, contact the Drinking Water Quality Section at (306) 787-0726.

UPON COMPLETION OF THIS FORM:

1. Submit the original with the original photographs to:
   Environmental Protection Branch
   Drinking Water Quality Section
   3211 Albert Street
   Regina, SK S4S 5W6
2. Submit a copy to the appropriate Environmental Protection Branch Field Office.
3. Maintain a copy for your records.

Photograph of the Well

Photograph from Well taken to the North

Photograph from Well taken to the Northeast

Photograph from Well taken to the East

Photograph from Well taken to the Southeast

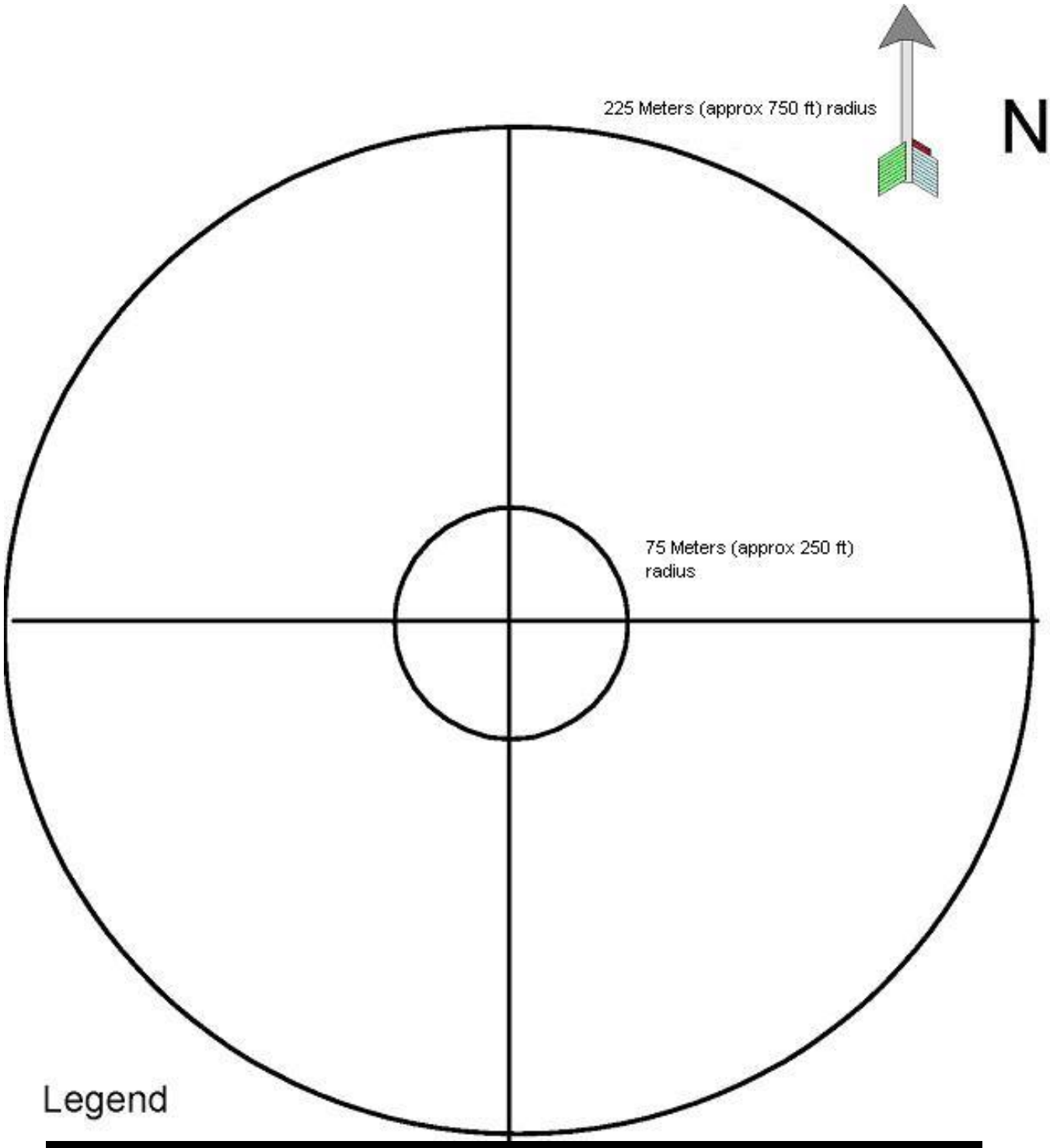
Photograph from Well taken to the South

Photograph from Well taken to the Southwest

Photograph from Well taken to the West

Photograph from Well taken to the Northwest

Detailed Sketch of the Area



House	Field, Grass
Building	Forest
Sinkhole	Septic System
Cemetrey	Surface Water (stream/ lake)
Surface Water Runoff Direction	
Underground utility lines (phone switchgear, electric).	

Example Detailed Sketch of the Area