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When WQ parameter levels pose health risks! Implications & Procedures

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The relative abundance of the chemical constituents dissolves in groundwater

Major Constituents (1-100mg/l)	Secondary Const (0.01-10mg/l)	Minor Const (0.0001- 0.1 mg/l)
Sodium	Iron	Arsenic
Calcium	Aluminium	Barium
Magnesium	Potassium	Bromide
Bicarbonate	Carbonate	Cadmium
Sulphate	Nitrate	Cobalt
Chloride	Fluoride	Copper
Silica	Bromide	Iodine
	Selenium	Phosphate
		Lithium
		Manganese
		Nickel
		Strontium
BMB Mott MacDonald		Uranium 
		Zinc

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Potential sources of groundwater contamination

SOURCES	POSSIBLE CONTAMINANTS
Accidental spills	Various inorganic and organic chemicals
Agricultural activities	Fertilisers, pesticides, herbicides and fumigants
Animal feedlot	Organic matter, nitrogen and phosphorus
Deicing of roads	Chlorides, sodium and calcium
Landfills, municipal	Heavy metals, gases, organic compounds and inorganic compounds (Ca, Cl & Na)
Mining	Minerals and acid mine drainage
Septic tank leaching fields	Organic matter, nitrogen, phosphorus, bacteria

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Category	Disease	Agent
Waterborne Ingesting contaminated water	Amebiasis, Shigellosis, Cholera, Gastroenteritis, Giardiasis, Infective hepatitis, Typhoid	Protozoa, Bacteria, Viruses
Water washed Washing with contaminated water	Shigellosis, Scabies, Trachoma	Bacteria, Mites, Virus
Water based Worm infections involving water as one stage in life cycle	Filariasis, Guinea worm, Schistosomiasis	Worms

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Parameter	Health effects beyond guideline values
pH	Low pH: Sour taste, Irritate mucous membranes, acid burns High pH: Salty taste, Irritate mucous membranes, alkali burns
Electrical conductivity (mS/m)	Increased risk of hydration (salt & water balance). High risk in infants, heart, high blood pressure patients & renal disease patients.
Turbidity	No direct health effects but an indicator of microbiological WQ.
Faecal coliforms	Gastro-intestinal disease that can lead to life threatening diarrhoea.
Residual Chlorine	Nausea and vomiting may occur
Arsenic	Acute or chronic arsenic poisoning – skin lesions.
Fluoride	Acute poisoning: vomiting, abdominal pain, nausea, diarrhoea & convulsions. Skeletal damage and discoloration of teeth
Nitrates	Chronic effect: tiredness and failure to thrive. Blue baby syndrome.
Manganese	Long term exposure to excessive doses: brain damage (Parkinsonism)

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What can we do?

Short to medium term

Develop a simple assessment tool to guide in addressing problems associated with parameters requiring routine analysis

Medium to long term

Develop Water Safety Plans

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Example of an assessment tool

Parameter	Treatment Options
pH	The use of acid or alkali to balance the pH. Care is needed when handling such chemicals
Electrical conductivity (mS/m)	Home treatment kits using ion exchange processes though an expensive options.
Turbidity	HHWTS which are able to flocculate, settle large particles for filtration.
Faecal coliforms	<ul style="list-style-type: none">-Effective disinfection (Chlorine, boiling etc)-Hygiene promotion-Safe water storage
Residual Chlorine	<ul style="list-style-type: none">-Boiling water reduces residual chlorine-Use of activated carbon as a HHWTS

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Water Safety Plan

The objectives are to ensure safe drinking-water. Thus:

- ❖ Prevent of contamination of source waters;
- ❖ Effective treatment to reduce/remove contamination
- ❖ Prevent re-contamination during storage, distribution and handling of drinking-water.

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The Big Issue!

- ❖ Protect DWQ
- ❖ The impacts of open faecal-oral transmission
 - Discourage open defecation,
 - Address poor sanitation and hygiene practices
- ❖ Reducing the chain of contamination from source to storage
 - Clean water containers*
 - Safe water storage*
 - HHWTS*