Sewerage System Regulation Section 3.1 (Setbacks) Rationale

Section 3.1 of the amended Sewerage System Regulation (SSR) stipulates minimum setback distances for holding tanks and sewerage system septic tanks (15 metres and 30 metres respectively) from all drinking water wells located in the vicinity of these systems. The setback distances may be varied, if endorsed by a professional with competency in hydrogeology. This amendment to the SSR is intended to enhance public health protection by reducing the risk of drinking water supply contamination.

Section 3.1 states:

'Professional' means a professional competent in the area of hydrogeology

'well' means a well used to supply a domestic water system.

1) *Subject to subsections (3) and (4)(b), a person must not construct*

    a) *a holding tank less than 15 metres from a well, or*

    b) *a sewerage system less than 30 metres from a well*

2) *Subsection 2) does not apply if a person receives, before construction, written advice from a professional that it would not likely cause a health hazard to construct a holding tank or sewerage system at a distance less than the distance required under that subsection.*

3) *If a person receives from a professional written advice respecting the distance from a well that a holding tank or sewerage system should be constructed to reasonably avoid causing a health hazard,*

    a) the person must give to a health officer

    i) a copy of the advice, and

    ii) notice of whether the person intends to construct the holding tank or sewerage system and, if so, the distance from the well the person intends to construct the holding tank or sewerage system, and

    b) a person must not construct a holding tank or sewerage system at a distance less than that indicated by the professional.

SETBACK DISTANCES

Issue:

- A wide range of constituents, with widely ranging physical, chemical and biological properties are found in household wastewater that can lead to health risks. These include various persistent organic substances from personal care products, heavy metals, solvents from household cleaners, nitrates, phosphorus, bacteria and viruses.

- Enteric viruses are responsible for a large number of groundwater-borne disease outbreaks every year. Septic tanks are the most frequently cited cause of groundwater contamination in disease outbreaks, and are probably the major contributors of viruses to the subsurface environment (Yates and Yates, 2003; Carroll *et al*, 2006). Studies have shown that overflow or seepage of sewage, primarily from septic tanks and lagoons was responsible for a significant portion of reported outbreaks and illnesses caused by the use of contaminated, untreated well water in the U.S. from 1971 to 1980 (Craun, 1986).

- A groundwater well is at risk when there is an increased likelihood for pathogenic bacteria or viruses to arrive at the well in an infectious state. Because most pathogens are not native to ground water, they are unable to reproduce in the ground water, and their survival is limited. Subsurface residence time is often used as a surrogate measure of pathogenic risk. In general, at shallow ground water temperatures, viral pathogens likely remain infectious for a significantly longer time as compared with the bacterial pathogens (USEPA, 2008).

- Viruses, in particular, due to their small size and extended survival times can migrate very long distances in soil and groundwater under certain conditions. e.g. Viruses have been shown to migrate 1600 meters in karst terrain and 400 meters in sandy soil (Yates and Yates, 1989).

- Minimum setback distances have been applied by regulatory agencies as a means of managing pathogenic risks; the approach couples pathogen inactivation rates with groundwater travel time to water wells. The farther the distance from the pathogenic source to the well, the longer it takes a pathogen to reach a well and the greater the likelihood the pathogen will become inactivated (USEPA, 2008).

- Regulatory setback standards for wells and septic tank systems vary widely, between 15 to 91 meters (Plews, 1977), but most range from 15 to 30 meters. Longer setback distances are especially important when special limiting geologic factors exist, such as the presence of karst formations, fractured bedrock and coarse-grained (sand and gravel) deposits (USEPA, 2008; Cho, 2010). Much of B.C.'s geology reflects fractured bedrock and coarse-grained deposits. In addition, karst formations may be found in certain areas. These conditions are distinct from geographic areas such as the prairies where fine-grained soil limits contaminant migration. Other risk factors contributing to pathogenic risks to groundwater include porous media aquifers, shallow unconfined aquifers, aquifers with thin or absent soil cover as well as poor well construction, and shallow wells and wells in flood zones (USEPA, 2008).

- Field studies and modelled estimates indicate that virus transport can extend beyond 30 meters under certain conditions. Modelled estimates suggest a substantive difference in the level of protection between a 15 meter setback and a 30 meter setback under certain aquifer conditions. For example, Yates and Yates (1989) demonstrated that the confidence level for a seven log reduction in virus improves from 70 to 85 percent moving from a 15 meter to a 30 meter setback respectively. Furthermore, given the conservative nature of nitrates and other persistent contaminants, i.e. substances with low rates of transformation or degradation in groundwater systems, a 30 m setback distance is more desirable.

Rationale for a 30 metre setback for septic tanks

- Septic tanks are considered to be an open system. Sewage effluent enters the tank, receives primary treatment through settling and floatation, and the liquid component is discharged to the dispersal field. The overall volume of effluent that passes through the tank and discharged to the environment is typically significant in households occupied on a year-round basis.

- Failing septic tanks pose an incrementally greater risk for groundwater contamination, since the leaking septic tank effluent adds to the existing sewage effluent discharged through the system's dispersal field. This combined effluent discharge poses an incrementally greater risk to soil and groundwater than does the failure of a holding tank, since the impact of a leaking holding tank does not include dispersal field effluent discharge to the environment. Consequently, the potential cumulative contaminant load of nitrates, pathogens and other contaminants of the onsite sewage system leads to greater risks for septic tank systems in the event of a leak. In some jurisdictions, septic tank leaks have been identified as a significant issue requiring improved tightness testing and structural soundness (Ball *et al,* 2004).

- Higher pumping rate wells can create a significant groundwater draw-down zone (zone of influence), which can potentially extend a significant distance beyond 30 meters (Yates and Yates, 1989), however, the 30 meters is consistent with other jurisdictions with similar geologic conditions (see below).

- The 30 meter setback provision is consistent with existing provisions in the *Public Health Act Transitional Regulation* which requires groundwater wells to be 100 feet from a probable source of contamination.

- Domestic water can be supplied by shallow wells (i.e. wells less than 15 m deep), which are more prone to the introduction of contaminants than drilled (deep) wells (Kross, 1993).

Rationale for 15 metre setback for holding tanks:

- Holding tanks differ from septic tanks because they are closed systems that contain the entire volume of sewage. Holding tanks require pumping on a regular basis to restore the volume available to receive new effluent. An advantage of a holding tank is that there is no continuous impact on local groundwater quality, as the contents of the tank are removed and treated at a separate location. Consequently, a leak from a holding tank would not be creating an incrementally greater contaminant load as in the case of the septic tank.

- There are relatively fewer holding tanks utilized in BC, so the overall risk can be considered to be low.

- Holding tanks are considered to be a 'last resort' for residential lots which are either small, or lack the soil structure and depth needed to support a disposal area. The 15 meter setback is stipulated for holding tanks to enable development on lots where a septic tank/field system is not an option. This option facilitates property development when there are minimal risks associated with a well maintained holding tank.

- Since the cost associated with the regular pumping of holding tanks is typically high, they are considered to be a 'last resort' for developments without an adequate land base to support a sewerage system discharge area.

General Considerations:

- The decision to implement minimum setback requirements in the sewerage system regulation is based on a combination of factors for public health protection, which include:
    - The inherent risks of system failure (Carroll *et al*, 2006) and incremental impact to groundwater quality from pre-existing conditions.
    - Flow of groundwater in high permeability situations common to B.C. (such as sand, gravel, or fractured bedrock).
    - The transport and attenuation of virus/bacteria in the subsurface (Yates, 1987).
    - Consistency with other regulations including the *Public Health Act Transitional Regulation.*

- There are inherent post-construction risks for both septic tanks and holding tanks from ground settlement that may, over time, lead to cracks in the structure which are prone to leaking. Since the waste contained within these tanks has elevated concentrations of contaminants such as bacteria, viruses, and nitrates, they pose a threat to drinking water supplies.

- Research suggests that applying a longer setback will provide a greater factor of safety for public health protection (Yates and Yates 1986). Furthermore, the Sewerage System Standard Practice manual recommends a number of setback distances for wells [up to 30 meters for septic tanks, and 90 metres for disposal fields from a high pumping rate water supply system well (in an unconfined aquifer), depending on the aquifer and pumping conditions present]. Taking these various possible conditions into consideration, the 30 meter setback prescribed in the *Sewerage System Regulation* for sewerage systems (which includes the septic tank) provides a reasonable margin of safety.

Jurisdictions incorporating a 30 metre setback for septic tanks

A number of jurisdictions within the western United States and eastern Canada have implemented a 30 metre setback requirement for septic tanks. Additionally, the *Sewerage System Regulation* allows flexibility through an option to vary the setback distance by a professional competent in the area of hydrogeology. Many jurisdictions do not provide this level of flexibility.

Canada:

New Brunswick	30 m from a dug well
Nova Scotia	30.5 m from a dug well or any other domestic water supply

U.S.:

California:	
	El Dorado County - 30m from well used for domestic purposes
	Placer County - 30m from public well and 15m from private well
	Monterey County - 30m from all wells – California Well Standards
Nevada:	30 m for water supply wells
	45m for public water supply wells
Washington State:	30m (public drinking water well)
Nebraska:	152 meter for community water systems

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