Development of Potential Technical Standards for Reinspection of Onsite Sewage Systems and Data Collection Guidelines to Develop Risk Models for Potential Reinspection Programs

Final Report

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Executive Summary

In recent years, increasing attention has been paid to onsite sewage systems and the degree to which such systems contribute to ground and surface water contamination. This is particularly true in Ontario since the events in Walkerton. Prior to that and especially since then a number of provincial inquiries (Sewell Commission, Walkerton Inquiry) and expert committees (the Ministry of Environment's Implementation Committee and the Technical Experts Committee) have recommended the consideration of some form of reinspection of onsite sewage systems to ensure that these systems continue to operate properly and protect water resources and human health.

Provincially, there is currently no requirement for reinspection of onsite systems beyond initial installation inspections. However, in the past decade twenty-three municipalities have initiated their own reinspection programs in an effort to protect public health and the environment. Additionally, new legislation (the Clean Water Act, 2006) was recently passed which will, among other things, facilitate the expansion and financing of these programs at the municipal level.

As part of this study, sixteen municipalities were surveyed to help describe the range of existing reinspection programs across the province and the degree of their acceptance and success. Generally, the programs were concentrated in areas with significant numbers of waterfront properties and seasonal properties. The programs were well received by property owners and were often facilitated by the support of local ratepayer associations.

In the majority of cases, reinspection programs were carried out by trained, temporary employees of the local municipality working under permanent staff. Reinspection rarely consisted of more than a surface assessment and review of the permit due to the time, expense and potential liability associated with more intrusive investigations that may have involved excavating in a leaching bed. The most extensive program required that all septic tanks be pumped, at the owner's expense, at the time of inspection.

A number of recommendations are made in this report (see Section 7) regarding the nature and extent of potential reinspection programs based on the literature and the experiences in Ontario municipalities. Key recommendations include:

- reinspection of any onsite sewage system should focus on making sure that the current operation of the system protects human health and the environment, rather than whether the system meets the current code requirements,
- programs should include tank pumping as part of the initial reinspection, (this may not be practical in some areas with poor access), and
- maintain the existing system of contract staff to conduct reinspections and identify opportunities to advantageously involve other parts of the onsite industry (e.g. septage haulers) in regional reinspection programs.

Overall the cost to deliver a reinspection program has proved to be reasonable. Approximate costs of less than $100 per inspection (excluding tank pumping) were the norm among the municipalities surveyed. The major costs of a reinspection program are the costs associated with repair, which were reported to range from negligible to $20,000. Given that these costs are directly borne by the property owner, it is recommended that a financial assistance program be considered as an important part of any program.

It is further recommended that a two level risk assessment tool be used to prioritize the order of reinspection of systems in any given area. The first level uses simple measures of system age, location and nearby water sources to categorize systems into high, medium and low risk groups in order to help prioritize which systems to inspect first. This is a modest improvement over approaches that rely solely on age as it involves other readily available data that indicates risk to water resources from onsite systems.

The second level of risk assessment tool recommended is more sophisticated and takes into account more risk factors regarding potential impact on water resources from onsite systems.

This would be more appropriate for data-rich areas and would be useful to prioritize on a regional basis as opposed to a lot-by-lot basis. It is recommended all municipalities incorporate some type of risk assessment tool in order to strategically focus their reinspection program on those systems that pose the greatest or most immediate threats to human health and the environment.

Communication and flexibility will be key to the successful delivery of any provincially mandated reinspection program. Communities in Ontario are diverse and the needs and capabilities of their constituents vary widely from one region to the next. Communication is very important to a successful program, and there must be a high degree of support within the community for the program to be effective and well received. Flexibility in the provincial program will allow municipalities to tailor the program to meet their specific community needs, which will in turn make communication of the goals of the program to the property owners easier and more tangible.

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1 Introduction

With over an estimated 1.2 million onsite sewage systems in Ontario, onsite systems provide wastewater treatment for a significant portion of Ontario's citizens, particularly in rural areas of the province. However, since they also represent a potential threat to water resources in Ontario, they are coming under increasing scrutiny for their potential contributions to ground and surface water contamination. The Sewell Commission 1993 (Sewell, 1993) was an early example of a public inquiry in Ontario that identified onsite sewage systems as a threat to the environment. Events surrounding the contamination of the drinking water in Walkerton lead to the inquiry by Justice O'Connor resulting in a strong recommendation that onsite systems be subject to periodic reinspections to ensure their proper operation, given the potential contribution of septic systems to groundwater contamination.

Recommendations of the Implementation and Technical Experts Committees (2004) working for the Ontario Ministry of the Environment also identified and endorsed reinspection of onsite systems as a means to both assess and limit the risk to water resources to be used for drinking water. This was followed by the passage of the Clean Water Act (Bill 43) by the province, which contained provisions allowing agencies responsible for enforcement of onsite sewage systems to introduce reinspection programs in their areas.

Since 1997 the Ministry of Municipal Affairs and Housing (MMAH) has been responsible for administering the approval process of onsite systems (previously, the Ministry of the Environment was responsible). Part 8 of the Ontario Building Code[1] (OBC), which describes the minimum construction standards for new onsite sewage systems with a capacity less than 10,000 L/day was introduced to facilitate the approval process under MMAH. Under the Building Code, enforcement of Part 8 occurs through the following agencies:

[1] Any comments or references regarding the OBC reflect the code in force at the time of the study (2005-2006).

- Upper or lower tier municipal governments
- Health Units
- Conservation Authorities, or
- Registered Code Agencies

While Part 8 of the Code requires that existing onsite sewage systems be maintained in accordance with the Code, it did not originally address or provide provision for the reinspection of existing onsite systems. This has changed with the passage of Bill 43.

For the purposes of this project, reinspection of onsite sewage systems is defined as an examination of an *existing* onsite sewage system to confirm the presence, nature and function of the system with the goal of protecting human health and environmental quality. Reinspection is not to be confused with an inspection of a new system at the time of construction for the purposes of approval.

Currently, onsite sewage system reinspection programs in Ontario have been independently developed and delivered by municipalities that have taken the initiative to do so. At present, there is no provincial standard for reinspection programs, although MMAH has issued a "Septic System Re-inspection Guide". MMAH has retained the Ontario Rural Wastewater Centre (ORWC) to develop recommendations for technical standards for reinspection of onsite sewage systems and to develop data collection guidelines to develop risk models for potential reinspection programs. These technical standards could be used as a guideline for potential regulations regarding the reinspection of existing onsite sewage systems across the province.

The principal objectives of this project are:

1. To determine the existing practices in the province in terms of onsite sewage system reinspection programs,
2. To develop technical standards for the reinspection of existing onsite sewage systems in Ontario,

3. To develop an inspection methodology to reinspect existing onsite sewage systems in Ontario,
4. To develop data collection guidelines that could be used by enforcement bodies to develop risk models for future reinspection programs, and,
5. To comment on the economic impact that implementing a sewage system reinspection program might have both on the agencies delivering the programs and the property owners whose systems are inspected.

Appendix A contains a copy of the proposal and terms of reference for this project.

2 Present Practices

At present there are approximately 18 municipalities delivering onsite sewage system reinspection programs in Ontario, according to the environmental scan conducted by the study team. The following two sections describe the methodology of the environmental scan conducted to gather information on the existing reinspection programs as well as summarize the major results of the environmental scan.

2.1 Environmental Scan

In order to obtain as much information about the existing onsite reinspection programs as possible, the ORWC developed a two-phase environmental scan. The first phase consisted of an initial letter survey, sent to every municipality or Part 8 delivery agency in the province (the mailing list was provided by MMAH). The purpose of the initial letter was to cull the number of intensive telephone interviews that would be conducted as part of Phase 2 of the environmental scan. In total, 285 organizations were targeted for Phase 1. The letter introduced the project and asked respondents to complete an attached form indicating whether or not their organization was currently conducting a reinspection program, or if they had conducted a program in the past. A copy of the letter and form are contained in Appendix B.

The response to the initial letter was excellent. Of the 285 agencies surveyed, 176 agencies responded (including agencies who responded that they were not responsible for the delivery of Part 8 programs in their area). Table C1 in Appendix C contains the complete list of agencies that responded to the initial letter and their response. Of these, 21 organizations responded that they were currently carrying out a reinspection program and 26 indicated that they had conducted one in the past (note: 16 agencies who responded that they were currently conducting a reinspection program also indicated they had conducted one in the past. Therefore, there were 31 unique respondents).

Once the organizations involved with reinspections were identified a standardized phone survey was developed in consultation with Ministry staff. This survey was conducted by ORWC by

interviewing the person responsible for or knowledgeable about the delivery of the program. A copy of the telephone survey questionnaire is included in Appendix B. The survey consisted of over 30 questions relating to the nature of the reinspection program, enforcement of the reinspection programs and administration of the reinspection program. The results of the telephone survey are discussed in detail in the following sections.

2.2 Telephone Survey Results

All 31 respondents that indicated they had a reinspection program were contacted. Six respondents noted that they conducted reinspection programs solely on systems with previously identified problems, or in instances of lot severance applications or real estate transactions (see Table C1 in Appendix C for details). Results from these respondents were omitted since they did not correspond to the type of reinspection programs of interest. There were two instances of duplicate responses for a single community – a response was received directly from the Township of South Bruce Penisula and the Grey-Bruce County Health Unit, who conducts the reinspection program on behalf of South Bruce Penisula. This also happened for the Township of Seguin and North Bay Mattawa Conservation Authority. Results from seven of the remaining respondents were not obtained because no one in the municipality could recall the details of the program, or were unavailable to answer the survey. All respondents were called at least 10 times. The remaining sixteen municipalities that were interviewed are shown in Table 1.

Table 1: Municipalities Participating in Telephone Survey (2006 Census Data)

Township of the Archipelago (576)	Town of Bracebridge (15,652)	Township of Georgian Bay (2,340)
Town of Gravenhurst (11,046)	Town of Huntsville (18,280)	Township of Lake of Bays (18,280)
Township of Muskoka Lakes (6,467)	Township of North Frontenac (1,904)	Township of Oro-Medonte (20,031)
Township of Seguin (4,276)	Township of Severn (12,030)	Township of South Bruce Peninsula (8,415)
Township of South Frontenac (18,227)	Township of Southgate (7,167)	Township of Tay Valley (9,748)
Tiny Township (10,784)		

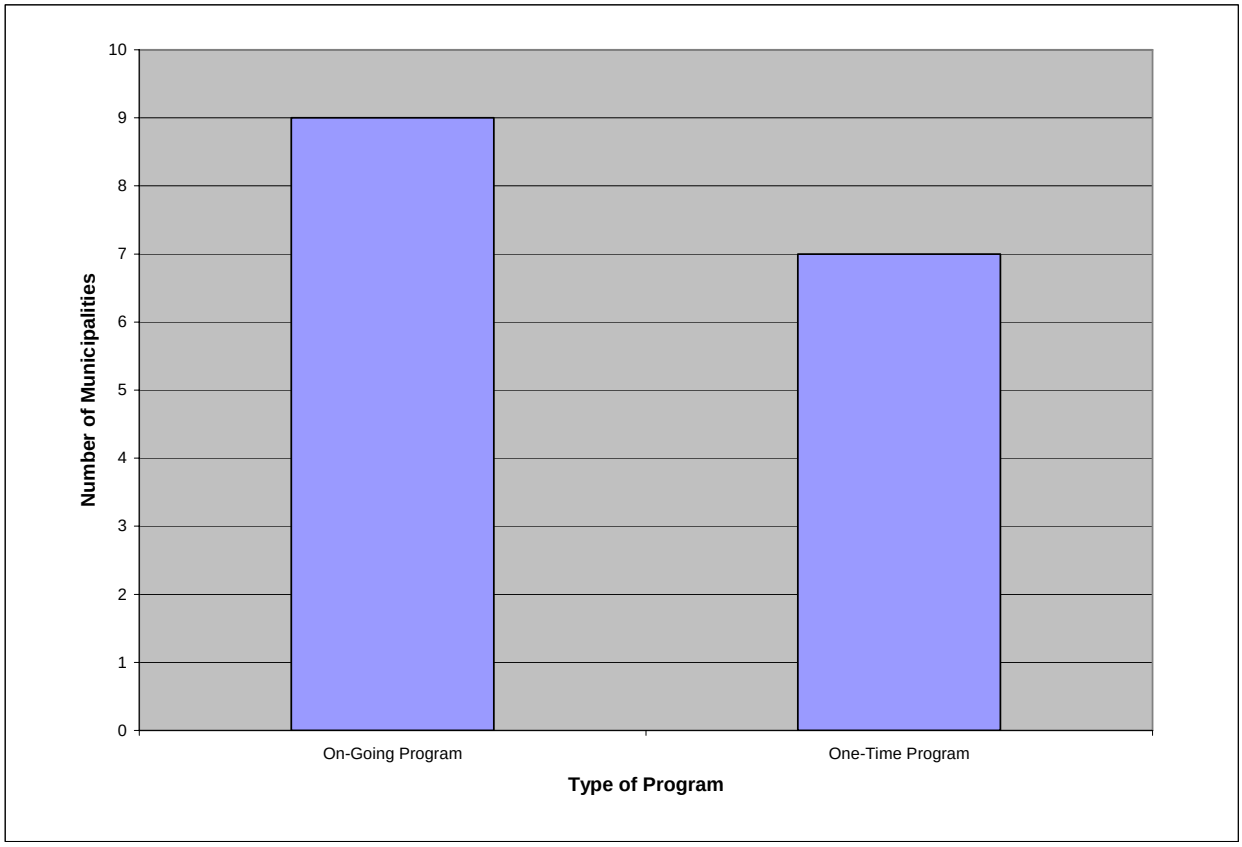
Table C2 in Appendix C gives the tabulated results of the entire questionnaire. The survey was broken down into four main components: administration, cost, details of the reinspection program and remediation resulting from the reinspection program. are outlined in the sub-sections below.

2.2.1 Administration

Reinspection programs for existing onsite sewage systems are a relatively new concept in Ontario. The programs surveyed as part of this study have all been initiated in the last seven years. The oldest programs were initiated in 1999 in the Townships of the Lake of Bays and the Archipelago, and the most recent program was initiated in the summer of 2005 in the Township of North Frontenac.

Given that these programs are relatively new, it was considered important to inquire about the duration of the programs. An on-going program could indicate that the community has made a long-term commitment to onsite sewage system management whereas a one-time program would help the community get a "snapshot" of the current conditions of the onsite systems in the area. As shown in Figure 1, nine municipalities are currently conducting on-going programs, while seven are conducting one-time reinspection programs only.

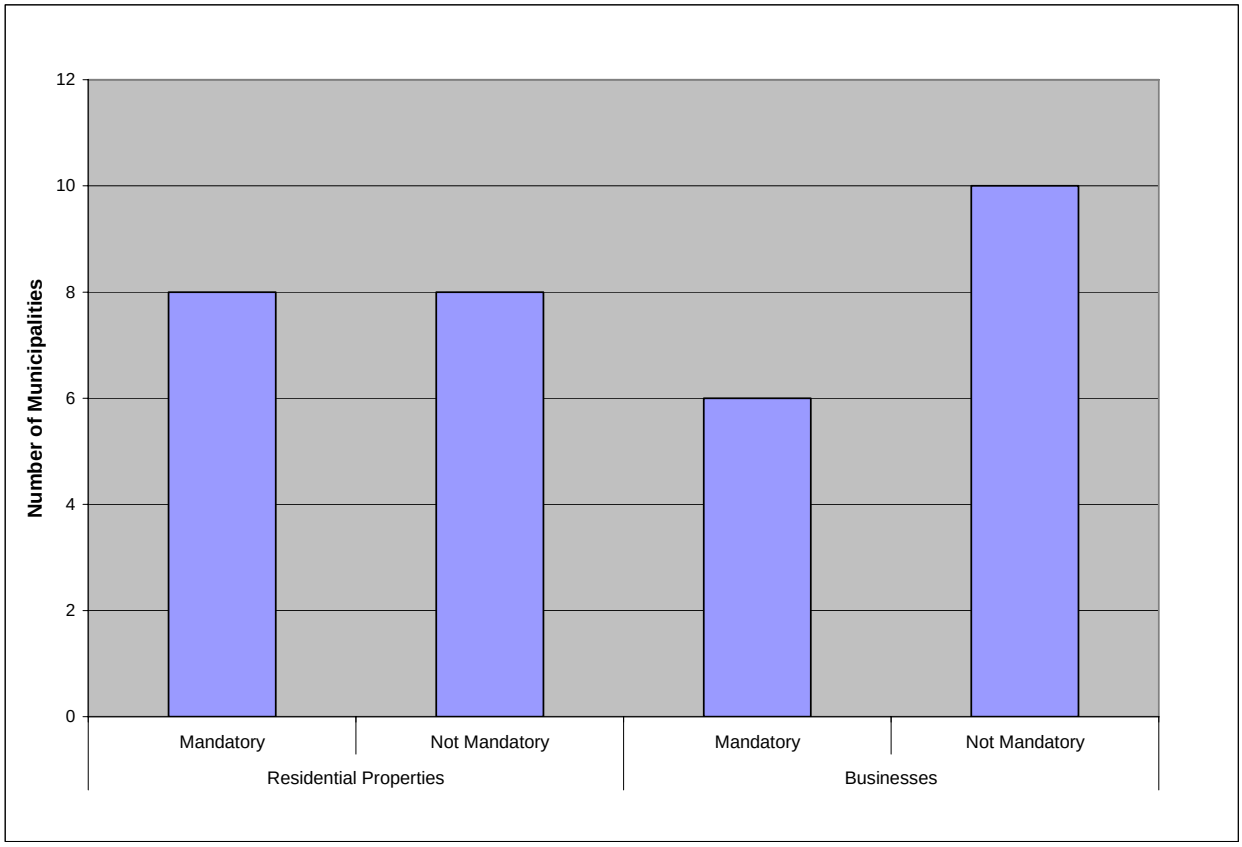
Figure 1: Duration/Type of Existing Reinspection Programs



On-going reinspection programs had a reinspection frequency that ranged between 5 to 10 years. Many organizations were estimating this duration since the first round of reinspections had not yet been completed. Three respondents with a one-time program indicated that they had completed the program, whereas five had not. Some of the respondents with one-time programs also indicated that subject to council approval, their one-time program could be converted into an on-going program over time. The duration of the one-time programs varied from 5 to 10 years.

One aspect for consideration of a reinspection program is whether it is mandatory for all property owners to participate or whether it will be voluntary. Figure 2 shows that the distribution of municipalities using a mandatory versus a voluntary approach to their reinspection programs is evenly split for residential properties. However, a slightly higher number of municipalities allowed voluntary participation for businesses in their jurisdiction.

Figure 2: Mandatory Participation Rates of Existing Reinspection Programs

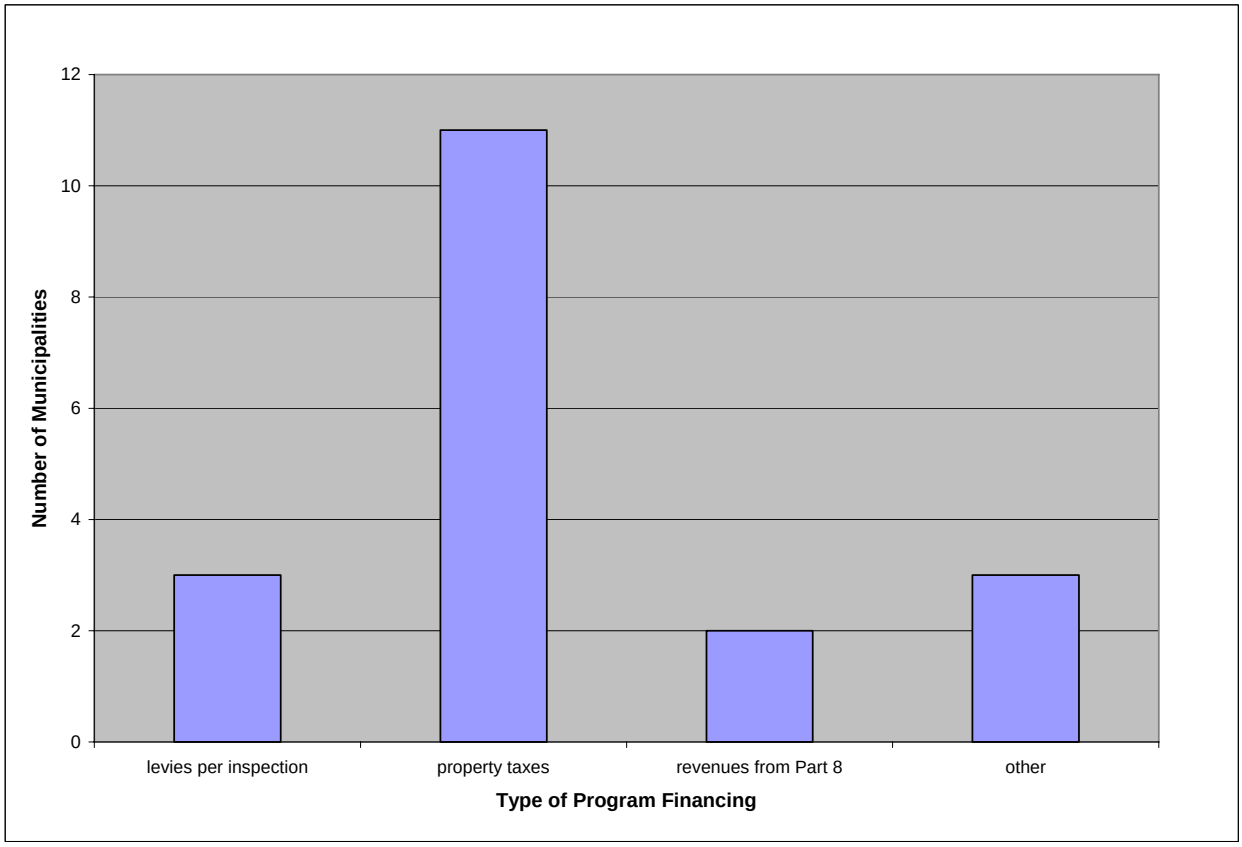


Municipalities with voluntary programs estimated a participation rate of between 75 and 100%.

2.2.2 Cost

A critical question for any municipality with respect to reinspection programs is the cost of delivering the program itself. Most agencies responsible for the delivery of Part 8 of the OBC are relatively small with limited staff and resources. As such, most areas conducting a reinspection program pass the cost of the program on to the property owner, directly or indirectly. Figure 3 shows the distribution of financing options in response to the survey.

Figure 3: Financing Options for Existing Reinspection Programs

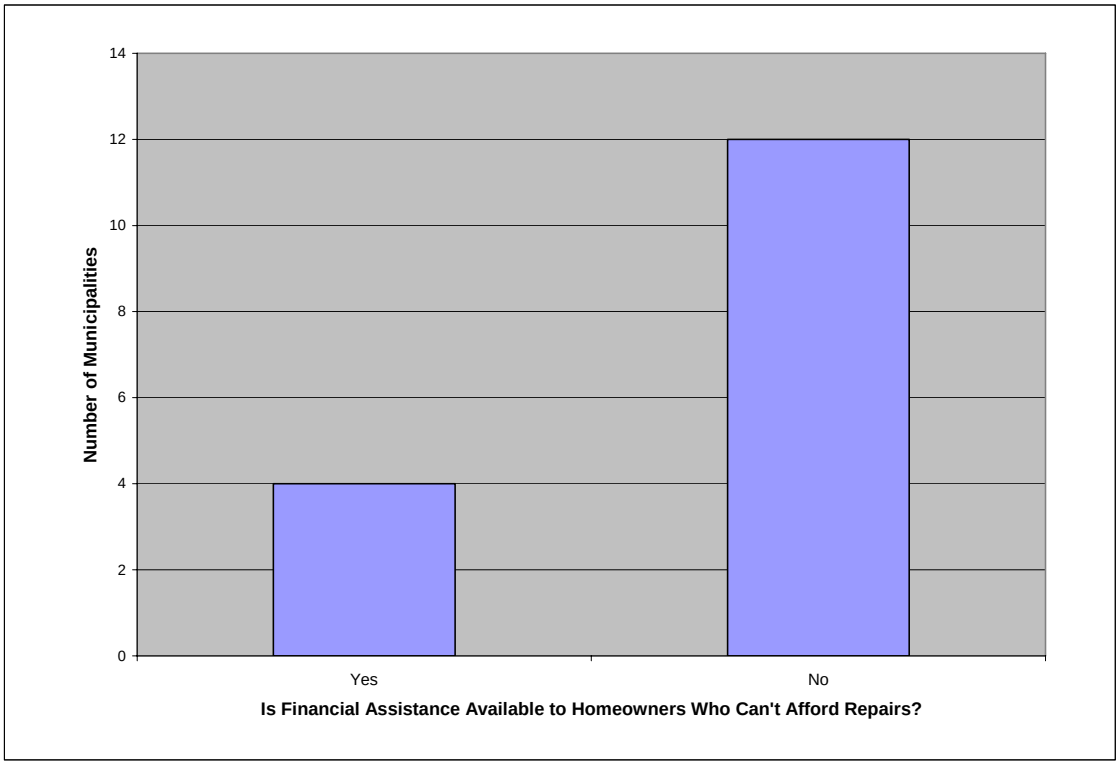


The majority of municipalities finance the cost of running a reinspection program through property taxes. In only two cases is this itemized on the tax bill. The second most common means of financing the program was to pass the cost directly to the property owner through special levies/charges per inspection. Most respondents indicated that although the general response to the reinspection program was good, the response to the requirement for payment was not. Two municipalities indicated that they used a funding source not listed: the Town of Bracebridge used a combination of the property taxes and revenue generated by permits issued for the work required under the reinspection program and the Township of South Frontenac supplements their property tax financing program with a Human Resources Development Canada grant program. The total number of responses (19) in Figure 3 exceeds the number of municipalities surveyed (16) since some municipalities used multiple types of financing. This is also true for some of the responses presented in subsequent figures.

According to respondents, the cost per inspection ranged between $25 and $85, with an average charge of approximately $65. One municipality indicated their intent to increase reinspection charges from $85 to $170 for 2007. The Township of South Bruce Peninsula has also negotiated a fixed price for septage pumpouts with two local septage haulers; the price is $90 to $110. Tiny Township indicated that the cost for pumpout in their area was approximately $150, but this was not negotiated with the Township. In both of these areas mandatory pumpouts were part of the programs. The cost for residential septic tank pumpout ranges from $150 to $400 across the province.

Onsite system repair or replacement can be expensive. Repair costs were estimated by respondents to range between $300 and $20,000 depending on the nature and extent of repair required. However, as shown in Figure 4, only four municipalities were offering some form of financial assistance to help property owners offset repair costs.

Figure 4: Financial Assistance of Property Owner Repairs



Tiny Township has a grant program in place, although the funding source is unknown to the survey respondent when interviewed by ORWC. The Town of Gravenhurst indicated that both grants and low interest loans are available to property owners as part of their reinspection program. However, both forms of funding are financed through external government programs (specific program unknown to ORWC). The Township of South Frontenac indicated that financial aid is available to property owners in its area through the Provincial Property Standards Fund and the local Remedial Action Plan program.

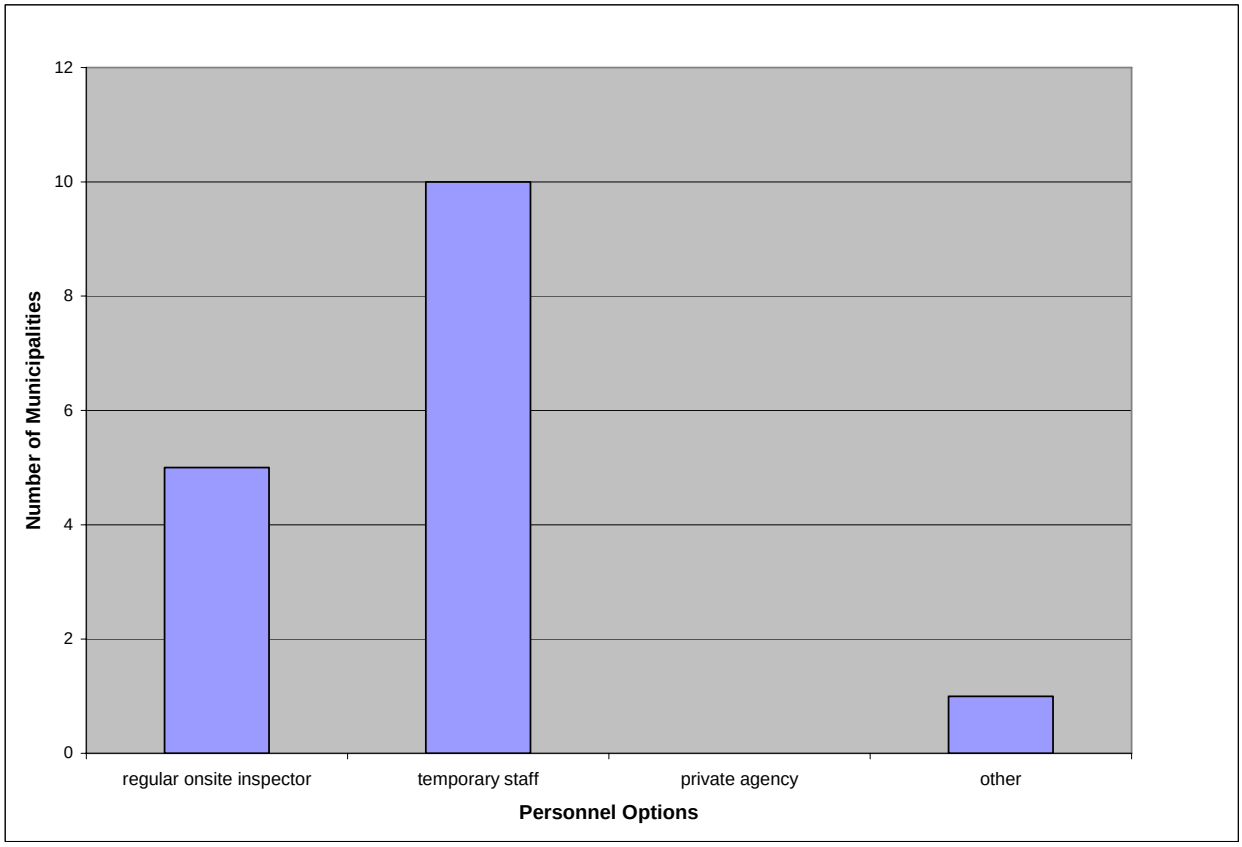
2.2.3 Details of Reinspection

The largest part of the survey was dedicated to gathering the details of who, what, where, and how these communities conducted their reinspection programs. As mentioned previously, most of the agencies that deliver the Part 8 program are small, with limited staff and resources. It was considered important to know who conducts the reinspection programs for these organizations because this will relate directly to not only the cost of delivering such a program, but also the "saleability" of such a program to municipalities (and their constituents) who might be reluctant to undertake more responsibility with the limited resources discussed earlier.

As shown in Figure 5, the majority of the municipalities surveyed used temporary, sometimes seasonal, staff. In all cases, the temporary staff were summer students trained to do the field inspections. Although no specific data was collected with respect to the training requirements for temporary staff, it was noted in most cases that the students are sent to the 5-day Ontario Building Code Part 8 Installer/Inspector training course developed by MMAH prior to being sent out into the field.

Four agencies used their regular Part 8 staff, and again this was largely due to lack of staff for additional work. Two municipalities used an "other" option: the Township of Georgian Bay contracted the work out to a local consultant, and the Township of North Frontenac split the program delivery between the Rideau Valley Conservation Authority and the Mississippi Valley Conservation Authority.

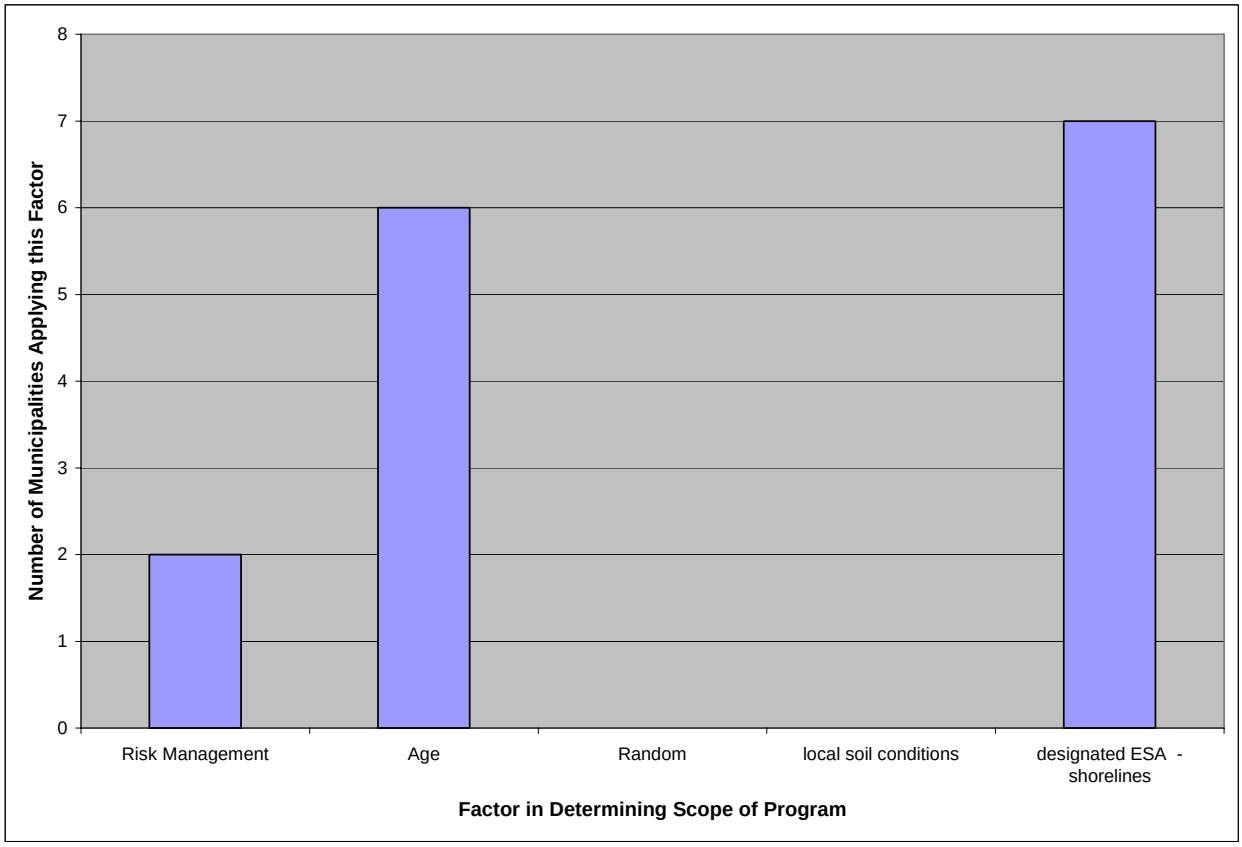
Figure 5: Personnel for Existing Reinspection Programs



As mentioned previously, a number of the municipalities surveyed are located in areas with a large number of seasonal summer homes - cottage country. Many cottage properties in Ontario do not necessarily have a Class 4 onsite sewage system, in fact, systems range from Class 1 to Class 5. All municipalities surveyed, with the exception of the Township of South Bruce Peninsula, indicated that they inspect all classes of onsite systems. The South Bruce Peninsula program is limited to Class 4 and Class 5 (holding tank) systems.

Given the large distribution in age, class, maintenance and operation of systems across the areas of these municipalities, it was considered important as ask whether or not they were inspecting all systems or only targeting specific types/locations of systems. Options included some form of risk assessment, age of system, soil conditions, Environmentally Sensitive Area (ESA) designation or simply random selection. Figure 6 shows the criteria used to select systems for reinspection if all systems were not reinspected as part of the program.

Figure 6: Criteria Used to Select Systems for Reinspection

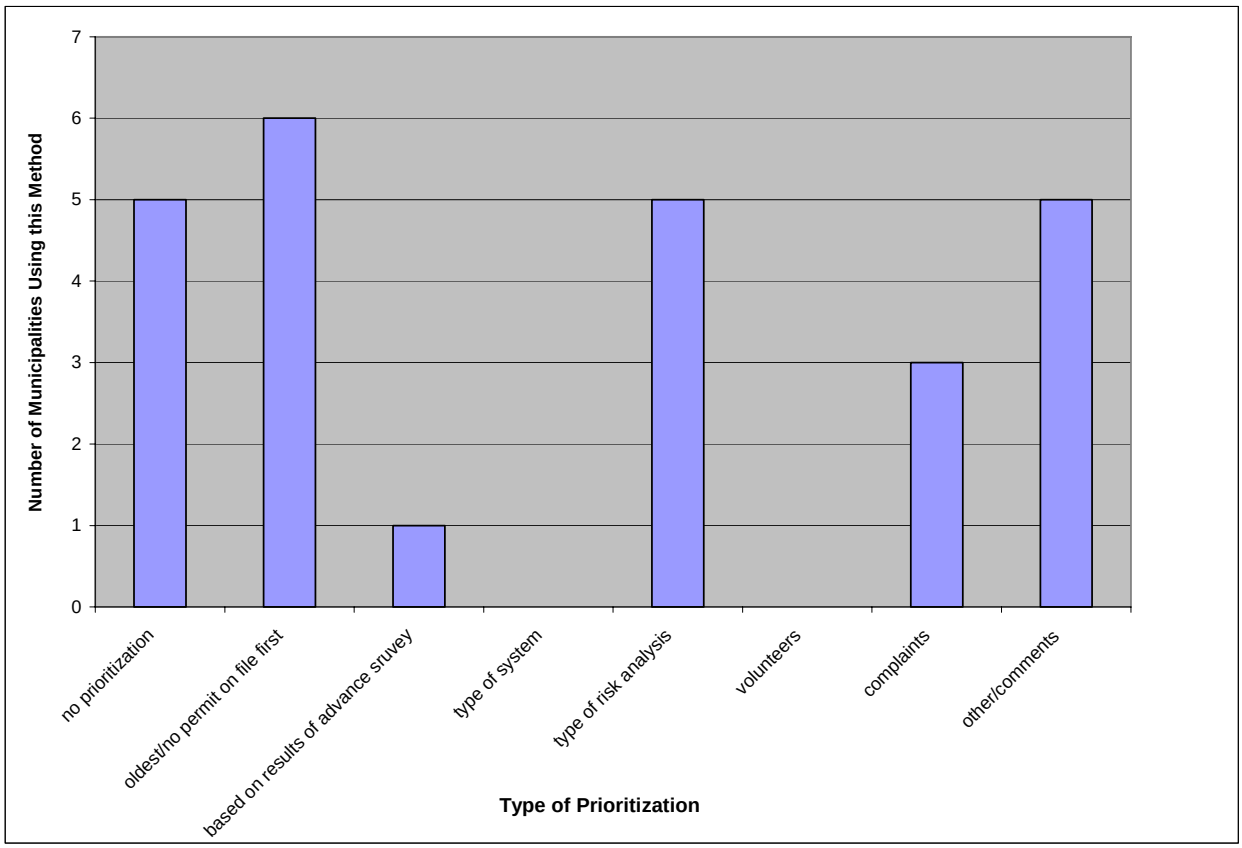


Four out of six municipalities who indicated that age was used as criteria in determining the systems to be inspected indicated that it was because some systems were considered too new to have significant problems, i.e. constructed after 1996. These newer systems were therefore not included in those reinspection programs. Only one of the communities who included age as a criteria indicated that it was specifically targeting older systems in the program, but did not specify the age.

It was also important to determine if there was any prioritization of reinspections, i.e. which ones to do first, once they had determined the scope of the program. As shown in Figure 7, five communities indicated that they had no prioritization scheme. These communities designated a region for reinspection and proceeded to work their way through that region regardless of other factors. However, it should be noted that some of these programs may have already limited their program by defining a specific scope for their program. For example if the scope of the program

was limited to inspecting waterfront properties, then within the waterfront zone every system was inspected regardless of age, class or type of system.

Figure 7: Prioritization of Systems for Reinspection

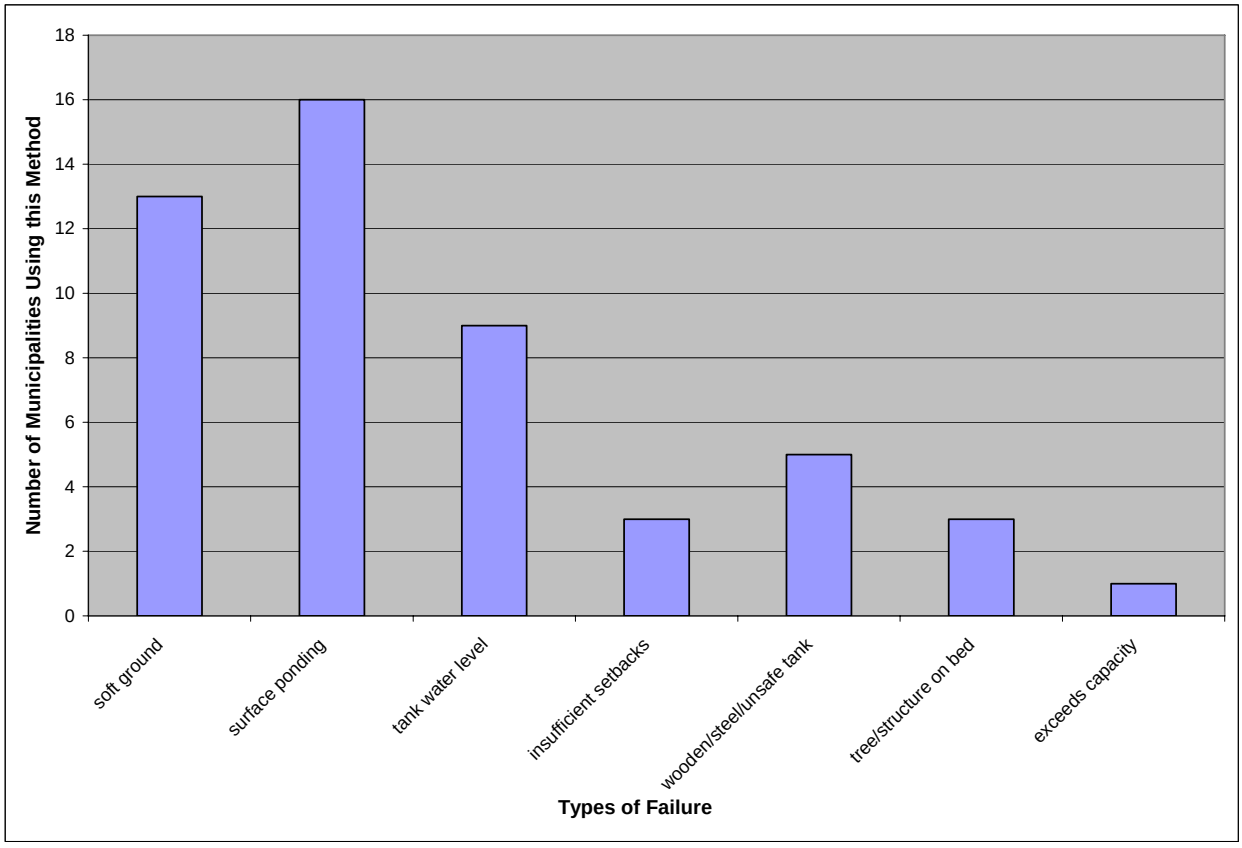


Many communities identified more than one priority for reinspection and thus the numbers indicated in Figure 7 add up to more than the 16 municipalities surveyed. For example, some municipalities may have identified the oldest systems, or those with no permit on file as first priority, but then may have identified some sort of risk analysis, such as a sensitive shoreline, as their second priority. In all the cases where a risk analysis was indicated as a priority, it was a shoreline/lake area that was designated. A number of municipalities indicated they used a priority other than those suggested by the survey, including a personal knowledge of the area/problems or areas with a high density of onsite systems. The Township of Southgate

prioritized first the hamlets and built-up areas of the township, and then worked their way geographically from west to east across the remainder of the township.

The survey also asked a number of questions regarding the techniques used in the field when conducting the physical reinspections. First and foremost was the question of failure. How did an inspector decide when a system had failed? Were there different degrees of failure? What were the physical indicators of failure? Figure 8 shows the distribution of indicators of failure as reported by the municipalities interviewed. Most municipalities used more than one indicator of failure.

Figure 8: Indicators of Failure



An indicator of failure as described in this report section did not necessarily mean that the system being inspected had to be completely replaced. Often, a failure indication simply meant that the

system has failed the reinspection program, but could pass if some remedial action was undertaken, e.g. the tree on a bed was removed, provided that no further damage was observed during the tree removal.

Figure 9 shows the various activities undertaken by the municipalities for the field component of their programs. Table 2 shows the activities that correspond to the letters shown in the graph. For example, Activity D (open and examine inside of tank) is conducted by three jurisdictions as a regular part of their reinspection program, and by seven jurisdictions as part of a more intensive inspection. Intensive inspection is defined as additional activities conducted only when deemed necessary by the inspector. This could be due to discrepancies between the permit and system components observed in the field, or due to an indication of malfunction or failure.

Figure 9: Activities Conducted in the Field Component of the Reinspection Program

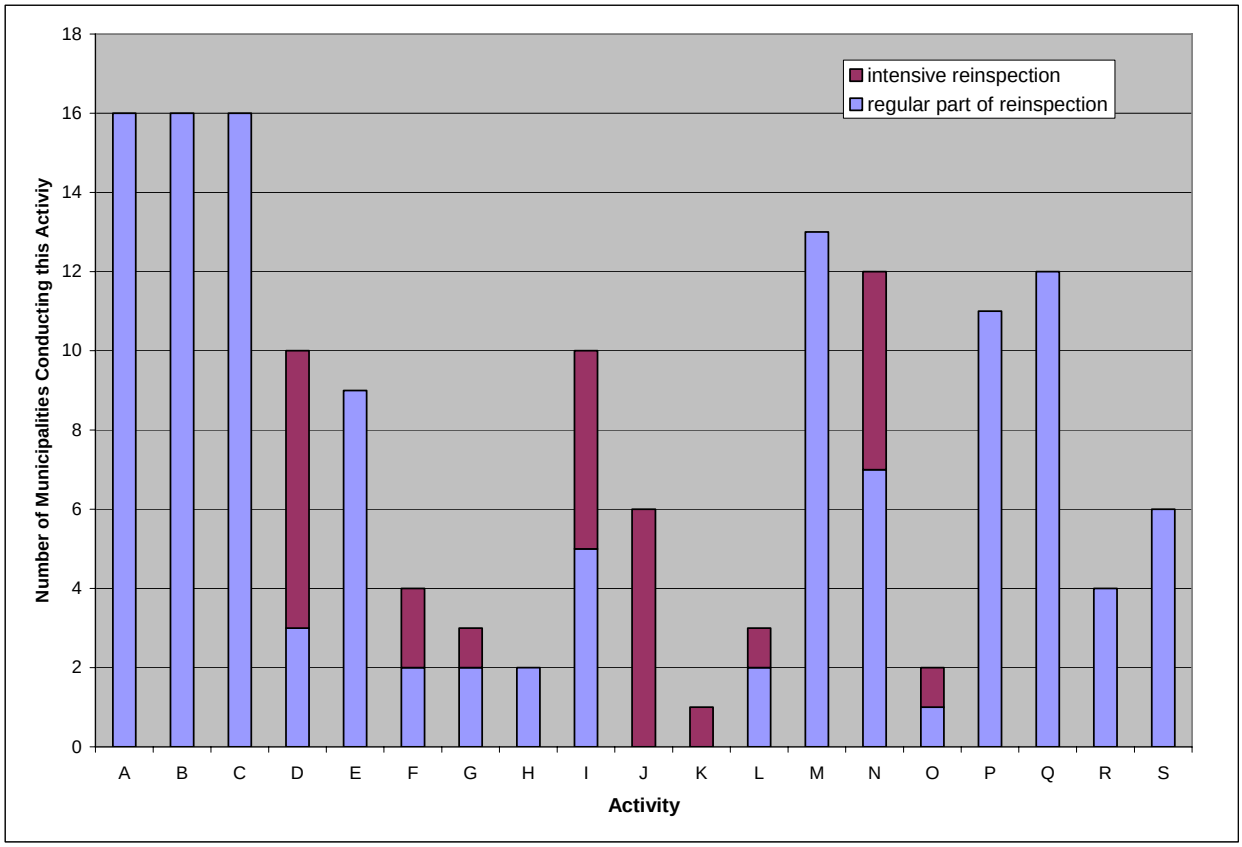


Table 2: Reinspection Activity Identifiers for Figure 9

Identifier	Activity	Identifier	Activity
A	Review of system against permit data	K	Soil sampling/testing
B	Identify location of system on property	L	Well testing/water quality analysis
C	Surface inspection of bed & tank	M	Surface drainage assessment
D	Open/examine inside of tank	N	Property owner interview
E	Estimate tank volume	O	Review of water consumption data
F	Pump out tank	P	Estimate distribution pipe length
G	Estimate sludge depth/volume	Q	Estimate setback distances
H	Inspect interior plumbing	R	Inspect mechanical equipment
I	Probe leaching bed area	S	other
J	Excavate bed area		

As shown, a variety of approaches were taken to the field component of the reinspection programs. In most cases, the approach was determined according to how much time was allocated for each inspection, and the cost involved. Some activities, such as the property owner interview, were often not conducted because it was difficult to coordinate an efficient reinspection schedule that would allow property owners to be present during the inspection.

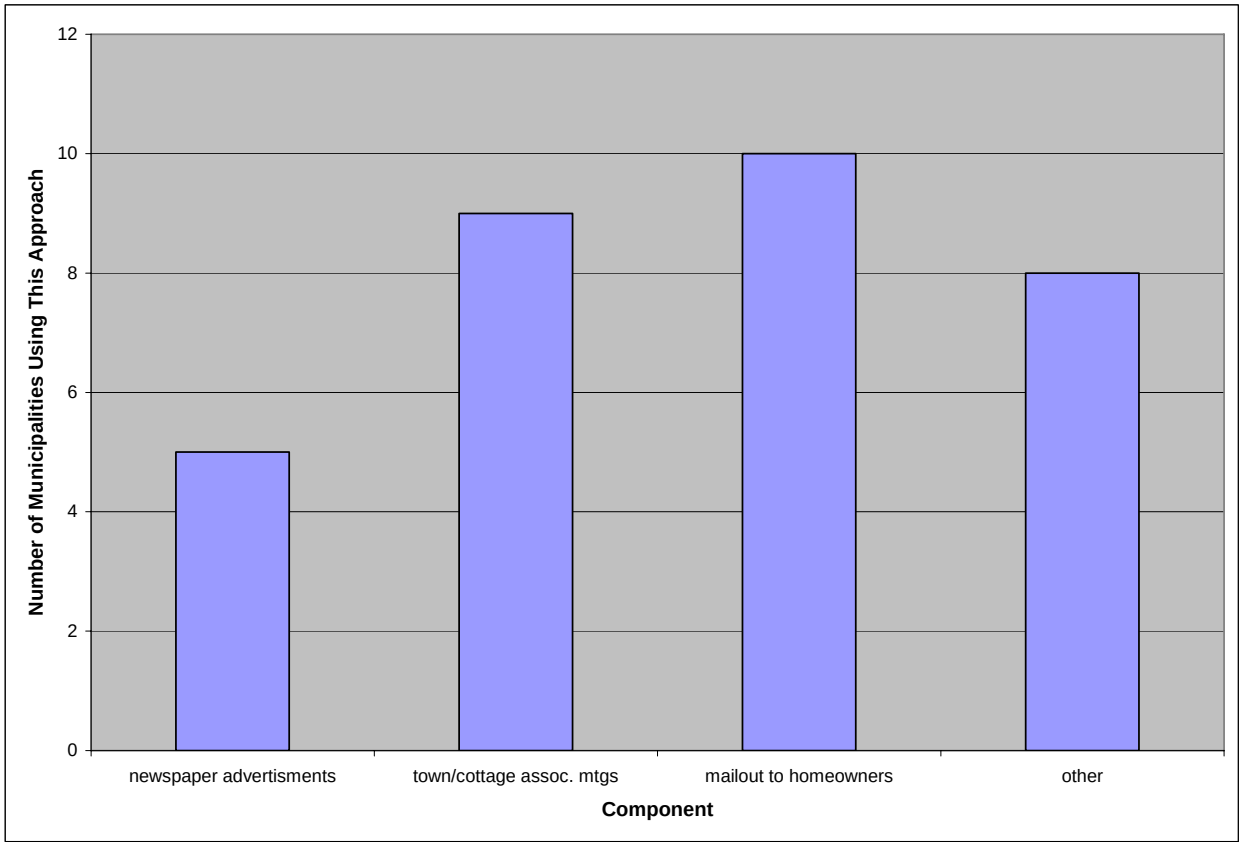
It should be noted that the "intensive reinspection" was only undertaken if indicators of failures were observed. However, these indicators varied widely, and depended on the activity. For instance, three municipalities indicated that they didn't open the tank as part of the regular inspection, but if the record showed that it was a steel tank, then the tank was opened, and in some cases a pumpout was required.

A critical item in any properly working onsite sewage system is the septic tank. Many onsite professionals (EPA, 2002) consider an examination of the inside of the tank an essential part of any onsite assessment. Thus information was collected on the number of agencies that opened and pumped the tank as part of the reinspection program. Results are summarized in Figure 9.

In addition to the field component of the reinspection program, most communities surveyed used additional tools to educate property owners and raise awareness of the program. These ranged from public meetings, to newsletters and information pamphlets (listed as other in the figure

below). In areas with large cottage populations, it was always commented that the cottage/lake associations had helped a great deal in raising awareness and campaigning for the program. All municipalities indicated the importance of an effective communication scheme for a successful reinspection program.

Figure 10: Educational Tools for Reinspection Programs



2.2.4 Remediation Resulting from Reinspection

The final portion of the survey attempted to quantify, if possible, the results of the reinspection programs that have been conducted to date. It was considered important by the study team to know not only what these organizations were doing when they conducted a reinspection of an

existing system, but also what kind of remedial work resulted from the reinspections, and how compliance with the required work was enforced.

On average, 25% of all systems inspected required some sort of remedial work. However this ranged from a low of 5% to a high of 45%, depending on location. Many participants commented that the percentage of systems requiring work was dropping annually while a reinspection program was in effect. In addition, where reinspections were prioritized by age, older systems represented a higher proportion of systems requiring remedial work.

The type of repair required for those systems identified as requiring some type of remedial work was also wide ranging. Figures 11 to 15 summarize how many systems, as a percentage of the number of systems that were identified as requiring some type of remedial work, required a certain type of repair. For example, the Township of Oro-Medonte identified that 4% of the total number of systems reinspected required some type of repair. They then went on to specify that 100% of these systems requiring repair required modifications to the distribution mechanism.

Figure 11 summarizes the percentage of remediated systems that required total system replacement, i.e. a new septic tank and new leaching bed. Only one municipality (South Bruce Peninsula) indicated that this represented 100% of its repairs. However, it would appear that complete system replacements accounted for at least a portion of nearly every community's repair requirements.

Figure 11: Percentage of Remediated Systems Requiring Total System Replacement

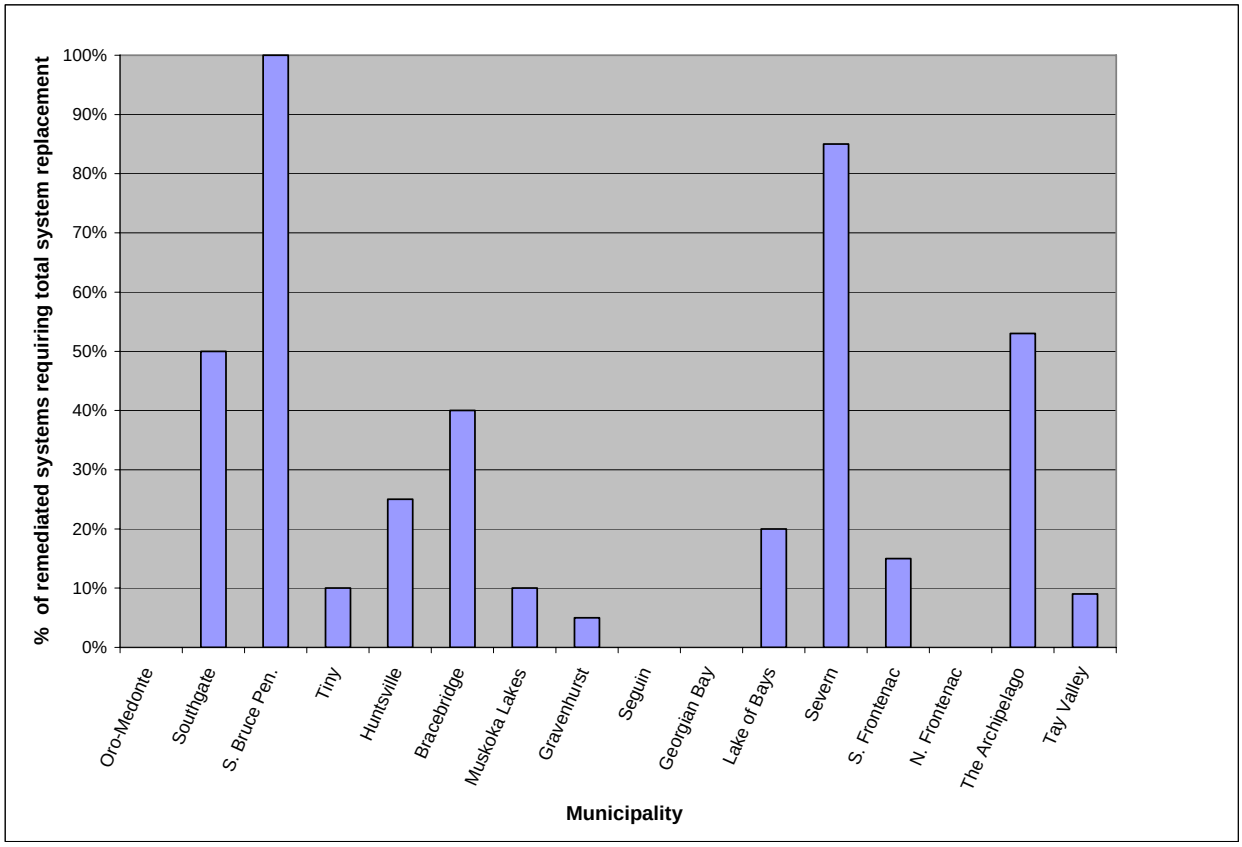
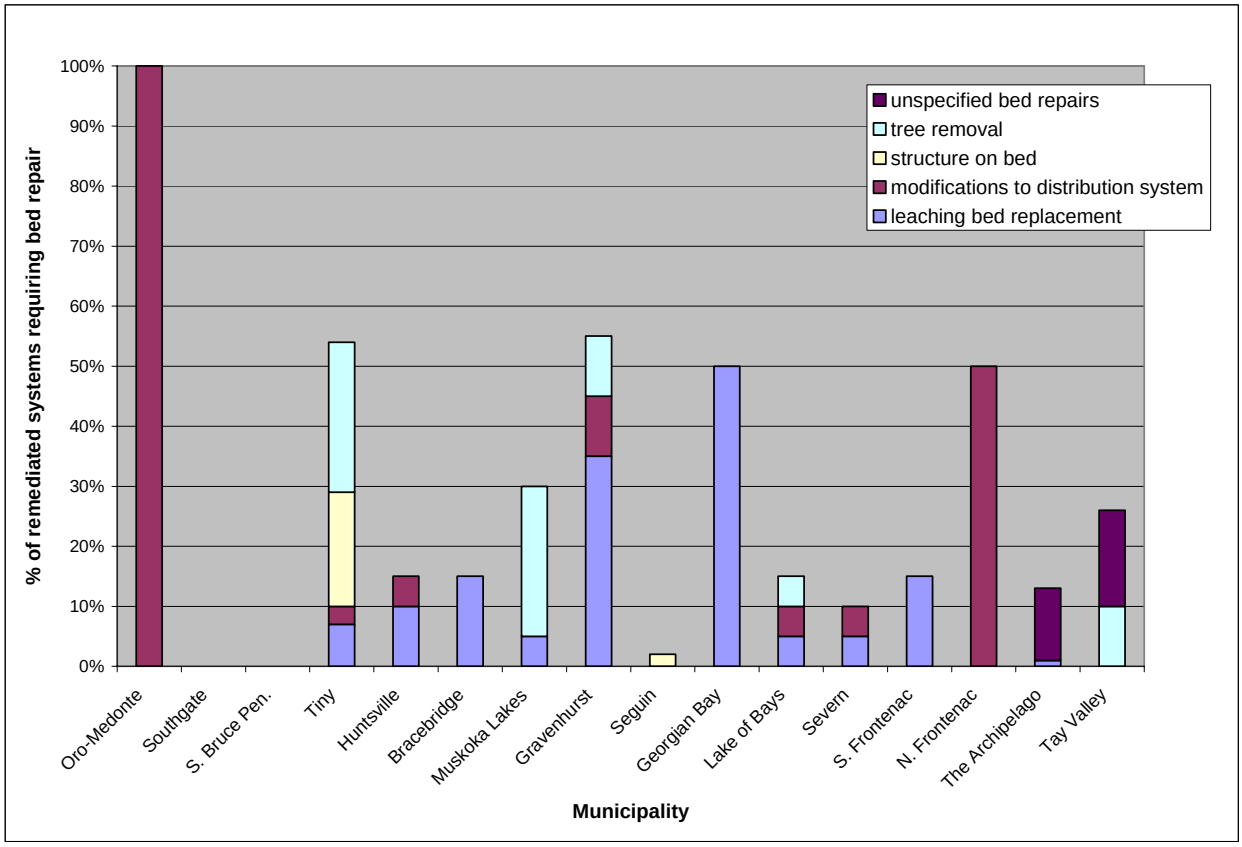


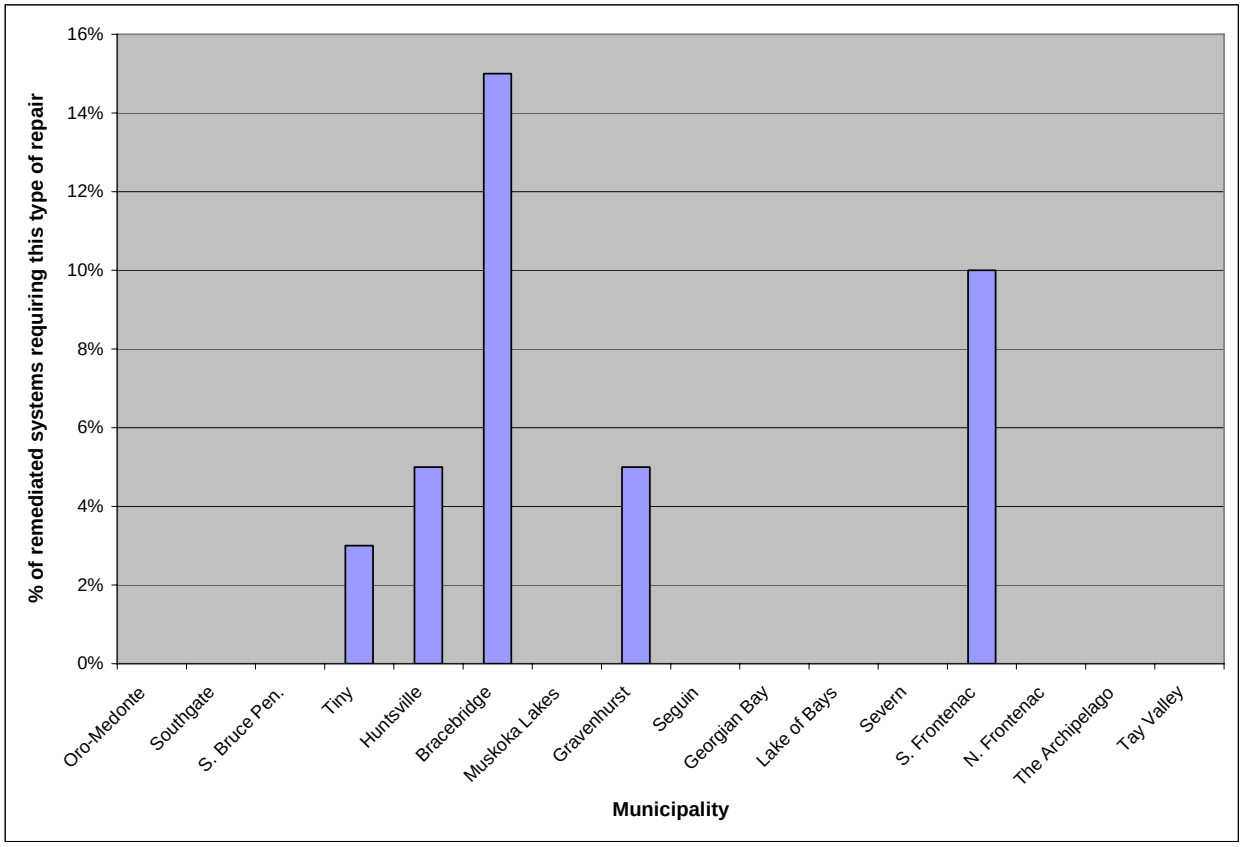
Figure 12 summarizes the proportion of remediated systems requiring some type of bed repair such as tree removal, removal of a structure on the bed, modifications to the distribution mechanism, i.e. the header or the distribution box or replacement of the leaching bed. According to the results replacement of the leaching bed makes up the majority of this type of repair for most municipalities.

Figure 12: Percentage of Remediated Systems Requiring Bed Repairs



Modifications to the surface drainage, i.e. grading to move surface water away from the onsite system, was a repair item that was anticipated to be common since it is easy to identify and would cost little to remediate. Figure 13 shows that although some municipalities were using this repair item, it was not as common as anticipated. Only five municipalities used it and the percentage of total repairs required was quite low (<15%) in most cases.

Figure 13: Proportion of Remediated Systems Requiring Repair to Surface Drainage



As expected, tank repair was a common repair item. Figure 14 summarizes the percentage of total repairs for different types of tank repair such as tank pumpout, total tank replacement or tank repair (e.g. repair to baffles, inlets/outlets, lids). As shown, this category exceeded 50% of all remediations for half of the communities surveyed, and made up a significant component for the rest. Only three municipalities indicated that they never had this type of repair.

Figure 14: Percentage of Remediated Systems Requiring Tank Repair

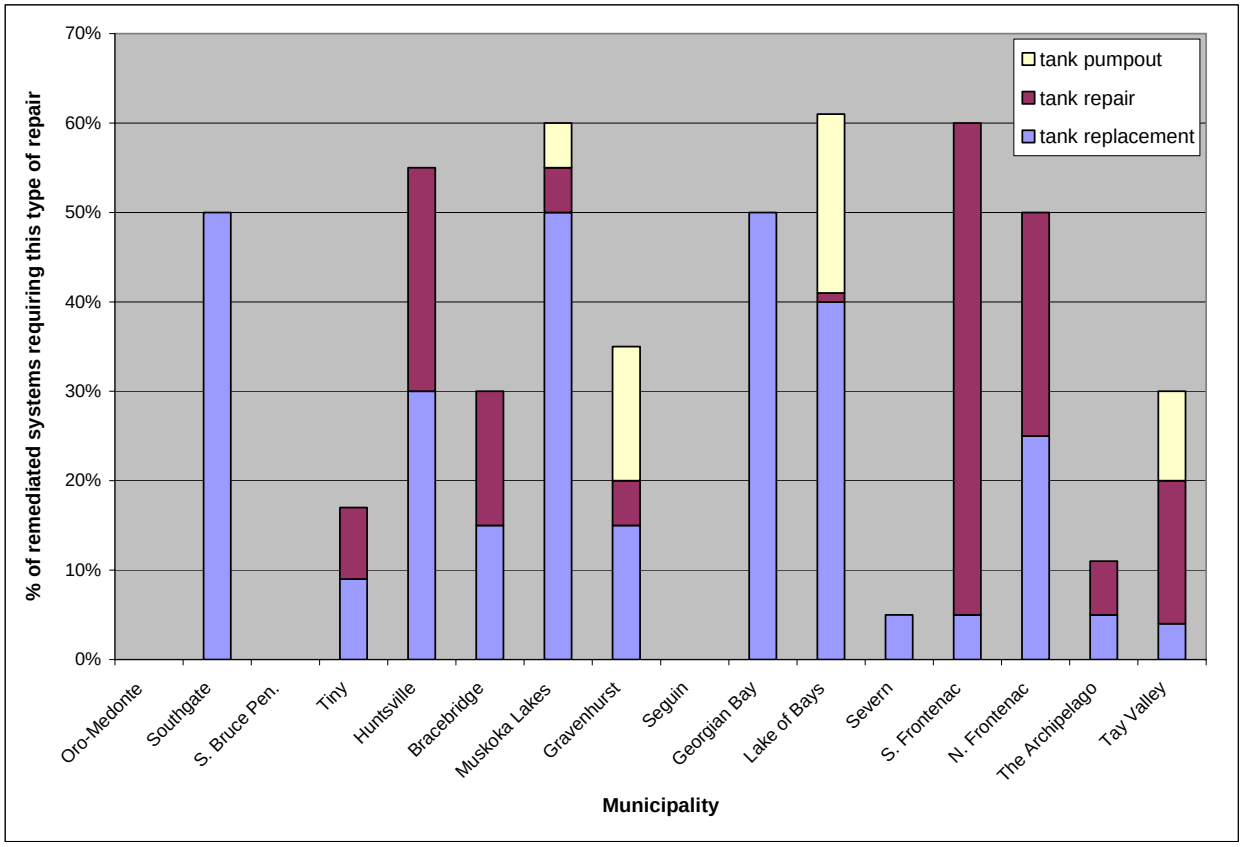
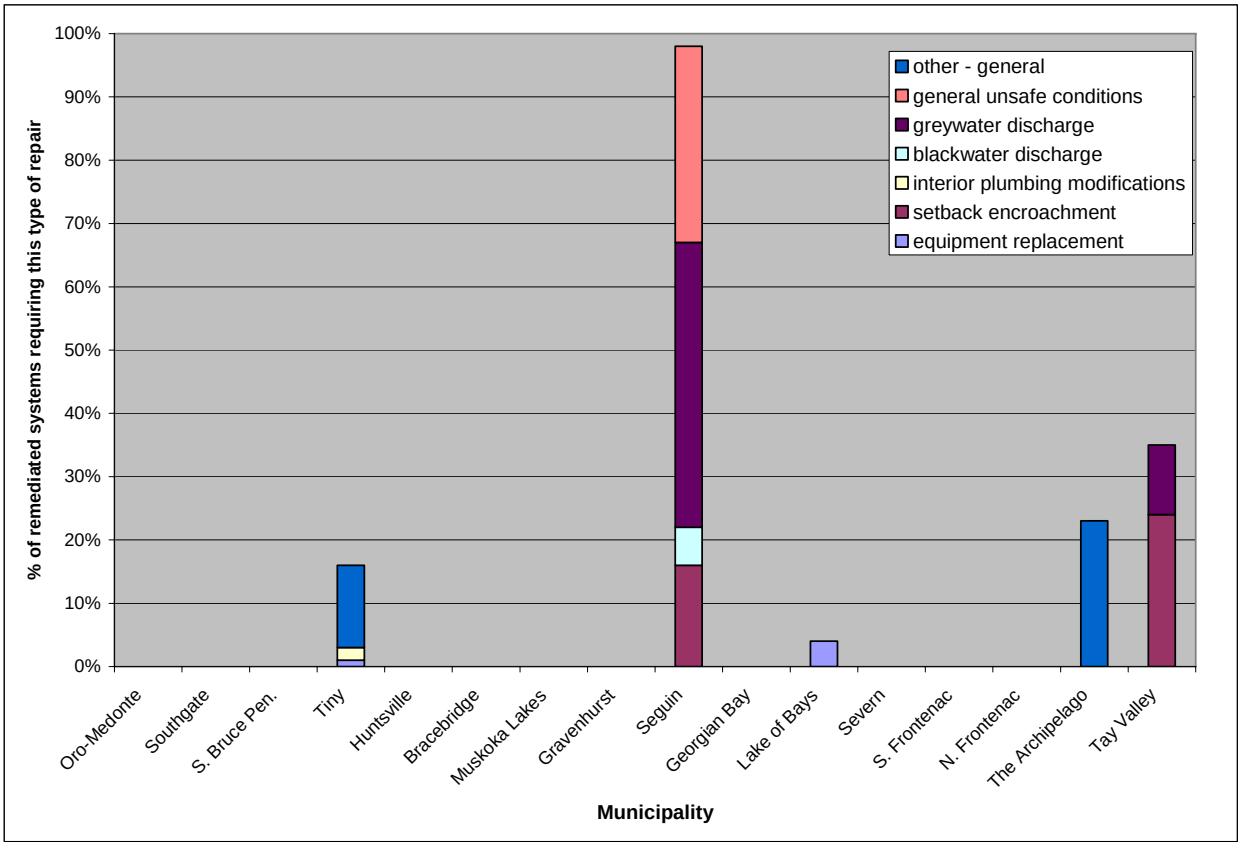


Figure 15 summarizes the percentage of remediated systems that required some other type of repair other than those listed on the survey. Because of the differences in reporting styles of the municipalities who participated in the survey, it could have been possible for some communities to hardly show up with repairs on the preceding graphs. For instance, the Township of Seguin had a remediation list that was completely different from that on the survey, but included important issues such as blackwater or greywater discharge. These items, along with general unsafe conditions and encroachment of setback distances, made up 98% of their repairs.

Equipment replacement, such as pump or blower replacement, or modification of the interior plumbing, was included in the list of repair items on the telephone survey because it was considered a legitimate factor in failing systems. It is interesting to note that although it was asked for, this type of repair was hardly ever acknowledged by respondents.

Figure 15: Percentage of Remediated Systems Requiring Some Other Type of Repair



Another important item in terms of results was how enforcement of the reinspection program was conducted. In most cases, municipalities used more than one approach, and it usually started with a letter, verbal notice or verbal agreement with the property owner regarding repairs, and gradually escalated to more serious enforcement options such as Orders to Comply issued by the Chief Building Official. Figure 16 shows the total number of enforcement options used by the municipalities and Figure 17 shows the first choice for enforcement by these communities.

Figure 16: All Enforcement Options used to Ensure Compliance

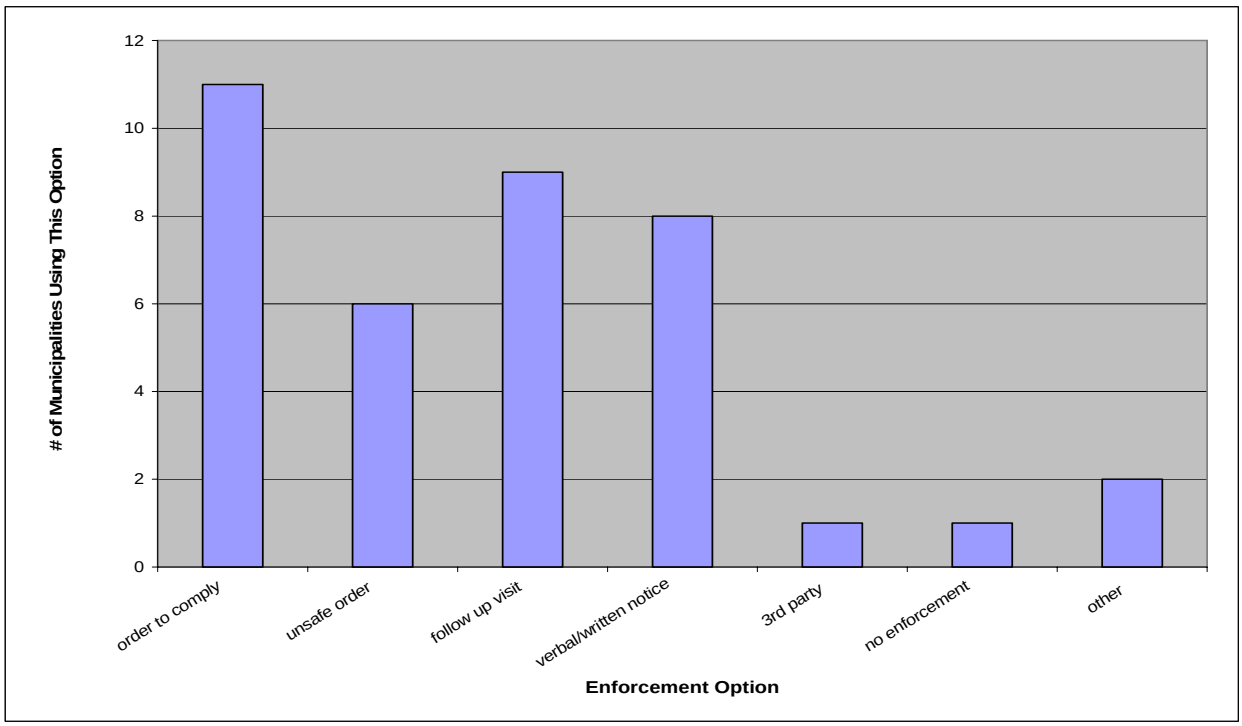
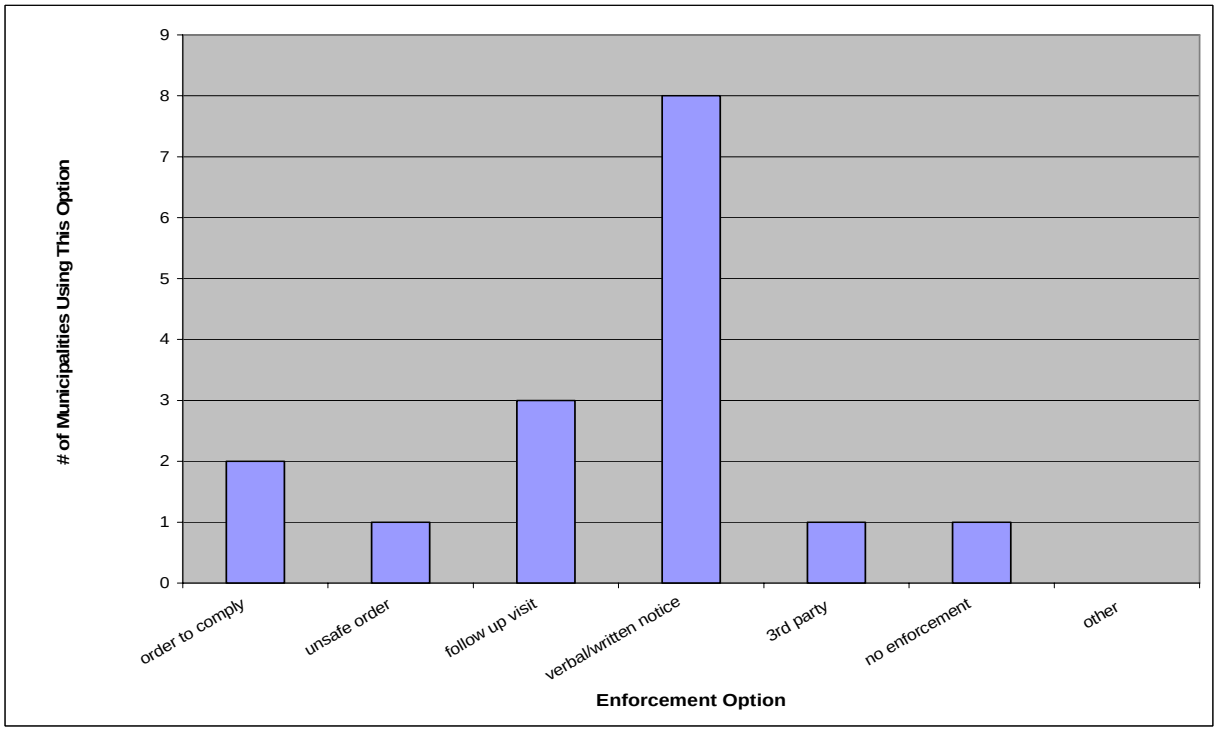


Figure 17: First Choice Option for Ensuring Compliance



Two municipalities used other forms of enforcement than those listed. Tiny Township would issue an "Order not to Occupy" if required, and the Township of Severn and the Township of the Archipelago indicated that they would take matters to the civil courts if property owners were unwilling to comply with the enforcement options provided. In both cases this was seen as a last resort option. However, both of these respondents indicated that they had taken these measures at least once during their reinspection programs.

It was interesting to note that where the remedial measures required a new tank/bed or a repair to the tank/bed, a building permit was required in every case and the property owner was required to pay the full fee for this permit. However, permits were not required for items such as tree removal.

Overall, most municipalities indicated that they had an excellent success rate when remedial work was required. The average rate of non-compliance (i.e. the proportion of property owners who refused to make the necessary repairs) typically varied from 0 to 10%, with only one jurisdiction responding with 50%. However, many conceded that the excellent rate of compliance was due to the fact that once an Order to Comply, or Unsafe Order was issued, the property owner did not have a lot of recourse. The Township of Southgate reported the lowest level of compliance (50%). The respondent commented that the poor compliance rate was likely due to lack of funds on the part of the property owners. This municipality does not have any appreciable number of seasonal residents and essentially all properties inspected were principal residences.

Generally, it was the impression of respondents that their programs had been well received by homeowners, businesses, rate payers and politicians. There were some comments that the cost of the repair was not always welcome, but this was to be expected. Many respondents indicated that the number of systems requiring remedial work was dropping every year that they ran the program, as property owners would often repair their systems before it was inspected.

3 Suggestions for Reinspection Standards

The following subsections outline suggestions for reinspections standards for onsite sewage systems. These suggestions are based on the approaches successfully used to date by municipalities in Ontario and recommendations in most current research in the field of wastewater management. The first section outlines the standards that systems should be expected to meet and the second outlines the details of a reinspection program.

3.1 Compliance/Construction Standards

Recent changes to the Ontario Building Code clearly outline a number of key objectives of the Code, including the protection of public health and environmental quality, which are achieved through the regulations in the OBC.

Building code standards regarding onsite sewage systems have changed substantially over the years. This presents a challenge for any reinspection program where systems may have been built to different standards that existed over time. The question then arises, should systems that were constructed and installed in accordance with previous standards be required to meet the standards of today?

None of the municipalities surveyed set a standard that required all inspected systems to meet current OBC requirements. All municipalities required that the system be deemed to be safe and meet the OBC intent of protecting public health and environmental quality. The reasons given for not requiring systems to meet current standards included the recognition that a system may still be safe under many situations even if not built to today's standard and the recognition that the present code does not require old systems to be upgraded to today's standard, unless there was a demonstrated health risk. In addition, it was understood by most that current standards were designed to safely service a building with the maximum potential occupancy and use, while most buildings, especially homes, have occupancy/use that are usually substantially below this design level.

How does one determine a risk to public health? In most cases the municipalities used the presence of raw sewage at the surface as the indicator of an unsafe condition. This was chosen because it was easy to identify, represented a clear health risk and was not subject to interpretation. On occasion dye tests were used to confirm this, but this was infrequent.

Recommendation: Given the clear unanimity of those presently conducting reinspections, the most logical standard to measure existing systems are measures of public health risk and risk to environmental quality, and not the code of the day. In addition, the current code also does not require that repairs for existing systems meet current standards. Therefore, it is recommended that the overriding standard that all classes of existing onsite systems are held to is that the system does not pose a public health risk or threaten environmental quality. The following sections outline potential standards that could be used for each class of system with this overriding principle in mind.

Class 1

Class 1 systems consist of privies, composting toilets, incinerating toilets, portable toilets and vault privies and can only accept human body waste. Class 1 systems do not require a permit under the OBC. However, these systems must still meet minimum construction standards and must not pose a threat to human health or the environment. Therefore, it is recommended that the following standards be used when evaluating Class 1 systems:

- Must be vermin proof,
- Must meet 75% of the minimum horizontal setback distances from wells and surface water bodies as defined in the OBC ,
- Must meet the vertical separation distance to the limiting layer as defined in the OBC in designated high risk areas (see Section 4 for further discussion on this),
- Must be installed, operated and maintained according to the manufacturer's recommendations (where applicable),
- Must only accept human body waste (check for illegal plumbing connections),
- There can be no evidence of illegal discharge or sewage on the ground.

If any of these standards are not met, the system will have failed the reinspection and remedial work would have to be completed.

Class 2 & 3

- Class 2 systems consist of greywater leaching pits, and Class 3 systems consist of cesspools. Although very similar in construction, Class 2 systems may not accept human body waste while Class 3 systems may accept only human body waste. Since these two classes of systems are so similar, the same standard is recommended for both types of system:
    - Must be vermin proof,
    - Must meet 75% of the minimum horizontal setback distances from wells and surface water bodies as defined in the OBC,
    - Must meet the vertical separation distance to the limiting layer as defined in the current building code in designated high risk areas,
    - Must only accept the type of waste it is designed for (see above),
    - There can be no evidence of illegal discharge or sewage on the ground.

If any of these standards are not met, the system would be considered a failure and remedial work would have to be completed.

Class 4

Class 4 systems are the most commonly installed systems in the province, and as such, will be the most commonly reinspected class of system. Class 4 systems consist of a septic tank and a leaching bed at minimum, and may also include alternative treatment systems. The following standards are recommended for reinspection with respect to human health and environmental quality for Class 4 systems:

- Must meet 75% of the minimum horizontal setback distances from wells and surface water bodies as defined in the OBC,

- Must meet the vertical separation distance to the limiting layer as defined in the current building code in designated high risk areas (see Section 4),
- All required components of the system must be present and function as it was intended to,
- Steel tanks are not considered functional,
- There can be no evidence of illegal discharge or sewage on the ground.

If any of these standards are not met, the system will have failed the reinspection and remedial work would have to be completed.

Class 5

Class 5 systems are holding tank systems. Although no longer permitted as permanent onsite wastewater solutions, many cottages still rely on this type of system. The following standards are recommended for Class 5 systems:

- All required components must be present and functional, including a current contract with a sewage hauler,
- Must meet 75% of the minimum horizontal setback distances as defined in the current building code wells and surface water bodies,
- There can be no evidence of illegal discharge or sewage on the ground.

If any of these standards are not met, the system would be considered a failure and remedial work would have to be completed.

It must be reiterated that the priority at the time of reinspection is to determine whether there is a demonstrated health or environmental risk, according to the standards described above, and not necessarily adherence to the existing building code. It is impractical to establish a specific set of compliance alternatives given that each site and use is unique. Therefore, it is recommended to use the standards described above, and if those meet the requirement of protecting public health

and environmental quality, then to use an acceptable alternative such as the building code, if feasible.

3.2 Field Reinspection Methodology

The approach taken to any reinspection program needs to be able to identify onsite sewage systems that represent a threat to public health or environmental quality as well as being affordable and timely. In addition the approach must be consistently applied and be flexible enough to accommodate the wide range of potential problems. The following sections describe the steps recommended for the physical reinspection of all five classes of onsite systems. It is important to remember that the field procedures outlined below are to be conducted with the goal of achieving the compliance and construction standards outlined in the previous section. A possible reinspection methodology, including a risk assessment tool, is presented at the end of Section 4.

Class 1

Reinspection of Class 1 systems should focus on measures to prevent vermin and meeting the requirements of the code of the day.

The following field reinspection techniques are recommended for Class 1 systems:

- Inspect inside and outside of pit/structure to ensure it is vermin proof,
- Measure horizontal setback distances,
- Note presence/absence of an appropriate greywater system, look for illegal discharge or sewage on ground,
- Determine if the unit is installed and operated according to the manufacturer's recommendations for proprietary systems,
- If high risk area, ensure vertical separation distances to limiting layer are met i.e. is there 900 mm between the bottom of the pit and the high groundwater table, bedrock or impermeable clay layer.

Class 2 & 3

The following field reinspection techniques are recommended for Class 2 and Class 3 systems:

- Determine if there is a permit on record,
- Inspect inside of systems to ensure it is not full of solids,
- Measure horizontal setback distances,
- Note presence/absence of appropriate greywater/blackwater system, look for illegal discharge or sewage on ground,
- Check interior plumbing connections,
- If high risk area, ensure vertical separation distances to limiting layer are met.

Class 4

Class 4 systems are the most complex type of system that will be encountered by reinspection programs. The key components of a Class 4 system are a septic tank and the leaching bed, and comments will focus on these components.

With a septic tank, possible approaches are to ignore them completely; open them and conduct a visual inspection; or open them and have them pumped out. Only four programs surveyed in the environmental scan includes tank pumping in their program. Reasons for excluding this from a reinspection program include costs (pumping costs and the time), difficulty of organizing the activity, liability and doubts about whether the costs justified the information gained.

Nearly all literature (USEPA, 2002) on onsite sewage system management recognizes the value of a tank inspection and pumping as part of any inspection program. However, discussions with the various agencies indicated a significant resistance to pumping being a part of a program due to the substantial costs involved and the difficulty of arranging this in a manner that adequately coincided with an inspection.

As a compromise it is recommended that a tank pumpout be included with any initial reinspection program (i.e. where no reinspection program has previously existed or where the date of any previous inspection is either unknown or non-existent), where practical. For instance, it may not be practical to include a tank pumpout program in cottage areas that do not have road access. If a reinspection is part of an ongoing program, opportunities exist whereby a tank pumping need not be part of the actual reinspection but could be arranged as part of a region-wide program involving local pumpers. The Clean Water Act authorizes a principle authority (e.g. a regular Part 8 delivery agency) to establish a reinspection program. Furthermore, it also gives the principal authority the power to accept certificates from classes of persons approved by the regulation in lieu of conducting the reinspection program themselves. Therefore, a certificate or similar document could be completed by the pumper and observations made of the state of the tank and contents and this could be included as part of the inspection report.

Recommendation: Septic tanks should be pumped out as part of an initial reinspection program, but not necessarily with each subsequent inspection. Members of the pumping industry should be actively involved with any regional program that involved compulsory tank pumping.

The inspection of the leaching bed should aim to identify any immediate public health concerns due to the potential for contact with sewage. This would be a visual inspection made by determining the location and size of the bed and the presence of any wet or spongy spots or breakout on the surface or toe.

It must be recognized that this sort of visual inspection of a leaching bed cannot identify all problems with a leaching bed (e.g. it will not identify situations of inadequate vertical separation to groundwater, it will not identify situations where only a small portion of the bed is being used, and it may miss problems that are not evident during dry periods). Although more could be learned by making exploratory excavations in and near the bed, (e.g. depth to groundwater, initial clogging of the bed, poor distribution of effluent in the bed) this would involve a

significant investment of time for the inspection. In addition, this may lead to claims that the inspection caused problems in the bed where none existed before.

An alternative to exploratory excavations in a bed may be to revisit the requirements for new beds to include features that would allow reinspection of the bed without excavation. Examples include simple inspection ports in the bed as described by Converse (2006).

Recommendation: All new leaching beds should be equipped with design features which allow an assessment of the degree of clogging without the requirement for excavation.

The final part of the leaching bed to be inspected should be the surface drainage of the area. Drainage is often a contributor to system failure and is often changed after the final inspection as part of the construction or subsequent landscaping activities.

Leaching beds as part of tertiary systems (e.g. smaller convention beds or filter beds, shallow buried trenches and area beds) should be similarly inspected. Since shallow buried trenches are already reinspected and tested as part of the agreement at the time of approval, it would suffice to have copies of those maintenance reports. For the others a reinspection as outlined below is appropriate.

Based on the foregoing, the following checklist describes the recommended activities for the reinspection of a Class 4 system:

- Check for permit,
- Observe site for illegal discharge or sewage on the ground,
- Pump the tank (see notes below on tank pumping),
- Estimate tank size,
- Visually observe leaching bed noting location, type, approximate size and breakout, if present,
- Measure horizontal setback distances,
- If high risk area, ensure vertical separation distances to limiting layer are met,

- If a treatment unit other than a septic tank is present, check for maintenance contract and records,
- If shallow buried trench system, ensure presence of a tertiary treatment unit as well as records of testing as appropriate.

When the tank is pumped, a number of observations are required. These include:

- State of tank material,
- Presence of and condition of baffles or tee's,
- Volume of sludge and scum,
- Degree of drainage back into the tank from the soil absorption system,
- Any indication of tank leakage,
- Condition of lids and risers,
- Potential for ingress of surface or groundwater.

Caution must be exercised when inspecting the tank and exceptions may need to be made. Any inspection may lead to safety concerns to the inspector and liability issues as emptying an already compromised tank may lead to its collapse. Exceptions may also need to be made for poorly installed plastic tanks.

We also note that tank pumping is recommended where practical. In some areas, such as those with water access only, and those with long distances to a local pumper, this may not be practical and alternative arrangements would be required. If it is not possible to pump the tank at the time of reinspection, then it may be appropriate to require a report from the hauler.

Recommendation: In areas where access to the tank for pumping is limited, a system needs to be put in place whereby the pumper has sufficient expertise to obtain and report on the required information.

Class 5

Class 5 systems will need a reinspection that addresses the essential issues with regard to the protection of public health and environmental quality. The recommended field techniques for reinspecting Class 5 systems are as follows:

- Check for permit,
- Check for presence of alarms and their operation,
- Connection of all plumbing to the system,
- Records of pumping/contract with hauler,
- Check for obvious leaks.

3.3 Signs and Symptoms of Failure of a Reinspection

Section 3.1 describes the recommended compliance and construction standards for all classes of systems with respect to ensuring that public health and the natural environment are not threatened. Therefore, any contravention of these standards would be considered a failure of the reinspection, although failure of the reinspection does not automatically mean that the entire system needs to be replaced. Signs or symptoms of failure of reinspection are as follows:

- Encroachment of 75% of the horizontal setback distances as per the OBC (including structures placed on the leaching bed or the tank),
- Evidence of sewage on the ground, including soft, moist, areas,
- Missing components, including septic tank, leaching bed, alarms (Class 5),
- Use of a steel tank,
- Collapsing of a plastic tank,
- Unrestricted access to vermin (Class 1, 2 & 3),

Potential signs of malfunction are as follows:

- Odour,
- Backup of sewage into the house or sluggish drainage,
- Presence of bulrushes or cattails on leaching bed,

- Evidence of uneven distribution on leaching bed,
- Excessive drainage from leaching bed back into septic tank after pumping - i.e. for more than 5 minutes,
- Water quality problems nearby,
- Depressions or soil subsidence on or near leaching bed,

Although it is important that inspectors recognize signs or symptoms of malfunction, it is emphasized that it is not the inspector's responsibility to address these problems. If malfunction is suspected, then the recommendation should be that a licensed installer be contacted to further investigate and remediate the problem, with input, permitting and inspection from the Part 8 delivery agency as required.

3.4 Intrusive Field Investigation

In some cases, it may be necessary to perform a more intrusive investigation than the one described in the preceding sections. An intrusive investigation may be warranted under the following conditions:

- Property is defined as high risk (see Section 4),
- There is no permit or record of the system on file,
- There are demonstrated problems (signs and symptoms of failure and malfunction as defined in Section 3.3).

The following paragraphs describe what steps should be taken if a more intrusive investigation is required.

Class 1, 2 & 3

For Class 1, 2 & 3 systems, determining the presence/absence and size of the system should suffice for most reinspections. A more intrusive investigation (other than that described in Section 3.1 and 3.2) would only be warranted if the system was located in a high risk area, at

which point it would be appropriate to determine if the minimum required vertical separation distance of 900 mm was maintained to the limiting layer.

Class 4

If no permit is on record, a more intrusive investigation is warranted. The following steps are recommended for this purpose:

- Size the tank by opening, pumping and determining dimensions,
- Determine the location, areal extent and number of runs of the soil absorption system by probing or excavating with a shovel where necessary.

If a permit is available, but there are demonstrated problems or the system is in a high risk area, the following steps should be taken:

- Ensure that vertical separation distance to limiting layer is maintained,
- Confirm depth of essential components of soil absorption system, e.g. for a filter bed, ensure that gravel and filter sand layers exist and are correct depths,
- Check depth of sand for systems constructed in fill,
- Perform squirt test on shallow buried trench systems and check observation ports for sand in chamber,
- Assess surface drainage,
- If an advanced treatment unit is present and malfunctioning, contact manufacturer,
- Perform a dye test if water quality issues arise.

Class 5

A more intrusive investigation for a holding tank may be appropriate if the system does not have a permit. In this case it is recommended that the tank be pumped out, visually checked for leaks and measured for size. If the system is located in a high risk area, it may be appropriate to conduct a more sophisticated leak test.

3.5 Administrative Considerations

To maximize the effectiveness of any reinspection program proper consideration must be given to a variety of administrative issues. These include reinspection personnel, data collection guidelines for reinspection, frequency of reinspection and program financing options.

3.5.1 Reinspection Personnel

The environmental scan indicated that the majority of the programs used temporary staff to carry out the programs under the direction of the permanent staff. This was followed by programs that used existing staff, and then private agencies. Another alternative would be to rely on those involved with the sewage pumping industry.

The reasons for using temporary staff were clearly articulated in the survey: cost and availability of personnel. Reinspections are generally conducted during the construction season when regular inspections and permit reviews are active. Taking a dedicated staff member who is trained to conduct regular permit reviews and provide inspections for new systems during and after construction away from their regular duties to conduct a reinspection program is difficult to justify. Thus the most logical approach has been to use either temporary summer staff or contract staff.

There are several advantages to utilizing temporary contract staff including that they only need to be hired for one specific task: septic reinspections. They can be trained relatively easily for the task, and their typical hiring period corresponds with the periodwhen most reinspections take place. In addition, this period coincides with the time when homeowners, particularly for vacation properties, are most likely to be available for interviews, if that is part of the program. Finally, as employees of the local authority they would report to the CBO and, because of this and appropriate training, are likely to be consistent in the approach to the reinspections.

Contracting out the work has also been done and raises the question of perhaps creating a new category of professional in the field specifically for septic reinspections. This would be similar to the home inspector market for the inspection of homes for real estate transactions. With the

growth of the service industry related to onsite systems it is likely that personnel would be available for this approach. Professionals in this category could apply to deliver a reinspection program as a registered code agency for a particular jurisdiction, although this new category of professionals would likely need to demonstrate sufficient training and expertise within the field of onsite sewage system reinspections. The establishment of the appropriate training and expertise of the new category of professional would takes some time.

A logical choice to consider for who would conduct inspections are those involved in the pumping of septic tanks and holding tanks. Many reinspection programs involve pumping the tank as part of the standard reinspection protocol. Regular maintenance of onsite sewage systems requires that septic tanks be pumped out when the solids and scum occupy more than 1/3 of the working capacity of the tank, which generally corresponds to every 3 to 5 years. In addition, many members of the pumping industry are involved in the construction and repair of onsite systems as part of their overall business and thus have expertise in this area. The additional time to complete a reinspection once on site to pump a tank would be minimal. Those not already involved in the repair and construction of onsite systems would likely need some additional training to be able to carry out the reinspection. A potential challenge to this approach would be the fact that they would not be direct employees of the local regulatory authority and thus it may be difficult to enforce consistency across the program. However, as stated previously, the Clean Water Act does make provision for new regulations regarding new certification classes of persons, which may help in addressing concerns of inconsistency. Alternatively a pumper, or group of pumpers could apply to become a registered code agency for the delivery of this particular aspect of the Part 8 delivery program in their local jurisdiction.

For any of the above personnel to carry out the reinspection, their activities would have to be considered the preliminary reinspection and that the CBO would need to make any final determination if problems identified by the initial reinspection warranted action.

Recommendation: Temporary employees are the most suitable people to carry out reinspection programs as they have demonstrated to work well with existing programs, and are relatively cost

effective. Temporary employees are especially effective with new reinspection programs in which many systems are being reinspected every year. They do, however, require proper training and will need the backup of the CBO for problem locations. It is recommended that as a minimum, temporary employees conducting reinspection programs complete the 5-day Part 8 Ontario Building Code Installer/Inspector workshop.

Companies providing pumping services are ideal as a second option as they often have expertise in the area, are already on site and would be able to carry out the reinspection easily. Again, it is recommended that as a minimum, pumpers/haulers conducting reinspection programs complete the 5-day Part 8 Ontario Building Code Installer/Inspector workshop. In addition, they would be required to seek approval to provide these services to the municipality, perhaps as a registered code agency. The creation of a training program specifically for persons conducting reinspections should be considered.

3.5.2 Data Collection Guidelines for the Reinspection Program

Data that should be collected as part of the reinspection program include details regarding the individual systems as follows:

- Location of system on property,
- Class and type of system (e.g. Class 1 system, composting toilet),
- Size and type of tank (Class 4 & 5),
- Size of leaching bed, length of distribution pipe (Class 4),
- Whether native soil or fill (Class 4), and
- General condition of system at time of inspection.

This is especially important for those systems that do not have existing records on file. Failure or malfunctions observed at the time of reinspection should be recorded, as well as any potential problems. Repairs completed as part of the reinspection program should also be note. It is highly recommended that photo records also be taken for future use.

Recommendation: The development of a centrally administered electronic database accessible to all municipalities in the province should be considered. A shortcoming of the current system is that information about onsite systems, while collected to some degree in all jurisdictions, is neither standardized nor available across the province. A database such as the one described would provide firm information on the numbers and types of onsite systems across the provinces, and could help to identify regional problems and shortcomings in the current design standards. These types of databases are currently being used within the onsite community, both in the regulatory sector (e.g. the RVCA) as well as the commercial sector (e.g. Ecoflo).

3.5.3 Frequency of Reinspection

The frequency at which a particular reinspection program conducts inspections in its jurisdiction is an important consideration since it will impact the cost of delivering a program, staffing and data management for the program as well as demand a significant time commitment. In addition, another consideration is that most Part 8 delivery programs service a large area, both geographically and in the number of permits issued per year. In fact, most of the respondents of the environmental scan estimated that it would take them between 5 – 10 years to complete the first round of reinspection, alone.

The relative risk of onsite systems with respect to the protection of human health and the environment must also be considered when discussing the frequency of reinspection, and it must be recognized that this risk will vary from region to region across the province. Given that most onsite sewage systems are expected to have an average lifespan of approximately 25 – 30 years, it is recommended that the frequency of reinspection in low to medium risk areas be approximately once every ten years. In high risk areas, it is recommended that the frequency of reinspection be increased to once every five years.

3.5.4 Financing Options

Most programs have successfully run their programs by putting the costs of the program towards the local tax assessment. Given the limited costs of these programs (see Section 5) the additional

amounts are small. Some respondents indicated that the revenue generated by permits for the repairs required under the reinspection program was close to that required to run the program.

The Clean Water Act makes provision for building code delivery agencies to charge for the cost of a reinspection program on to the homeowner similar to the regular Part 8 delivery program. While this would certainly cover the costs of delivering the program, it may become problematic in those areas of the province where Part 8 is delivered by an organization other than the local municipality. For example, if a conservation authority chooses to initiate a reinspection program in its jurisdiction, and its jurisdiction consists of more than one municipality, this may lead to conflicts among the different municipalities, especially if some municipalities have already conducted their own reinspection programs. It should also be noted that a user pay system would by necessity be voluntary, which may not produce the desired results. To date, all of the reinspection programs carried out across the province have been initiated on a municipal level.

Recommendation: Financing the program through the property taxes of onsite sewage system owners is the most appropriate way to fund the program.

4 Risk Assessment

A risk-based assessment for water protection is becoming the norm in Ontario. Under the Clean Water Act, onsite sewage systems must be considered as part of any source water protection plan. The sections below describe the risks associated with onsite systems, the data required for a risk assessment for onsite systems, the features of a simple risk assessment tool for onsite systems and makes suggestions for their use with respect to reinspection programs.

4.1 Risks Associated with Onsite Systems

There are three types of risk commonly related to onsite wastewater systems: public health risk, ecological risk and financial risk (Jones et al., 2000).

Minimizing public health risks are the main driving forces behind most onsite system regulations, followed closely by protection of the natural environment. Contamination of drinking water by pathogens and nitrate are two major public health issues commonly related to onsite sewage systems. Direct contact with ponding or surfacing effluent from a failed system can also constitute a significant risk to public health. Traditionally, prescriptive regulations have attempted to ensure sufficient depths of unsaturated soil and adequate horizontal separation distances between an onsite sewage system and water supply wells or water bodies to protect public health from pathogen contamination. In Ontario, subdivision plans must ensure adequate surface area (lot size) for dilution of nitrate from onsite systems through groundwater infiltration of precipitation. These regulations, coupled with system inspections at the time of construction, attempt to minimize public health risks from onsite system effluent.

There are two common modes of failure of onsite systems; a hydraulic failure, where effluent breaks out onto the surface or backs up into the home, and a subsurface failure, where effluent is not adequately treated prior to reaching the groundwater. A hydraulic failure, with effluent ponding on the surface, is easy to observe from a surficial reinspection, while a subsurface failure, for instance a broken pipe or uneven distribution box, will only be discovered through a thorough and intrusive reinspection.

Ecological risk is a macro-level risk that considers the health of a watershed or an eco-system. This is often related to nutrient loading of surface water bodies and to cultural eutrophication (particularly phosphorus). An evaluation of ecological risk must consider all sources of contamination including agricultural runoff, sewage plant discharges, industrial and storm water outfalls, and natural sources in addition to onsite systems. The evaluation of ecological risk often starts with a water quality issue such as algal blooms in a lake or stream.

The financial risks from onsite system failure can be evaluated at both the community and individual property levels. At the community level, impacts to tourism, fishing industries and to recreational water use from surface water contamination or public health crises arising from contaminated communal water supplies can cause devastating economic loss to a community, as recent Canadian examples have shown. At the scale of the individual property owner, system failure and its replacement cost, potential reduction in property value or high connection costs to a centralized system all represent significant financial risks for the individual owner.

Risk assessment methodologies have been developed to address one or more of these types of risk as they relate to onsite sewage systems. The Onsite Wastewater Treatment Manual (USEPA, 2002) describes several model approaches including the following:

- A subjective vulnerability assessment,
- A probability analysis of water resources impact from wastewater discharges, and,
- Contaminant transport modeling.

In addition to these, the DRASTIC model (Aller et al., 1987) was developed by the USEPA to rate groundwater vulnerability using weighted factors of hydrogeologic settings. The factors included in the DRASTIC model are:

- Depth to ground water,
- Net recharge,
- Aquifer media,

- Soil media,
- Topography,
- Impact of the vadose zone media,
- Hydraulic conductivity of the aquifer.

The Risk Assessment System Handbook (Government of New South Wales, 2001) provides a comprehensive approach to risk assessment from onsite systems up to the watershed scale. Contaminant fate from onsite systems is well described in the Guidelines for Assessing the Risk to Groundwater from Onsite Sanitation (British Geological Survey, 2001).

All of the models listed above provide information to decision makers, enabling them to relate a risk of surface or groundwater pollution to mitigating actions such as mandating a higher level of technology or conducting more frequent inspections in high risk areas. Examples of high risk areas could include aquifer recharge zones, high density rural developments, village cores, waterfront areas, or areas with poor soils. A risk assessment model can be a useful management tool for regulatory authorities.

4.2 Data Collection & Risk Assessment for Existing Systems Prior to Reinspection

A risk assessment tool can be based upon one or more factors which are representative of the state of the onsite system and its potential risk of polluting either surface or groundwater resources. The most commonly used factors to prioritize reinspection programs in Ontario as indicated in the environmental scan have been system age, presence of a permit and proximity to surface water.

The risk factors selected should represent to the extent possible the state of the onsite system, contaminant loading to the area (scope of the potential problem) and contaminant migration (likelihood of contaminants reaching either ground or surface water resources). Any risk assessment tool selected should be based upon readily available data. Table 3 below describes a number of potential risk factors and sources of data.

Table 3: Risk Factors and Sources of Data.

Risk Factor	Rationale	Sources of Data
System Age	Systems have finite life, older system = bigger risk	• Installation permit & building age
Property Adjacent to Water Body	High risk of contaminant migration to surface water	• Floodplain mapping (GIS layer) • Municipal survey mapping
Soil Type	Poor soils (clay, silt, till) are relatively impermeable and increase risk of system hydraulic failure	• Installation permit • Surficial geology mapping • Local onsite system inspectors
Depth to High Groundwater	Many systems are improperly installed in seasonally saturated soils leading to potential effluent breakout or groundwater contamination	• Installation permit • Well records • Local well drillers & hydrogeologists • Local onsite system inspectors
System Density (Lot Size)	The lot size in a subdivision or village area can be used to represent the areal loading of wastewater to the groundwater	• Municipal parcel mapping (GIS layer) • Municipal survey mapping
Aquifer Characteristics	Unconfined or shallow aquifers increase the risk of groundwater pollution	• Aquifer vulnerability mapping • Municipal GIS mapping Local well drillers & hydrogeologists
Water Quality	Water quality data can flag a problem area	• Municipal studies and monitoring data • MOE surface & groundwater monitoring data • Conservation Authority data • Homeowner well data

Unfortunately, household practices are perhaps the largest risk factor to the proper operation of onsite sewage systems and cannot be assessed prior to an inspection. Household practices which can impact system operation include: water use, frequency of septic tank pump-out, planting trees and shrubs on the leaching field, driving over the leaching bed and breaking pipes, building structures on the leaching bed, directing surface drainage or downspouts onto the leaching bed and inappropriate use of household chemicals. The public outreach component of a reinspection program is as critical as the actual reinspection.

Two risk assessment tools are presented for consideration in this report. The first is a simple risk assessment tool based on three factors: system age, waterfront property and water quality data. This tool could be used by a municipality to prioritize a reinspection program with a minimum of data collection or analysis. The second risk assessment tool follows a more comprehensive approach which attempts to account for the condition of the system (age of the system, soil conditions, water table), contaminant loading (density of development) and contaminant

pathways (distance to surface water, aquifer characteristics) and is based upon a risk assessment model initially developed for the City of Ottawa (Kinsley *et al.* 2004; Kinsley and Joy, 2006).

4.2.1 Simple Risk Assessment Tool

The Simple Risk Assessment Tool (SRAT) considers three factors: system age, proximity to surface water and water quality data. In this approach, *the highest rating for any of the three factors* will determine the rating for the onsite wastewater system. Water quality data would only play a role when data is readily available. Table 4 outlines the approach for SRAT.

Table 4: Simple Risk Assessment Tool

Criteria	Risk Level
Waterfront Property	
Yes	High
No	Low
System Age	
System > 30 Years or No Permit in System	High
System 10-29 Years Old	Medium
System <10 Years Old	Low
Evidence of Water Quality Impairment	
Groundwater Quality	
NO_3-N > 2.5 mg/L or *E.coli* > 0 CFU/100mL	High
1.0 mg/L < NO_3-N < 2.5 mg/L and *E.coli* = 0 CFU/100mL	Medium
NO_3-N < 1.0 mg/L and *E.coli* = 0 CFU/100mL	Low
Surface Water Quality	
E.coli > 100 CFU/100mL or TP > 0.01 mg/L	High
E.coli < 100 CFU/100mL and TP < 0.01 mg/L	Low

Note: *E.coli* = 0 CFU/100mL (Universal Drinking Water Standard); NO_3-N <10 mg/L (Ontario Drinking Water Standard); *E.coli* < 100 CFU/100mL (PWQO for Recreational Water Use); TP <0.02 (PWQO to avoid eutrophication)

For example, if a waterfront property had a system that was less than 10 years old with a medium risk associated with the evidence of water quality impairment, this property would be considered high risk its highest risk level is associated with it being a waterfront property. Section 3 details the additional reinspection steps to be taken for high risk designations based on system type.

4.2.2 Comprehensive Risk Assessment Tool

The simple model described above is meant to be an easy to use risk assessment tool where limited data is available. Where more extensive data is available, and a more detailed

assessment is required a more complex assessment may be appropriate. The Comprehensive Risk Assessment Tool (CRAT) is designed to aid in the prioritization of a reinspection program within a given community and can be used as a tool to determine the level of on-going management required for an area based upon risk to human health or the environment. The model attempts to address risks related to system failure and water pollution. The Comprehensive Risk Assessment Tool is divided into two components, the Community Context and the Onsite Wastewater Risk Assessment Model.

The Community Context attempts to relate community concerns and priorities to water use, water quality and other potential sources of contamination and provides the rationale and context for an onsite wastewater system management program. The Onsite Wastewater Risk Assessment Model is comprised of a series of weighted risk factors applied to lot parcels in a GIS database. The factors were developed using existing data readily available to a municipality (soils, floodplain, parcel and building mapping, aquifer vulnerability mapping, local hydro geological knowledge). The factors attempt to account for contaminant loading, contaminant pathways and operational life of onsite systems.

Table 5: Community Context

Water Quality

Water Quality indicators of both groundwater and surface water can be used to justify or monitor the success of an onsite wastewater management program. Typical indicators for groundwater quality are nitrate and *E.coli*, while typical indicators of surface water quality are total phosphorus and *E.coli*. Suggested threshold limits which can be used to increase the scope or importance of a management plan could include:

- 0 *E.coli* for groundwater (Universal Drinking Water Standard)
- 100 *E.coli* for surface water (Ontario PWQO - Bathing)
- 0.01 mg/L TP for surface water (50% of Ontario PWQO to avoid eutrophication)
- 2.5 mg/L NO_3^--N (25% of Ontario Drinking Water Standard)

Water Use

The uses of a water resource should be considered when defining the scope of an onsite wastewater management program. Typical water uses which could be influenced by onsite wastewater discharges include drinking water wells in a shallow or unconfined aquifer or surface water recreational uses including swimming, boating or sport fishing. Aquaculture is also an important water use in coastal areas.

Other Sources of Water Contamination

Onsite wastewater systems are typically not the sole source of water quality impairment; therefore other non-point sources including agricultural runoff and point sources such as sewage outfall should be incorporated into any strategy aimed at improving water quality.

Onsite Wastewater Risk Assessment Model

The Onsite Wastewater Risk Assessment Model uses the same approach as the DRASTIC model (Aller et al., 1987), which attributes proportional weightings to a variety of risk factors. The Model is comprised of a series of factors accounting for contaminant loading, contaminant pathways, and age of systems. Each risk factor is assigned a value of 0-5, with 0 representing no risk and 5 representing a high risk. Each factor is assigned a corresponding weighting to account for its relative importance in the risk model. The weightings are described in the table below. The sum of each risk factor multiplied by its weighting determines the risk model value [RISK = ∑ (RISK FACTOR X WEIGHTING)].

Table 6: Onsite Wastewater Risk Assessment Model Factor Weighting

Risk Factor	Description	Weighting (% of total)
R_1	System Age	30%
R_2	Soil Permeability	15%
R_3	Lot Size	15%
R_4	Depth to High Ground Water Table	15%
R_5	Aquifer Conductivity	5%
R_6	Proximity to Surface Water	20%

The weighting of the system age factor (R_1) was set at 30% to reflect the high relative risk of system failure by age determined through the analysis of replacement systems (Kinsley and Joy, 2006). The soil factor (R_2) and lot size factor (R_3) were assigned 15% each, representing half of the weighting of the age factor. Factors affecting groundwater contaminant transport (R_4, R_5) were assigned a total weighting of 20% to equal the weighting of the factor affecting contaminant transport to surface water (R_6). The model can be applied by area (subdivision, village, lakefront, etc.) or by individual lot. A description of each risk factor follows.

Risk Factors

R_1 – System Age: Relative risk of failure due to system age has been shown to increase from 1 to 5 to 12 times as the age of the system increases from 1-9 years to 10-29 years to 30 years and

older (Kinsley and Joy, 2006). The building age can be used to represent the age of the onsite system when onsite system records are incomplete.

Table 7: System Age

System Age (years)	Risk Rating
0-9	0.4
10-29	2.1
$\geq$ 30	5

R_2 - Soil Type: The soil type is based upon surficial geology mapping. The type of soil reflects the hydraulic conductivity of systems built using *in-situ* soils as well as soils beneath systems constructed with imported soils. The various soil types were classified by hydraulic conductivity (K) as described in Table 8 below. The soil type factor reflects the increased risk of system clogging and surface break out of effluent (low K values). An area-weighted average can be calculated or soil data from septic system records can be used for individual lots.

Table 8: Soil Hydraulic Conductivity

Estimated Soil Hydraulic Conductivity, K (cm/s)	R_2- Soil Permeability
$\leq 10^{-6}$	5
10^{-5}	3
10^{-4}	0.5
10^{-3}	0
$\geq 10^{-2}$	0

R_3 – Lot Size: Lot size provides an indirect measure of the wastewater loading to the groundwater. As well, small lots often do not meet regulatory separation distances and may pose a risk to drinking water safety and quality. The highest risk is assigned to lots of less than 0.1 ha (0.25 acres), while the lowest risk is assigned to lots of greater than 0.4 ha (1 acre). The following table describes the risk ratings for lot size.

Table 9: Lot Size

Lot Size	Risk Rating
0 - 0.1 ha	5
0.1 - 0.2 ha	4
0.2 - 0.4 ha	3
>0.4 ha	1

R_4 - Depth to High Groundwater Table: The depth of the seasonal high water table is estimated for an area based on a subjective assessment by a hydrogeologist with local knowledge. A seasonal high water table at a depth of greater than 5 m is considered to be of low risk while a seasonal water table of less than 1 m is considered to be of high risk, as described in the table below. Alternately, data from septic system inspection files can be used to provide a lot specific high water table value, although this information is likely not available.

Table 10: Depth to High Groundwater Table

Estimated High Seasonal Water Table Depth (m)	Risk Rating
> 5	1
1-5	3
< 1	5

R_5 – Aquifer Conductivity: This factor can be taken directly from an Aquifer Vulnerability Study for the area of interest. These studies have been conducted for many municipalities. Aquifer conductivity refers to the hydraulic conductivity of the groundwater aquifer underlying the study area. Higher hydraulic conductivity increases the potential for pollution, as it facilitates the migration of contaminants through the aquifer.

R_6 – Proximity to Surface Water: The 100-yr flood plain boundary is used to determine lots that are in close proximity to a water body. Each lot partially or fully within the floodplain is considered as high risk. All other lots are reported as no risk. The table below describes the risk ratings for proximity to surface water.

Table 11: Proximity to Surface Water

Part of lot within the floodplain	Risk Rating
Yes	5
No	0

4.3 Post-Reinspection Risk Assessment

The two risk assessment tools described in Section 4.2 will continue to be applicable after a reinspection and can be used to define the frequency or scope of further reinspections. The data gathered from the reinspection can be used to update or correct the model risk factor values. The following risk factor values may be corrected based upon information obtained from a reinspection:

R1 – System Age: The system age can be verified through observation (i.e. age of tank) and through discussion with the homeowner.

R2 – Soil Type: The soil type can be verified through test pits or through discussion with the installer.

R4 – Depth to High Groundwater: The depth to high groundwater can be determined through a test pit and observation of soil mottling or through discussion with the homeowner.

4.4 Recommendations for Risk Assessment

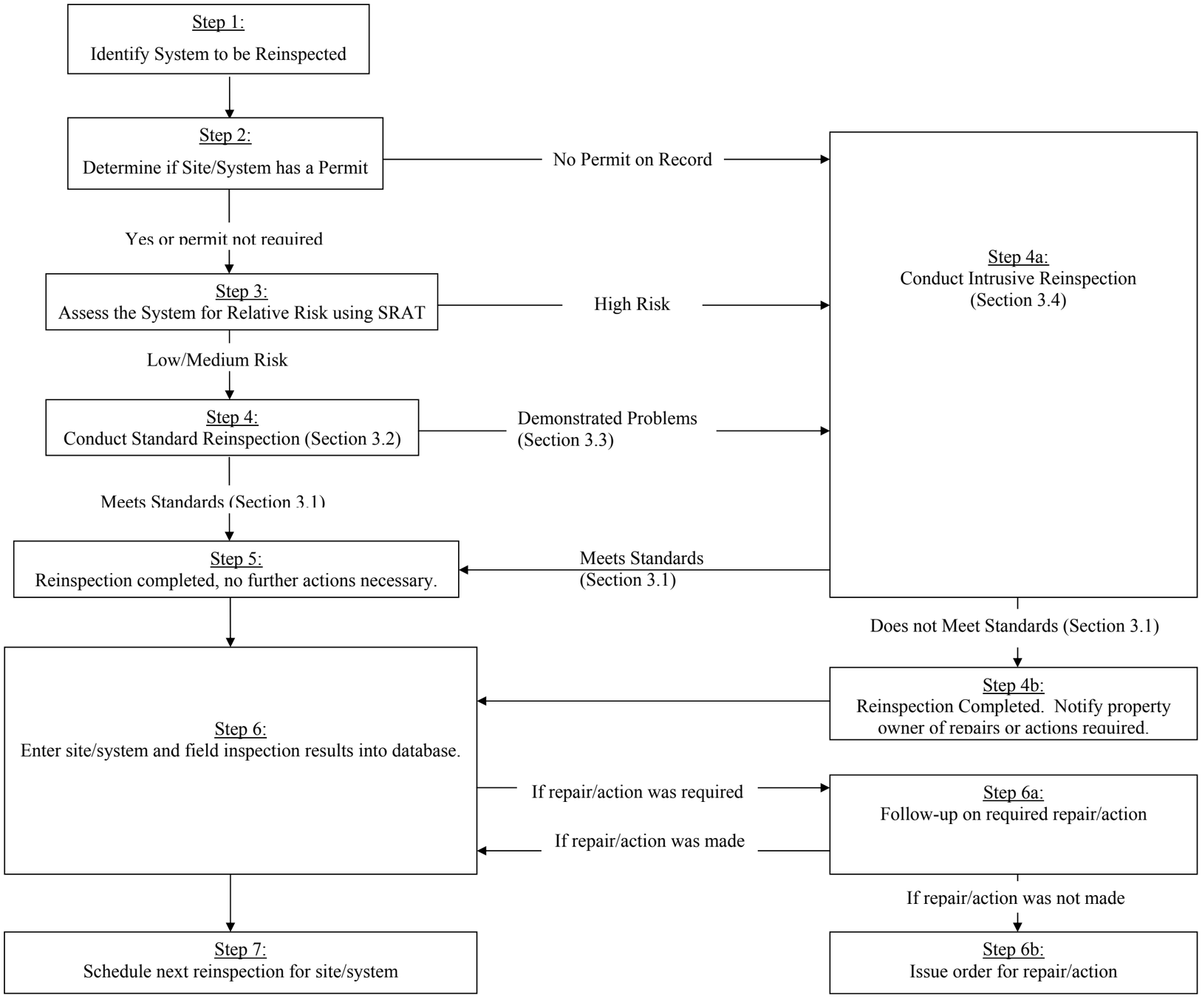
The risk assessment tools presented above are valuable and could be implemented by a reinspection program. However, there are some issues with both the SRAT and the CRAT that make them more or less appropriate for different situations. The following approach is recommended for consideration:

1. Use the SRAT model first. SRAT provides a reasonable model to help a municipality prioritize which systems it should be prioritizing in its reinspection program, especially the first time around.
2. Use a modified approach of the CRAT with the data/risk factors that are readily available in the community. The CRAT approach could be used in the following manner:
    a. Where or what regions of a municipality to target for reinspection,
    b. To decide the intensity/degree of inspection, i.e. surface vs. intrusive inspection, based on risk,
    c. To decide the frequency of reinspection, e.g. high risk areas will be reinspected every two years vs. every 5 years for lower risk areas.

As stated, the CRAT model will have to be modified to use data readily available to the individual municipality in order to avoid being cost prohibitive. For example, risk factors such as Soil Hydraulic Conductivity may need to be replaced with soil T-time, and factors such as Aquifer Conductivity may need to be eliminated. However, some municipalities may have this information readily at hand from previous Hydrogeological or Water Management Studies, or it may become available through Source Water Protection Plans. Again, it is important that the approach be flexible in order to accommodate a wide range of needs.

4.5 Reinspection Methodology

A possible reinspection methodology has been developed based on the foregoing sections. Further detail on the Simple Risk Assessment Tool is provided in Section 4.2.1. When navigating the methodology, it should be noted that it is presumed that when one is directed to conduct the Intrusive Reinspection, the Standard Reinspection will also be conducted.


Step 1:
Identify System to be Reinspected
Step 2:
Determine if Site/System has a Permit
No Permit on Record
Yes or permit not required
Step 3:
Assess the System for Relative Risk using SRAT
High Risk
Low/Medium Risk
Step 4:
Conduct Standard Reinspection (Section 3.2)
Demonstrated Problems
(Section 3.3)
Meets Standards (Section 3.1)
Step 4a:
Conduct Intrusive Reinspection
(Section 3.4)
Step 5:
Reinspection completed, no further actions necessary.
Meets Standards
(Section 3.1)
Does not Meet Standards (Section 3.1)
Step 4b:
Reinspection Completed. Notify property owner of repairs or actions required.
Step 6:
Enter site/system and field inspection results into database.
If repair/action was required
If repair/action was made
Step 6a:
Follow-up on required repair/action
If repair/action was not made
Step 7:
Schedule next reinspection for site/system
Step 6b:
Issue order for repair/action

5 Economic Impact Assessment

A potential impediment to reinspection programs are the costs – for the property owner, for the municipality and for the local industry.

Reinspection programs will require start-up funds from the municipality to initiate a program. These costs will vary depending on the characteristics of the region and on the sophistication of the reinspection program that is developed. However, the Clean Water Act clearly gives municipalities the ability to charge fees to undertake reinspection programs. The environmental scan indicated that the costs to deliver a reinspection program ranged from $25 to $85 per inspection. In most cases these costs were passed onto the property owners through their taxes. Different regions had different numbers of reinspections per year (from 200 to 1000 per year) with a typical number of 500 per year. Using these typical numbers, a municipality can expect a reinspection program to cost from $20,000 to $80,000 per year. Although not expressed in the surveys, it is assumed that these costs probably did not include time spent by permanent staff in support of the reinspection program. Therefore, the cost estimates from the survey are likely low.

Costs to the property owner are two-fold: any increase in taxes associated with program and any costs of repair to systems found to be deficient. Given the $25 to $85 cost above for a reinspection, and the realization that at most any system would be re-inspected every 5 years, the annual increase in taxes would amount to from $5 to $17/year. This is not considered a significant amount. More important is the potential costs of repair, reported by the respondents in the environmental scan to be anywhere from $500 to $20,000. Although some property owners may be able to afford this, it can be a substantial economic burden to many. Results from the survey in the regions not strongly associated with second homes indicated that the cost of repairs was a major hurdle in getting property owners to make the necessary changes or repairs required by the reinspection program. This would indicate that a system of financial support for those who cannot pay the cost of repair may be necessary in some areas for a reinspection program to be truly successful.

Any reinspection program will result in a noticeable increase in activity amongst the onsite construction industry. Although this cannot be quantified, it can be considerable – to the point that the industry may not be able to absorb the additional work immediately. A case in point is that experienced in the Township of the Archipelago. So much work was generated early in the reinspection program that the local industry had difficulty keeping up (Ray Hachigian, CBO, Township of the Archipelago). It is unlikely this would be a problem today with the growth in the industry since that time. This may vary from region to region, however, and consideration must be given to local conditions when determining response times for repairs and other items which may be limited by the capacity of the local onsite construction industry.

6 Summary

At present, there are approximately 20 independently run reinspection programs across the province. The scope and general approach taken to these programs vary widely from community to community, but they all have a common goal of addressing the perceived problems with malfunctioning onsite sewage systems and the risk these present to public health and environmental quality. Given the fact that the average rate of "failure" was 1 in 4, it would appear that there is a real need for reinspection programs across the province.

The number of existing reinspection programs was somewhat surprising, given the lack of clear legislation authorizing this type of activity. However, there appears to be a real desire for these programs; many of the municipalities who did not have a reinspection program indicated that they were either considering implementing such a program on their own in the near future or, were extremely interested in the results of this work and a province-wide approach to reinspections.

The results of the environmental scan show that the programs that are currently being conducted are enjoying success. The decrease in the number of problem sites as the programs progress is an excellent indicator of the success of the programs. The ability to enforce compliance through tools such as Orders to Comply give the reinspection programs the authority they need to deliver them effectively. However, there is a wide range of interpretation among those who are conducting these programs as to what they can and cannot do out in the field. Clarification of the rights of municipalities with regard to reinspection programs, either through clarification of the legislation or through education programs, would help greatly in this regard.

All of the current reinspection programs are driven by the local municipal government and not necessarily the Part 8 delivery agent (although they may play a role in the delivery of the reinspection program). On reflection, this appears consistent with the financing options described by those municipalities who participated. If the cost of the program is going to be financed through property tax revenue, it seems reasonable that the municipality would be in

charge of implementing the program. The alternative to this approach would be to charge directly for each inspection, as an agency could for a building permit. However, the feedback from the environmental scan indicated that this was the less popular approach to payment from the property owner perspective.

Cost is a very important issue. The program cannot be too expensive to the municipality, and there may be a real need to provide some financial support for municipalities who cannot afford to deliver the programs, or for aid for private repairs. The program also needs to be flexible. Not all municipalities have the same issues. For example, most of the municipalities who participated in this study have large waterfront/shoreline populations, where the health of the lakes/waterbodies is a highly motivating factor. Many of these communities had active ratepayer groups who promoted or assisted in the programs. Not all communities have a common factor that binds all the property owners, such as local water quality, and this could be a potential stumbling block for many communities. However, all municipalities will need to incorporate some risk factors in the prioritization of which onsite sewage systems to inspect – the job is to big to do efficiently otherwise.

Overall the cost of the programs is not large when distributed amongst the ratepayers. Costs as little as $6/owner/year (omitting pumping costs where required) were not uncommon. Although the costs probably do not reflect the whole cost of the programs, they do indicate the programs are highly affordable when it comes to the costs of individual inspections.

Communication is key to a successful program, and there must be a high degree of support for the program to be effective and well received. It was encouraging that every respondent indicated that the program had been positively received by the majority of property owners. In addition, where the programs were voluntary, participation rates were extremely high. It is important to emphasize that the influence and help of ratepayers associations can be invaluable.

7 Recommendations

The following recommendations were made throughout the report based on the findings of the environmental survey and are summarized here for clarity.

- For the purposes of reinspection, the principal standard that all classes of existing onsite sewage systems should be held to is that the sewage system is safe i.e. that the sewage system does not pose a public health risk or threaten environmental quality. Refer to Section 3.0 for details on how to determine whether a sewage system is safe or unsafe.

- Septic tanks should be pumped out as part of an initial reinspection program, but not necessarily with each subsequent inspection. Members of the pumping industry should be actively involved with any regional program that involves compulsory tank pumping.

- In areas where access to the tank for pumping is limited, a system needs to be put in place whereby the pumper has sufficient expertise to obtain and report on the required information.

- All new leaching beds should be equipped with design features which allow an assessment of the degree of clogging without the requirement for excavation.

- Properly trained temporary employees are suitable personnel to carry out reinspection programs as they have demonstrated to work well with existing programs, and are relatively cost effective.

- Temporary employees carrying out reinspections must receive proper training and support from the chief building officials for problem locations. Proper training means completing the 5 day MMAH Onsite Sewage Systems Training Course and conducting a number of site visits under the supervision of an experienced building official.

- The frequency of a reinspection program is recommended to vary between five and ten years, depending on the relative risk of the area i.e. designated high risk areas should be reinspected more frequently than low risk areas.

- Companies providing pumping services should be considered an excellent option to deliver or contribute to reinspection programs, provided they meet the requirements of a registered code agency or principal authority.

- The development of a centrally administered electronic database accessible to all municipalities in the province should be considered.

- Risk assessment tools should be part of any program for prioritizing systems and regions for reinspection. The following approach to risk assessment is proposed:
    - Use the SRAT model first
    - Use a modified approach of the CRAT with the data/risk factors that are readily available.
- Financing a reinspection program through property taxes is an appropriate way to fund the program.

8 References

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Appendix A – Proposal

Technical Standards for Reinspection of Onsite Sewage Systems

Ontario Ministry of Municipal Affairs and Housing

Proposal Prepared by:

Ontario Rural Wastewater Centre

University of Guelph

Guelph, ON

November 14, 2005

1.0 Introduction

This proposal is in response to the invitation by the Ministry of Municipal Affairs and Housing to develop Technical Standards for Inspection of Onsite Sewage Systems. There are over 1 million onsite systems in Ontario and, although some jurisdictions have independently developed reinspection approaches, there is at present no Provincial standard for these inspections. This is especially important as more jurisdictions launch local reinspection programs in response to concerns over source water protection across the Province. This proposal is by the Ontario Rural Wastewater Centre at the University of Guelph in partnership with the Rideau Valley Conservation Authority.

2.0 Experience and Qualifications

2.1 Proponent Description

This project would be directed by the Ontario Rural Wastewater Centre, part of the University of Guelph. The mission of the Ontario Rural Wastewater Centre (ORWC) is to promote environmentally sustainable development of rural and unsewered areas through the effective use of wastewater disposal technologies. The Centre's mandate is to provide training, testing and research services to all aspects of the on-site wastewater industry in Ontario. Part of this mandate includes offering workshops for both information and training purposes to adults with a wide range of experience and educational backgrounds and interests.

2.2 Services and Project History of the ORWC

The ORWC has extensive knowledge and expertise in the area of on-site wastewater treatment. As an example, the ORWC has offered the 5-day training course for inspectors and installers for Part 8 of the Ontario Building Code. This course has been offered over 20 times since 1999 with most recent delivery of this course was by Dr. Joy and Ms. Rentsch in October 2005 at ORWC training facility in Arkell, Ontario. Mr. Davidson has also delivered this course at the ORWC facility in Ottawa.

In addition to the 5-day Part 8 course, the ORWC has developed a number of other training courses for practitioners in the on-site industry. These include a course specifically developed for the Inspection, Troubleshooting and Remediation on On-site Systems as well as a course on the Management of Decentralised Systems. These courses deal with the inspection of new and existing systems, and were developed by a number of industry professionals, including staff at the ORWC. This Inspection, Troubleshooting and Remediation course was most recently delivered at the Arkell facility on November 10, 2005.

The ORWC has extensive experience providing services to government, not for profit and corporate clients. The ORWC has recently partnered with XCG Limited, on a Lime Stabilization and Screening Project for Septage in Ontario. This project was commissioned by the Ministry of the Environment in response to the proposed phase-out of land application of untreated septage. This project included a large environmental scan component as well as an evaluation of the stakeholder concerns, best practices and cost considerations in developing recommendations on how to implement a lime stabilization program in Ontario. An additional recent project for the Township of Archipelago focused on the Sturgeon Bay area of Georgian Bay and involved the inspection of 40 onsite systems to determine their performance with respect to phosphorus loading to the surface water. Finally, the ORWC partnered with R.J. Burnside & Associates to develop a reinspection strategy and risk assessment for onsite systems in the City of Ottawa.

In addition to extensive experience with government projects, the ORWC has carried out a number of pilot studies for corporate clients seeking to introduce new equipment or technologies to the onsite industry in Ontario. Also, the ORWC has developed and delivered a number of training courses for non-profit organizations, such as the Green Communities Association, various Ontario Realtor Regions and Home Inspectors. Finally, the ORWC has conducted numerous evaluations of technologies through ongoing testing and sampling on operating systems.

2.3 Roles and Responsibilities of the Project Team

CV's for all personnel are included as Appendix D and only brief descriptions of the various member's qualifications and responsibilities are described.

Douglas M. Joy, P.Eng.

Dr. Joy is the Director of the ORWC and a faculty member of the School of Engineering. He has over 20 years of experience developing and delivering courses for adults in the engineering and on-site wastewater fields. His technical expertise is in the area of water and environmental resources with an emphasis on on-site systems. He has facilitated the Ministry On-site Sewage course over 20 times. He is also involved in the present round of revisions to the Code as the chair of the Technical Committee for Part 8, is a member of the BMEC and was a member of the Source Water Protection Technical Experts Committee

Dr. Joy's role will be overall project management, development of the economic impact assessment, and overseeing the technical content of the reinspection standards and methodology.

Katherine Rentsch, B.Sc (Eng).

Ms. Rentsch is the Project Coordinator for the ORWC in Guelph. She has 4 years of experience in the water and environmental engineering field with a significant involvement in on-site wastewater issues. She has taught or coordinated a number on-site wastewater courses for adults in addition to directing on-site wastewater research projects for the Centre. In her previous position with a consulting engineering firm she was responsible for the design, inspection and troubleshooting of on-site systems all across the Province.

She will be responsible for the day-to-day coordination of the project, development of the reinspection methods and standards and delivery of the draft and final report.

Chris Kinsley, P.Eng.

Mr. Kinsley is a professional engineer with a wide range of experience in the on-site wastewater field. He is the General Manager and lead researcher at the ORWC. In addition he teaches college diploma courses in the environment field at the Alfred Campus of the University of Guelph as well as short courses for adult learners through ORWC. The new College Diploma of Environmental Management focuses on rural environmental issues and includes as part of the curriculum the OBC Part 8 certification.

Mr. Kinsley was an integral part of the Rural Wastewater Management Study commissioned by the City of Ottawa in 2003. As part of this project, Mr. Kinsley developed a sophisticated risk assessment model using GIS to determine a septic reinspection strategy for the City of Ottawa. His responsibilities for this project will include the data collection guidelines (Part C) which could be used to develop risk assessment models for reinspection programs. Mr. Kinsley will also provide technical support and input in other areas of this project.

Terry Davidson, P.Eng.

Mr. Davidson is the Director of the Ottawa Septic Office at the Rideau Valley Conservation Authority. The Ottawa Septic Office is the local regulatory agency for Part 8 of the Ontario Building Code in the Ottawa area. His responsibilities include managing inspection and approvals of all on-site wastewater systems in the city of Ottawa. Mr. Davidson has also been instrumental in implementing and delivering a septic reinspection program in his jurisdiction. Mr. Davidson will be responsible for providing technical support throughout the project, to act as an internal reviewer and provide input on the areas of deficiency in the current reinspection programs available throughout the province.

Sarah Willie, B.Sc.(Eng)

Ms. Willie is an Inspector at the Ottawa Septic Office at the Rideau Valley Conservation Authority. Ms. Willies' responsibilities include delivery of the inspection and approval of new building permit applications for on-site systems, as well as the delivery of the

septic reinspection program. Ms. Willie will be responsible for completing the Environmental Scan (Part A) portion of this project.

3.0 Proposed Workplan

3.1 Project Schedule and Deliverables

Given the timetable provided in the request for proposal documents, the following table work plan with deliverables has been developed based on project award by November 28, 2005.

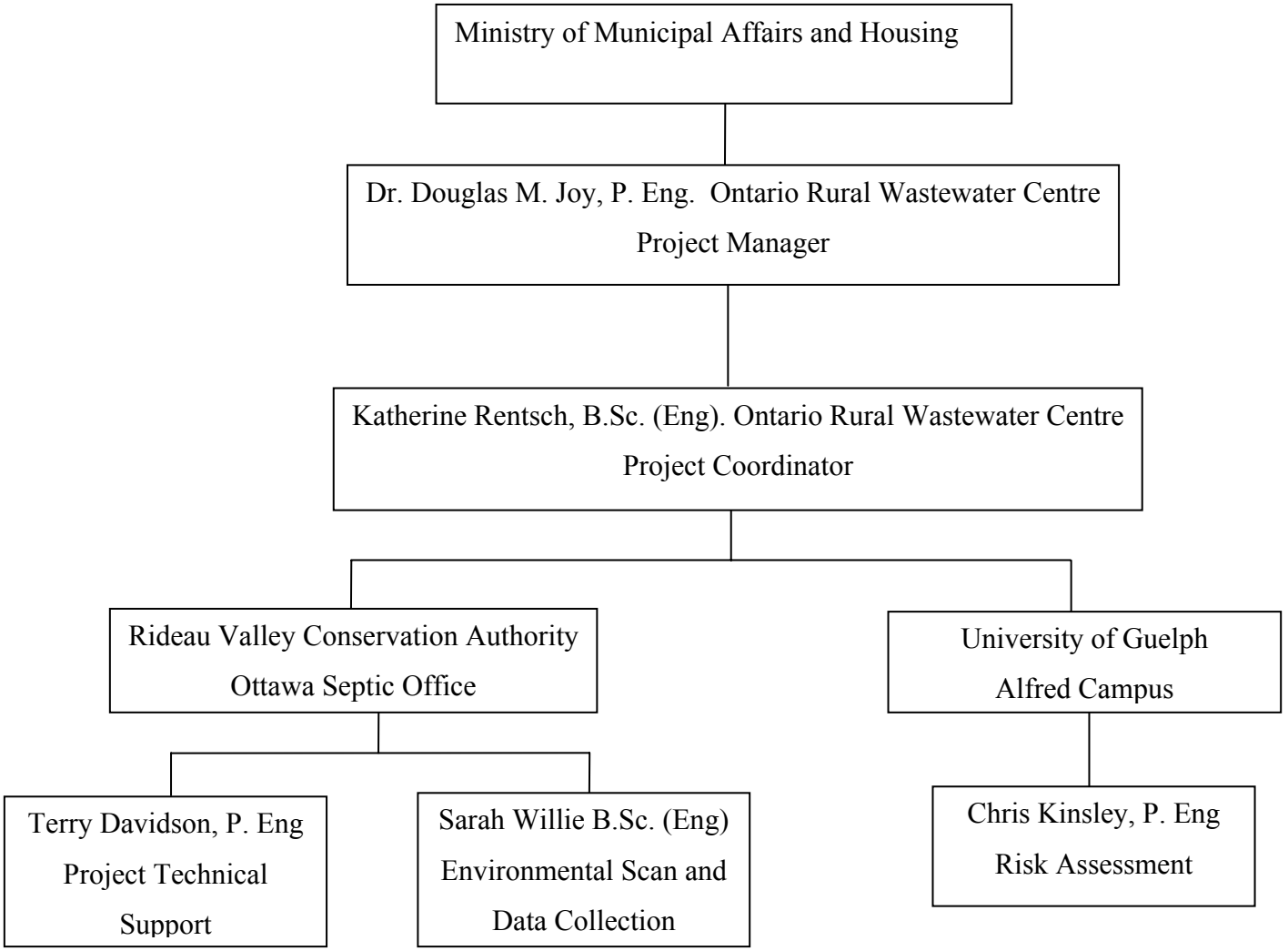
Table 1: Project Schedule

Task	Description	Team Member	Start Date	End Date
	Project Kick off Meeting with MAH	D. Joy , K. Rentsch	Nov. 30, 2005	Nov. 30, 2005
A1:	Develop written and phone survey	D. Joy, S. Willie	Dec. 1, 2005	Dec. 5, 2005
A2 – A4:	Environmental Scan	S. Willie, D. Joy	Dec. 6, 2005	Dec. 20, 2006
B1 – B8:	Develop Reinspection Standards and Methodology	K. Rentsch, D. Joy, T. Davidson	Dec. 21, 2005	Jan.10, 2006
C1 – C2:	Develop Data Collection Guidelines & Risk Process	C. Kinsley, D. Joy	Dec. 21, 2005	Jan.10, 2006
D1 – D2:	Develop Economic Impact Assessment	D. Joy, T. Davidson	Dec. 21, 2005	Jan.10, 2006
	Solicit stakeholder feedback	K. Rentsch	Jan.10, 2006	Jan. 20, 2006
	Draft Report	All		Jan. 30, 2006
	Meet with MAH to review draft report	D. Joy, K. Rentsch		Feb. 10, 2006
	Final Report	All		Mar. 6, 2006

3.2 Project Team Organization

Dr. Joy will be the project leader and be responsible for overall project management. Ms. Rentsch will direct the day-to-day activities of the project and all others will report to her. Liaisons with the Ministry will be by Dr. Joy and Ms. Rentsch. Figure 1 shows the proposed project team structure for this project.

Figure 1: Organizational Chart



3.3 Availability

All members of the project team have the required time available in the scheduled dates given in Table 1. The principal time commitments are for Ms. Willie and Ms. Rentsch. Ms. Willie will be given 2 weeks leave from her current duties with the RVCA in December to complete the environmental scan as this time of year the need for inspections are minimal. Ms. Rentsch's schedule will be adjusted to accommodate the development of reinspection standards and methodology in early January, and completion of the draft report. Mr. Kinsley and Dr. Joy will be able to complete their tasks (Parts C & D, respectively) as their teaching duties end on December 1st and neither have teaching duties in the upcoming winter semester.

3.4 Study Approach

The proposed approach to the work is straight forward and generally follows the activity descriptions in the RFP. Although not all the specific tasks are addressed here, all items in the RFP are to be addressed.

Part A

The first stage will be a simple questionnaire sent to all organizations in the province involved with any form of inspection of on-site systems to determine who are or have been involved with reinspection programs in the province. Although the study team is aware of most organizations who are involved with reinspection programs, this will ensure that none are missed. These will include health units, building offices, conservation authorities and Registered Code Agencies across the province. This is to answer the simple question, "who is doing reinspections".

It is expected that beyond those involved with reinspections under the auspices of the building code, contact will also be made with individuals who may carry out reinspections of on-site systems will also be part of the survey. This will include some individuals whose main activity is septic tank pumping or real estate inceptions who may also be active in the business of inspection.

Once the organizations involved with reinspections are identified, a standardized phone survey will be conducted of with the person responsible for the delivery of the program. Although

earlier surveys have been conducted by the ORWC on this topic, this survey will build on these earlier surveys to specifically focus on the questions for the proposal. Examples of two surveys developed for two earlier projects (Rondeau Park and Township of the Archipelago) are included in Appendix B. Specific information to be collected include:

- How are reinspections conducted?
- How is enforcement ensured?
- How is data on existing systems collected?
- How is data tracked?
- What standards are used for the various classes of systems?
- How is compliance with the existing code established?
- How is the inspection carried out? Who does it?
- What symptoms of failure are used?
- When is a more intrusive investigation required?
- What is the frequency of inspection?

It is expected the survey will be prepared as a first stage of the work and will be reviewed by MMAH before carrying out the survey in early December.

The RFP noted that other jurisdictions, outside of Ontario, may be identified by MAH for inclusion in the Environmental Scan. Although not budgeted for this can be done on a cost recovery basis and will depend on the number of jurisdictions to be considered. There are, of course, many jurisdictions that should be considered since other areas have been active with reinspections for some time. Suggestions include Ohio which has a fairly extensive program, North Carolina and some locations in Quebec, for example. The project team has contacts in all these areas should MAH decide to look outside Ontario.

In addition to the above information based on direct contact with those involved with inspection program, pertinent literature both web-based and printed, will be collected as part of the data base.

Part B

This part of the work requires the development of standards for re-inspection for systems which fall under the Ontario Building Code. The work will draw on the previous experience of team members developing a reinspection program for the City of Ottawa. Most importantly it will

incorporate the information collected in the Environmental Scan of Part A, respecting the variable jurisdictional considerations across the province. Once a draft standard and methodology is developed, it will be returned to MAH staff for review and to selected individuals identified in Part A as active in reinspections.

All items in Part B listed in Table A-1 of the RFP are to be addressed in these developed standards. The outcome would be a recommended set of standards for inspection and the justification for the standards. It is anticipated that these standards would then be made available across the Province for use by the many different agencies who may do the inspections. In recognition of the potentially varied users, these standards would be compiled into a checklist format with a guide for its use to try and help those who may use it.

Part C

The RFP calls for data collection guidelines that could be used to develop risk models for reinspection programs. Based on the types of systems currently being used, the process of the assignment of risk can range from the simple (e.g. the older it is, the higher the risk) to the highly complex (e.g. involving sophisticated computer models). Clearly a balance has to be struck between the availability of data and the time available for any risk based approach. As mentioned earlier the project team developed a risk-based model for the City of Ottawa for onsite systems and their inspections. Although the data availability in this area was quite high, unlike many other areas of the province, it can be used as a guide to the development of a model for use elsewhere. This experience, combined with the information collected in the Environmental Scan from across the province and consultation with stakeholders will lead to the development of a sensible process to assign risk for an on-site system.

It is expected that the process developed would not involve the use of sophisticated computed models but would use a scoring system based on a variety of features and information that would generally be known – as indicated by the Environmental Scan of Part A. Some of the features that are expected to be involved in the system include:

- Age of the system
- System type
- Density of systems

- Availability of building permit
- Sensitivity of nearby receiving waters
- Geological conditions (soil type, depth to groundwater, aquifer conductivity)

Part D Economic Impacts

In discussions with municipalities as part the Technical Experts Committee for the Source Water Protection Initiative it was clear that the cost of delivering inspection programs and the cost to homeowners of potential repairs was key to their willingness to buy into these programs. In short, the cost to the municipality and the cost to the homeowners were of key concern.

While many models for program financing exist (from homeowners pay all of the inspection cost to they pay nothing), alternatives will be explored in the Environmental Scan and successes and failures documented. As, well, for the cost of repairs the Scan will extract information on the cost of repairs and the options used for paying these. Again many models exist from the provision of low interest loans, putting the cost on an owner's tax bill to requiring the property owner to carry the entire burden.

An additional item of concern from an economic point of view is the question of whether the industry can support the large number of repairs that might be the outcome from an inspection program. Again, this information will be collected during the Environmental Scan stage and summarized in this section.

Additional Features

While not specifically called for in the proposal, two additional features are included as part of this proposal. Firstly, the timing of the completion of the project (Early March) is just before the annual Ontario Onsite Wastewater Conference scheduled for March 20 and 21st in Kitchener. The results of the study would be, if approved, presented at the conference which is attended by over 200 professionals active in the onsite industry.

A second feature that the project team can offer is the exposure of the results of the study through their ongoing workshop activities. With over a dozen workshops offered around the province every year, these represent an opportunity to get the information in the report widely

disseminated. Indeed the material may be suitable for a unique course on reinspection programs that the ORWC would offer on a cost recovery basis. An example of this is work carried out for the Ministry of the Environment on lime stabilization and the associated course for individuals in the septage haulage industry.

4.0 Budget

Details of the budget are outlined in Appendix A which includes Tables A-1 and A-2 and include all costs including labour, disbursements, taxes and contingencies for the work described in this proposal.

5.0 Conflict of Interest

No member of the work team is now nor is anticipated to be in a position of a conflict of interest with respect to the proposed work. None are employees of the Ministry of Municipal Affairs or any other provincial agency.

5.0 Tax Compliance and Proof of Insurance

A Tax Compliance form is included as part of Appendix C attached. The University of Guelph carries the necessary insurance and will provide the necessary certificate upon execution of the agreement.

6.0 Summary

The proposed work in developing a standard inspection protocol by the Ministry of Municipal Affairs and Housing is critical to the health of the onsite wastewater industry and the protection of source water in Ontario. It is both timely and highly needed.

The Ontario Rural Wastewater Centre project team brings a unique set of experiences with onsite systems to the proposed project which makes it uniquely qualified to carry out the project in a timely and effective manner. These experiences include not only direct experience with the inspection of onsite systems for compliance with the regulations, but also for failure analysis, research, design and compliance purposes. The proposed methodology will draw on not only the

experiences of the ORWC but also those involved with the inspection industry all across the Province. The outcome will be a set of guiding principles for the carrying out of inspection programs across the Province.

Appendix B – Environmental Scan Documents

Ontario Rural Wastewater Centre
University of Guelph, School of Engineering
Guelph, ON – N1G 2W1

January 18, 2006

Cataraqui Region Conservation Authority
P.O. Box 160
Glenburnie, ON K0H 1S0

Attention: Designated Sewage System Inspector

Re: Septic System Re-inspection Programs

Dear Sir or Madam,

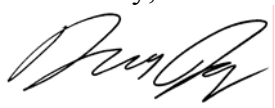
The Ontario Rural Wastewater Centre (ORWC) has recently been retained by the Ontario Ministry of Municipal Affairs & Housing (MAH) to develop Septic System Re-inspection Standards for existing septic systems across the province.

As you know septic system re-inspections are not mandatory in Ontario, although many jurisdictions have started these on their own initiative. An important component of this project involves carrying out a detailed environmental scan of Part 8 enforcement bodies to determine what, if any, re-inspection programs exist in the Province and how they are delivered. We need to determine who is carrying out re-inspection programs and, for those that are doing these, what they consist of. Could you please take the time to fill out the attached sheet indicating whether you do or do not carry out a re-inspection program and fax it back to us? We greatly appreciate your time taken to do this.

If your office is currently conducting a septic re-inspection program, or has conducted one in the past, we would be interested in discussing your approach with you. This would involve a short 30 minute telephone survey conducted by Katherine Rentsch of the ORWC or myself. We hope that by learning what as worked (and not worked) that we can develop a strategy for the Province that may work in all parts of the Province. If you have any questions contact Katherine Rentsch at 519 824 4120 x 54687 or via email at krentsch@uoguelph.ca.

Thank you for your interest in our project.

Yours truly,



Douglas Joy
General Manager

FAX

TO : Ontario Rural Wastewater Centre

ATTN: Katherine Rentsch

Number: 519.836.0227

From: _____

Municipality: _____

Phone Number: _____

Please Answer The Following Two Questions:

Are you currently conducting a septic system reinspection program in your municipality? YES/NO

Have you conducted a septic reinspection program in the past in your municipality? YES/NO

Re-Inspection Program Questionnaire

Basic Information:

Name:_____ Organization:_____

Date:_____ Number:_____

Introduction:

Thank you for agreeing to participate in this telephone survey. Before we begin, please let me quickly describe the purpose of this survey.

The Ontario Rural Wastewater Centre has been retained by the Ministry of Municipal Affairs & Housing to conduct research for consideration by the Government of Ontario. While the Government has not made any decision regard septic system re-inspections, the purpose of this technical research is to support the Ministry's consideration of some of the technical issues involved in potentially establishing a framework for septics reinspection programs.

Please note that municipal stakeholders will be consulted before any potential standards are introduced.

If you are ready, we can begin.

Administration

1. What year did you begin your re-inspection program?

2. Is your program a 1 time program or an on-going program?

   a. If on-going, what is the frequency of reinspections? (e.g., every 3 years?)
   b. If a 1 time program, have you completed the program? Yes/No

3. What was the duration of your program/contact, or, how long do you see the program continuing? _____Years

4. Is participation in the program mandatory for:

   a. all homeowners? Yes/No
   b. all businesses? Yes/No

5. For voluntary programs, what was the rate of participation? _____%

6. How many systems do you inspect per year?

Costs

7. How is the program financed?

_____ special levies for each inspection
_____ property taxes _____ if yes, is this itemized on the tax bill?
_____ revenues from regular Part 8 delivery program
_____ other (describe)

8. How are repairs financed?

_____ home owner pays full cost
_____ cost sharing between owner and municipality / conservation authority / board of health (circle all that apply)
_____ municipality / conservation authority / board of health (circle all that apply)
_____ other

9. Is financial help available for those who cannot afford to pay for the repairs? Yes/No

a. If yes, is it:
_____ grant
_____ low interest loan
_____ other

b. From what funding source?: _____

Details

10. Who conducts the re-inspections?
_____ Your regular septic inspectors
_____ Temporary employees trained for re-inspections (e.g. students)
_____ Private Agency
_____ Other (Describe)

11. Which of the following classes of systems are inspected?
_____ Class 1 (privies)
_____ Class 2 (Gray Water Systems)
_____ Class 3 (Cesspools)

_____ Class 4 (Conventional leaching beds and filter beds)
_____ Class 4 (Advanced treatment units)
_____ Class 5 (Holding Tanks)
_____ All

12. If you do not inspect all systems, how did you decide which systems to inspect?
    _____ Risk management (describe)
    _____ Age (describe)
    _____ Random
    _____ localized soil conditions
    _____ designated environmentally sensitive areas (e.g. shorelines)
    _____ Other (describe)

13. What is used to prioritize which systems to inspect first?
    _____ no prioritization (describe)
    _____ oldest / no permit on file first (describe)
    _____ based on results of advance survey (describe)
    _____ type of system (describe)
    _____ some type of risk analysis which may include age, type or location of system (describe)
    _____ volunteers (describe)
    _____ complaints (by neighbour or other property owner)
    _____ other (describe)

14. For the systems that are re-inspected, what percentage do you have existing records for?

15. To pass the re-inspection, must the system being inspected meet the current standards in the Building Code? Yes/No

16. If no, what standards are the systems expected to meet? How are these standards set?

17. Is the same standard used for all classes of systems? Yes/No
    a. If no, describe.

18. Within a particular class, do you use the same standard for all situations? For example, is the same standard used for an inground Class 4 systems and a raised Class 4 system. Yes/No.

19. How is compliance with the standard established?

20. Which symptoms of failures are used as benchmarks (select all that apply)?
    _____ soft ground
    _____ surface ponding
    _____ water in tank above outlet T
    _____ other

21. Which of the following activities are involved in the inspection (select all that apply):
    _____ Review of system against latest permit data
    _____ Identify location of sewage system on property
    _____ Surface inspection of the bed and tank
    _____ Opening and examination of inside of septic tank
    _____ Estimation of tank volume
    _____ Pumping of septic tank
    _____ Estimation of sludge depth/volume
    _____ Inspection of interior plumbing
    _____ Probing of bed
    _____ Excavation in bed
    _____ Soil sampling and analysis
    _____ Well testing / water quality results
    _____ Surface drainage assessment
    _____ Homeowner interview
    _____ Water consumption data
    _____ Estimation of pipe length
    _____ Estimation/measurements of separation distances
    _____ Inspection of mechanical equipment (pumps, aerators, alarms)
    _____ Other

22. If some of these activities are only done under special circumstances, what triggers this more intensive inspection?

23. As part of this re-inspection program, does your jurisdiction require mandatory septic tank pump-outs? Yes/No

    If yes:
    a. how often? Every _____ years
    b. How is this paid for? By owner____, By Municipality____, Other_____

24. Do you require mandatory pump-outs outside of the re-inspection program?

25. Apart from the actual re-inspections, what other components make up your program?

_____ newspaper advertisements
_____ town hall meetings
_____ mailout to homeowners
_____ other

Results

26. How many systems required remediation work to be completed? _____

27. Of the systems that require some amount of remedial work. What percentage required the following: (answer may be more than one)
    _____ complete system replacement
    _____ tank replacement
    _____ tank repair (includes baffles, lids, inlet/outlets etc.)
    _____ tank pumpout
    _____ equipment replacement (includes pump, filter, blowers etc.)
    _____ complete leaching bed replacement
    _____ modifications to distribution system (header, d-box, etc.)
    _____ modification to surface drainage
    _____ plumbing modifications
    _____ other

28. If the inspection indicates some remedial work is necessary, how is compliance ensured?
    _____ CBO issues order to comply
    _____ unsafe order
    _____ follow up inspection
    _____ verbal agreement/negotiation between inspector & property owner
    _____ 3rd party documentation
    _____ no enforcement
    _____ other (describe)

29. If an order to comply is issued, what is the time frame allowed to complete repairs? (range)

    a. Is the time frame based on the nature of the problem or risk associated with the problem? Yes/No
    b. If so, how? (describe)

30. If remedial work is required how often is a building permit required? _____%

    a. If yes, do you charge a fee? Yes/No
    b. If so, what is the fee?

31. Overall, what has the response been to the program for the following groups?
    Homeowners : _____ positive _____ negative_____ neutral
    Businesses : _____ positive _____ negative_____ neutral
    Rate payers ass: _____ positive _____ negative_____ neutral
    Politicians : _____ positive _____ negative_____ neutral

32. What is the average cost of repair? $_____

33. What is the cost per inspection? $_____ (range)

34. What was the average rate of non-compliance, i.e. the proportion of property owners who refuse to make necessary repairs?

Could you provide us with any of the following additional information:

1. Literature on your program, describing it, numbers, methodology
2. Any annual summary reports of program (including reports to Council)
3. Any survey sheets and/or tools used in the assessment
4. Any public education tools such as brochures, flyers etc.
5. Program budget summary

Thank you for your time and participation in this survey. Would you be willing to respond to any future follow-up questions we may have? Thank you once again.

Appendix C – Results of Environmental Scan

Table C1: Phase One Environmental Scan Results						
Name of Agency		**Response**				
		not responsible for part 8	delivering reinspection program currently		has delivered reinspection program in the past	
			YES	NO	YES	NO
1	Town of Mono	✓				
2	Township of Wellington North			✓		✓
3	Town of Fort Erie			✓		✓
4	City of Brantford			✓		✓
5	Maitland Valley CA			✓		✓
6	Town of Aurora			✓		✓
7	Saugeen Valley CA			✓		✓
8	Town of Halton Hills			✓		✓
9	Region of Waterloo PHU			✓		✓
10	Township of Wilmot			✓		✓
11	Ganaraska Region CA			✓		✓
12	Toronto Public Health			✓		✓
13	Central Lake Ontario CA			✓		✓
14	City of Cambridge			✓		✓
15	Township of Perth East			✓		✓
16	Grey Sauble CA			✓		✓
17	Town of Whitby			✓		✓
18	Township of Centre Wellington			✓		✓
19	City of Hamilton Public Health	✓		✓		✓
20	Town of Richmond Hill			✓		✓
21	Town of Markham			✓		✓
22	Town of Laurentian Hills			✓		✓
23	City of Burlington			✓		✓
24	Edwardsburgh/Cardinal			✓		✓
25	Town of Innisfil			✓		✓
26	Township of Georgian Bay		✓		✓	
27	Region of Peel Public Health*			✓	✓	
28	KFLA Public Health (for S. Frontenac)		✓		✓	
29	Town of Leamington			✓		✓
30	Township of Essa			✓		✓
31	Town of Kingsville*		✓		✓	
32	Simcoe Muskoka DHU	✓		✓		✓
33	Township of Seguin		✓		✓	
34	Town of Petawawa			✓		✓
35	Township of the Archipelago			✓	✓	
36	Sudbury District Health Unit			✓		✓
37	Town of Pelham, Twsp of Wainfleet	✓				
38	Town of South Bruce Penisula			✓	✓	
39	Sioux Lookout	✓				
40	Killaloe, Hagarty & Richards Twsp			✓		✓
41	Peterborough City & County HU			✓		✓
42	Guelph Eramosa Township			✓		✓

	Name of Agency	Response				
		not responsible for part 8	delivering reinspection program currently		has delivered reinspection program in the past	
			YES	NO	YES	NO
43	Township of Springwater			✓		✓
44	Town of New Tecumseth			✓		✓
45	City of Welland			✓		✓
46	Township of Adelaide Metcalfe			✓		✓
47	City of St. Catharines			✓		✓
48	Ausable Bayfield CA			✓	✓	
49	Town of Milton			✓		✓
50	Renfrew County & District HU			✓		✓
51	Wasaga Beach			✓		✓
52	Municipality of Brockton			✓		✓
53	Township of Tiny		✓			✓
54	City of Kawartha Lakes	✓				
55	Town of Caledon			✓		✓
56	Windsor Essex County HU			✓		✓
57	Algoma Health Unit			✓		✓
58	City of Brampton			✓		✓
59	Township of Tudor & Cashel			✓		✓
60	Township of Montague			✓		✓
61	Township of North Frontenac		✓			✓
62	Sault Ste. Marie Region CA*			✓	✓	
63	Township of Lake of Bays		✓		✓	
64	Twsp of Southwest Middlesex			✓		✓
65	Township of Severn		✓		✓	
66	Township of Middlesex Centre			✓		✓
67	Hastings & Prince Edward Cty HU	✓		✓		✓
68	Lakehead Region CA			✓		✓
69	Limerick Township			✓		✓
70	Town of Cobourg			✓		✓
71	Quinte Conservation			✓		✓
72	Township of Champlain			✓		✓
73	Township of Faraday			✓		✓
74	Township of Muskoka Lakes		✓		✓	
75	City of Kingston			✓		✓
76	Cataraqui Region CA			✓		✓
77	Township of Ramara		✓		✓	
78	Madawaska Valley Township			✓		✓
79	Town of Bracebridge		✓			✓
80	Township of Tay			✓		✓
81	City of Cornwall			✓		✓
82	Town of Gravenhurst		✓		✓	
83	Oxford County			✓		✓
84	Town of Renfrew			✓		✓

	Name of Agency	Response				
		not responsible for part 8	delivering reinspection program currently		has delivered reinspection program in the past	
			YES	NO	YES	NO
85	Township of Mapleton*		✓		✓	
86	Town of Oakville			✓		✓
87	Township of Hamilton			✓		✓
88	Nickel District CA			✓		✓
89	Armour Township			✓		✓
90	Town of Parry Sound	✓				
91	County of Brant			✓		✓
92	East Gwillimbury			✓		✓
93	Township of North Dundas			✓		✓
94	Town of Oakville			✓		✓
95	Town of Huntsville		✓		✓	
96	County of Lambton			✓		✓
97	City of Oshawa			✓		✓
98	City of Kitchener			✓		✓
99	Chatsworth			✓		✓
100	Township of Carlow/Mayo			✓		✓
101	Township of Howick			✓		✓
102	Town of Collingwood			✓		✓
103	Leeds Grenville Lanark District HU			✓	✓	
104	Penetanguishene			✓		✓
105	Georgina Island First Nation			✓	✓	
106	Municipality of Chatham-Kent*		✓		✓	
107	Centre Hastings			✓		✓
108	County of Huron Health Unit		✓			✓
109	Municipality of Morrie-Turnberry	✓				
110	County of Prince Edward			✓		✓
111	Grey Bruce Health Unit		✓		✓	
112	Durham Region Health Unit			✓		✓
113	South Bruce*			✓	✓	
114	Stirling Rowdon			✓		✓
115	Town of Whitchurch Stouffville			✓		✓
116	Six Nations of the Grand River		✓		✓	
117	Bradford West Gwillimbury			✓		✓
118	North Bay Mattawa CA		✓		✓	
119	Timiskaming Health Unit			✓		✓
120	Township of Beckwith			✓		✓
121	Municipality of Killarney	✓		✓		✓
122	Town of Midland			✓		✓
123	Dysart			✓	✓	
124	Municipality of Thames Centre			✓		✓
125	Township of McNab Braeside			✓		✓
126	Oro-Medente			✓	✓	
127	York Region Health Unit	✓				

	Name of Agency	Response				
		not responsible for part 8	delivering reinspection program currently		has delivered reinspection program in the past	
			YES	NO	YES	NO
128	Town of West Perth			✓		✓
129	Township of Stone Mills	✓				
130	Haldimand County			✓		✓
131	City of Belleville			✓		✓
132	Town of Newmarket			✓		✓
133	Eastern Ontario Health Unit			✓		✓
134	Middlesex/London Health Unit	✓				
135	City of Stratford			✓		✓
136	Municipality of Highlands East	✓				
137	County of Northumberland	✓				
138	Township of Whiteater Region			✓		✓
139	Raisin Region CA			✓		✓
140	Lower Thames Valley CA	✓				
141	Ogemawahj Tribal Council	✓				
142	Clearview Township			✓		✓
143	Town of St. Mary's			✓		✓
144	City of Toronto			✓		✓
145	City of Ottawa			✓		✓
146	Town of Tecumseh	✓				
147	City of Barrie			✓		✓
148	Porcupine Health Unit			✓		✓
149	Township of Southgate		✓			✓
150	Town of Bancroft			✓		✓
151	Laurentian Valley			✓		✓
152	District Muncicpality of Muskoka			✓		✓
153	City of Mississauga			✓		✓
154	North Perth			✓		✓
155	St. Clair Region CA			✓		✓
156	City of Windsor	✓				
157	Township of Tay Valley	✓	✓		✓	
	TOTAL		**21**	**121**	**26**	**116**

* = jurisdictions which only conduct reinspections for severances, real estate transactions or where specific problems have been identified.

Table C2: Phase Two Environmental Scan Results - Questions 1 - 6

Question No.	1	2	2a	2b		3	4				5	6
Organization	What year did you begin your program?	Is it a 1 time or an on-going program?	If on going, what is the frequency of reinspection?	If a 1 time program, have you completed the program?		What was the duration of your program, or, how long do you see it continuing?	Is participation mandatory for?				For voluntary programs, what was the rate of participation? (%)	How many systems do you inspect per year?
							homeowners		Businesses			
				Yes	No		Yes	No	Yes	No		
Oro-Medonte	2004	on-going	5-10 years					✓		✓	100%	500-600
Southgate	2000	1-time			✓	7 years		✓		✓	90-95%	200-250
South Bruce Penisula	2004	on-going	haven't completed 1st round yet			4 years	✓			✓		250
Tiny Township	2002	1-time			✓	10 years	✓		✓			1000
Town of Huntsville	2001	1-time	n/a	✓		5 years	✓		✓			1000
Town of Bracebridge	2000	on-going	10 years			n/a	✓		✓			300-400
Twp of Muskoka Lakes	2000	on-going	5 years				✓			✓		500
Town of Gravenhurst	2000	on-going	8 - 10 years					✓		✓	95%	400-600
Twp of Seguin	2000	on-going	5 years					✓		✓	100%	400 -700
Twp of Gerogian Bay	2000	on-going					✓		✓			200- 700
Twp of Lake of Bays	1999	1-time		✓		5 years	✓		✓			800
Twp of Severn	2002	on-going	5 years			indefinitely		✓		✓	75%	450-500
Twp of South Frontenac	2002	on-going	10 + years					✓		✓	100%	100-400
Twp of North Frontenac	2005	1-time			✓	5 - 10 years		✓		✓	100%	30 - 100
Twp of the Archipelago	1999	1-time		✓		7 years	✓		✓			300-800
Tay Valley	2004	1-time			✓	3 years		✓		✓	50-60%	100-150

Table C2: Phase Two Environmental Scan Results - Questions 7 - 9

Question No.	7					8				9		9a			9b
Organization	How is the program financed?					How are repairs financed?				Is financial Help available for those who cannot afford to pay for repairs?		If yes, is it:			From What funding source?
	levies per inspection	Property taxes	separate item on tax bill?	Revenuefrom Part 8	other	owner pays full cost	cost sharing	Municipality pays	other	Yes	No	grant	low interest loan	other	
Oro-Medonte		✓	No			✓					✓				
Southgate		✓	No			✓					✓				
South Bruce Penisula	✓					✓					✓				
Tiny Township	✓					✓				✓		✓			unknown
Town of Huntsville	✓					✓					✓				
Town of Bracebridge		✓	No	✓	revenue from reinspection program	✓					✓				
Twp of Muskoka Lakes		✓	No			✓					✓				
Town of Gravenhurst		□		✓		✓				✓		✓	✓		external gov't programs
Township of Seguin		✓	No			✓					✓				
Twp of Georgian Bay		✓	Yes			✓					✓				
Twp of Lake of Bays		✓	Yes			✓					✓				
Twp of Severn		✓	No			✓					✓				
Twp of South Frontenac		✓	No		HDRC grants	✓				✓				✓	Provincial Property standards, RAP.
Twp of North Frontenac		✓	No			✓					✓				
Twp of the Archipelago		✓	No			✓					✓				
Tay Valley		□			Township budgeted item	✓				✓	□	✓			Rideau Valley Rural Clean Water Program

Table C2: Phase Two Environmental Scan Results - Questions 10 - 11											
Question No.	10				11						
Organization	Who conducts the re-inspections?				Which of the following clases of systems are you inspecting?						
	your regular septic inspector	temp. employees trained for re-inspection	private agency	other	All	Class 1	Class 2	Class 3	Class 4 (conventional)	Class 4 (advanced)	Class 5
Oro-Medonte	✓				✓						
Southgate	✓				✓						
South Bruce Penisula		✓							✓	✓	✓
Tiny Township		✓			✓						
Town of Huntsville		✓			✓						
Town of Bracebridge		✓			✓						
Twp of Muskoka Lakes		✓			✓						
Town of Gravenhurst		✓			✓						
Twp of Seguin		✓			✓						
Twp of Georgian Bay	□			contract out	✓						
Twp of Lake of Bays	✓				✓						
Twp of Severn	✓				✓						
Twp of South Frontenac		✓			✓						
Twp of North Frontenac*		✓	□	RVCA & MVCA	✓						
Twp of the Archipelago		✓			✓						
Tay Valley	✓				✓						
* Note: The Township of North Fronetenac has contracted the reinspection program out to the RVCA and the MVCA, who in turn use temporary employees. For the purposes of Figure 5 Personnel for Reinspection Programs, North Forntenac's response has ben indicated as temporary employees.											

Table C2: Phase Two Environmental Scan Results - Questions 12 - 16

Question No.	12						13								14	15		16	16a
Organization	If you do not inspect all systems, how did you decide which systems to inspect?						What is used to prioritize which systems to inspect first?								What percentage of systems do you have records for?	To pass, must the system meet the current standards in the Building Code?		If not, what standards are they expected to meet?	How are these standards set?
	Risk Analysis	Age	Random	local soil condition	designated ESA	Other & Comment	no priority	oldest/no permit on file	advance survey	type of system	risk analysis	volunteer	complaint	other & comment		Yes	No		
Oro-Medonte						voluntary		2			1			knowledge of problems, high density	75 - 80%		✓	standards at yr of install	breakout
Southgate						voluntary								hamlets first, then west to east in twp	50%		✓	standards at yr of install	seepage or breakout
South Bruce Penisula		✓			✓	don't inspect if < 3 yrs	1								60-70%		✓	must be safe	
Tiny Township		✓				only systems built prior to 96		2			1				70%		✓	safe or unsafe,	standards at yr of install
Town of Huntsville		✓				only systems built prior to 97					1				80%		✓	standards at yr of install	obvious health risks
Town of Bracebridge						inspects ALL					1				80%		✓	functioning as intended, safe	health risks
Twp of Muskoka Lakes		✓			✓	lakes & shorelines		1						within specific area	0%		✓	maintained per original design	OBC 8.9.3 & 8.9.1.2
Town of Gravenhurst		✓			✓	only old and waterfront systems	✓								75%		✓	standards at yr of install	system is "sound"
Twp of Seguin							✓								60 - 70%		✓	standards at yr of install	
Twp of Georgian Bay	✓							✓					✓		95%		✓	safe vs. unsafe	

Table C2: Phase Two Environmental Scan Results - Questions 12 – 16 continued

Question No.	12						13								14	15		16	16a
Organization	If you do not inspect all systems, how did you decide which systems to inspect?						What is used to prioritize which systems to inspect first?								What percentage of systems do you have records for?	To pass, must the system meet the current standards in the Building Code?		If not, what standards are they expected to meet?	How are these standards set?
	Risk Analysis	Age	Random	local soil condition	designated ESA	Other & Comment	no priority	oldest/no permit on file	advance survey	type of system	risk analysis	volunteer	complaint	other & comment		Yes	No		
Twp of Lake of Bays						inspect ALL	✓								75%		✓	standards at yr of install	
Twp of Severn					✓	shorelines			✓				✓		90%		✓	standards at yr of install	
Twp of South Frontenac					✓	shorelines	✓								90%		✓	doesn't contravene 8.9.1.2	
Twp of North Frontenac	✓				✓	task force assess-ment		✓											
Twp of the Archipelago								✓					✓	pre 1980 = high 1993 = moderate 1994 & newer = low	44%		✓	deficiency letter	
Tay Valley		✓			✓						✓			lake associations	>50%		✓	no malfunctions	must meet clearance distance requirements

Table C2: Phase Two Environmental Scan Results - Questions 17 - 20

Question No.	17		18		19	20			
Organization	Is the same standard used for all classes sof systems?		Within a particular class, is the same standard for all situations?		How is compliance with the standard established?	Which symptoms of failures are used as benchmarks?			
	Yes	No	Yes	No		soft ground	surface ponding	water in tank above outlet T?	other
Oro-Medonte	✓		✓		site inspection	✓	✓		
Southgate	✓		✓		site inspection	✓	✓		
South Bruce Penisula	✓		✓		site inspection	✓	✓	✓	wooden tank
Tiny Township	✓		✓		site inspection and record of pumpout by hauler	✓	✓	✓	encroachment of setbacks, traffic/structures on lb, root intrusion, unsafe tank conditions
Town of Huntsville	✓		✓		site inspection	✓	✓		
Town of Bracebridge	✓		✓		site inspection	✓	✓	✓	steel tanks are considered failures
Twp of Muskoka Lakes	✓		✓		site inspection	✓	✓	✓	tree growth on bed, steel tanks, encroachment of setbacks, absence of LB
Town of Gravenhurst		✓	✓		site inspection	✓	✓	✓	
Twp of Seguin	✓		✓		site inspection	✓	✓	✓	trees on bed, off property, setback encroachment
Twp of Georgian Bay	✓		✓		site inspection		✓		
Twp of Lake of Bays	✓		✓		site inspection	✓	✓	✓	steel tanks are considered failures
Twp of Severn		✓	✓		site inspection		✓		look at record to determine design capacity
Twp of South Frontenac		✓	✓		site inspection		✓		
Twp of North Frontenac					site inspection	✓	✓	✓	
Twp of the Archipelago	✓		✓		site inspection	✓	✓		breakout at toe of bed
Tay Valley	✓		✓		records, visual inspection, tank excavation	✓	✓	✓	

Table C2: Phase Two Environmental Scan Results - Question 21

Question No.	21																		
Organization	Which of the following activities are involved in the inspection? ✓ = regular part of inspection, * = only triggered under certain circumstances																		
	reivew system against permit data	locate system on property	surface inspection of bed & tank	open & examine inside of tank	estimate tank volume	pump out tank	estimate sludge depth & volume	inspect interior plumbing	probing of bed	excavate in bed area	soil sampling/ testing	well testing/ water quality results	surface drainage assess-ment	property owner intervie w	water consump-tion data	estimate pipe length	estimate setback distances	inspect mechanical equipment	other
Oro-Medonte	✓	✓	✓						*	*		*	✓	✓					✓
Southgate	✓	✓	✓										✓	✓	□	✓	✓		✓
South Bruce Penisula	✓	✓	✓	✓	✓	✓	✓					✓	✓	✓					shoreline water sampling with colour-imeter
Tiny Township	✓	✓	✓	✓	✓	✓			✓	*			✓	*		✓	✓		trees etc. close to bed
Town of Huntsville	✓	✓	✓		✓				*	*			✓	*	✓	✓	✓		record of last pumpout
Town of Bracebridge	✓	✓	✓	*					*	*			✓	✓	*	✓	✓	✓	
Twp of Muskoka Lakes	✓	✓	✓	*	✓								✓			✓	✓		
Town of Gravenhurst	✓	✓	✓			*			*		*		✓	*					veget-ation on bed
Twp of Seguin	✓	✓	✓		✓				✓				✓			✓	✓		
Twp of Georgian Bay	✓	✓	✓	*										*					
Twp of Lake of Bays	✓	✓	✓	*		*							✓			✓	✓	✓	
Twp of Severn	✓	✓	✓	*	✓				✓	*			✓	✓		✓	✓	✓	
Twp of South Frontenac	✓	✓	✓	*	✓		*		*	*				✓		✓	✓		
Twp of North Frontenac	✓	✓	✓	*	✓				✓				✓	*		✓	✓		
Twp of the Archipelago	✓	✓	✓		✓	□	□	inspect exterior plumbing								✓	✓		
Tay Valley	✓	✓	✓	✓			✓	✓	✓			✓	✓	✓			✓	✓	

Table C2: Phase Two Environmental Scan Results - Question 22 - 26

Question No.	22	23		23a	23b	24		25				26
Organization	What triggers this more intesive inspection? (denoted by * in previous)	Do you require mandatory pump-outs as part of this program?		if yes, how often?	if yes, who pays for the pumpout?	Do you require mandatory pump-outs outside the program?		Apart from the actual re-inspections, what other components make up your program?				How many systems required mediation work to be completed as a percentage of total systems inspected?
		Yes	No			Yes	No	advertise in paper	town or assoc-iation meeting	mailout to owners	other	
Oro-Medonte	if breakout apparent		✓				✓		✓	✓	council mtg annoucements	5%
Southgate	if system is unsafe		✓				✓	✓	✓	✓		20% and dropping
South Bruce Penisula	n/a	✓		3 years	property owner		✓				education seminars before inspectors go out	10%
Tiny Township	based on indicators from pumpout record	✓		10 years	property owner		✓		✓		maintenance pamphlet	25%
Town of Huntsville	failure/breakout apparent		✓				✓				information pamphlet	25%
Town of Bracebridge	only open steel tanks, if bed failure conduct other items	✓		5 years	property owner		✓	✓			information pamphlet	30%
Twp of Muskoka Lakes	only open tank w. permission of owner	✓		only if steel tank	property owner		✓		✓		maintenance pamphlet	20 - 30%
Town of Gravenhurst	if noticeable odour		✓				✓	✓	✓			35-45%
Twp of Seguin	n/a		✓				✓		✓	✓		20%
Twp of Georgian Bay	only if surface breakout apparent		✓				✓	✓		✓		60 - 70%
Twp of Lake of Bays	only if steel tank present		✓				✓			✓		25%
Twp of Severn	if steel tank present or system is operating outside design capacity		✓				✓			✓	advance survey, forms for report	5%
Twp of South Frontenac	only if owner agrees		✓				✓			✓		10%
Twp of North Frontenac	if homeowner agrees		✓				✓		✓	✓		13%
Twp of the Archipelago	no		✓				✓	✓	✓	✓		22%
Tay Valley	postive response on homeowner survey		✓				✓		✓	✓	septic inspections for delivery of Part 8	21%

Table C2: Phase Two Environmental Scan Results - Question 27-28

Question No.	27										28						
Organization	Of the systems that require some amount of remedial work, what percentage required the following:										If the inspection indicates some remedial work is necessary, how is compliance ensured?						
	replace total system	replace tank	tank repair	tank pumpout	replace equip.	replace bed	modify distribution	modify drainage	modify plumbing	other	Order to Comply	Unsafe Order	follow up inspection	verbal or written direction	3rd party	no enforce-ment	other
Oro-Medonte							100%					1	2				
Southgate	50%	50%									2		3	1			
South Bruce Penisula	100%											2				1	
Tiny Township	10%	9%	8%		1%	7%	3%	2%	2%	25% remove tree, 13% decommission outhouse, 11% remove structure -bed, 9% remove structure -tank	2	3		1			Order not to Occupy
Town of Huntsville	25%	30%	25%			10%	5%	5%			3		2	1			
Town of Bracebridge	40%	15%	15%			15%		15%			2		1				
Twp of Muskoka Lakes	10%	50%	5%	5%		5%				25% tree removal or bushes	2			1			
Town of Gravenhurst	5%	15%	5%	15%		35%	5%	5%		5% line between tank & d-box is disconnected, 10% tree/bush removal			1				
Twp. Of Seguin										6 % blackwater discharge, 45% greywater discharge, 16% setback issues, 2% large objects on bed, 31% unsafe conditions	3	4	2	1			
Twp of Georgian Bay		50%				50%					1						
Twp of Lake of Bays	20%	40%	1%	20%	4%	5%	5%			5% tree removal					1		
Twp of Severn	85%	5%				5%	5%				2		1				3, civil courts
Twp of South Frontenac	15%	5%	55%			15%		10%			1	2					
Twp of North Frontenac		25%	25%				50%										
Twp of the Archipelago	50%	5%	5%			1%	10%				3	4	2	1			
Tay Valley	9%	4%	16%	10%						16% bed repairs,11% greywater discharge, 10% tree removal, 24% setback issues	2			1			

Table C2: Phase Two Environmental Scan Results - Question29 - 34

Question No.	29	29a		29b	30	30a		30b	31												32	33	34
Organization	If an order to comply is issued, what is the time frame allowed to complete repairs?	Is the time frame based on the nature of the problem or risk associated with the problem?		If so, how?	If remedial work is required how often is a building permit required?	If yes, do you charge a fee?		If so, what is the fee?	Overall, what has the response been to the program for the following groups?												Average cost of repair?	Cost Per inspection?	Average rate of non-compliance
									Homeowners			Businesses			Rate Payer's Association			Politicians					
		Yes	No			Yes	No		POS	NEG	NEU	POS	NEG	NEU	POS	NEG	NEU	POS	NEG	NEU			
Oro-Medonte	1 month				100%	✓		$100-$200	✓			✓			✓			✓			unknown	unknown	0%
Southgate	up to 2.5 years	✓			100%	✓		full charge	✓			✓			✓			✓			$3k - $20k	$50	50%
South Bruce Penisula	up to 6 months		✓		100%	✓		$250 - $450	✓					✓	✓					✓	unknown	$85, but going up to $170	2%
Tiny Township	1 month - 1year	✓		unsafe - immediate repair	25%	✓		$175 - $400			✓			✓	✓			✓			$500 - $6000	$70, + $120-$150 for pumpout	0%
Town of Huntsville	1 week - 2 months	✓		health risk - immediate repair	50%	✓		$200 - $350	✓			✓			✓			✓			$500 - $15,000	$40	0%
Town of Bracebridge	1 day - 1 month	✓		"polluting" system - immediate pumpout & repair	75%	✓		$100 - $350	✓			✓			✓			✓			$150	$25-$30	1%
Twp of Muskoka Lakes	1 month - 1year	✓		direct discharge - immediate stop use	90%	✓		$100 - $350	✓			✓			✓			✓			$300 - $15,000	$50	0%
Town of Gravenhurst	up to 6 months	✓		health risk	50%	✓		$100 - $350	✓					✓	✓					✓	$2000 - 20,000	$75?	
Twp. Of Seguin	unknown								✓					✓	✓			✓			unknown	$65	0%

Table B2: Phase Two Environmental Scan Results - Question29 – 34 continued

Question No.	29	29a		29b	30	30a		30b	31												32	33	34
Organization	If an order to comply is issued, what is the time frame allowed to complete repairs?	Is the time frame based on the nature of the problem or risk associated with the problem?		If so, how?	If remedial work is required how often is a building permit required?	If yes, do you charge a fee?		If so, what is the fee?	Overall, what has the response been to the program for the following groups?												Average cost of repair?	Cost Per inspection?	Average rate of non-compliance
									Homeowners			Businesses			Rate Payer's Association			Politicians						
		Yes	No			Yes	No		POS	NEG	NEU	POS	NEG	NEU	POS	NEG	NEU	POS	NEG	NEU			
Twp of Georgian Bay	1 month or next occupancy	✓		systems near lake given priority	10%	✓		$125 - $400	✓			✓			✓			✓			unknown	$50	0.10%
Twp of Lake of Bays	1 month - 1 year	✓		total failure - addressed within month	25%	✓		$250 - $400	✓			✓			✓			✓			$3000-$10000	$50	7-10%
Twp of Severn	1 week - 1 year	✓		depends on time of yr, occupancy & problem	100%	✓		$125-$400	✓					✓	✓			✓			$500-$6000	0 - comes out of general taxes	0.10%
Twp of South Frontenac	15-30 days	✓		bed failure - immediate	100%	✓		$110 - $400	✓			✓			✓			✓			$250 - $15,000	$50 - $60	0%
Twp of North Frontenac					100%	✓			✓					✓	✓			✓			unknown	unknown	0%
Twp of the Archipelago	10 - 30 days	✓		minor = 30 days, sewage on the ground = 1 day	60%	✓			✓			✓			✓			✓			unknown	$35	<1%
Tay Valley	15 days	✓				✓			✓					✓	✓					✓	unknown	$60 (not enough, add. funding req'd)	unknown