COUNCIL INFORMATION PACKAGE

SUMMARY

MAY 6, 2022

1. **C-2022-090**
   Correspondence received April 19, 2022 from the Office of the Regional Clerk to Local Area Municipalities, respecting the Ontario Housing Affordability Task Force report.

2. **C-2022-091**
   Correspondence dated May 5, 2022 from the City of Thorold, respecting a resolution regarding Bill 109 and the recommendations proposed by the Province's Housing Affordability Task Force.

3. **C-2022-092**
   Correspondence dated May 4, 2022 from the City of Thorold, respecting a resolution regarding Russian Sanctions.

4. **C-2022-093**
   Correspondence dated April 29, 2022 from the Office of the Regional Clerk to Local Area Municipalities and the Niagara Peninsula Conservation Authority, respecting Report PDS 14-2022 regarding Proposed Niagara Official Plan.

5. **C-2022-094**
   Correspondence received April 29, 2022 from the Niagara Peninsula Conservation Authority, respecting Board of Directors Meeting Highlights from April 22, 2022.

6. **C-2022-095**
   Correspondence dated April 26, 2022 from the Office of the Regional Clerk, respecting PDS 9-2022; 2021 Census Series: Population and Dwelling Counts.

7. **C-2022-096**
   Correspondence dated April 22, 2022 from the Office of the Regional Clerk, respecting PDS 13-2022; 2021 Reserve Water and Wastewater Treatment Capacities.

8. **C-2022-097**
   Correspondence dated April 26, 2022 from the Office of the Regional Clerk, respecting PDS 4-2022; Development Applications Monitoring Report – 2021 Year End.

9. **C-2022-098**
   Correspondence dated April 22, 2022 from the Office of the Regional Clerk, respecting PW 11-2022; Inspection Programs and Condition of Niagara Region Trunk Sanitary Sewer Infrastructure.

10. **C-2022-099**
Correspondence dated April 22, 2022 from the Office of the Regional Clerk, respecting PW 14-2022; Inspection of Regional Water Infrastructure.

11. **C-2022-100**
Correspondence dated April 22, 2022 from the Municipality of Arran-Elderslie, respecting a Multi Municipal Working Group resolution regarding proposals for setbacks from wind turbines.

12. **C-2022-101**
Correspondence dated April 20, 2022 from the Town of Halton Hills to the Honourable Steve Clark, Minister of Municipal Affairs and Housing, respecting a resolution regarding action on climate change related to the Building Code.

13. **C-2022-102**
Correspondence dated April 20, 2022 from the Municipality of Hastings Highlands to the Honourable Doug Ford, Premier of Ontario, respecting a resolution of support for Clearview Township's request to Premier Ford for funding support for more funding to rural municipalities to support infrastructure projects.

14. **C-2022-103**
Correspondence dated April 5, 2022 from the Town of Cochrane, respecting a resolution proclaiming 2022 as the Year of the Garden.

Received April 19, 2022
C-2022-090

Report of the

Ontario Housing Affordability Task Force

Contents

Letter to Minister Clark

Dear Minister Clark,

Hard-working Ontarians are facing a housing crisis. For many years, the province has not built enough housing to meet the needs of our growing population. While the affordability crisis began in our large cities, it has now spread to smaller towns and rural communities.

Efforts to cool the housing market have only provided temporary relief to home buyers. The long-term trend is clear: house prices are increasing much faster than Ontarian's incomes. The time for action is now.

When striking the Housing Affordability Task Force, you and Premier Ford were clear: you wanted actionable, concrete solutions to help Ontarians and there was no time to waste. You asked us to be bold and gave us the freedom and independence to develop our recommendations.

In the past two months, we have met municipal leaders, planners, unions, developers and builders, the financial sector, academics, think tanks and housing advocates. Time was short, but solutions emerged consistently around these themes:

- More housing density across the province
- End exclusionary municipal rules that block or delay new housing
- Depoliticize the housing approvals process
- Prevent abuse of the housing appeals system
- Financial support to municipalities that build more housing

We present this report to you not as an "all or nothing" proposal, but rather as a list of options that the government has at its disposal to help address housing affordability for Ontarians and get more homes built. We propose an ambitious but achievable target: 1.5 million new homes built in the next ten years.

Parents and grandparents are worried that their children will not be able to afford a home when they start working or decide to start a family. Too many Ontarians are unable to live in their preferred city or town because they cannot afford to buy or rent.

The way housing is approved and built was designed for a different era when the province was less constrained by space and had fewer people. But it no longer meets the needs of Ontarians. The balance has swung too far in favour of lengthy consultations, bureaucratic red tape, and costly appeals. It is too easy to oppose new housing and too costly to build. We are in a housing crisis and that demands immediate and sweeping reforms.

It has been an honour to serve as Chair, and I am proud to submit this report on behalf of the entire Task Force.

Jake Lawrence
Chair, Housing Affordability Task Force
Chief Executive Officer and Group Head, Global Banking and Markets, Scotiabank

Executive summary and recommendations

House prices in Ontario have almost tripled in the past 10 years, growing much faster than incomes. This has home ownership beyond the reach of most first-time buyers across the province, even those with well-paying jobs. Housing has become too expensive for rental units and it has become too expensive in rural communities and small towns. The system is not working as it should.

For too long, we have focused on solutions to "cool" the housing market. It is now clear that we do not have enough homes to meet the needs of Ontarians today, and we are not building enough to meet the needs of our growing population. If this problem is not fixed – by creating more housing to meet the growing demand – housing prices will continue to rise. We need to build more housing in Ontario.

This report sets out recommendations that would set a bold goal and clear direction for the province, increase density, remove exclusionary rules that prevent housing growth, prevent abuse of the appeals process, and make sure municipalities are treated as partners in this process by incentivizing success.

Setting bold targets and making new housing the planning priority

Recommendations 1 and 2 urge Ontario to set a bold goal of adding 1.5 million homes over the next 10 years and update planning guidance to make this a priority.

The task force then recommends actions in five main areas to increase supply:

Require greater density

Land is not being used efficiently across Ontario. In too many neighbourhoods, municipal rules only allow single-family homes – not even a granny suite. Taxpayers have invested heavily in subway, light rail, bus and rail lines and highways, and the streets nearby are ideally suited for more mid- and high-rise housing. Underused or redundant commercial and industrial buildings are ripe to be redeveloped into housing or mixed commercial and residential use. New housing on undeveloped land should also be higher density than traditional suburbs, especially close to highways.

Adding density in all these locations makes better use of infrastructure and helps to save land outside urban boundaries. Implementing these recommendations will provide Ontarians with many more options for housing.

Recommendations 3 through 11 address how Ontario can quickly create more housing supply by allowing more housing in more locations "as of right" (without the need for municipal approval) and make better use of transportation investments.

Reduce and streamline urban design rules

Municipalities require numerous studies and set all kinds of rules for adding housing, many of which go well beyond the requirements of the provincial Planning Act. While some of this guidance has value for urban design, some rules appear to be arbitrary and not supported by evidence – for example, requiring condo buildings to include costly parking stalls even though many go unsold. These rules and requirements result in delays and extra costs that make housing either impossible to build or very expensive for the eventual home buyer or renter.

Recommendation 12 would set uniform provincial standards for urban design, including building shadows and setbacks, do away with rules that prioritize preservation of neighbourhood physical character over new housing, no longer require municipal approval of design matters like a building's colour, texture, type of material or window details, and remove or reduce parking requirements in cities over 50,000 in population.

Depoliticize the process and cut red tape

NIMBYism (not in my backyard) is a major obstacle to building housing. It drags out the approval process, pushes up costs, and keeps out new residents. Because local councillors depend on the votes of residents who want to keep the status quo, the planning process has become politicized. Municipalities allow far more public consultation than is required, often using formats that make it hard for working people and families with young children to take part. Too few technical decisions are delegated to municipal staff. Pressure to designate buildings with little or no heritage value as "heritage" if development is proposed and bulk listings of properties with "heritage potential" are also standing in the way of getting homes built. Dysfunction throughout the system, risk aversion and needless bureaucracy have resulted in a situation where Ontario lags the rest of Canada and the developed world in approval times. Ontarians have waited long enough.

Recommendations 13 through 25 would require municipalities to limit consultations to the legislated maximum, ensure people can take part digitally, mandate the delegation of technical decisions, prevent abuse of the heritage process and see property owners compensated for financial loss resulting from designation, restore the right of developers to appeal Official Plans and Municipal Comprehensive Reviews, legislate timelines for approvals and enact several other common sense changes that would allow housing to be built more quickly and affordably.

Fix the Ontario Land Tribunal

Largely because of the politicization of the planning process, many proponents look to the Tribunal, a quasi-judicial body, to give the go-ahead to projects that should have been approved by the municipality. Even when there is municipal approval, however, opponents appeal to the Tribunal – paying only a $400 fee – knowing that this may well succeed in delaying a project to the point where it might no longer make economic sense. As a result, the Tribunal faces a backlog of more than 1,000 cases and is seriously under-resourced.

Recommendations 26 through 31 seek to weed out or prevent appeals aimed purely at delaying projects, allow adjudicators to award costs to proponents in more cases, including instances where a municipality has refused an approval to avoid missing a legislated deadline, reduce the time to issue decisions, increase funding, and encourage the Tribunal to prioritize cases that would increase housing supply quickly as it tackles the backlog.

Support municipalities that commit to transforming the system

Fixing the housing crisis needs everyone working together. Delivering 1.5 million homes will require the provincial and federal governments to invest in change. Municipalities that make the difficult but necessary choices to grow housing supply should be rewarded, and those that resist new housing should see funding reductions.

Recommendations 49 and 50 call for Ontario government to create a large "Ontario Housing Delivery Fund" and encourage the federal government to match funding, and suggest how the province should reward municipalities that support change and reduce funding for municipalities that do not.

This executive summary focuses on the actions that will get the most housing units approved and built in the shortest time. Other recommendations in the report deal with issues that are important but may take more time to resolve or may not directly increase supply (recommendation numbers are indicated in brackets): improving tax and municipal financing (**32-37, 39, 42-44**); encouraging new pathways to home ownership (**38, 40, 41**); and addressing labour shortages in the construction industry (**45-47**).

This is not the first attempt to "fix the housing system". There have been efforts for years to tackle increasing housing prices and find solutions. This time must be different. **Recommendations 50-55** set out ways of helping to ensure real and concrete progress on providing the homes Ontarians need.

Introduction

Ontario is in a housing crisis. Prices are skyrocketing: the average price for a house across Ontario was $923,000 at the end of 2021.[1] Ten years ago, the average price was $329,000.[2] Over that period, average house prices have climbed 180% while average incomes have grown roughly 38%.[3] [4]

Not long ago, hard-working Ontarians – teachers, construction workers, small business owners – could afford the home they wanted. In small towns, it was reasonable to expect that you could afford a home in the neighbourhood you grew up in. Today, home ownership or finding a quality rental is now out of reach for too many Ontarians. The system is not working as it should be.

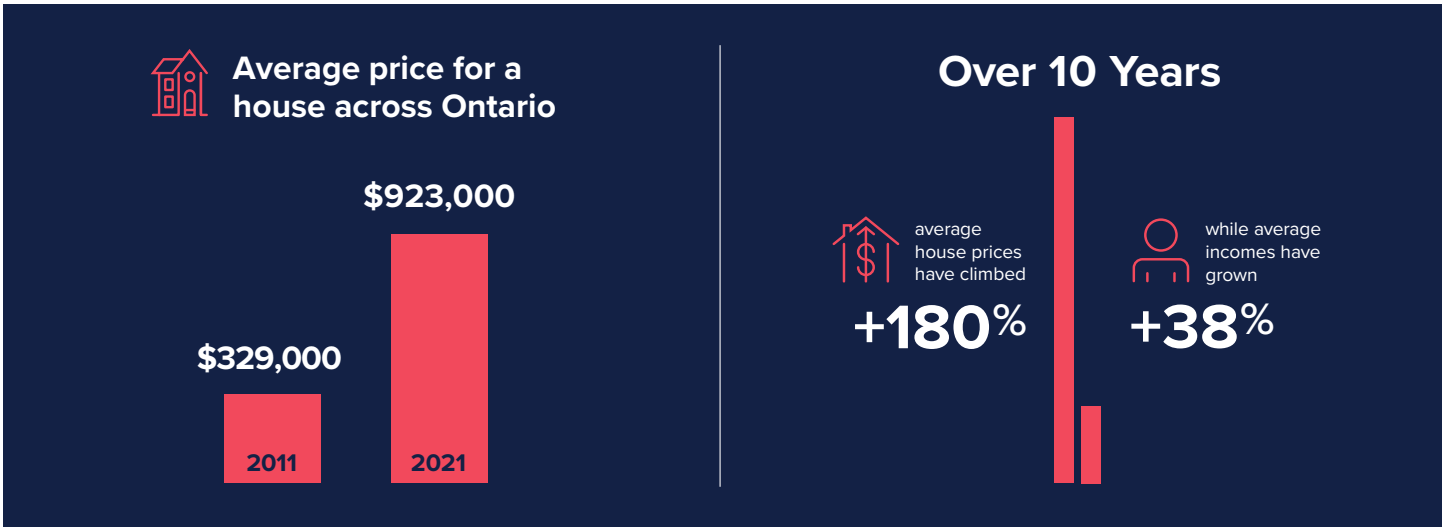
Housing has become too expensive for rental units and it has become too expensive in rural communities and small towns.

While people who were able to buy a home a decade or more ago have built considerable personal equity, the benefits of having a home aren't just financial. Having a place to call home connects people to their community, creates a gathering place for friends and family, and becomes a source of pride.

Today, the reality for an ever-increasing number of Ontarians is quite different. Everyone in Ontario knows people who are living with the personal and financial stress of not being able to find housing they can afford. The young family who can't buy a house within two hours of where they work. The tenant with a good job who worries about where she'll find a new apartment she can afford if the owner decides to sell. The recent graduate who will have to stay at home for a few more years before he can afford to rent or buy.

While the crisis is widespread, it weighs more heavily on some groups than on others. Young people starting a family who need a larger home find themselves priced out of the market. Black, Indigenous and marginalized people face even greater challenges. As Ontarians, we have only recently begun to understand and address the reality of decades of systemic racism that has resulted in lower household incomes, making the housing affordability gap wider than average.

The high cost of housing has pushed minorities and lower income Ontarians further and further away from job markets. Black and Indigenous homeownership rates are less than half of the provincial average.[5] And homelessness rates among Indigenous Peoples are 11 times the national average. When housing prevents an individual from reaching their full potential, this represents a loss to every Ontarian: lost creativity, productivity, and revenue. Lost prosperity for individuals and for the entire Ontario economy.



As much as we read about housing affordability being a challenge in major cities around the world, the depth of the challenge has become greater in Ontario and Canada than almost anywhere in the developed world.

Canada has the lowest amount of housing per population of any G7 country.

How did we get here? Why do we have this problem?

A major factor is that there just isn't enough housing. A 2021 Scotiabank study showed that Canada has the fewest housing units per population of any G7 country – and, our per capita housing supply has *dropped* in the past five years.[6] An update to that study released in January 2022 found that two thirds of Canada's housing shortage is in Ontario.[7] Today, Ontario is 1.2 million homes – rental or owned – short of the G7 average. With projected population growth, that huge gap is widening, and bridging it will take immediate, bold and purposeful effort. And to support population growth in the next decade, we will need one million more homes.

While governments across Canada have taken steps to "cool down" the housing market or provide help to first-time buyers, these demand-side solutions only work if there is enough supply. Shortages of supply in any market have a direct impact on affordability. Scarcity breeds price increases. Simply put, if we want more Ontarians to have housing, we need to build more housing in Ontario.

Ontario must build 1.5 million homes over the next 10 years to address the supply shortage

The housing crisis impacts all Ontarians. The ripple effect of the crisis also holds back Ontario reaching its full potential.

Economy

Businesses of all sizes are facing problems finding and retaining workers. Even high-paying jobs in technology and manufacturing are hard to fill because there's not enough housing nearby. This doesn't just dampen the economic growth of cities, it makes them less vibrant, diverse, and creative, and strains their ability to provide essential services.

Public services

Hospitals, school boards and other public service providers across Ontario report challenges attracting and retaining staff because of housing costs. One town told us that it could no longer maintain a volunteer fire department, because volunteers couldn't afford to live within 10 minutes drive of the firehall.

Environment

Long commutes contribute to air pollution and carbon emissions. An international survey of 74 cities in 16 countries found that Toronto, at 96 minutes both ways, had the longest commute times in North America and was essentially tied with Bogota, Colombia, for the longest commute time worldwide.[8] Increasing density in our cities and around major transit hubs helps reduce emissions to the benefit of everyone.

Ontario must build

1.5M

homes over the next **10 years** to address the supply shortage.

Our mandate and approach

Ontario's Minister of Municipal Affairs and Housing tasked us with recommending ways to accelerate our progress in closing the housing supply gap to improve housing affordability.

Time is of the essence. Building housing now is exactly what our post-pandemic economy needs. Housing construction creates good-paying jobs that cannot be outsourced to other countries. Moreover, the pandemic gave rise to unprecedented levels of available capital that can be invested in housing – if we can just put it to work.

We represent a wide range of experience and perspectives that includes developing, financing and building homes, delivering affordable housing, and researching housing market trends, challenges and solutions. Our detailed biographies appear as Appendix A.

We acknowledge that every house in Ontario is built on the traditional territory of Indigenous Peoples.

People in households that spend 30% or more of total household income on shelter expenses are defined as having a "housing affordability" problem. Shelter expenses include electricity, oil, gas, coal, wood or other fuels, water and other municipal services, monthly mortgage payments, property taxes, condominium fees, and rent.

Our mandate was to focus on how to increase market housing supply and affordability. By market housing, we are referring to homes that can be purchased or rented without government support.

Affordable housing (units provided at below-market rates with government support) was not part of our mandate. The Minister and his cabinet colleagues are working on that issue. Nonetheless, almost every stakeholder we spoke with had ideas that will help deliver market housing and also make it easier to deliver affordable housing. However, affordable housing is a societal responsibility and will require intentional investments and strategies to bridge the significant affordable housing gap in this province. We have included a number of recommendations aimed at affordable housing in the body of this report, but have also included further thoughts in Appendix B.

We note that government-owned land was also outside our mandate. Many stakeholders, however, stressed the value of surplus or underused public land and land associated with major transit investments in finding housing solutions. We agree and have set out some thoughts on that issue in Appendix C.

How we did our work

Our Task Force was struck in December 2021 and mandated to deliver a final report to the Minister by the end of January 2022. We were able to work to that tight timeline because, in almost all cases, viewpoints and feasible solutions are well known. In addition, we benefited from insights gleaned from recent work to solve the problem in other jurisdictions.

During our deliberations, we met with and talked to over 140 organizations and individuals, including industry associations representing builders and developers, planners, architects, realtors and others; labour unions; social justice advocates; elected officials at the municipal level; academics and research groups; and municipal planners. We also received written submissions from many of these participants. In addition, we drew on the myriad public reports and papers listed in the References.

We thank everyone who took part in sessions that were uniformly helpful in giving us a deeper understanding of the housing crisis and the way out of it. We also thank the staff of the Ministry of Municipal Affairs and Housing who provided logistical and other support, including technical briefings and background.

The way forward

The single unifying theme across all participants over the course of the Task Force's work has been the urgency to take decisive action. Today's housing challenges are incredibly complex. Moreover, developing land, obtaining approvals, and building homes takes years.

Some recommendations will produce immediate benefits, others will take years for the full impact.

This is why there is no time to waste. We urge the Minister of Municipal Affairs and Housing and his cabinet colleagues to continue measures they have already taken to accelerate housing supply and to move quickly in turning the recommendations in this report into decisive new actions.

The province must set an ambitious and bold goal to build 1.5 million homes over the next 10 years. If we build 1.5 million new homes over the next ten years, Ontario can fill the housing gap with more affordable choices, catch up to the rest of Canada and keep up with population growth.

By working together, we can resolve Ontario's housing crisis. In so doing, we can build a more prosperous future for everyone.

The balance of this report lays out our recommendations.

Focus on getting more homes built

Resolving a crisis requires intense focus and a clear goal. The province is responsible for the legislation and policy that establishes the planning, land use, and home building goals, which guide municipalities, land tribunals, and courts. Municipalities are then responsible for implementing provincial policy in a way that works for their communities. The province is uniquely positioned to lead by shining a spotlight on this issue, setting the tone, and creating a single, galvanizing goal around which federal support, provincial legislation, municipal policy, and the housing market can be aligned.

In 2020, Ontario built about 75,000 housing units.[9] For this report, we define a housing unit (home) as a single dwelling (detached, semi-detached, or attached), apartment, suite, condominium or mobile home. Since 2018, housing completions have grown every year as a result of positive measures that the province and some municipalities have implemented to encourage more home building. But we are still 1.2 million homes short when compared to other G7 countries and our population is growing. The goal of 1.5 million homes feels daunting – but reflects both the need and what is possible. In fact, throughout the 1970s Ontario built more housing units each year than we do today.[10]

The second recommendation is designed to address the growing complexity and volume of rules in the legislation, policy, plans and by-laws, and their competing priorities, by providing clear direction to provincial agencies, municipalities, tribunals, and courts on the overriding priorities for housing.

1. Set a goal of building 1.5 million new homes in ten years.
2. Amend the Planning Act, Provincial Policy Statement, and Growth Plans to set "growth in the full spectrum of housing supply" and "intensification within existing built-up areas" of municipalities as the most important residential housing priorities in the mandate and purpose.

The "missing middle" is often cited as an important part of the housing solution. We define the missing middle as mid-rise condo or rental housing, smaller houses on subdivided lots or in laneways and other additional units in existing houses.

Making land available to build

The Greater Toronto Area is bordered on one side by Lake Ontario and on the other by the protected Greenbelt. Similarly, the Ottawa River and another Greenbelt constrain land supply in Ottawa, the province's second-largest city.

But a shortage of land isn't the cause of the problem. Land is available, both inside the existing built-up areas and on undeveloped land outside greenbelts.

We need to make better use of land. Zoning defines what we can build and where we can build. If we want to make better use of land to create more housing, then we need to modernize our zoning rules. We heard from planners, municipal councillors, and developers that "as of right" zoning – the ability to by-pass long, drawn out consultations and zoning by-law amendments – is the most effective tool in the provincial toolkit. We agree.

Stop using exclusionary zoning that restricts more housing

Too much land inside cities is tied up by outdated rules. For example, it's estimated that 70% of land zoned for housing in Toronto is restricted to single-detached or semi-detached homes.[11] This type of zoning prevents homeowners from adding additional suites to create housing for Ontarians and income for themselves. As one person said, "my neighbour can tear down what was there to build a monster home, but I'm not allowed to add a basement suite to my home."

It's estimated that

70%

of land zoned for housing in Toronto is restricted to **single-detached** or **semi-detached** homes.

While less analysis has been done in other Ontario communities, it's estimated that about half of all residential land in Ottawa is zoned for single-detached housing, meaning nothing else may be built on a lot without public consultation and an amendment to the zoning by-law. In some suburbs around Toronto, single unit zoning dominates residential land use, even close to GO Transit stations and major highways.

One result is that more growth is pushing past urban boundaries and turning farmland into housing. Undeveloped land inside and outside existing municipal boundaries must be part of the solution, particularly in northern and rural communities, but isn't nearly enough on its own. Most of the solution must come from densification. Greenbelts and other environmentally sensitive areas must be protected, and farms provide food and food security. Relying too heavily on undeveloped land would whittle away too much of the already small share of land devoted to agriculture.

Modernizing zoning would also open the door to more rental housing, which in turn would make communities more inclusive.

Allowing more gentle density also makes better use of roads, water and wastewater systems, transit and other public services that are already in place and have capacity, instead of having to be built in new areas.

The Ontario government took a positive step by allowing secondary suites (e.g., basement apartments) across the province in 2019. However, too many municipalities still place too many restrictions on implementation. For the last three years, the total number of secondary suites in Toronto has actually declined each year, as few units get permitted and owners convert two units into one.[12]

These are the types of renovations and home construction performed by small businesses and local trades, providing them with a boost.

Underused and vacant commercial and industrial properties are another potential source of land for housing. It was suggested to us that one area ripe for redevelopment into a mix of commercial and residential uses is the strip mall, a leftover from the 1950s that runs along major suburban streets in most large Ontario cities.

"As of right" zoning allows more kinds of housing that are accessible to more kinds of people. It makes neighbourhoods stronger, richer, and fairer. And it will get more housing built in existing neighbourhoods more quickly than any other measure.

3. Limit exclusionary zoning in municipalities through binding provincial action:

   a) Allow "as of right" residential housing up to four units and up to four storeys on a single residential lot.

   b) Modernize the Building Code and other policies to remove any barriers to affordable construction and to ensure meaningful implementation (e.g., allow single-staircase construction for up to four storeys, allow single egress, etc.).

4. Permit "as of right" conversion of underutilized or redundant commercial properties to residential or mixed residential and commercial use.

5. Permit "as of right" secondary suites, garden suites, and laneway houses province-wide.

6. Permit "as of right" multi-tenant housing (renting rooms within a dwelling) province-wide.

7. Encourage and incentivize municipalities to increase density in areas with excess school capacity to benefit families with children.

Align investments in roads and transit with growth

Governments have invested billions of dollars in highways, light rail, buses, subways and trains in Ontario. But without ensuring more people can live close to those transit routes, we're not getting the best return on those infrastructure investments.

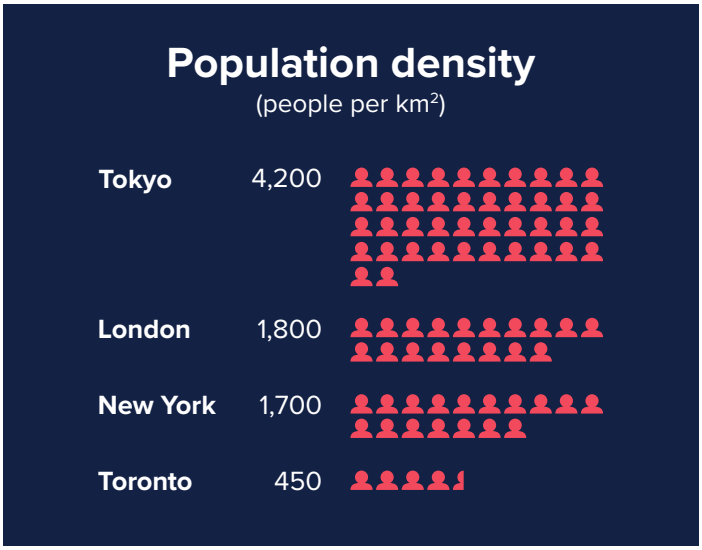
Access to transit is linked to making housing more affordable: when reliable transit options are nearby, people can get to work more easily. They can live further from the centre of the city in less expensive areas without the added cost of car ownership.

The impacts of expanding public transit go far beyond serving riders. These investments also spur economic growth and reduce traffic congestion and emissions. We all pay for the cost of transit spending, and we should all share in the benefits.

If municipalities achieve the right development near transit – a mix of housing at high- and medium-density, office space and retail – this would open the door to better ways of funding the costs. Other cities, like London, UK and Hong Kong, have captured the impacts of increased land value and business activity along new transit routes to help with their financing.

Ontario recently created requirements (residents/hectare) for municipalities to zone for higher density in transit corridors and "major transit station areas".[13] These are areas surrounding subway and other rapid transit stations and hubs. However, we heard troubling reports that local opposition is blocking access to these neighbourhoods and to critical public transit stations. City staff, councillors, and the province need to stand up to these tactics and speak up for the Ontarians who need housing.

The Province is also building new highways in the Greater Golden Horseshoe, and it's important to plan thoughtfully for the communities that will follow from these investments, to make sure they are compact and liveable.



8. Allow “as of right” zoning up to unlimited height and unlimited density in the immediate proximity of individual major transit stations within two years if municipal zoning remains insufficient to meet provincial density targets.
9. Allow “as of right” zoning of six to 11 storeys with no minimum parking requirements on any streets utilized by public transit (including streets on bus and streetcar routes).
10. Designate or rezone as mixed commercial and residential use all land along transit corridors and redesignate all Residential Apartment to mixed commercial and residential zoning in Toronto.
11. Support responsible housing growth on undeveloped land, including outside existing municipal boundaries, by building necessary infrastructure to support higher density housing and complete communities and applying the recommendations of this report to all undeveloped land.

Start saying “yes in my backyard”

Even where higher density is allowed in theory, the official plans of most cities in Ontario contain conflicting goals like maintaining “prevailing neighbourhood character”. This bias is reinforced by detailed guidance that often follows from the official plan. Although requirements are presented as “guidelines”, they are often treated as rules.

Examples include:

- Angular plane rules that require successively higher floors to be stepped further back, cutting the number of units that can be built by up to half and making many projects uneconomic
- Detailed rules around the shadows a building casts
- Guidelines around finishes, colours and other design details

One resident’s desire to prevent a shadow being cast in their backyard or a local park frequently prevails over concrete proposals to build more housing for multiple families. By-laws and guidelines that preserve “neighbourhood character” often prevent simple renovations to add new suites to existing homes. The people who suffer are mostly young, visible minorities, and marginalized people. It is the perfect example of a policy that appears neutral on its surface but is discriminatory in its application.[14]

Far too much time and money are spent reviewing and holding consultations for large projects which conform with the official plan or zoning by-law and small projects which would cause minimal disruption. The cost of needless delays is passed on to new home buyers and tenants.

Minimum parking requirements for each new unit are another example of outdated municipal requirements that increase the cost of housing and are increasingly less relevant with public transit and ride share services. Minimum parking requirements add as much as $165,000 to the cost of a new housing unit, even as demand for parking spaces is falling: data from the Residential Construction Council of Ontario shows that in new condo projects, one in three parking stalls goes unsold. We applaud the recent vote by Toronto City Council to scrap most minimum parking requirements. We believe other cities should follow suit.

While true heritage sites are important, heritage preservation has also become a tool to block more housing. For example, some municipalities add thousands of properties at a time to a heritage register because they have “potential” heritage value. Even where a building isn’t heritage designated or registered, neighbours increasingly demand it be as soon as a development is proposed.

This brings us to the role of the “not in my backyard” or NIMBY sentiment in delaying or stopping more homes from being built.

New housing is often the last priority

A proposed building with market and affordable housing units would have increased the midday shadow by 6.5% on a nearby park at the fall and spring equinox, with no impact during the summer months. To conform to a policy that does not permit “new net shadow on specific parks”, seven floors of housing, including 26 affordable housing units, were sacrificed.

Multiple dry cleaners along a transit route were designated as heritage sites to prevent new housing being built. It is hard not to feel outrage when our laws are being used to prevent families from moving into neighbourhoods and into homes they can afford along transit routes.

NIMBY versus YIMBY

NIMBYism (not in my backyard) is a large and constant obstacle to providing housing everywhere. Neighbourhood pushback drags out the approval process, pushes up costs and discourages investment in housing. It also keeps out new residents. While building housing is very costly, opposing new housing costs almost nothing.

Unfortunately, there is a strong incentive for individual municipal councillors to fall in behind community opposition – it's existing residents who elect them, not future ones. The outcry of even a handful of constituents (helped by the rise of social media) has been enough, in far too many cases, to persuade their local councillor to vote against development even while admitting its merits in private. There is a sense among some that it's better to let the Ontario Land Tribunal approve the development on appeal, even if it causes long delays and large cost increases, then to take the political heat.

Mayors and councillors across the province are fed up and many have called for limits on public consultations and more "as of right" zoning. In fact, some have created a new term for NIMBYism: BANANAs – Build Absolutely Nothing Anywhere Near Anything, causing one mayor to comment "NIMBYism has gone BANANAs". We agree. In a growing, thriving society, that approach is not just bad policy, it is exclusionary and wrong.

As a result, technical planning decisions have become politicized. One major city has delegated many decisions to senior staff, but an individual councillor can withdraw the delegation when there is local opposition and force a vote at Council. We heard that this situation is common across the province, creating an electoral incentive for a councillor to delay or stop a housing proposal, or forcing a councillor to pay the electoral cost of supporting it. Approvals of individual housing applications should be the role of professional staff, free from political interference.

The pressure to stop any development is now so intense that it has given rise to a counter-movement – YIMBYism, or "yes in my backyard," led by millennials who recognize entrenched opposition to change as a huge obstacle to finding a home. They provide a voice at public consultations for young people, new immigrants and refugees, minority groups, and Ontarians struggling to access housing by connecting our ideals to the reality of housing. People who welcome immigrants to Canada should welcome them to the neighbourhood, fighting climate change means supporting higher-density housing, and "keeping the neighbourhood the way it is" means keeping it off-limits. While anti-housing voices can be loud, a member of More Neighbours Toronto, a YIMBY group that regularly attends public consultations, has said that the most vocal opponents usually don't represent the majority in a neighbourhood. Survey data from the Ontario Real Estate Association backs that up, with almost 80% of Ontarians saying they are in favour of zoning in urban areas that would encourage more homes.

Ontarians want a solution to the housing crisis. We cannot allow opposition and politicization of individual housing projects to prevent us from meeting the needs of all Ontarians.

12. Create a more permissive land use, planning, and approvals system:

a) Repeal or override municipal policies, zoning, or plans that prioritize the preservation of physical character of neighbourhood

b) Exempt from site plan approval and public consultation all projects of 10 units or less that conform to the Official Plan and require only minor variances

c) Establish province-wide zoning standards, or prohibitions, for minimum lot sizes, maximum building setbacks, minimum heights, angular planes, shadow rules, front doors, building depth, landscaping, floor space index, and heritage view cones, and planes; restore pre-2006 site plan exclusions (colour, texture, and type of materials, window details, etc.) to the Planning Act and reduce or eliminate minimum parking requirements; and

d) Remove any floorplate restrictions to allow larger, more efficient high-density towers.

13. Limit municipalities from requesting or hosting additional public meetings beyond those that are required under the Planning Act.

14. Require that public consultations provide digital participation options.

15. Require mandatory delegation of site plan approvals and minor variances to staff or pre-approved qualified third-party technical consultants through a simplified review and approval process, without the ability to withdraw Council's delegation.

16. Prevent abuse of the heritage preservation and designation process by:
    a) Prohibiting the use of bulk listing on municipal heritage registers
    b) Prohibiting reactive heritage designations after a Planning Act development application has been filed
17. Requiring municipalities to compensate property owners for loss of property value as a result of heritage designations, based on the principle of best economic use of land.
18. Restore the right of developers to appeal Official Plans and Municipal Comprehensive Reviews.

We have heard mixed feedback on Committees of Adjustment. While they are seen to be working well in some cities, in others they are seen to simply add another lengthy step in the process. We would urge the government to first implement our recommendation to delegate minor variances and site plan approvals to municipal staff and then assess whether Committees of Adjustment are necessary and an improvement over staff-level decision making.

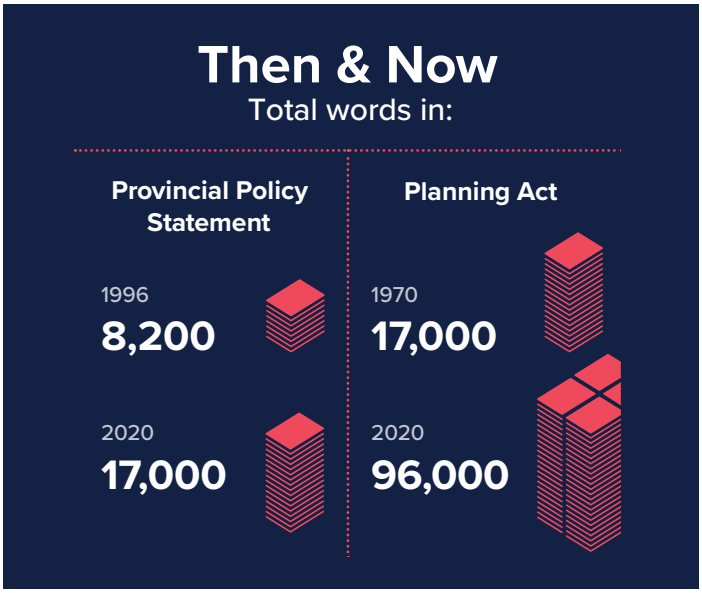
Cut the red tape so we can build faster and reduce costs

One of the strongest signs that our approval process is not working: of 35 OECD countries, only the Slovak Republic takes longer than Canada to approve a building project. The UK and the US approve projects three times faster without sacrificing quality or safety. And they save home buyers and tenants money as a result, making housing more affordable.[15]

A 2020 survey of development approval times in 23 Canadian cities shows Ontario seriously lagging: Hamilton (15th), Toronto (17th), Ottawa (21st) with approval times averaging between 20-24 months. These timelines do not include building permits, which take about two years for an apartment building in Toronto. Nor did they count the time it takes for undeveloped land to be designated for housing, which the study notes can take five to ten years.[16]

Despite the good intentions of many people involved in the approvals and home-building process, decades of dysfunction in the system and needless bureaucracy have made it too difficult for housing approvals to keep up with the needs of Ontarians. There appear to be numerous reasons why Ontario performs so poorly against other Canadian cities and the rest of the developed world. We believe that the major problems can be summed up as:

- Too much complexity in the planning process, with the page count in legislation, regulation, policies, plans, and by-laws growing every year
- Too many studies, guidelines, meetings and other requirements of the type we outlined in the previous section, including many that go well beyond the scope of Ontario's Planning Act
- Reviews within municipalities and with outside agencies that are piecemeal, duplicative (although often with conflicting outcomes) and poorly coordinated
- Process flaws that include reliance on paper
- Some provincial policies that are more relevant to urban development but result in burdensome, irrelevant requirements when applied in some rural and northern communities.



All of this has contributed to widespread failure on the part of municipalities to meet required timelines. The provincial Planning Act sets out deadlines of 90 days for decisions on zoning by-law amendments, 120 days for plans of subdivision, and 30 days for site plan approval, but municipalities routinely miss these without penalty. For other processes, like site plan approval or provincial approvals, there are no timelines and delays drag on. The cost of delay falls on the ultimate homeowner or tenant.

The consequences for homeowners and renters are enormous. Ultimately, whatever cost a builder pays gets passed on to the buyer or renter. As one person said: "Process is the biggest project killer in Toronto because developers have to carry timeline risk."

Site plan control was often brought up as a frustration. Under the Planning Act, this is meant to be a technical review of the external features of a building. In practice, municipalities often expand on what is required and take too long to respond.

Then: In 1966, a draft plan of subdivision in a town in southwestern Ontario to provide 529 low-rise and mid-rise housing units, a school site, a shopping centre and parks was approved by way of a two-page letter setting out 10 conditions. It took seven months to clear conditions for final approval.

And now: In 2013, a builder started the approval process to build on a piece of serviced residential land in a seasonal resort town. Over the next seven years, 18 professional consultant reports were required, culminating in draft plan approval containing 50 clearance conditions. The second approval, issued by the Local Planning Appeals Board in 2020, ran to 23 pages. The developer estimates it will be almost 10 years before final approval is received.

An Ontario Association of Architects study calculating the cost of delays between site plan application and approval concluded that for a 100-unit condominium apartment building, each additional month of delay costs the applicant an estimated $193,000, or $1,930 a month for each unit.[17]

A 2020 study done for the Building Industry and Land Development Association (BILD) looked at impacts of delay on low-rise construction, including single-detached homes. It estimated that every month an approval is delayed adds, on average, $1.46 per square foot to the cost of a single home. A two-year delay, which is not unusual for this housing type, adds more than $70,000 to the cost of a 2,000-square-foot house in the GTA.[16]

Getting rid of so much unnecessary and unproductive additional work would significantly reduce the burden on staff. It would help address the widespread shortages of planners and building officials. It would also bring a stronger sense among municipal staff that they are part of the housing solution and can take pride in helping cut approval times and lower the costs of delivering homes.

Adopt common sense approaches that save construction costs

Wood using "mass timber" – an engineer compressed wood, made for strength and weight-bearing – can provide a lower-cost alternative to reinforced concrete in many mid-rise projects, but Ontario's Building Code is hampering its use. Building taller with wood offers advantages beyond cost:

- Wood is a renewable resource that naturally sequesters carbon, helping us reach our climate change goals
- Using wood supports Ontario's forestry sector and creates jobs, including for Indigenous people

British Columbia's and Quebec's building codes allow woodframe construction up to 12 storeys, but Ontario limits it to six. By amending the Building Code to allow 12-storey woodframe construction, Ontario would encourage increased use of forestry products and reduce building costs.

Finally, we were told that a shift in how builders are required to guarantee their performance would free up billions of dollars to build more housing. Pay on demand surety bonds are a much less onerous option than letters or credit, and are already accepted in Hamilton, Pickering, Innisfil, Whitchurch-Stouffville and other Ontario municipalities. We outline the technical details in Appendix D.

19. Legislate timelines at each stage of the provincial and municipal review process, including site plan, minor variance, and provincial reviews, and deem an application approved if the legislated response time is exceeded.

20. Fund the creation of "approvals facilitators" with the authority to quickly resolve conflicts among municipal and/or provincial authorities and ensure timelines are met.

21. Require a pre-consultation with all relevant parties at which the municipality sets out a binding list that defines what constitutes a complete application; confirms the number of consultations established in the previous recommendations; and clarifies that if a member of a regulated profession such as a professional engineer has stamped an application, the municipality has no liability and no additional stamp is needed.

22. Simplify planning legislation and policy documents.

23. Create a common, province-wide definition of plan of subdivision and standard set of conditions which clarify which may be included; require the use of standard province-wide legal agreements and, where feasible, plans of subdivision.

24. Allow wood construction of up to 12 storeys.

25. Require municipalities to provide the option of pay on demand surety bonds and letters of credit.

Prevent abuse of the appeal process

Part of the challenge with housing approvals is that, by the time a project has been appealed to the Ontario Land Tribunal (the Tribunal), it has usually already faced delay and compromises have been made to reduce the size and scope of the proposal. When an approved project is appealed, the appellant – which could just be a single individual – may pay $400 and tie up new housing for years.

The most recent published report showed 1,300 unresolved cases.[18] While under-resourcing does contribute to delays, this caseload also reflects the low barrier to launching an appeal and the minimal risks if an appeal is unsuccessful:

- After a builder has spent time and money to ensure a proposal conforms with a municipality's requirements, the municipal council can still reject it – even if its own planning staff has given its support. Very often this is to appease local opponents.
- Unlike a court, costs are not automatically awarded to the successful party at the Tribunal. The winning side must bring a motion and prove that the party bringing the appeal was unreasonable, clearly trying to delay the project, and/or being vexatious or frivolous. Because the bar is set so high, the winning side seldom asks for costs in residential cases.

This has resulted in abuse of the Tribunal to delay new housing. Throughout our consultations, we heard from municipalities, not-for-profits, and developers that affordable housing was a particular target for appeals which, even if unsuccessful, can make projects too costly to build.

Clearly the Tribunal needs more resources to clear its backlog. But the bigger issue is the need for so many appeals: we believe it would better to have well-defined goals and rules for municipalities and builders to avoid this costly and time-consuming quasi-judicial process. Those who bring appeals aimed at stopping development that meets established criteria should pay the legal costs of the successful party and face the risk of a larger project being approved.

The solution is not more appeals, it's fixing the system. We have proposed a series of reforms that would ensure only meritorious appeals proceeded, that every participant faces some risk and cost of losing, and that abuse of the Tribunal will be penalized. We believe that if Ontario accepts our recommendations, the Tribunal will not face the same volume of appeals. But getting to that point will take time, and the Tribunal needs more resources and better tools now.

Recommendation 1 will provide legislative direction to adjudicators that they must prioritize housing growth and intensification over competing priorities contained in provincial and municipal policies. We further recommend the following:

26. Require appellants to promptly seek permission ("leave to appeal") of the Tribunal and demonstrate that an appeal has merit, relying on evidence and expert reports, before it is accepted.

27. Prevent abuse of process:

a) Remove right of appeal for projects with at least 30% affordable housing in which units are guaranteed affordable for at least 40 years.

b) Require a $10,000 filing fee for third-party appeals.

c) Provide discretion to adjudicators to award full costs to the successful party in any appeal brought by a third party or by a municipality where its council has overridden a recommended staff approval.

28. Encourage greater use of oral decisions issued the day of the hearing, with written reasons to follow, and allow those decisions to become binding the day that they are issued.

29. Where it is found that a municipality has refused an application simply to avoid a deemed approval for lack of decision, allow the Tribunal to award punitive damages.

30. Provide funding to increase staffing (adjudicators and case managers), provide market-competitive salaries, outsource more matters to mediators, and set shorter time targets.

31. In clearing the existing backlog, encourage the Tribunal to prioritize projects close to the finish line that will support housing growth and intensification, as well as regional water or utility infrastructure decisions that will unlock significant housing capacity.

Reduce the costs to build, buy and rent

The price you pay to buy or rent a home is driven directly by how much it costs to build a home. In Ontario, costs to build homes have dramatically increased at an unprecedented pace over the past decade. In most of our cities and towns, materials and labour only account for about half of the costs. The rest comes from land, which we have addressed in the previous section, and government fees.

A careful balance is required on government fees because, as much as we would like to see them lowered, governments need revenues from fees and taxes to build critically needed infrastructure and pay for all the other services that make Ontario work. So, it is a question of balance and of ensuring that our approach to government fees encourages rather than discourages developers to build the full range of housing we need in our Ontario communities.

Align government fees and charges with the goal of building more housing

Improve the municipal funding model

Housing requires more than just the land it is built on. It requires roads, sewers, parks, utilities and other infrastructure. The provincial government provides municipalities with a way to secure funding for this infrastructure through development charges, community benefit charges and parkland dedication (providing 5% of land for public parks or the cash equivalent).

These charges are founded on the belief that growth – not current taxpayers – should pay for growth. As a concept, it is compelling. In practice, it means that new home buyers pay the entire cost of sewers, parks, affordable housing, or colleges that will be around for generations and may not be located in their neighbourhood. And, although building affordable housing is a societal responsibility, because affordable units pay all the same charges as a market unit, the cost is passed to new home buyers in the same building or the not-for-profit organization supporting the project. We do not believe that government fees should create a disincentive to affordable housing.

A 2019 study carried out for BILD showed that in the Greater Toronto Area, development charges for low-rise housing are on average more than three times higher per unit than in six comparable US metropolitan areas, and roughly 1.75-times higher than in the other Canadian cities.

For high-rise developments the average per unit charges in the GTA are roughly 50% higher than in the US areas, and roughly 30% higher than in the other Canadian urban areas.[19]

If you ask any developer of homes – whether they are for-profit or non-profit – they will tell you that development charges are a special pain point. In Ontario, they can be as much as $135,000 per home. In some municipalities, development charges have increased as much as 900% in less than 20 years.[20] As development charges go up, the prices of homes go up. And development charges on a modest semi-detached home are the same as on a luxury 6,000 square foot home, resulting in a disincentive to build housing that is more affordable. Timing is also a challenge as development charges have to be paid up front, before a shovel even goes into the ground.

To help relieve the pressure, the Ontario government passed recent legislation allowing builders to determine development charges earlier in the building process. But they must pay interest on the assessed development charge to the municipality until a building permit is issued, and there is no cap on the rate, which in one major city is 13% annually.

Cash payments to satisfy parkland dedication also significantly boost the costs of higher-density projects, adding on average $17,000 to the cost of a high-rise condo across the GTA.[21] We heard concerns not just about the amount of cash collected, but also about the money not being spent in the neighbourhood or possibly not being spent on parks at all. As an example, in 2019 the City of Toronto held $644 million in parkland cash-in-lieu payments.[22] Everyone can agree that we need to invest in parks as our communities grow, but if the funds are not being spent, perhaps it means that more money is being collected for parklands than is needed and we could lower the cost of housing if we adjusted these parkland fees.

Modernizing HST Thresholds

Harmonized sales tax (HST) applies to all new housing – including purpose-built rental. Today, the federal component is 5% and provincial component is 8%. The federal and provincial government provide a partial HST rebate. Two decades ago, the maximum home price eligible for a rebate was set at $450,000 federally and $400,000 provincially, resulting in a maximum rebate of $6,300 federally and $24,000 provincially, less than half of today's average home price. Buyers of new homes above this ceiling face a significant clawback. Indexing the rebate would immediately reduce the cost of building new homes, savings that can be passed on to Ontarians. When both levels of government agree that we are facing a housing crisis, they should not be adding over 10% to the cost of almost all new homes.

32. Waive development charges and parkland cash-in-lieu and charge only modest connection fees for all infill residential projects up to 10 units or for any development where no new material infrastructure will be required.

33. Waive development charges on all forms of affordable housing guaranteed to be affordable for 40 years.

34. Prohibit interest rates on development charges higher than a municipality's borrowing rate.

35. Regarding cash in lieu of parkland, s.37, Community Benefit Charges, and development charges:

a) Provincial review of reserve levels, collections and drawdowns annually to ensure funds are being used in a timely fashion and for the intended purpose, and, where review points to a significant concern, do not allow further collection until the situation has been corrected.

b) Except where allocated towards municipality-wide infrastructure projects, require municipalities to spend funds in the neighbourhoods where they were collected. However, where there's a significant community need in a priority area of the City, allow for specific ward-to-ward allocation of unspent and unallocated reserves.

36. Recommend that the federal government and provincial governments update HST rebate to reflect current home prices and begin indexing the thresholds to housing prices, and that the federal government match the provincial 75% rebate and remove any clawback.

Government charges on a new single-detached home averaged roughly $186,300, or almost 22% of the price, across six municipalities in southcentral Ontario. For a new condominium apartment, the average was almost $123,000, or roughly 24% of a unit's price.

Make it easier to build rental

In cities and towns across Ontario, it is increasingly hard to find a vacant rental unit, let alone a vacant rental unit at an affordable price. Today, 66% of all purpose-built rental units in the City of Toronto were built between 1960 and 1979. Less than 15% of Toronto's purpose-built rentals were constructed over the ensuing 40 years in spite of the significant population growth during that time. In fact, between 2006 and 2016, growth in condo apartments increased by 186% while purpose-built rental only grew by 0.6%.[12] In 2018, the Ontario government introduced positive changes that have created growth in purpose-built rental units – with last year seeing 18,000 units under construction and 93,000 proposed against a 5-year average prior to 2020 of 3,400 annually.[23]

Long-term renters often now feel trapped in apartments that don't make sense for them as their needs change. And because they can't or don't want to move up the housing ladder, many of the people coming up behind them who would gladly take those apartments are instead living in crowded spaces with family members or roommates. Others feel forced to commit to rental units at prices way beyond what they can afford. Others are trying their luck in getting on the wait list for an affordable unit or housing co-op – wait lists that are years long. Others are leaving Ontario altogether.

66%

of all purpose-built rental units in the City of Toronto were built between **1960** and **1979**.

A pattern in every community, and particularly large cities, is that the apartments and rented rooms that we do have are disappearing. Apartment buildings are being converted to condos or upgraded to much more expensive rental units. Duplexes get purchased and turned into larger single-family homes.

A major challenge in bridging the gap of rental supply is that, more often than not, purpose-built rental projects don't make economic sense for builders and investors. Ironically, there is no shortage of Canadian investor capital seeking housing investments, particularly large pension funds – but the economics of investing in purpose-built rental in Ontario just don't make sense. So, investments get made in apartment projects in other provinces or countries, or in condo projects that have a better and safer return-on-investment. What can governments do to get that investor capital pointed in the right direction so we can create jobs and get more of the housing we need built?

Some of our earlier recommendations will help, particularly indexing the HST rebate. So will actions by government to require purpose-built rental on surplus government land that is made available for sale. (Appendix C)

Municipal property taxes on purpose-built rental can be as much as 2.5 times greater than property taxes for condominium or other ownership housing.[24] The Task Force recommends:

37. Align property taxes for purpose-built rental with those of condos and low-rise homes.

Make homeownership possible for hardworking Ontarians who want it

Home ownership has always been part of the Canadian dream. You don't have to look far back to find a time when the housing landscape was very different. The norm was for young people to rent an apartment in their twenties, work hard and save for a down payment, then buy their first home in their late twenties or early thirties. It was the same for many new Canadians: arrive, rent, work hard and buy. The house might be modest, but it brought a sense of ownership, stability and security. And after that first step onto the ownership ladder, there was always the possibility of selling and moving up. Home ownership felt like a real possibility for anyone who wanted it.

That's not how it works now. Too many young people who would like their own place are living with one or both parents well into adulthood.

The escalation of housing prices over the last decade has put the dream of homeownership out of reach of a growing number of aspiring first-time home buyers. While 73% of Canadians are homeowners, that drops to 48% for Black people, 47% for LGBTQ people[5] (StatsCan is studying rates for other populations, including Indigenous People who are severely underhoused). This is also an issue for younger adults: a 2021 study showed only 24% of Torontonians aged 30 to 39 are homeowners.[25]

In Canada, responsibility for Indigenous housing programs has historically been a shared between the federal and provincial governments. The federal government works closely with its provincial and territorial counterparts to improve access to housing for Indigenous peoples both on and off reserve. More than 85% of Indigenous people live in urban and rural areas, are 11 times more likely to experience homelessness and have incidence of housing need that is 52% greater than all Canadians. The Murdered and Missing Indigenous Women and Girls report mentions housing 299 times – the lack of which being a significant, contributing cause to violence and the provision of which as a significant, contributing solution. The Province of Ontario has made significant investments in Urban Indigenous Housing, but we need the Federal Government to re-engage as an active partner.

While measures to address supply will have an impact on housing prices, many aspiring homeowners will continue to face a gap that is simply too great to bridge through traditional methods.

The Task Force recognizes the need for caution about measures that would spur demand for housing before the supply bottleneck is fixed. At the same time, a growing number of organizations – both non-profit and for-profit are proposing a range of unique home equity models. Some of these organizations are aiming at households who have sufficient income to pay the mortgage but lack a sufficient down payment. Others are aiming at households who fall short in both income and down payment requirements for current market housing.

The Task Force heard about a range of models to help aspiring first-time home buyers, including:

- Shared equity models with a government, non-profit or for-profit lender holding a second "shared equity mortgage" payable at time of sale of the home
- Land lease models that allow residents to own their home but lease the land, reducing costs
- Rent-to-own approaches in which a portion of an occupant's rent is used to build equity, which can be used as a down payment on their current unit or another market unit in the future
- Models where the equity gain is shared between the homeowner and the non-profit provider, such that the non-profit will always be able to buy the home back and sell it to another qualified buyer, thus retaining the home's affordability from one homeowner to the next.

Proponents of these models identified barriers that thwart progress in implementing new solutions.

- The Planning Act limits land leases to a maximum of 21 years. This provision prevents home buyers from accessing the same type of mortgages from a bank or credit union that are available to them when they buy through traditional homeownership.
- The Perpetuities Act has a similar 21-year limit on any options placed on land. This limits innovative non-profit models from using equity formulas for re-sale and repurchase of homes.
- Land Transfer Tax (LTT) is charged each time a home is sold and is collected by the province; and in Toronto, this tax is also collected by the City. This creates a double-tax in rent-to-own/equity building models where LTT ends up being paid first by the home equity organization and then by the occupant when they are able to buy the unit.
- HST is charged based on the market value of the home. In shared equity models where the homeowner neither owns nor gains from the shared equity portion of their home, HST on the shared equity portion of the home simply reduces affordability.
- Residential mortgages are highly regulated by the federal government and reflective of traditional homeownership. Modifications in regulations may be required to adapt to new co-ownership and other models.

The Task Force encourages the Ontario government to devote further attention to avenues to support new homeownership options. As a starting point, the Task Force offers the following recommendations:

38. Amend the Planning Act and Perpetuities Act to extend the maximum period for land leases and restrictive covenants on land to 40 or more years.

39. Eliminate or reduce tax disincentives to housing growth.

40. Call on the Federal Government to implement an Urban, Rural and Northern Indigenous Housing Strategy.

41. Funding for pilot projects that create innovative pathways to homeownership, for Black, Indigenous, and marginalized people and first-generation homeowners.

42. Provide provincial and federal loan guarantees for purpose-built rental, affordable rental and affordable ownership projects.

Support and incentivize scaling up housing supply

Our goal of building 1.5 million homes in ten years means doubling how many homes Ontario creates each year. As much as the Task Force's recommendations will remove barriers to realizing this ambitious goal, we also need to ensure we have the capacity across Ontario's communities to deliver this new housing supply. This includes capacity of our housing infrastructure, capacity within our municipal planning teams, and boots on the ground with the skills to build new homes.

There is much to be done and the price of failure for the people of Ontario is high. This is why the provincial government must make an unwavering commitment to keeping the spotlight on housing supply. This is also why the province must be dogged in its determination to galvanize and align efforts and incentives across all levels of government so that working together, we all can get the job done.

Our final set of recommendations turns to these issues of capacity to deliver, and the role the provincial government can play in putting the incentives and alignment in place to achieve the 1.5 million home goal.

Invest in municipal infrastructure

Housing can't get built without water, sewage, and other infrastructure

When the Task Force met with municipal leaders, they emphasized how much future housing supply relies on having the water, storm water and wastewater systems, roads, sidewalks, fire stations, and all the other parts of community infrastructure to support new homes and new residents.

Infrastructure is essential where housing is being built for the first time. And, it can be a factor in intensification when added density exceeds the capacity of existing infrastructure, one of the reasons we urge new infrastructure in new developments to be designed for future capacity. In Ontario, there are multiple municipalities where the number one barrier to approving new housing projects is a lack of infrastructure to support them.

Municipalities face a myriad of challenges in getting this infrastructure in place. Often, infrastructure investments are required long before new projects are approved and funding must be secured. Notwithstanding the burden development charges place on the price of new housing, most municipalities report that development charges are still not enough to fully cover the costs of building new infrastructure and retrofitting existing infrastructure in neighbourhoods that are intensifying. Often infrastructure crosses municipal boundaries creating complicated and time-consuming "who pays?" questions. Municipal leaders also shared their frustrations with situations where new housing projects are approved and water, sewage and other infrastructure capacity is allocated to the project – only to have the developer land bank the project and put off building. Environmental considerations with new infrastructure add further cost and complexity. The Task Force recommends:

43. Enable municipalities, subject to adverse external economic events, to withdraw infrastructure allocations from any permitted projects where construction has not been initiated within three years of build permits being issued.

44. Work with municipalities to develop and implement a municipal services corporation utility model for water and wastewater under which the municipal corporation would borrow and amortize costs among customers instead of using development charges.

Create the Labour Force to meet the housing supply need

The labour force is shrinking in many segments of the market

You can't start to build housing without infrastructure. You can't build it without people – skilled trades people in every community who can build the homes we need.

The concern that we are already facing a shortage in skilled trades came through loud and clear in our consultations. We heard from many sources that our education system funnels young people to university rather than colleges or apprenticeships and creates the perception that careers in the skilled trades are of less value. Unions and builders are working to fill the pipeline domestically and recruit internationally, but mass retirements are making it challenging to maintain the workforce at its current level, let alone increase it.

Increased economic immigration could ease this bottleneck, but it appears difficult for a skilled labourer with no Canadian work experience to qualify under Ontario's rules. Moreover, Canada's immigration policies also favour university education over skills our economy and society desperately need. We ought to be welcoming immigrants with the skills needed to build roads and houses that will accommodate our growing population.

The shortage may be less acute, however, among smaller developers and contractors that could renovate and build new "missing middle" homes arising from the changes in neighbourhood zoning described earlier. These smaller companies tap into a different workforce from the one needed to build high rises and new subdivisions. Nonetheless, 1.5 million more homes will require a major investment in attracting and developing the skilled trades workforce to deliver this critically needed housing supply. We recommend:

45. Improve funding for colleges, trade schools, and apprenticeships; encourage and incentivize municipalities, unions and employers to provide more on-the-job training.

46. Undertake multi-stakeholder education program to promote skilled trades.

47. Recommend that the federal and provincial government prioritize skilled trades and adjust the immigration points system to strongly favour needed trades and expedite immigration status for these workers, and encourage the federal government to increase from 9,000 to 20,000 the number of immigrants admitted through Ontario's program.

Create a large Ontario Housing Delivery Fund to align efforts and incent new housing supply

Build alignment between governments to enable builders to deliver more homes than ever before

All levels of government play a role in housing.

The federal government sets immigration policy, which has a major impact on population growth and many tax policies. The province sets the framework for planning, approvals, and growth that municipalities rely upon, and is responsible for many other areas that touch on housing supply, like investing in highways and transit, training workers, the building code and protecting the environment. Municipalities are on the front lines, expected to translate the impacts of federal immigration policy, provincial guidance and other factors, some very localized, into official plans and the overall process through which homes are approved to be built.

The efficiency with which home builders can build, whether for-profit or non-profit, is influenced by policies and decisions at every level of government. In turn, how many home developers can deliver, and at what cost, translates directly into the availability of homes that Ontarians can afford.

Collectively, governments have not been sufficiently aligned in their efforts to provide the frameworks and incentives that meet the broad spectrum of housing needs in Ontario. Much action, though, has been taken in recent years.

- The Ontario government has taken several steps to make it easier to build additional suites in your own home: reduced disincentives to building rental housing, improved the appeal process, focused on density around transit stations, made upfront development charges more predictable, and provided options for municipalities to create community benefits through development.
- The federal government has launched the National Housing Strategy and committed over $70 billion in funding.[26] Most recently, it has announced a $4 billion Housing Accelerator Fund aimed at helping municipalities remove barriers to building housing more quickly.[27]
- Municipalities have been looking at ways to change outdated processes, rules, and ways of thinking that create delays and increases costs of delivering homes. Several municipalities have taken initial steps towards eliminating exclusionary zoning and addressing other barriers described in this report.

All governments agree that we are facing a housing crisis. Now we must turn the sense of urgency into action and alignment across governments.

Mirror policy changes with financial incentives aligned across governments

The policy recommendations in this report will go a long way to align efforts and position builders to deliver more homes.

Having the capacity in our communities to build these homes will take more than policy. It will take money. Rewarding municipalities that meet housing growth and approval timelines will help them to invest in system upgrades, hire additional staff, and invest in their communities. Similarly, municipalities that resist new housing, succumb to NIMBY pressure, and close off their neighbourhoods should see funding reductions. Fixing the housing crisis is a societal responsibility, and our limited tax dollars should be directed to those municipalities making the difficult but necessary choices to grow housing supply.

In late January 2022, the provincial government announced $45 million for a new *Streamline Development Approval Fund* to "unlock housing supply by cutting red tape and improving processes for residential and industrial developments".[28] This is encouraging. More is needed.

Ontario should also receive its fair share of federal funding but today faces a shortfall of almost $500 million,[29] despite two thirds of the Canadian housing shortage being in Ontario. We call on the federal government to address this funding gap.

48. The Ontario government should establish a large "Ontario Housing Delivery Fund" and encourage the federal government to match funding. This fund should reward:

a) Annual housing growth that meets or exceeds provincial targets

b) Reductions in total approval times for new housing

c) The speedy removal of exclusionary zoning practices

49. Reductions in funding to municipalities that fail to meet provincial housing growth and approval timeline targets.

We believe that the province should consider partial grants to subsidize municipalities that waive development charges for affordable housing and for purpose-built rental.

Sustain focus, measure, monitor, improve

Digitize and modernize the approvals and planning process

Some large municipalities have moved to electronic tracking of development applications and/or electronic building permits ("e-permits") and report promising results, but there is no consistency and many smaller places don't have the capacity to make the change.

Municipalities, the provincial government and agencies use different systems to collect data and information relevant to housing approvals, which slows down processes and leaves much of the "big picture" blank. This could be addressed by ensuring uniform data architecture standards.

Improve the quality of our housing data to inform decision making

Having accurate data is key to understanding any challenge and making the best decisions in response. The Task Force heard from multiple housing experts that we are not always using the best data, and we do not always have the data we need.

Having good population forecasts is essential in each municipality as they develop plans to meet future land and housing needs. Yet, we heard many concerns about inconsistent approaches to population forecasts. In the Greater Golden Horseshoe, the forecast provided to municipalities by the province is updated only when the Growth Plan is updated, generally every seven years; but federal immigration policy, which is a key driver of growth, changes much more frequently. The provincial Ministry of Finance produces a population forecast on a more regular basis than the Growth Plan, but these are not used consistently across municipalities or even by other provincial ministries.

Population forecasts get translated into housing need in different ways across the province, and there is a lack of data about how (or whether) the need will be met. Others pointed to the inconsistent availability of land inventories. Another challenge is the lack of information on how much land is permitted and how much housing is actually getting built once permitted, and how fast. The Task Force also heard that, although the Provincial Policy Statement requires municipalities to maintain a three-year supply of short-term (build-ready) land and report it each year to the province, many municipalities are not meeting that requirement.

At a provincial and municipal level, we need better data on the housing we have today, housing needed to close the gap, consistent projections of what we need in the future, and data on how we are doing at keeping up. Improved data will help anticipate local and provincial supply bottlenecks and constraints, making it easier to determine the appropriate level and degree of response.

It will also be important to have better data to assess how much new housing stock is becoming available to groups that have been disproportionately excluded from home ownership and rental housing.

Put eyes on the crisis and change the conversation around housing

Ours is not the first attempt to "fix the housing system". There have been efforts for years to tackle increasing housing prices and find solutions so everyone in Ontario can find and afford the housing they need. This time must be different.

The recommendations in this report must receive sustained attention, results must be monitored, significant financial investment by all levels of government must be made. And, the people of Ontario must embrace a housing landscape in which the housing needs of tomorrow's citizens and those who have been left behind are given equal weight to the housing advantages of those who are already well established in homes that they own.

50. Fund the adoption of consistent municipal e-permitting systems and encourage the federal government to match funding. Fund the development of common data architecture standards across municipalities and provincial agencies and require municipalities to provide their zoning bylaws with open data standards. Set an implementation goal of 2025 and make funding conditional on established targets.

51. Require municipalities and the provincial government to use the Ministry of Finance population projections as the basis for housing need analysis and related land use requirements.

52. Resume reporting on housing data and require consistent municipal reporting, enforcing compliance as a requirement for accessing programs under the Ontario Housing Delivery Fund.

53. Report each year at the municipal and provincial level on any gap between demand and supply by housing type and location, and make underlying data freely available to the public.

54. Empower the Deputy Minister of Municipal Affairs and Housing to lead an all-of-government committee, including key provincial ministries and agencies, that meets weekly to ensure our remaining recommendations and any other productive ideas are implemented.

55. Commit to evaluate these recommendations for the next three years with public reporting on progress.

Conclusion

We have set a bold goal for Ontario: building 1.5 million homes in the next 10 years.

We believe this can be done. What struck us was that everyone we talked to – builders, housing advocates, elected officials, planners – understands the need to act now. As one long-time industry participant said, "for the first time in memory, everyone is aligned, and we need to take advantage of that."

Such unity of purpose is rare, but powerful.

To leverage that power, we offer solutions that are bold but workable, backed by evidence, and that position Ontario for the future.

Our recommendations focus on ramping up the supply of housing. Measures are already in place to try to cool demand, but they will not fill Ontario's housing need. More supply is key. Building more homes will reduce the competition for our scarce supply of homes and will give Ontarians more housing choices. It will improve housing affordability across the board.

Everyone wants more Ontarians to have housing. So let's get to work to build more housing in Ontario.

APPENDIX A:
Biographies of Task Force Members

Lalit Aggarwal is President of Manor Park Holdings, a real estate development and operating company active in Eastern Ontario. Previously, Lalit was an investor for institutional fund management firms, such as H.I.G. European Capital Partners, Soros Fund Management, and Goldman Sachs. He is a past fellow of the C.D. Howe Institute and a former Director of both Bridgepoint Health and the Centre for the Commercialization of Regenerative Medicine. Lalit holds degrees from the University of Oxford and the University of Pennsylvania. He is also a current Director of the Hospital for Sick Children Foundation, the Sterling Hall School and the Chair of the Alcohol & Gaming Commission of Ontario.

David Amborski is a professional Urban Planner, Professor at Ryerson University's School of Urban and Regional Planning and the founding Director of the Centre for Urban Research and Land Development (CUR). His research and consulting work explore topics where urban planning interfaces with economics, including land and housing markets. He is an academic advisor to the National Executive Forum on Public Property, and he is a member of Lambda Alpha (Honorary Land Economics Society). He has undertaken consulting for the Federal, Provincial and a range of municipal governments. Internationally, he has undertaken work for the Canadian International Development Agency (CIDA), the World Bank, the Inter-American Development Bank, the Lincoln Institute of Land Policy, and several other organizations in Eastern Europe, Latin America, South Africa, and Asia. He also serves on the editorial boards of several international academic journals.

Andrew Garrett is a real estate executive responsible for growing IMCO's $11+ Billion Global Real Estate portfolio to secure public pensions and insurance for Ontario families. IMCO is the only Ontario fund manager purpose built to onboard public clients such as pensions, insurance, municipal reserve funds, and endowments. Andrew has significant non-profit sector experience founding a B Corp certified social enterprise called WeBuild to help incubate social purpose real estate projects. He currently volunteers on non-profit boards supporting social purpose real estate projects, youth programs and the visual arts at Art Gallery of Ontario. Andrew sits on board advisory committees for private equity firms and holds a Global Executive MBA from Kellogg School Management and a Real Estate Development Certification from MIT Centre for Real Estate.

Tim Hudak is the CEO of the Ontario Real Estate Association (OREA). With a passion and voice for championing the dream of home ownership, Tim came to OREA following a distinguished 21-year career in politics, including five years as Leader of the Progressive Conservative Party of Ontario.

In his role, Tim has focused on transforming OREA into Ontario's most cutting-edge professional association at the forefront of advocacy on behalf of REALTORS® and consumers, and providing world-class conferences, standard forms, leadership training and professional guidance to its Members. As part of his work at OREA, Tim was named one of the most powerful people in North American residential real estate by Swanepoel Power 200 for the last five years. Tim is married to Deb Hutton, and together they have two daughters, Miller and Maitland. In his spare time, Tim enjoys trails less taken on his mountain bike or hiking shoes as well as grilling outdoors.

Jake Lawrence was appointed Chief Executive Officer and Group Head, Global Banking and Markets in January 2021. In this role, Jake is responsible for the Bank's Global Banking and Markets business line and strategy across its global footprint. Jake joined Scotiabank in 2002 and has held progressively senior roles in Finance, Group Treasury and Global Banking and Markets. From December 2018 to January 2021, Jake was Co-Group Head of Global Banking and Markets with specific responsibility for its Capital Markets businesses, focused on building alignment across product groups and priority markets to best serve our clients throughout our global footprint. Previously, Jake was Executive Vice President and Head of Global Banking and Markets in the U.S., providing overall strategic direction and execution of Scotiabank's U.S. businesses. Prior to moving into GBM, Jake served as Senior Vice President and Deputy Treasurer, responsible for Scotiabank's wholesale funding activities and liquidity management as well as Senior Vice President, Investor Relations.

Julie Di Lorenzo (GPLLM, University of Toronto 2020), is self-employed since 1982, operates one of the largest female-run Real Estate Development Companies in North America. She was instrumental in the Daniel Burnham award-winning Ontario Growth Management Plan (2004) as President of BILD. Julie served as the first female-owner President of GTHBA (BILD) and on the boards of the Ontario Science Centre, Harbourfront Toronto, Tarion (ONHWP), St. Michael's Hospital, NEXT36, Waterfront Toronto, Chair of IREC Committee WT, Havergal College (Co-Chair of Facilities), York School (interim Vice-Chair), and Canadian Civil Liberties Association Board. Julie has served various governments in advisory capacity on Women's issues, Economic Development, Innovation and Entrepreneurship. Awards include Lifetime Achievement BILD 2017, ICCO Business Excellence 2005 & ICCO Businesswoman of the Year 2021.

Justin Marchand (CIHCM, CPA, CMA, BComm) is Métis and was appointed Chief Executive Officer of Ontario Aboriginal Housing Services (OAHS) in 2018. Justin has over 20 years of progressive experience in a broad range of sectors, including two publicly listed corporations, a large accounting and consulting firm, and a major crown corporation, and holds numerous designations across financial, operations, and housing disciplines. He was most recently selected as Chair of the Canadian Housing and Renewal Association's (CHRA's) Indigenous Caucus Working Group and is also board member for CHRA. Justin is also an active board member for both the Coalition of Hamilton Indigenous Leadership (CHIL) as well as Shingwauk Kinoomaage Gamig, located in Bawaating. Justin believes that Housing is a fundamental human right and that when Indigenous people have access to safe, affordable, and culture-based Housing this provides the opportunity to improve other areas of their lives.

Ene Underwood is CEO of Habitat for Humanity Greater Toronto Area), a non-profit housing developer that helps working, lower income families build strength, stability and self-reliance through affordable homeownership. Homes are delivered through a combination of volunteer builds, contractor builds, and partnerships with non-profit and for-profit developers. Ene's career began in the private sector as a strategy consultant with McKinsey & Company before transitioning to not-for-profit sector leadership. Ene holds a Bachelor of Arts (Honours) from the University of Waterloo and a Master of Business Administration from Ivey Business School.

Dave Wilkes is the President and CEO of the Building Industry and Land Development Association of the GTA (BILD). The Association has 1,300 members and proudly represents builders, developers, professional renovators and those who support the industry.

Dave is committed to supporting volunteer boards and organizations. He has previously served on the George Brown College Board of Directors, Ontario Curling Association, and is currently engaged with Black North Initiative (Housing Committee) and R-Labs I+T Council.

Dave received his Bachelor of Arts (Applied Geography) from Ryerson.

APPENDIX B:
Affordable Housing

Ontario's affordable housing shortfall was raised in almost every conversation. With rapidly rising prices, more lower-priced market rental units are being converted into housing far out of reach of lower-income households. In parallel, higher costs to deliver housing and limited government funding have resulted in a net decrease in the number of affordable housing units run by non-profits. The result is untenable: more people need affordable housing after being displaced from the market at the very time that affordable supply is shrinking.

Throughout our consultations, we were reminded of the housing inequities experienced by Black, Indigenous and marginalized people. We also received submissions describing the unique challenges faced by off-reserve Indigenous Peoples both in the province's urban centres and in the north.

While many of the changes that will help deliver market housing will also help make it easier to deliver affordable housing, affordable housing is a societal responsibility. We cannot rely exclusively on for-profit developers nor on increases in the supply of market housing to fully solve the problem.

The non-profit housing sector faces all the same barriers, fees, risks and complexities outlined in this report as for-profit builders. Several participants from the non-profit sector referred to current or future partnerships with for-profit developers that tap into the development and construction expertise and efficiencies of the private sector. Successful examples of leveraging such partnerships were cited with Indigenous housing, supportive housing, and affordable homeownership.

We were also reminded by program participants that, while partnerships with for-profit developers can be very impactful, non-profit providers have unique competencies in the actual delivery of affordable housing. This includes confirming eligibility of affordable housing applicants, supporting independence of occupants of affordable housing, and ensuring affordable housing units remain affordable from one occupant to the next.

One avenue for delivering more affordable housing that has received much recent attention is inclusionary zoning. In simple terms, inclusionary zoning (IZ) requires developers to deliver a share of affordable units in new housing developments in prescribed areas. The previous Ontario government passed legislation in April 2018 providing a framework within which municipalities could enact Inclusionary Zoning bylaws.

Ontario's first inclusionary zoning policy was introduced in fall 2021 by the City of Toronto and applies to major transit station areas. Internationally, inclusionary zoning has been used successfully to incentivize developers to create new affordable housing by providing density bonuses (more units than they would normally be allowed, if some are affordable) or reductions in government fees. Unfortunately, the City's approach did not include any incentives or bonuses. Instead, Toronto requires market-rate fees and charges for below-market affordable units. This absence of incentives together with lack of clarity on the overall density that will be approved for projects has led developers and some housing advocates to claim that these projects may be uneconomic and thus will not get financed or built. Municipalities shared with us their concerns regarding the restriction in the provincial IZ legislation that prohibits "cash in lieu" payments. Municipalities advised that having the option of accepting the equivalent value of IZ units in cash from the developer would enable even greater impact in some circumstances (for example, a luxury building in an expensive neighbourhood, where the cost of living is too high for a low-income resident).

Funding for affordable housing is the responsibility of all levels of government. The federal government has committed to large funding transfers to the provinces to support affordable housing. The Task Force heard, however, that Ontario's share of this funding does not reflect our proportionate affordable housing needs. This, in turn, creates further financial pressure on both the province and municipalities, which further exacerbates the affordable housing shortages in Ontario's communities.

Finally, many participants in Task Force consultations pointed to surplus government lands as an avenue for building more affordable housing and this is discussed in Appendix C.

We have made recommendations throughout the report intended to have a positive impact on new affordable housing supply. We offer these additional recommendations specific to affordable housing:

- Call upon the federal government to provide equitable affordable housing funding to Ontario.
- Develop and legislate a clear, province-wide definition of "affordable housing" to create certainty and predictability.
- Create an Affordable Housing Trust from a portion of Land Transfer Tax Revenue (i.e., the windfall resulting from property price appreciation) to be used in partnership with developers, non-profits, and municipalities in the creation of more affordable housing units. This Trust should create incentives for projects serving and brought forward by Black- and Indigenous-led developers and marginalized groups.
- Amend legislation to:
  - Allow cash-in-lieu payments for Inclusive Zoning units at the discretion of the municipality.
  - Require that municipalities utilize density bonusing or other incentives in all Inclusionary Zoning and Affordable Housing policies that apply to market housing.
  - Permit municipalities that have not passed Inclusionary Zoning policies to offer incentives and bonuses for affordable housing units.
- Encourage government to closely monitor the effectiveness of Inclusionary Zoning policy in creating new affordable housing and to explore alternative funding methods that are predictable, consistent and transparent as a more viable alternative option to Inclusionary Zoning policies in the provision of affordable housing.
- Rebate MPAC market rate property tax assessment on below-market affordable homes.

APPENDIX C:
Government Surplus Land

Surplus government lands fell outside the mandate of the Task Force. However, this question came up repeatedly as a solution to housing supply. While we take no view on the disposition of specific parcels of land, several stakeholders raised issues that we believe merit consideration:

- Review surplus lands and accelerate the sale and development through RFP of surplus government land and surrounding land by provincially pre-zoning for density, affordable housing, and mixed or residential use.
- All future government land sales, whether commercial or residential, should have an affordable housing component of at least 20%.
- Purposefully upzone underdeveloped or underutilized Crown property (e.g., LCBO).
- Sell Crown land and reoccupy as a tenant in a higher density building or relocate services outside of major population centres where land is considerably less expensive.
- The policy priority of adding to the housing supply, including affordable units, should be reflected in the way surplus land is offered for sale, allowing bidders to structure their proposals accordingly.

APPENDIX D:
Surety Bonds

Moving to surety bonds would free up billions of dollars for building

When a development proposal goes ahead, the developer typically needs to make site improvements, such as installing common services. The development agreement details how the developer must perform to the municipality's satisfaction.

Up until the 1980s, it was common practice for Ontario municipalities to accept bonds as financial security for subdivision agreements and site plans. Today, however, they almost exclusively require letters of credit from a chartered bank. The problem with letters of credit is that developers are often required to collateralize the letter of credit dollar-for-dollar against the value of the municipal works they are performing.

Often this means developers can only afford to finance one or two housing projects at a time, constraining housing supply. The Ontario Home Builders' Association estimates that across Ontario, billions of dollars are tied up in collateral or borrowing capacity that could be used to advance more projects.

Modern "pay on demand surety bonds" are proven to provide the same benefits and security as a letter of credit, while not tying up private capital the way letters of credit do. Moving to this option would give municipalities across Ontario access to all the features of a letter of credit with the added benefit of professional underwriting, carried out by licensed bonding companies, ensuring that the developer is qualified to fulfill its obligations under the municipal agreement.

Most important from a municipal perspective, the financial obligation is secured. If a problem arises, the secure bond is fully payable by the bond company on demand. Surety companies, similar to banks, are regulated by Ontario's Office of the Superintendent of Financial Institutions to ensure they have sufficient funds in place to pay out bond claims.

More widespread use of this instrument could unlock billions of dollars of private sector financial liquidity that could be used to build new infrastructure and housing projects, provide for more units in each development and accelerate the delivery of housing of all types.

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Planning and Development Services
1815 Sir Isaac Brock Way, Thorold, ON L2V 4T7
905-980-6000 Toll-free: 1-800-263-7215

MEMORANDUM

CWCD 2022-71

Subject: Report of the Ontario Housing Affordability Task Force

Date: March 18, 2022

To: Planning and Economic Development Committee

From: Diana Morreale, Acting Director, Community and Long Range Planning

The purpose of this memo is to provide a copy of staff's response letter to the recommendations contained within the "Report of the Ontario Housing Affordable Task Force" (Appendix 1).

In December 2021, the Province created a Housing Affordability Task Force. The Task Force was created to deliver recommendations on ways to address market housing supply and affordability. The Province appointed nine members to the Task Force.

In February 2022, the Task Force released recommendations to the public. The recommendations within the report centred on the following themes:

- Focus on getting more homes built;
- Making land available to build;
- Cut the red tape so we can build faster and reduce costs;
- Reduce the costs to build, buy and rent; and,
- Support and incentivize scaling up housing supply;

Appendix 1 to CWCD 2022-71 contains a letter to Minister Clark outlining staff's response on the Task Force recommendations.

Respectfully submitted and signed by

_____

Diana Morreale, MCIP, RPP
Acting Director, Community and Long Range Planning

Niagara Region

Planning and Development Services
1815 Sir Isaac Brock Way, Thorold, ON L2V 4T7
905-980-6000 Toll-free: 1-800-263-7215

Sent via e-mail: steve.clark@pc.ola.org

March 15, 2022

The Honourable Steve Clark
Minister of Municipal Affairs and Housing
17th Floor, 777 Bay Street
Toronto, Ontario
M7A 2J3

Subject: Response to the Report of the Ontario Housing Affordability Task Force

Dear Minister Clark,

On February 8, 2022, the Ontario Housing Affordability Task Force ("Task Force") published a total of 55 recommended actions aimed at increasing Ontario's housing supply by 1.5 million households over the next ten years. The recommendations, which are aimed at all levels of government and their associated agencies, primarily seek to increase "as-of-right" intensification within urban areas, streamline development approvals and related timelines, improve tax and municipal financing, and reform the Ontario Land Tribunal appeals process.

The Niagara Region appreciates the Province's commitment to improving housing affordability across Ontario. Over 20,000 of Niagara's households were reported to have been in core housing need as of 2016, primarily driven by a lack of affordable housing options within the community. Given the recent surge in housing prices experienced across the Province, rates of core housing need are have risen. Action must be taken to ensure more housing of all types are provided to meet the needs of our growing population.

The provision of affordable, accessible, and adequate housing is a complex matter that requires coordination between all levels of government. The report focuses on the inefficiencies in the land development process and how it contributes to the crisis, however planning approvals at the municipal level are only one factor in housing affordability. There are other economic factors contributing to the housing supply challenge and affordability including:

- building industry capacity (lack of labour);
- supply chain and shortages in materials ; and,
- approved land supply being held back by landowners.

While not addressed specifically in the Task Force's report, the Province should also consider the specific challenges associated with increasing the supply of community housing (i.e. housing owned and operated by non-profit housing corporations, housing co-operatives and municipal governments) and supportive housing. Although an increase in market supply can address the issue of housing affordability in part, the private sector alone cannot solve the entirety of this problem and it is the community housing need that is the most dire and needs to be addressed. A collective effort from all levels of government, housing service providers, and the development industry is required to provide the necessary tools and interventions to address this problem.

The Province should also consider the unique housing challenges faced by communities of all types and sizes, including small to medium sized cities and rural communities. A city like Toronto versus a city like Thorold will have access to different resources and require vastly different solutions towards the achievement of improved housing affordability. In short, a "one-size-fits-all" approach should be avoided.

Regional and local staff have reviewed all recommendations provided by the Task Force. At this time, the Province has not specified which, if any, policy, regulation, and/or protocol changes the Province may elect to advance. In the absence of more substantive details relating to the recommendations, Regional and local staff have outlined general comments on the primary objectives and themes of the Task Force's report below, which are shared with the Ministry of Municipal Affairs and Housing for their consideration. In addition to this letter, a few of our local municipalities have also indicated that they will be submitting comments on these recommendations.

Increase Density and "As of Right" Permissions

Relevant Task Force Recommendations

3. Limit exclusionary zoning in municipalities through binding provincial action:

a) Allow "as of right" residential housing up to four units and up to four storeys on a single residential lot.

b) Modernize the Building Code and other policies to remove any barriers to affordable construction and to ensure meaningful implementation (e.g., allow single-staircase construction for up to four storeys, allow single egress, etc.).

4.	Permit “as of right” conversion of underutilized or redundant commercial properties to residential or mixed residential and commercial use.
5.	Permit as of right secondary suites, garden suites, and laneway houses province-wide
6.	Permit “as of right” multi-tenant housing (renting rooms within a dwelling) province-wide.
7.	Encourage and incentivize municipalities to increase density in areas with excess school capacity to benefit families with children.
8.	Allow “as of right” zoning up to unlimited height and unlimited density in the immediate proximity of individual major transit stations within two years if municipal zoning remains insufficient to meet provincial density targets.
9.	Allow “as of right” zoning of six to 11 storeys with no minimum parking requirements on any streets utilized by public transit (including streets on bus and streetcar routes).
11.	Support responsible housing growth on undeveloped land, including outside existing municipal boundaries, by building necessary infrastructure to support higher density housing and complete communities and applying the recommendations of this report to all undeveloped land.

- Staff is generally supportive of the objective to increase the overall density and diversity of housing in built up areas.
- Over 60% of Niagara’s current housing stock is made up of single-detached dwellings. Although recent construction activity has begun a shift towards more medium density builds there is a range of housing types the Region is seeking to encourage through its new Niagara Official Plan.
- Staff do support flexibility in “as of right” permissions for housing, particularly within planned major transit station areas and strategic growth areas and in a manner that is compatible in scale with stable residential areas; however, staff cannot support intensification that is completely unplanned and unrestricted.
- Intensification must be considered in balance with other key considerations needed for the creation of complete communities, such as infrastructure and servicing

capacity, parking requirements, impacts to neighbourhood character, access to employment uses, and landscaping and public realm design. In the absence of municipal oversight through zoning, there are limited tools to ensure development and related services are planned for in a strategic manner.

- **Recommendation 4,** Regional staff support the conversion of underutilized commercial lands along major arterial transit routes as priority areas for mixed residential and commercial use, provided that these sites do not serve as land supply for population based employment.

- **Recommendation 11,** clarification is needed to understand what is meant by development "outside municipal boundaries". If referring to settlement area expansions, existing Provincial policy provides sufficient ability for municipalities to consider adjustments to their urban and rural settlement area boundaries, and while Regional staff support higher densities and the creation of complete communities on potential expansion lands, staff do not support unplanned development within natural areas or agricultural lands. Development should be directed to settlement areas where infrastructure and service levels exists to support development vs. to areas outside of settlement of settlement area boundaries. The resultant financial burden on municipalites would be significant if development occurs outside of settlement area boundaries.

Streamline Development Approvals

Relevant Task Force Recommendations

12. Create a more permissive land use, planning, and approvals system:

a) Repeal or override municipal policies, zoning, or plans that prioritize the preservation of physical character of neighbourhood.

b) Exempt from site plan approval and public consultation all projects of 10 units or less that conform to the Official Plan and require only minor variances

c) Establish province-wide zoning standards, or prohibitions, for minimum lot sizes, maximum building setbacks, minimum heights, angular planes, shadow rules, front doors, building depth, landscaping, floor space index, and heritage view cones, and planes; restore pre-2006 site plan exclusions

	(colour, texture, and type of materials, window details, etc.) to the Planning Act and reduce or eliminate minimum parking requirements; and d) Remove any floorplate restrictions to allow larger, more efficient high-density towers.
13.	Limit municipalities from requesting or hosting additional public meetings beyond those that are required under the Planning Act.
14.	Require that public consultations provide digital participation options.
15.	Require mandatory delegation of site plan approvals and minor variances to staff or pre-approved qualified third-party technical consultants through a simplified review and approval process, without the ability to withdraw Council's delegation.
16.	Prevent abuse of the heritage preservation and designation process by: a) Prohibiting the use of bulk listing on municipal heritage registers. b) Prohibiting reactive heritage designations after a Planning Act development application has been filed.
19.	Legislate timelines at each stage of the provincial and municipal review process, including site plan, minor variance, and provincial reviews, and deem an application approved if the legislated response time is exceeded.
49.	Reductions in funding to municipalities that fail to meet provincial housing growth and approval timeline targets.
50.	Fund the adoption of consistent municipal e-permitting systems and encourage the federal government to match funding. Fund the development of common data architecture standards across municipalities and provincial agencies and require municipalities to provide their zoning bylaws with open data standards. Set an implementation goal of 2025 and make funding conditional on established targets.

- Regional staff support the objective to streamline the development approvals process, expand the usage of delegated approval for applications that are technical and/or minor and nature, and reduce unnecessary delays in the delivery of needed housing supply. However, several of the recommendations noted above impede the ability for municipalities to consider local characteristics and existing built environments as part of planned development. It must also be acknowledged that development approval processes does not only rest with municipalities; there are

development approval processes that take place at the provincial level and there is the need to have appropriate staff resources available to thoses ministries and and a commitment to streamlining provincial development approval processes as well.

- NIMBY is a significant barrier for the development of affordable housing, community housing, supportive housing, and other facilities needed for homelessness services in particular, and presents a challenge for intensification in particular.
- Addressing NIMBY requires continued dialogue, education, negotiation and relationship building is required to demystify the perceived threats associated with growth and development, which is where the importance of public consultation should also be acknowledged. Public consultation allows opportunities to provide information with local residents, allow for open dialogue, and allow a variety of voices to be heard.
- **Recommendation 12 c)**, although staff support additional guidance for flexible zoning standards, a Regional approach would be more appropriate. The growth forecasts, intensification targets, and existing built form in Niagara are different from those of Toronto and the Greater Toronto Area. A “one size fits all” approach with such technical considerations would contribute to a homogenous urban form that disregards local characteristics
- **Recommendation 13,** Regional staff are of the opinion that the necessity for additional meetings remain at the discretion of the local municipality and/or approval authorities provided they comply with existing *Planning Act* timeframes.
- With regards to **Recommendation 16,** Regional staff note that recent changes to the Ontario Heritage Act includes statutory timeline limitations for when municipalities can designate a property following the submission of certain applications under the *Planning Act*. The conservation of culturally and historically significant resources is a Provincial objective that merit continued priority in site specific cases.

Reform the Ontario Land Tribunal Appeals Process

Relevant Task Force Recommendations

18. Restore the right of developers to appeal Official Plans and Municipal Comprehensive Reviews.

20. Fund the creation of “approvals facilitators” with the authority to quickly resolve conflicts among municipal and/or provincial authorities and ensure timelines are met.

21. Require a pre-consultation with all relevant parties at which the municipality sets out a binding list that defines what constitutes a complete application; confirms the number of consultations established in the previous recommendations; and clarifies that if a member of a regulated profession such as a professional engineer has stamped an application, the municipality has no liability and no additional stamp is needed.

26. Require appellants to promptly seek permission ("leave to appeal") of the Tribunal and demonstrate that an appeal has merit, relying on evidence and expert reports, before it is accepted.

27. Prevent abuse of process:

a) Remove right of appeal for projects with at least 30% affordable housing in which units are guaranteed affordable for at least 40 years.

b) Require a $10,000 filing fee for third-party appeals.

c) Provide discretion to adjudicators to award full costs to the successful party in any appeal brought by a third party or by a municipality where its council has overridden a recommended staff approval.

28. Encourage greater use of oral decisions issued the day of the hearing, with written reasons to follow, and allow those decisions to become binding the day that they are issued.

29. Where it is found that a municipality has refused an application simply to avoid a deemed approval for lack of decision, allow the Tribunal to award punitive damages.

30. Provide funding to increase staffing (adjudicators and case managers), provide market-competitive salaries, outsource more matters to mediators, and set shorter time targets.

31. In clearing the existing backlog, encourage the Tribunal to prioritize projects close to the finish line that will support housing growth and intensification, as well as regional water or utility infrastructure decisions that will unlock significant housing capacity.

- Regional staff agree that additional changes can be made to continuously improve the appeals process. For instance, subject to further information regarding the manner in which these objectives are implemented, Regional staff generally support the aims of **Recommendations 20, 21, 26, 28** and **30** as a means of reducing baseless appeals and reducing the wait times for decisions to be rendered.

- Regional staff are concerned, however, that measures to increase the filing fee for appeals as outlined in **Recommendation 27 b)** or to introduce the ability to award punitive costs as outlined in **Recommendation 29** would essentially eliminate the ability for residents or small interest groups to participate in the appeals.

- **Recommendation 18,** allowing developers to appeal MCRs will result in a dramatic slow down of the growth management process, and ultimately, the development approvals process. In addition, there are competing interests within the development community itself that will serve to frustrate and lengthen the appeals process. One of the challenges of the last several years has been the instability in the planning and development sector as a result of the long protracted appeals associated with the original conformity excercises to the Growth Plan followed by several years of changes to Provinical legislation and Plans. Permitting these types of appeals will serve to undermine the Province's goal of streamlining the approvals process and will prevent municipalities from bringing housing on-line in an expedited fashion.

- **Recommendation 31,** prioritization should focus on proposals that include an affordable housing component, and should allow for equitable consideration across the Province (i.e. in areas outside of Toronto and the Greater Toronto Area).In clearing the existin backlog of appeals priorities should be given to municipal initiated amendments that are appealed.

Improve Municipal Financing and Taxes

Relevant Task Force Recommendations

25. Require municipalities to provide the option of pay on demand surety bonds and letters of credit.

32. Waive development charges and parkland cash-in-lieu and charge only modest connection fees for all infill residential projects up to 10 units or for any development where no new material infrastructure will be required.

33. Waive development charges on all forms of affordable housing guaranteed to be affordable for 40 years.

34. Prohibit interest rates on development charges higher than a municipality's borrowing rate.

35. Regarding cash in lieu of parkland, s.37, Community Benefit Charges, and development charges:

a) Provincial review of reserve levels, collections and drawdowns annually to ensure funds are being used in a timely fashion and for the intended purpose, and, where review points to a significant concern, do not allow further collection until the situation has been corrected.

b) Except where allocated towards municipality-wide infrastructure projects, require municipalities to spend funds in the neighbourhoods where they were collected. However, where there's a significant community need in a priority area of the City, allow for specific ward-to-ward allocation of unspent and unallocated reserves.

36. Recommend that the federal government and provincial governments update HST rebate to reflect current home prices and begin indexing the thresholds to housing prices, and that the federal government match the provincial 75% rebate and remove any claw back.

37. Align property taxes for purpose-built rental with those of condos and low-rise homes.

39. Eliminate or reduce tax disincentives to housing growth.

42. Provide provincial and federal loan guarantees for purpose-built rental, affordable rental and affordable ownership projects.

43. Enable municipalities, subject to adverse external economic events, to withdraw infrastructure allocations from any permitted projects where construction has not been initiated within three years of build permits being issued.

44. Work with municipalities to develop and implement a municipal services corporation utility model for water and wastewater under which the municipal corporation would borrow and amortize costs among customers instead of using development charges.

The recommendations included above require further detail and analysis to provide substantive comments. There are a number of recommendations Regional staff have concerns with, including:

- **Recommendation 25,** The Region does not support the use of surety bonds as they do not offer the same financial security as a Letter of Credit.

- **Recommendation 32,** The Region currently has grant programs for development charges on social housing that meet specific grant program criteria. Infill units still create a demand for regional sevices. Development Charges (DCs) help pay for the construction of growth related infrastructure, waiving them for infill units will have

impacts on the Region's finances and will shift growth costs to existing homeowners. Also, it is not clear what is meant by "no new material infrastructure" and this could lead to appeals based of different interpretations.

- **Recommendation 33,** DCs help pay for the construction of growth related infrastructure, waiving them for affordable housing will have significant impacts on the Region's finances and will shift growth costs to existing taxpayer. Additional information is required on the definition of affordable. The Region currently has grant programs for development charges on social housing that meet specific grant program criteria. However, occupants of this housing type still create demand for services which are paid for by DCs. The cost of growth for these developments are funded from Regional taxes and shift growth costs to existing homeowners which also impacts affordability. The Provincial government should provide funding for such programs.

- **Recommendation 34**, The Region has concerns of the potential funding gap that will occur if interest rates are not included in DCs, this places a greater burden on the existing taxpayer. Municipal borrowing rates fluctuate so flexibility needs to be provided to municipalities.

- **Recommendation 35(b),** The Region does not support and prefers the current flexibility to adopt area specific or Region wide charges and the flexibility to prioritize use of DCs based on actual growth and need.

- **Recommendation 37**, the Niagara Region has a tax policy already in place that charges new multi-residential at the same tax rate as residential.

- **Recommendation 44**, the Region does not support. Municipal development charge models are effective tools to ensure growth pays for growth.

Moving Forward

Further consultation with the municipal sector is recommended before the implementation of any strategy, actions, or regulations in response to the Task Force's recommendations to ensure that strong and effective solutions for facilitating the development of affordable housing is reflected in all communities across the Province. The Report recommendations does not address the need for additional mechanisms to support affordable housing from Provincial and Federal governments (i.e. tax incentives). Long-term funding from all levels of government must also be available to provide needed support services to create healthy mixed income communities.

Regional and local municipal staff are available to convene and contribute municipal expertise and knowledge in this matter.

Respecfully,

_____

Diana Morreale, MCIP, RPP
Acting Driector, Community and Long Range Planning
Planning and Development, Niagara Region
Niagara Region
1815 Sir Isaac Brock Way, Thorold, ON, L2V 4T7

Received May 5, 2022
C-2022-091

Office of the City Clerk
Matthew Trennum
905-227-6613 ext. 226
matthew.trennum@thorold.ca

City of Thorold
3540 Schmon Parkway P.O. Box. 1044
Thorold, ON L2V 4A7

Where Ships Climb The Mountain...

May 5, 2022

Sent ELECTRONICALLY

Re: Thorold City Council Submission – Bill 109

At its meeting held on May 3rd, 2022, Thorold City Council adopted the following resolution respecting Council's submission to the Province pertaining to Bill 109 and the recommendations proposed by the Province's Housing Affordability Task Force:

> **THAT** Report CC2022-39 **BE RECEIVED** for information and **BE CIRCULATED** to Regional Council, Niagara's Local Area Municipalities, Local MPPs and AMO.

Please find appended to this correspondence, a copy of Report CC2022-39 and the City's submission to the Province for your information.

Yours truly,

Matthew Trennum
City Clerk

Title:	**Council's Submission to the Province respecting Bill 109 and the recommendations proposed by the Province's Housing Affordability Task Force**
Report Number:	**CC2022-39**
Meeting Date:	**Tuesday, May 03, 2022**
Report Prepared:	**Thursday, April 28, 2022**

RECOMMENDATION(S):

That Report CC2022-39 **BE RECEIVED** for information and **BE CIRCULATED** to Regional Council, Niagara's Local Area Municipalities, and Local MPPs and AMO.

REPORT:

Please find attached to this Report as Appendix 1, City Council's submission to the Province respecting Bill 109 and the recommendations proposed by the Province's Housing Affordability Task Force.

This submission was submitted on behalf of Regional Council on Friday, April 29, 2022, as directed by City Council as directed at its meeting held on Monday, April 25, 2022.

BUDGETARY STATUS:

There are no budget implications to this Report

STRATEGIC PLAN:

Responsible Community Growth and Infrastructure Planning

CANADIAN CONTENT:

Not applicable.

ATTACHMENTS:

Appendix 1 – City Council's Comments on Bill 109 and the recommendations proposed by the Province's Housing Affordability Task Force

PREPARED BY: “original signed” Matthew Trennum, City Clerk

SUBMITTED BY: “original signed” Matthew Trennum, City Clerk

APPROVED BY: “original signed” Manoj Dilwaria, Chief Administrative Officer

At a Special Council meeting held on Monday, April 25, 2022, Thorold City Council held a round table discussion on the impacts of Bill 109, *More Homes for Everyone Act,* 2022, and the recommendations proposed by the Province's Housing Affordability Task Force (HATF).

Thorold City Council supports the Association of Municipalities of Ontario (AMO's) response to the HAFT report, and specifically addressed the following issues during the roundtable discussion:

- Increasing the supply of housing, without municipal intervention through planning and financial instruments, will not address affordability. Rather, a more targeted approach, to ensure an appropriate mix of supply is needed to ensure the needs of individuals of all income levels in Ontario are met;
- The importance of municipal decision-making and the insight provided by locally elected officials. Additional municipal engagement on these issues is necessary, to ensure a productive and coordinated approach to addressing housing affordability; and
- More generally the need for a comprehensive examination of housing, rather than specific policy outcomes.

As an additional comment, specifically related to zoning by-law and official plan amendment applications, City Council recommends that the timelines for response to an application should be determined by a formula based on the size of the municipality and its level of growth, rather than a set amount of time for all municipalities. The City of Thorold is experiencing vast growth at this time. Although a boom for the City itself, the ability for planning staff to manage the increased workload, and receive punitive penalties if they don't, is a risk to smart growth planning.

With regards to the passing of Bill 109, the *More Homes for Everyone Act,* the City Council additionally wished to support the resolution passed by the Township of Mulmar, at its meeting on April 6, 2022, which stated the following:

1. Final Decision making should rest with elected officials
2. Planner's recommendations should be subject to public input and local expertise
3. Ratepayers should not be subsidizing development applications through refunds to application fees intended to cover the cost of processing applications
4. That a definition of minor rezoning has not been established
5. Planners should not be put in a position of having to be experts and decision makers over all other disciplines
6. Delegating authority for site plans and creating penalties for site plan and minor rezonings will not solve housing crisis, as the proposed legislation targets single lot developments opposed to large scale residential development

   AND FURTHER THAT a copy of this resolution be forwarded to the Province of Ontario, Ministry of Municipal Affairs and Housing, Environmental Registry, the County of Dufferin and all Ontario municipalities.

Received May 4, 2022
C-2022-092

Office of the City Clerk
Matthew Trennum
905-227-6613 ext. 226
matthew.trennum@thorold.ca

City of Thorold
3540 Schmon Parkway P.O. Box. 1044
Thorold, ON L2V 4A7

Where Ships Climb The Mountain...

May 4, 2022

Sent ELECTRONICALLY

Re: City of Thorold Resolution – Russian Sanctions

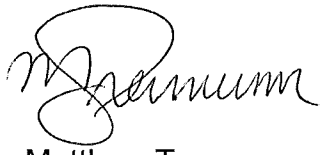
At its meeting held on May 3rd, 2022, Thorold City Council adopted the following resolution respecting Russian Sanctions:

> **WHEREAS** the country of Ukraine has experienced a premeditated and unprovoked invasion by Russia;
>
> **WHEREAS** silence is complicity;
>
> **WHEREAS** Canada imports hundreds of millions of dollars' worth of goods from Russia each year; and
>
> **WHEREAS** negative financial impacts upon a country can be used as a means to deter further conflict.
>
> **NOW THEREFORE BE IT RESOLVED:**
>
> 1. That the Correspondence from the Town of Gravenhurst regarding sanctions on Russia be received for information;
>
> 2. That the City of Thorold unequivocally denounces Russia's unjustifiable war against Ukraine;
>
> 3. That the City of Thorold supports the sanctions which the Federal government of Canada has thus far imposed on Russia;
>
> 4. That effective immediately and until a time when the sovereignty of Ukraine is once again unchallenged, the City of Thorold will:
>
>   1. Not purchase any products (i.e. plywood, fertilizer, steel, furniture or machinery) which can be easily traced to have originated from Russia; and
>
>   2. Insist that any future contracts for services for the City of Thorold abide by these same limitations within our municipality;

5. That upon confirmation that the Belarusian military is engaged within Ukraine that the City of Thorold apply these limitations upon goods from that country as well; and

6. That this decision of Thorold City Council be forwarded to all other municipalities within Ontario requesting they enact similar measures so that as a united front we can make a noticeable difference.

Yours truly,



Matthew Trennum
City Clerk

cc: Manoj Dilwaria, CAO
All Ontario Municipalities

GRAVENHURST
GATEWAY TO MUSKOKA

Sent via Email

April 19, 2022

RE: TOWN OF GRAVENHURST RESOLUTION – RUSSIAN SANCTIONS

At the Town of Gravenhurst Committee of the Whole meeting held on April 12, 2022 the following resolution was passed:

> **WHEREAS** the country of Ukraine has experienced a premeditated and unprovoked invasion by Russia;
>
> **AND WHEREAS** silence is complicity;
>
> **AND WHEREAS** Canada imports hundreds of millions of dollars' worth of goods from Russia each year;
>
> **AND WHEREAS** negative financial impacts upon a country can be used as a means to deter further conflict;
>
> **BE IT THEREFORE RESOLVED THAT** the Correspondence from the Town of Georgina regarding sanctions on Russia be received for information;
>
> **AND THAT** The Town of Gravenhurst unequivocally denounces Russia's unjustifiable war against Ukraine;
>
> **AND THAT** the Town of Gravenhurst supports the sanctions which the Federal government of Canada has thus far imposed on Russia;
>
> **AND THAT** effective immediately and until a time when the sovereignty of Ukraine is once again unchallenged, the Town of Gravenhurst will:
>
> 1) Not purchase any products (ie plywood, fertilizer, steel, furniture or machinery) which can be easily traced to have originated from Russia; and
> 2) Insist that any future contracts for services for the Town of Gravenhurst abide by these same limitations within our municipality;
>
> **AND THAT** upon confirmation that the Belarusian military is engaged within Ukraine that the Town of Gravenhurst apply these limitations upon goods from that country as well;

AND THAT this decision of Gravenhurst Council be forwarded to all other municipalities within Ontario requesting they enact similar measures so that as a united front we can make a noticeable difference.

Sincerely,

J.G.

Jacob Galvao
Administrative Clerk II – Legislative Services
Town of Gravenhurst

Received April 29, 2022
C-2022-093

Administration
Office of the Regional Clerk
1815 Sir Isaac Brock Way, PO Box 1042, Thorold, ON L2V 4T7
Telephone: 905-980-6000 Toll-free: 1-800-263-7215 Fax: 905-687-4977
www.niagararegion.ca

April 29, 2022

CL 9-2022, April 28, 2022
PDS 14-2022, April 28, 2022

LOCAL AREA MUNICIPALITIES
NIAGARA PENINSULA CONSERVATION AUTHORITY

SENT ELECTRONICALLY

Proposed Niagara Official Plan
PDS 14-2022

Regional Council, at its Special meeting held on April 28, 2022, passed the following resolution:

> That Report PDS 14-2022, dated April 28, 2022, respecting Proposed Niagara Official Plan, **BE RECEIVED** and **BE CIRCULATED** to the Local Area Municipalities and the Niagara Peninsula Conservation Authority (NPCA).

A copy of Report PDS 14-2022 (report only) is attached for your reference. All documents related to the proposed Official Plan may be found at: https://niagararegion.ca/official-plan/proposed-plan.aspx

Yours truly,

Ann-Marie Norio
Regional Clerk

CLK-C 2022-071

cc: M. Sergi, Commissioner, Planning & Development Services
N. Oakes, Executive Assistant, Planning & Development Services
D. Heyworth, Official Plan Consultant

Subject: Proposed Niagara Official Plan

Report to: Regional Council

Report date: Thursday, April 28, 2022

Recommendations

1. That this report **BE CIRCULATED** to the Local Area Municipalities and the Niagara Peninsula Conservation Authority (NPCA).

Key Facts

- The purpose of this report is to provide an overview on the proposed Niagara Official Plan (NOP) and to inform the April 28, 2022 statutory public meeting.
- The NOP contains a wide range of policies that set out what we protect, where and how the Region will grow, and policy tools for success.
- The NOP policies protect the natural environment, Niagara Escarpment, source water, agricultural system, aggregate resources, and cultural heritage and archaeology.
- The NOP plans for a population of 674,000 and 272,000 jobs by 2051 and allocates growth to local municipalities by establishing intensification targets for built up areas and densities for greenfield areas and strategic growth areas.
- The NOP includes policies to support the success of our growth by requiring the development of district and secondary plans, the use of urban design to guide built form, and preparing subwatershed plans for growth areas.
- The report addresses the consultation received on the January 2022 draft NOP and highlights key changes made.
- Input on the proposed NOP will be received throughout the statutory process. In addition to this statutory public meeting, a statutory open house was held on the proposed NOP on April 7, 2022.
- All input received on the proposed NOP will be considered and a revised NOP will be recommended for adoption by Regional Council in June 2022.
- The deadline for submitting the Niagara Official Plan to the Province is July 1, 2022.

Financial Considerations

There are no financial considerations directly related to this report. Council approved the resources to complete the NOP over a five year period as part of the 2017 Budget Process.

The growth forecasts associated with the NOP inform the Niagara 2051 initiatives, guiding updates to the Water and Wastewater Master Servicing Plan (MSP), Transportation Master Plan (TMP) and Development Charges Study (DCS). These key master plans and studies identify growth related projects to be undertaken and identify related capital costs to ensure financial responsibility and accountability are appropriately placed and maintained.

Analysis

The purpose of this report is to provide Council with an overview of the proposed NOP, consultation to date, and to advise Council of the statutory requirements of the open house and public meeting under the *Planning Act*. The NOP must conform to all provincial policies and plans, assess our land needs to accommodate provincial growth forecasts, identify systems to protect and plan for future infrastructure and financials.

On March 30, 2022, the proposed NOP was released for public comment, and an official notice was issued for both the statutory open house and public meeting under the Planning Act. The open house was scheduled and held on April 7, 2022 and the public meeting is occurring today, on April 28, 2022. The proposed NOP can be viewed at https://niagararegion.ca/official-plan/proposed-plan.aspx.

The development of a new Niagara Official Plan was launched on July 5, 2018 with a special meeting of Council to provide the public with an opportunity to identify areas of interest. Over the following years, several background reports were produced on a variety of themes related to growth management, the natural environment, the agricultural system, housing, and employment. The background work was followed by the creation of themed policy sections which culminated in a consolidated draft of the official plan made available for public review in January 2022. The consolidated draft incorporated Council reviewed directions on settlement area boundary expansions and natural environment system (NES) mapping and policies. At the end of March 2022, a proposed NOP was made available for formal consultation under the Planning Act. Appendix 1 provides a more detailed chronology of steps taken to develop the NOP.

Consultation and Next Steps

A significant amount of consultation went into the development of the proposed NOP, including outreach with the public, agencies, stakeholder groups, First Nations and Indigenous communities, local municipalities and Niagara Peninsula Conservation Authority. Appendix 1 also outlines the consultation which has taken place on the development of the NOP from the beginning of the process.

More specifically, to assist in gathering comments on the draft consolidated NOP from January to March 2022 the following consultation steps were taken:

- The draft plan was posted on the website;
- Agencies were circulated;
- Subscribers for information on the NOP were e-mailed a newsletter;
- Public Information Sessions were held on Settlement Area Boundary Review (January 24, 2002), NES (February 10, 2022) and all components of the NOP (February 24, 2022);
- A zoom workshop was held to inform urban property owners with newly mapped natural heritage features;
- An NES mapping tool was made available for property owners and public to comment on specific mapped natural features;
- Presentations have been made to local municipal councils; and,
- Staff have been in direct contact with Ministry to discuss conformity in an effort expedite approval when the NOP adoption package is sent to the province.

The Niagara Official Plan

The NOP is the first comprehensive review since the original policy plan was approved in the early 1970's. The NOP is a long range planning document that will set out what we protect, where and how the region will grow, and policy approaches for success. The NOP implements a planning horizon to 2051, which conforms with the timeframe *in A Place to Grow, Growth Plan for the Greater Golden Horseshoe* (2019, amended 2020) (*Growth Plan*).

The requirements for an Official Plan is set out in the *Planning Act*. Additionally, the NOP must be consistent with the *Provincial Policy Statement*, conform to the *Growth Plan*, the *Greenbelt Plan* and not conflict with the *Niagara Escarpment Plan*.

The region is developing an entire new Official Plan to ensure contemporary policies are developed in order to:

- address provincial policy conformity, matters of Regional interest and provide policy support to the local municipalities;
- guide planning at a Regional level while assisting local municipalities with managing growth pressures including policies that support the protection of established neighbourhoods and varying intensification rates across municipalities;
- prioritize climate change throughout the Plan to achieve sustainable and resilient communities;
- improve mapping and policies to protect the natural features and water resources of the natural environment system;
- protect the agricultural system and land base, and provide for opportunities for value added agriculture;
- support a diverse range of housing types and sufficient housing supply to address affordability and market demand; and,
- identify employment areas to protect for long term investment.

The NOP is built on a vision derived from pillar statements which were developed from public and Council consultation. The pillar statements are:

EXCEPTIONAL development and communities - Well planned, high quality development in appropriate locations that improves our communities, while protecting what is valuable.

DIVERSE housing types, jobs and population - A wide mix of housing types and employment opportunities that attract diverse populations to Niagara across all ages, incomes and backgrounds.

THRIVING agriculture and tourism - A prosperous agricultural industry and world-class tourism opportunities that grow our economy and elevate the Niagara experience.

RESILIENT urban and natural areas - Areas rich in biodiversity that mitigate and adapt to climate change while strengthening Niagara’s ability to recover from extreme weather events.

Policy Content and Directions

Many policies across the plan relate to one another and work together to create co-benefits, like protecting the natural environment, reducing greenhouse gas emissions, and growing the economy, while also improving quality of life. One of the best examples of policy interconnection is climate change. The climate change pulls policy directions from other areas of the plan that support addressing climate change such as complete communities, strategic growth areas, intensification in proximity to public transit, green infrastructure and protecting the environment. The climate change section also commits the Region to future work such as completing greening and adaptation strategies and climate modelling.

The core policy directions of the NOP related to the resources we protect, how and where we grow, and the policy tools for success are found throughout different Chapters in the NOP. For the purposes of this report the core policy directions of the NOP are summarized below.

What We Protect

The NOP contains key policy directions that protect significant resources such as the natural environment, Niagara Escarpment, source water, agricultural system, aggregate resources and cultural heritage and archaeology.

Based on consultation the NES and agriculture systems were considered fundamental to protect. In this regard policy directions on the NES go beyond the provincial plan requirements in what is protected. The NES is an overlay designation across Niagara Region. Individual features are identified within the NES and specific policies apply to protect these features depending on their geographic location in the system. There are policies requiring Environmental Impact Studies and for transition policies for development applications initiated or in process.

The policies of the Agricultural Section aim to protect the Region’s agricultural system land base and provided value added agricultural opportunities. Additionally, the proposed NOP identifies Specialty Crop lands, Prime Agricultural lands and Rural lands. Specialty Crop lands are protected in conformity with Greenbelt Plan policies and Prime Agricultural lands are protected from fragmentation and non-farm development. Rural residential development is limited to Rural areas.

How and Where We Grow

The Growth Plan requires the Region to plan for a population of 674,000 and 272,000 jobs by 2051. In order to plan for this growth, the Region is required to allocate growth to local municipalities, set intensification targets for built up areas, densities for greenfield areas, strategic growth areas and determine if there is sufficient settlement area land to accommodate the growth to 2051.The Region has planned for a population 20,000 people higher than the provincial forecast with the extra population being accommodated in the built up areas of Welland and Lincoln.

The NOP contains policies supporting a housing mix to address aging in place and housing affordability, as well as setting affordable housing targets. There are policies to support gentle density and integration of intensification in established neighborhoods as well as flexibility for municipalities to plan for intensification in a manner that addresses their local needs provided the intensification targets of the plan are met.

Urban settlement areas are the focus of growth. The Region is required to plan for growth (population and employment) to 2051 and despite an intensification target of 60% in built up areas certain municipalities need additional community or employment lands based on the Region's land needs assessment. To accommodate allocated growth, the proposed NOP includes urban expansions in West Lincoln, Niagara Falls, Fort Erie, Welland and Pelham/Thorold, as well as hamlet expansions in West Lincoln and Wainfleet. The location of expansion areas were selected through a comprehensive Settlement Area Boundary Review (SABR). Larger expansion areas shall develop by secondary plan and sub-watershed planning to ensure natural areas are protected.

Strategic Growth areas are a focus of growth because of available infrastructure and transit. These areas include: the provincial Urban Growth Centre of downtown St. Catharines; GO Station areas of Grimsby, St. Catharines, Niagara Falls, and future station in Lincoln; downtowns of Niagara Falls and Welland; and the South Niagara Falls Regional Growth Centre. Over 30 percent of all growth is directed to these areas. Secondary planning will be required for Strategic Growth Areas and where existing secondary plans are in effect these will be reviewed to determine the necessity of updates.

Employment Areas are identified for protection over the long term. Conversion of Employment Areas can only take place through a Municipal Comprehensive Review. The NOP identifies density targets and employment uses for Core, Dynamic and Knowledge and Innovation Employment Areas.

Policy Tools for Success

The NOP includes policy tools to support the management of our growth while protecting our resources by requiring the development of district and secondary plans, the use of urban design to guide built form, and preparing subwatershed plans for growth areas.

District and Secondary Plans are community level plans that establish a blue print for how a community will grow identifying strategic areas for intensification and ensuring infrastructure and transportation planning along with community consultation are considered. These plans envision the types of land uses to be developed within a specified area and the improvements needed to realize a vision. Secondary plans will be required for strategic growth areas and expansion areas.

Urban design will play an important role in fitting intensification in developed areas and enhancing the public realm. The NOP includes policies and guidelines that outline the scale, form and design standards used for a community's built form, streetscape, and public realm.

Infrastructure policies support where and how we grow and provide a sustainable transportation system that accommodates forecasted growth. The Water and Wastewater and Transportation Master Plans are informed by the NOPs growth allocations.

Sub-watershed planning or its equivalent will compliment and inform secondary plans and ensure growth scenarios consider the natural environment system on a comprehensive scale.

Changes Based on Consultation

The proposed NOP revises the draft made available for comment between January and March 2022.

Significant feedback was received on the draft consolidated NOP from the public, agencies, interest groups, First Nations and Indigenous communities, local municipalities and Niagara Peninsula Conservation Authority.

Comments received and regional response can be reviewed within the following Appendices at: https://www.niagararegion.ca/official-plan/proposed-plan-comments-jan-mar-2022.aspx

Appendix 2- Comments on the draft Consolidated NOP
Appendix 3- Comments on the NES
Appendix 4- Summary of Comments on NES Mapping
Appendix 5- Comments/Requests Submitted for SABR after the March 4, 2022 deadline

After considering all the consultations, revisions were made throughout the Plan. Appendix 6, attached to this report, identifies key changes made in terms of policy additions or changes in direction for the sections in each of the Chapters.

Some revisions and important matters to bring to Council's attention are:

- Urban and hamlet expansions as per the Council endorsed Reports PDS 6 2022 and PDS 7 2022.
- New strategic growth area boundary in Niagara Falls around the future hospital site as discussed in Report PDS 6-2022.
- Alignment with provincial policy with respect to protected major transit station areas (Go Station areas) and providing opportunities for inclusionary zoning in these areas.
- Revisions to the policy to clarify that the NES is an overlay, to align with a core policy that allows refinements to limits of features without a Regional Official Plan amendment.
- A new Schedule C4 incorporating definitions and criteria for NES features.
- Changes to the transition policies for the NES.
- New climate change policies addressing the preparation of a municipal energy plan, exploring options for green building development standards; considering opportunities to integrate electric vehicle charging, and committing the Region to LEED silver for new Corporate facilities.
- Technical and editorial changes to Aggregate policies to ensure that proposed policies are consistent with the PPS and conform to provincial plans.
- Recognition of existing rural employment areas, outside settlement area boundaries, in Thorold and Port Colborne.
- Clarification of the intent of future employment areas recognizing their consideration in long range planning.
- Stronger acknowledgement of First Nations and Indigenous communities in engagement, archaeological management and cultural heritage planning.

Next Steps

Staff will consider all the comments submitted on the proposed NOP. The final version of the NOP will be presented with supporting material to complete the Municipal Comprehensive Review. If adopted all the materials will be submitted to the Province for approval. A recommendation report with the final NOP will be presented to Council in June 2022 for adoption to meet the Provincial deadline of July 1, 2022.

Alternatives Reviewed

This report is for information purposes. There can be more than one good planning approach to achieve the policies and objectives set out in the NOP. Consultation to date has identified a variety of competing interests. The NOP works to strike a balance between these interests to ensure the social and economic health of our communities.

Relationship to Council Strategic Priorities

The Niagara Official Plan supports the following Council Strategic Priorities:

- **Supporting Business and Economic Growth-** Through long range planning for the supply and retention of a broad range of community and employment lands that offer community related employment and industrial employment opportunities to attract and support economic wellbeing;

- **Healthy and Vibrant Community-** Through planning for safe, healthy neighbourhoods that are attractive, inclusive and connected, based on complete community principles and design;

- **Responsible Growth and Infrastructure Planning-** Through coordinated, efficient use of existing infrastructure and optimizing planned infrastructure that will service the communities of Niagara and facilitate movement of people and goods; and

- **Sustainable and Engaging Government:** Through planned growth that is fiscally sustainable and fosters strong, successful relationships between all levels of government in the supply of services and infrastructure.

Other Pertinent Reports

PDS 40-2016	Regional Official Plan Update
PDS 41-2017	New Official Plan Structure and Framework
PDS 3-2018	New Official Plan Update
PDS 6-2018	Natural Environment Project Initiation Report
PDS 18-2018	Natural Environment – Project Framework
PDS 9-2019	New Official Plan Consultation Timeline Framework
PDS 10-2019	Update on Natural Environment Work Program – New Regional Official Plan
CWCD 122-2019	Agricultural and Environmental Groups – Draft Stakeholder Lists
CWCD 150-2019	Update on Official Plan Consultations – Spring 2019
CWCD 179-2019	Notice of Public Information Centres – Natural Environment Work Program, New Regional Official Plan
CWCD 271-2019	Update on Consultation for New Official Plan
PDS 32-2019	Natural Environment Work Program – Phases 2 & 3: Mapping and Watershed Planning Discussion Papers and Comprehensive Background Study
PDS 1-2020	New Niagara Official Plan – Public Consultation Summary
PDS 3-2020	Ecological Land Classification Mapping Update
PDS 9-2020	Niagara Official Plan – Consultation Details and Revised Framework
CWCD 153-2020	Natural Environment Work Program Update – New Niagara Official Plan
PDS 26-2020	Natural Environment Work Program – Phase 4: Identification and Evaluation of Options
CWCD 314-2020	Update Natural Environment Work Program
PDS 35-2020	Niagara Official Plan Consultation Update
PDS 4-2021	Niagara Official Plan – Steps and Direction Moving Forward
PDS 1-2021	Natural Environment Work Program – 2nd Point of Engagement
CWCD 2021-70	Mapping and Data for Natural Environment Options
PDS 17-2021	Niagara Official Plan Consolidated Policy Report
PDS 30-2021	Niagara Watershed Plan – Draft for Consultation
PDS 32-2021	Update on Niagara Official Plan - Further Draft Policy Development
PDS 36-2021	Consultation Response and Further Policy Development
PDS 39-2021	Niagara Official Plan: Employment Area Conversion Recommendations
PDS 8-2021	Niagara Official Plan: Natural Environment System

PDS 41-2021	Settlement Area Boundary Review - Urban Recommendations
PDS 42-2021	Settlement Area Boundary Review - Rural Recommendations
PDS 2-2022	Niagara Official Plan - Proposed Draft for Consultation
PDS 6-2022	Niagara Official Plan: Final Urban Settlement Area Recommendations
PDS 7-2022	Niagara Official Plan: Final Rural Settlement Area Recommendations

Prepared by:
Dave, Heyworth, MCIP, RPP
Official Plan Policy Consultant
Planning and Development

Recommended by:
Michelle Sergi, MCIP, RPP
Commissioner
Planning and Development Services

Submitted by:
Ron Tripp, P.Eng.
Chief Administrative Officer

This report was prepared in consultation with Diana Morreale, Acting Director of Community and Long Range Planning.

Appendices

Appendix 1 Key NOP Development Steps/ Consultation on the NOP

(Note: Appendices 2-5 available electronically only)

Appendix 2 Comments on the draft Consolidated NOP

Appendix 3 Comments on the Natural Environment System (NES)

Appendix 4 Summary of Comments on NES Mapping (available electronically)

Appendix 5 Comments/Requests Submitted for SABR after the March 4/ 2022

Appendix 6 Key Policy Changes to the Draft Consolidated NOP

Received April 29, 2022
C-2022-094

NIAGARA PENINSULA CONSERVATION AUTHORITY

Board of Directors Meeting Highlights – April 22nd, 2022

On Friday April 22nd, 2022, the Board of Directors of the Niagara Peninsula Conservation Authority (NPCA) held its regular monthly meeting electronically. Highlights from the meeting included:

2021 Restoration Program Highlights and 2022 Restoration Project Approvals

The Board of Directors was provided information regarding the activities of the Restoration Program in 2021 and approved 43 restoration projects selected from the November 2021 application intake. The projects selected will result in 24.24 ha of reforestation, 3.8 ha of wetlands created, 7.39 ha of new or improved hedgerows, 7.05 ha of riparian restoration, and 3 agricultural best management practices projects. Staff will engage several significant traditional and new partner organizations which will allow the NPCA to leverage funds and organizational capacities to deliver on its current priorities.

NPCA Draft 2021 Annual Report

The Board of Directors approved the digital and print publication of the NPCA 2021 Annual Report. The Annual Report highlights the successes of the NPCA in 2021 that included increased conservation area visitation, volunteer hours logged, planning and permit reviews completed, and trees and shrubs planted.

2021 Audited Financial Statements and Audit Findings Report

The Board of Directors approved the 2021 Audited Financial Statements and the 2021 Audit Findings Report developed by KPMG LLP, following a high-level summary presentation of the firm's findings.

2022 Operating and Capital Budgets

The Board of Directors approved the NPCA Operating and Capital Budgets for 2022. The NPCA 2022 Operating and Capital Budgets were approved by Niagara Region Council on December 16, 2021, City of Hamilton Council on March 30, 2022, and Haldimand County Council on April 4, 2022.

The Board also approved the allocation of funds from Reserves to fund ongoing initiates carried over from 2021, including those outlined in the 2022 Unfunded Budget Priorities list. This included allocation of funds into the General Operating Reserve, General Capital Reserve, Restoration Reserve, and Tree By-Law Reserve.

Board Resolution to The City of St. Catharines and Ontario Power Generation Regarding 12 Mile Creek

After lengthy discussion at the meeting, the Board of Directors adopted a resolution apprising the City of St. Catharines and Ontario Power Generation of the NPCA's ongoing interest in future use and environmental enhancement of the 12 Mile Creek Valley. The Board further requested that any future high intensity use of the 12 Mile Creek Valley undergo slope stability, environmental impact studies and/or other technical works as deemed appropriate by the NPCA.

Links to Agendas, Minutes and Video

https://npca.ca/about/board-meetings

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Administration
Office of the Regional Clerk
1815 Sir Isaac Brock Way, PO Box 1042, Thorold, ON L2V 4T7
Telephone: 905-980-6000 Toll-free: 1-800-263-7215 Fax: 905-687-4977
www.niagararegion.ca

April 26, 2022

CL 8-2022, April 14, 2022
PEDC 3-2022, April 6, 2022
PDS 9-2022, April 6, 2022

DISTRIBUTION LIST

SENT ELECTRONICALLY

2021 Census Series: Population and Dwelling Counts
PDS 9-2022

Regional Council, at its meeting held on April 14, 2022, passed the following recommendation of its Planning and Economic Development Committee:

That Report PDS 9-2022, dated April 6, 2022, respecting 2021 Census Series: Population and Dwelling Counts, **BE RECEIVED** for information and **BE CIRCULATED** to Local Area Municipalities, Niagara Peninsula Conservation Authority, Niagara Home Builders Association, Niagara Industrial Association, local Chambers of Commerce and School Boards.

A copy of PDS 9-2022 is enclosed for your reference.

Yours truly,

Ann-Marie Norio
Regional Clerk
:cv

CLK-C 2022-062

Distribution List

Local Area Municipalities
Niagara Peninsula Conservation Authority
Niagara Home Builders Association
Niagara Industrial Association
M. Balsom, President/CEO, Greater Niagara Chamber of Commerce
D. Fabiano, Executive Director, Niagara Falls Chamber of Commerce, Port Colborne/Wainfleet Chamber of Commerce, Welland/Pelham Chamber of Commerce, Greater Fort Erie Chamber of Commerce
M. Ward, President/CEO, Niagara-on-the-Lake Chamber of Commerce
R. Shelley, Executive Director, Grimsby Chamber of Commerce
D. Potter, Executive Director, West Lincoln Chamber of Commerce
S. Mabee, Niagara District School Board
M. Ladouceur, Conseil scolaire Viamonde
S. Whitwell, Niagara Catholic District School Board
A. Aazouz, Conseil Scolaire de District Catholique Centre-Sud

cc: M. Sergi, Commissioner, Planning and Development Services
N. Oakes, Executive Assistant, Planning and Development Services
G. Bowie, Senior Planner, Planning and Development Services

Subject: 2021 Census Series: Population and Dwelling Counts

Report to: Planning and Economic Development Committee

Report date: Wednesday, April 6, 2022

Recommendations

1. That this Report **BE RECEIVED** for information; and
2. That this Report **BE CIRCULATED** to Local Area Municipalities, Niagara Peninsula Conservation Authority, Niagara Home Builders Association, Niagara Industrial Association, local Chambers of Commerce and School Boards.

Key Facts

- Population and Dwellings, from the 2021 Census of Population, were released by Statistics Canada on February 9, 2022.
- Niagara's population increased by 30,000 people between 2016 and 2021, the highest 5-year increase since the baby boom era (1951-1961).
- The City of Thorold had Ontario's fourth highest growth rate and 8th fastest in Canada, with a 27% increase in population between 2016 and 2021.
- All municipalities in Niagara experienced an increase in population during the census period for the first time since 2006.
- Nearly 40% of dissemination areas in Niagara experienced a decline in population over the last five years showing decline in more established neighbourhoods and growth in newly developing areas.

Financial Considerations

There are no financial implications associated with this report.

Analysis

2021 Census and Topic Release Schedule

The Census of Population is conducted by Statistics Canada every five years. In the census year, the survey is sent out in May to every household in Canada for completion. The last survey was conducted in May 2021.

There will be seven major releases of Census data throughout 2022. The seven release dates and topics are summarized as follows:

Census Data Release Date	Census Topic
February 9, 2022	• Population and dwelling counts
April 27, 2022	• Age • Sex at birth and gender • Type of dwelling
July 13, 2022	• Families, households, and martial status • Canadian military experience • Income
August 17, 2022	• Language
September 21, 2022	• Indigenous peoples • Housing
October 26, 2022	• Immigration, place of birth and citizenship • Ethnocultural and religious diversity • Mobility and migration
November 30, 2022	• Education • Labour • Language of work • Commuting • Instruction in the official minority language

This report is the first in a series of reports that will be prepared by staff throughout the year to summarize key findings, trends and data points from the 2021 Census topic releases.

The information provided in this report is based on the seven data points that were released for population and dwelling counts released on February 9, 2022. The seven data points are:

- Population, 2021
- Population, 2016
- Population percentage change, 2016 to 2021
- Total private dwellings
- Private dwellings occupied by usual residents
- Population density per square kilometre
- Land area in square kilometres

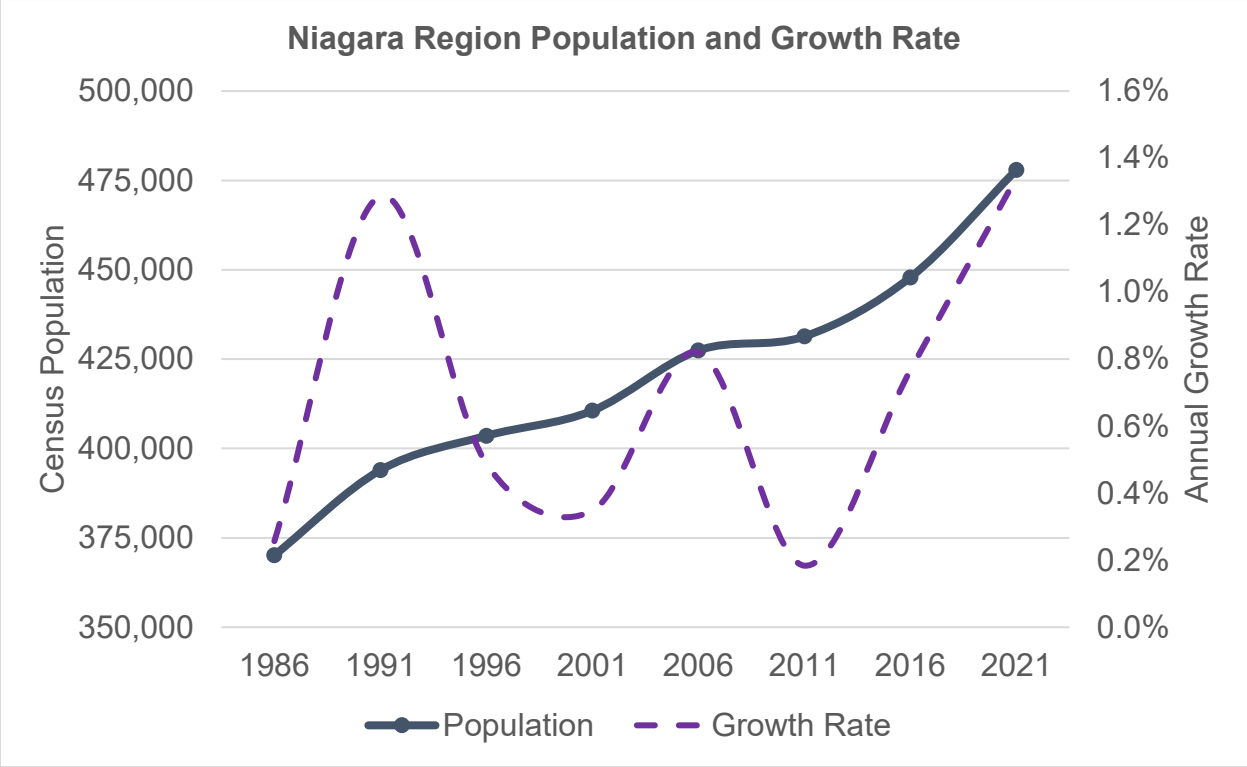
This report provides baseline data for further analysis as the remainder of 2021 census information is released throughout 2022.

Strongest Population Growth in 70 Years

Niagara Region added over 30,000 people between 2016 and 2021. This is the largest population increase in a five-year period since the baby boom era and highest annual growth rate (1.3%) since 1986.

As shown in Figure 1, the pace of population growth has been increasing since 2011. Between 2016 and 2021 Niagara added an average of 6,000 people per year.

Figure 1: Niagara Region population and growth rate (1986 to 2021)



The pace of growth between 2016 and 2021 is lower than what is needed to meet the 2051 population target of 694,000. Niagara needs to add an average of 6,750 people per year to achieve population forecasts identified in the draft Niagara Official Plan.

Niagara's population increase of 30,000 is lower than comparative upper- and single-tier municipalities in Ontario. Table 1 shows Niagara's growth is close to Hamilton (32,400) but well below Simcoe (53,500), Waterloo (52,000) and Halton (48,200). When comparing growth rate, Niagara is growing faster than Hamilton but below other municipalities in the Growth Plan outer ring (Waterloo, Simcoe and Middlesex).

Table 1: 2021 population and growth rate among comparative municipalities in Ontario.

Census Division	2021 Population	2016 Population	Population Change	Growth Rate
Halton	596,637	548,435	48,202	9%
Waterloo	587,165	535,154	52,011	10%
Hamilton	569,353	536,917	32,436	6%
Simcoe	533,169	479,635	53,534	11%
Middlesex	500,563	455,526	45,037	10%
Niagara	477,941	447,888	30,053	7%
Essex	422,860	398,953	23,907	6%

Municipal Population and Growth Rates

All 12 municipalities in Niagara experienced population growth between census periods for the first time since 2001-2006.

Niagara Falls had the largest increase in population (6,345), followed by Thorold (5,015), St. Catharines (3,690) and Welland (3,455).

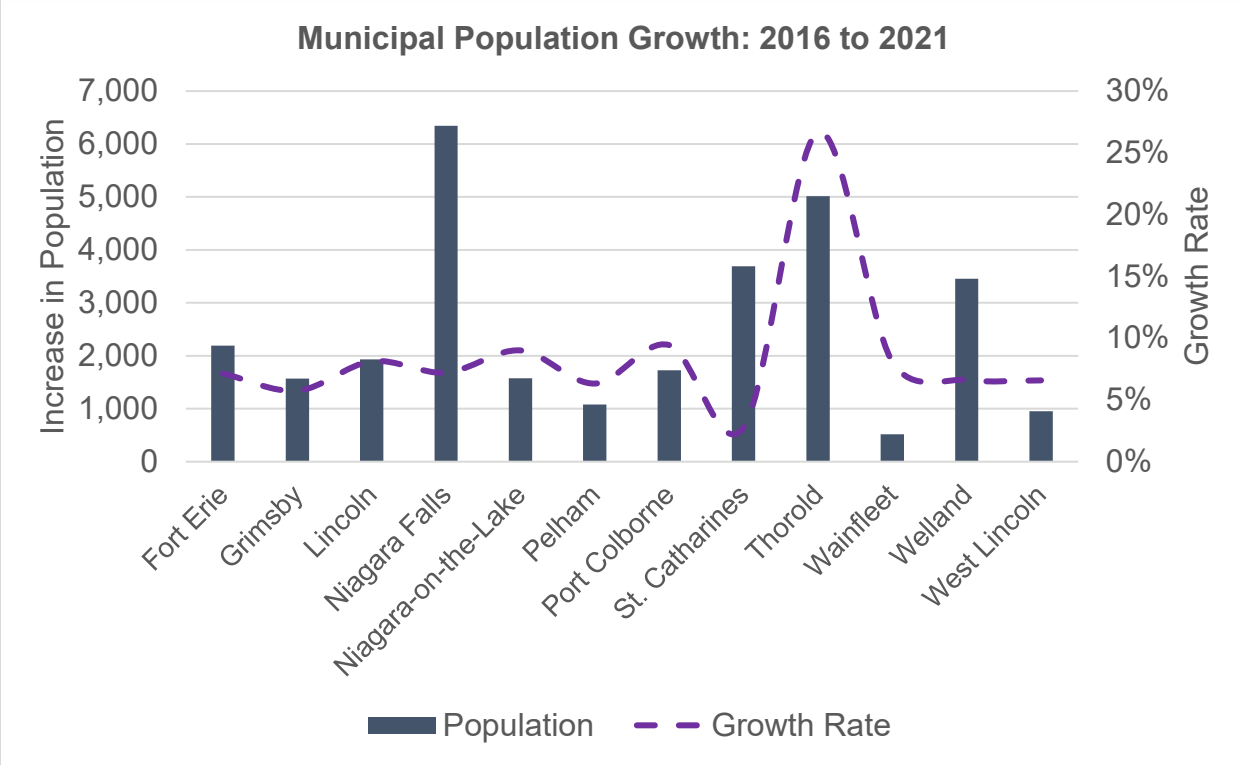
Thorold had the highest population growth rate with an increase of 27%, which is the highest municipal growth rate in Niagara, 4th in Ontario and 8th in Canada.

11 out of 12 municipalities had a population increase above 6%, excluding St. Catharines (3%). The lower growth rate in St. Catharines is not due to a lack of population growth as the City added the third most population. Rather, the lower rate of 3% is reflective of St. Catharines having the largest population base in Niagara.

Port Colborne had a 9% growth rate in the 2021 Census which is appears to be attributed to a combination of new residents and a shift in seasonal residents now considering Port Colborne their usual place of residence.

Figure 2 provides a summary of population and growth rates for each municipality in Niagara.

Figure 2: 2021 population and growth rate by municipality



Growth Concentrated Along Highway Corridors and Designated Greenfield Areas

Appendix 1 and 2 identify population growth based on geography. Appendix 1 identifies population growth by municipality and Appendix 2 looks at Dissemination Areas[1] (DA).

As shown on Appendix 1, the greatest concentration of growth over the last 5 years has been located primarily along the 406 corridor in Niagara Falls, Thorold, and St. Catharines. Population growth remains strong along the QEW corridor but has slowed in Grimsby and Niagara-on-the-Lake.

Appendix 2 provides greater clarity on areas of population change within municipalities. The areas with the highest levels of population growth are situated within Designated Greenfield Areas and are made up of large developments that have been built over the

[1] A dissemination area (DA) is a small, relatively stable geographic unit with an average population of 400 to 700 persons based on data from the previous Census of Population Program

last five years. Such developments can be seen in west Smithville, west Welland, south Thorold and south Niagara Falls.

Appendix 2 also highlights the decline in population across more established neighbourhoods and the rural area. Nearly 40% of DA's in Niagara experience a decline in population of the last 5 years.

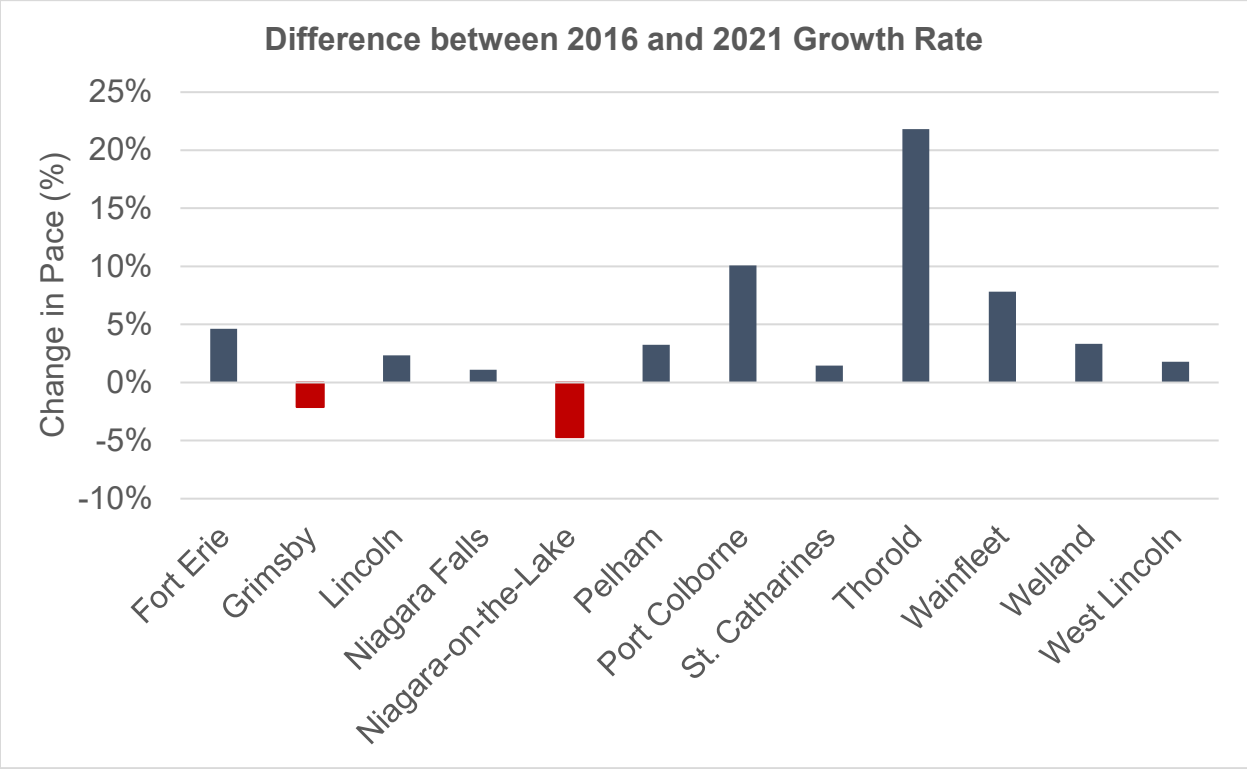
Pace of Growth Shifting to Central and South Niagara

One of the notable trends from the 2021 Census is the shifting pace of growth across municipalities in Niagara.

The highest municipal growth rates from the 2016 Census were primarily in north Niagara within Greenbelt municipalities. This trend has shifted over the last five years with most municipalities in Niagara having experienced an increase in population between 7% and 9%.

Figure 3 explores the difference in growth rate between the 2016 and 2021 Census.

Figure 3: Change in growth rate between 2016 Census and 2021 Census



As shown in Figure 3, the greatest change in growth rate was within Thorold (22%), Port Colborne (10%), Wainfleet (8%), and Fort Erie (5%).

Niagara-on-the-Lake experienced the largest decline in growth rate, going from 14% to 9%. The 9% growth rate in Niagara-on-the-Lake is still significant and the second highest in Niagara. Population growth in Niagara-on-the-Lake is likely to remain at this pace as development within the Glendale District Plan area continues.

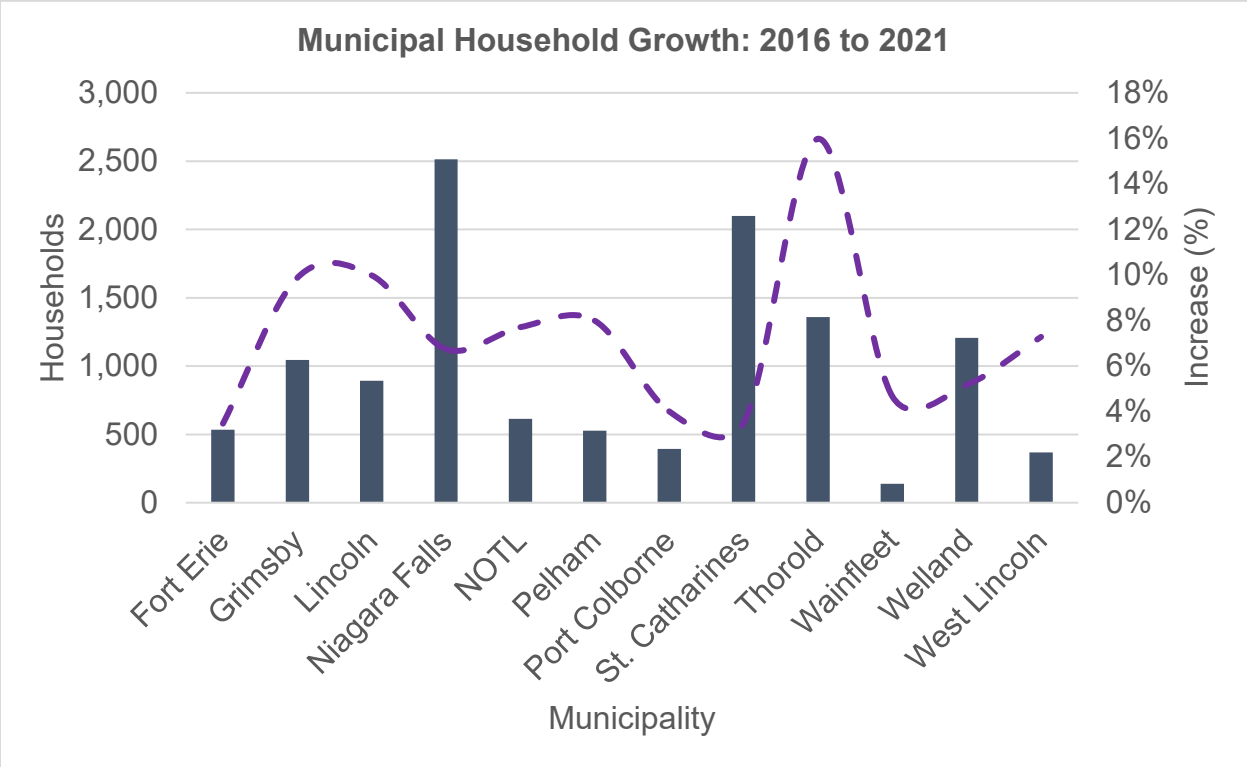
Growth in Total Dwelling Units

A total of 11,685 dwelling units were added to Niagara Region between 2016 and 2021, a 6% increase.

Niagara Falls (2,515), St. Catharines (2,100), Thorold (1,360), Welland (1,210) and Grimsby (1,045) added the most dwelling units over the census period.

Figure 4 highlights housing growth by municipality.

Figure 4: Municipal Household Growth between 2016 and 2021

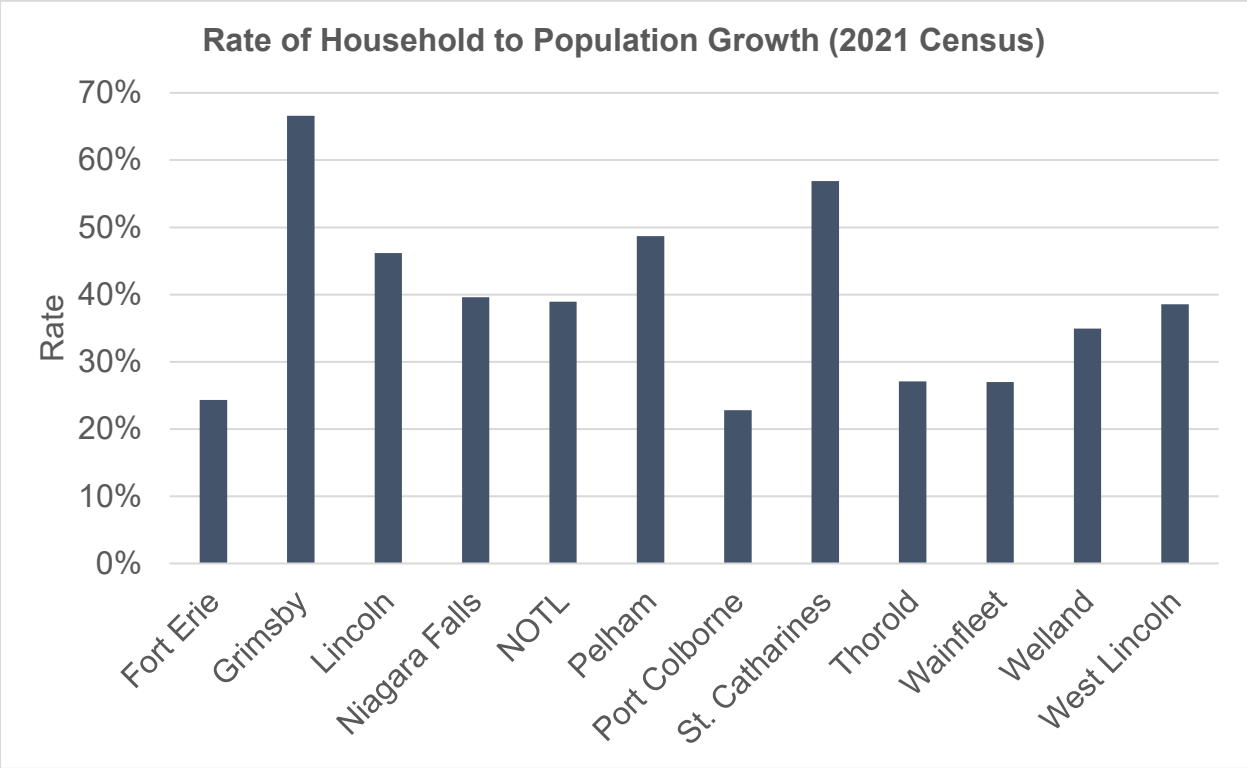


While information on housing mix will not be released until April 27, 2022, we can interpret a few trends from the limited information we do have. Figure 5 compares the rate of household growth to population growth. Higher rates in municipalities like Grimsby (67%), St. Catharines (57%) and Pelham (49%) imply housing growth has been within medium to high density unit types (townhomes and apartments) where there are few people per unit. It may also imply an aging demographic where, despite healthy housing growth, the population is declining within existing units.

Alternatively, lower rates such as Port Colborne (23%), Fort Erie (24%), Thorold (27%) and Wainfleet (27%) imply housing growth has been primarily in lower density housing types and/or population growth has been within existing units.

This topic will be revisited through future reports as we get additional information on housing mix and age.

Figure 5: 2021 rate of household to population growth



Alternatives Reviewed

This report provides Planning and Economic Development Committee a summary of the first release of data from the 2021 census. No alternatives were considered.

Relationship to Council Strategic Priorities

- Supporting Businesses and Economic Growth

  The census provides key information and details on business and economic growth trends. This topic is not addressed in this report but will be the subject of a future report once data is released in November, 2022.

- Healthy and Vibrant Community

  The census provides key socioeconomic data. This topic is not addressed in this report but will be the subject of a future report once data is released throughout 2022.

- Responsible Growth and Infrastructure Planning

  The census is the authoritative source for population data that is used by departments across the Region. This information is critical for monitoring the Official Plan and insuring to the Region plans growth and infrastructure responsibly.

- Sustainable and Engaging Government

  This report, and forthcoming reports for this series, is aimed at providing Planning and Economic Development Committee information from the census so Council is engaged and aware of trends in Niagara.

Other Pertinent Reports

PDS 2-2022 Niagara Official Plan: Proposed Draft for Consultation

PDS 23-2021 2020 End of Year Growth Report and 5 Year Growth Trend

Prepared by:
Greg Bowie
Senior Planner
Planning and Development Services

Recommended by:
Michelle Sergi, MCIP, RPP
Commissioner
Planning and Development Services

Submitted by:
Ron Tripp, P.Eng.
Chief Administrative Officer

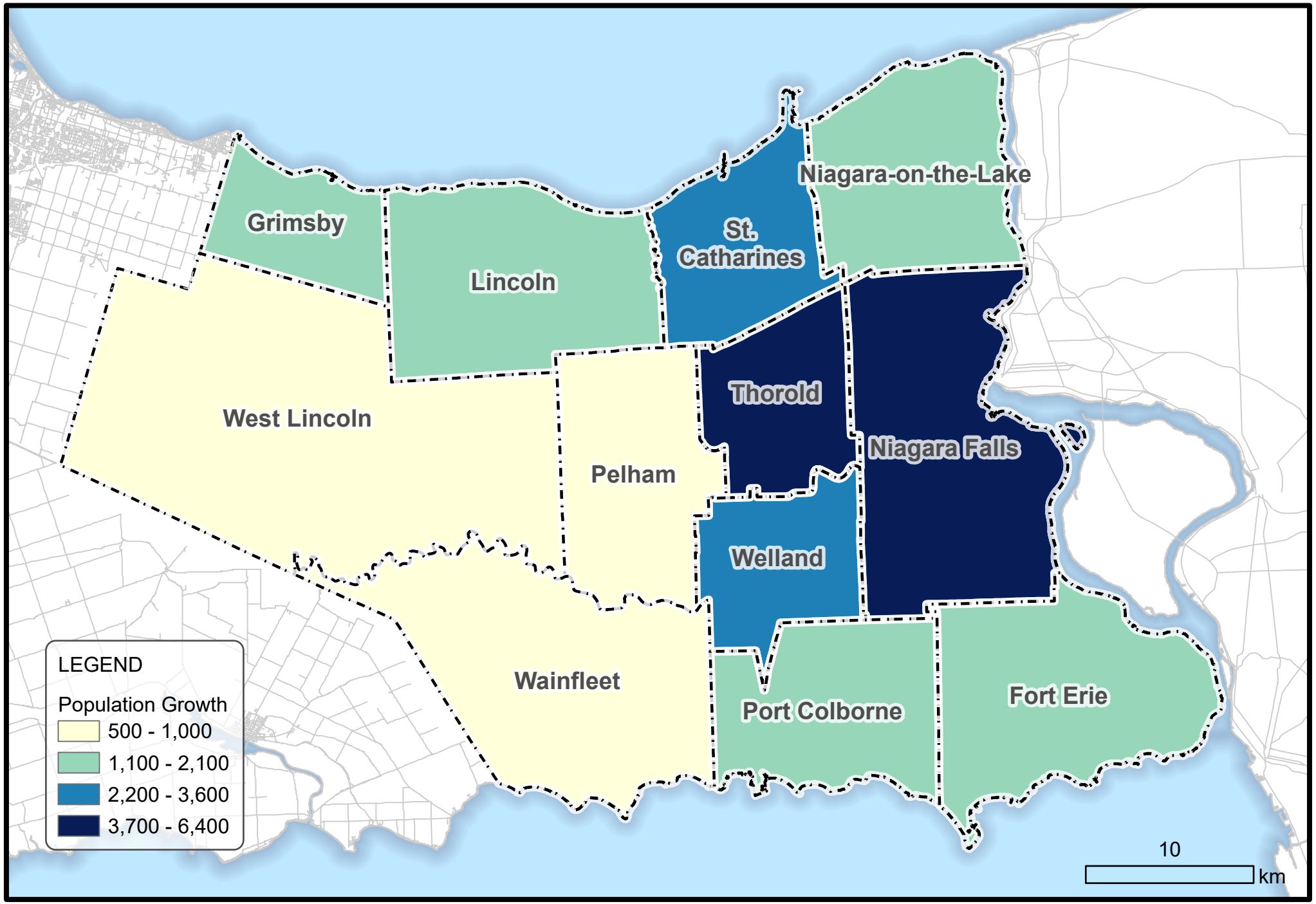
This report was prepared in consultation with John Federici, Planner and reviewed by Diana Morreale, Acting Director of Community and Long Range Planning.

Appendices

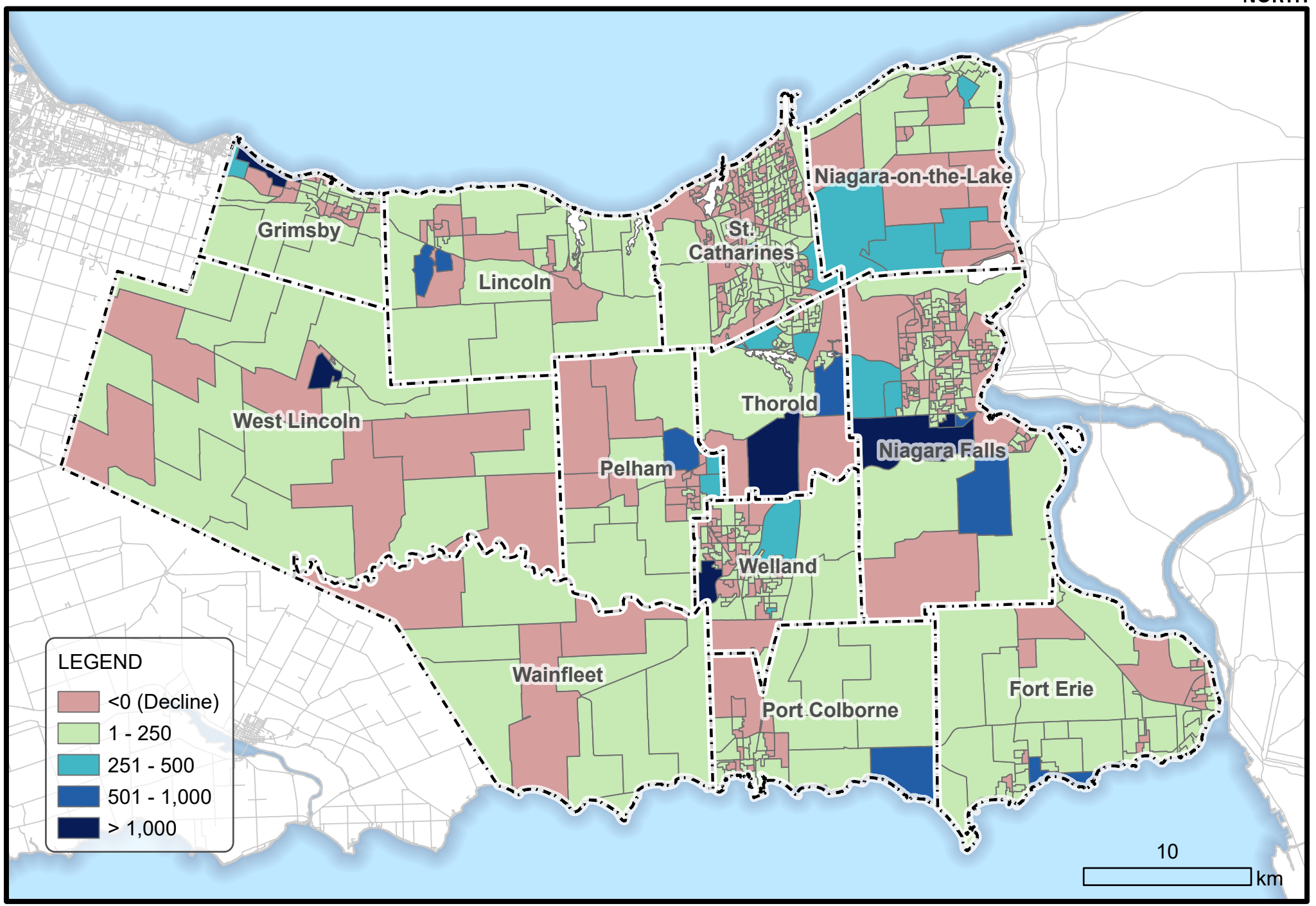
Appendix 1 Population Growth by Municipality (2016 to 2021)

Appendix 2 Population Growth by Dissemination Area (2016 to 2021)

Appendix 1: Population Growth by Municipality (2016 to 2021)



Appendix 2: Population Growth by Dissemination Area (2016 to 2021)



Administration
Office of the Regional Clerk
1815 Sir Isaac Brock Way, PO Box 1042, Thorold, ON L2V 4T7
Telephone: 905-980-6000 Toll-free: 1-800-263-7215 Fax: 905-687-4977
www.niagararegion.ca

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April 22, 2022

CL 8-2022, April 14, 2022
PEDC 3-2022, April 6, 2022
PDS 13-2022, April 6, 2022

DISTRIBUTION LIST

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2021 Reserve Water and Wastewater Treatment Capacities
PDS 13-2022

Regional Council, at its meeting held on April 14, 2022, passed the following recommendation of its Planning and Economic Development Committee:

That Report PDS 9-2022, dated April 6, 2022, respecting 2021 Reserve Water and Wastewater Treatment Capacities, **BE RECEIVED** for information and **BE CIRCULATED** to the Ministry of the Environment, Conservation and Parks, and Local Area Municipalities.

A copy of PDS 13-2022 is enclosed for your reference.

Yours truly,

Ann-Marie Norio
Regional Clerk
:cv

CLK-C 2022-063

Distribution List
Ministry of the Environment, Conservation and Parks
Local Area Municipalities

cc: M. Sergi, Commissioner, Planning and Development Services
N. Oakes, Executive Assistant, Planning and Development Services
I. Stetic, Water Wastewater Development Project Manager, Planning and Development Services

Subject: 2021 Reserve Water and Wastewater Treatment Capacities

Report to: Planning and Economic Development Committee

Report date: Wednesday, April 6, 2022

Recommendations

1. That this Report **BE RECEIVED** for information**;** and
2. That this Report **BE CIRCULATED** to the Ministry of the Environment, Conservation and Parks and Local Municipalities

Key Facts

- The purpose of this report is to inform Council of the reserve treatment capacities at Niagara's Water and Wastewater Treatment facilities. This reporting is required by the Ministry of Environment, Conservation and Parks (MECP).
- The data contained in this report assists in commenting on new development proposals and related servicing as well as planning for future treatment capacity.
- All of Niagara Water Treatment Plants (WTPs) and Wastewater Treatment Plants (WWTPs) are positioned to accept growth beyond the minimum 10-year horizon.

Financial Considerations

This report provides Council with historical and projected treatment capacity and flow data. There are no direct financial implications in receiving this report.

The reserve treatment capacities at the water and wastewater (W&WW) facilities are considered in commenting on new development proposals and related servicing and, as a result, could result in a financial impact related to specific future applications.

Analysis

The Infrastructure Planning and Development Engineering section of Planning and Development Services Department annually reports on an assessment of the average daily W&WW flows based on the previous five years, as recorded at our various facilities compared to MECP rated capacities for the facilities. A key objective of this report is to highlight potential capacity constraints and allow sufficient lead-time to plan for future capacity increases through the W&WW capital programs so that development

may continue unencumbered. This is a desktop exercise, which compares five-year (annual) average flows to the respective MECP Environmental Compliance Approval(s), formerly known as Certificate of Approval(s) for each facility, then incorporates 10-year growth forecasts into the calculation. Ongoing phasing and staging strategy works with our local municipal partners will further refine this assessment for understanding development capacity.

This assessment does not reflect specific compliance, quality, sustainability, risk, or operational deficiencies at the treatment plants or trunk conveyance/transmission systems, which may affect the Region's ability to approve new development or permit servicing extensions.

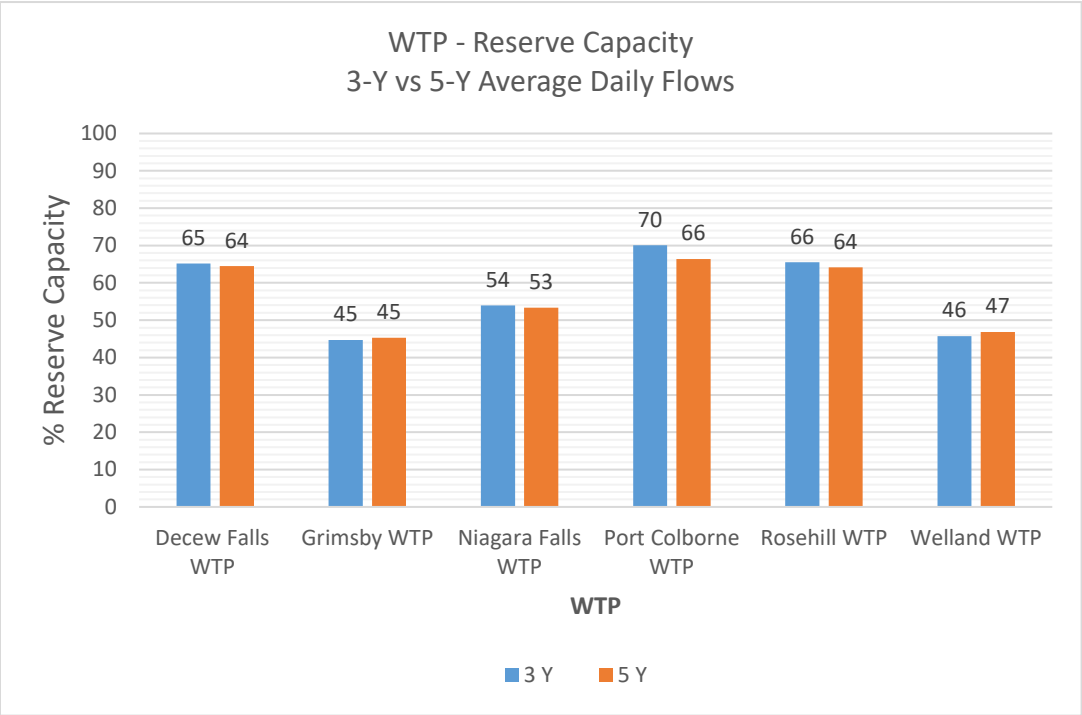
For municipal wastewater treatment, weather is the key factor that results in peak wet weather flow, which impacts the collection and trunk sewers in both local and regional systems through "Rainfall Derived Inflow and Infiltration" (RDI&I). Wet weather flows can have substantial impact on available WWTP capacities and a direct impact on the limitations of available servicing capacity for future growth.

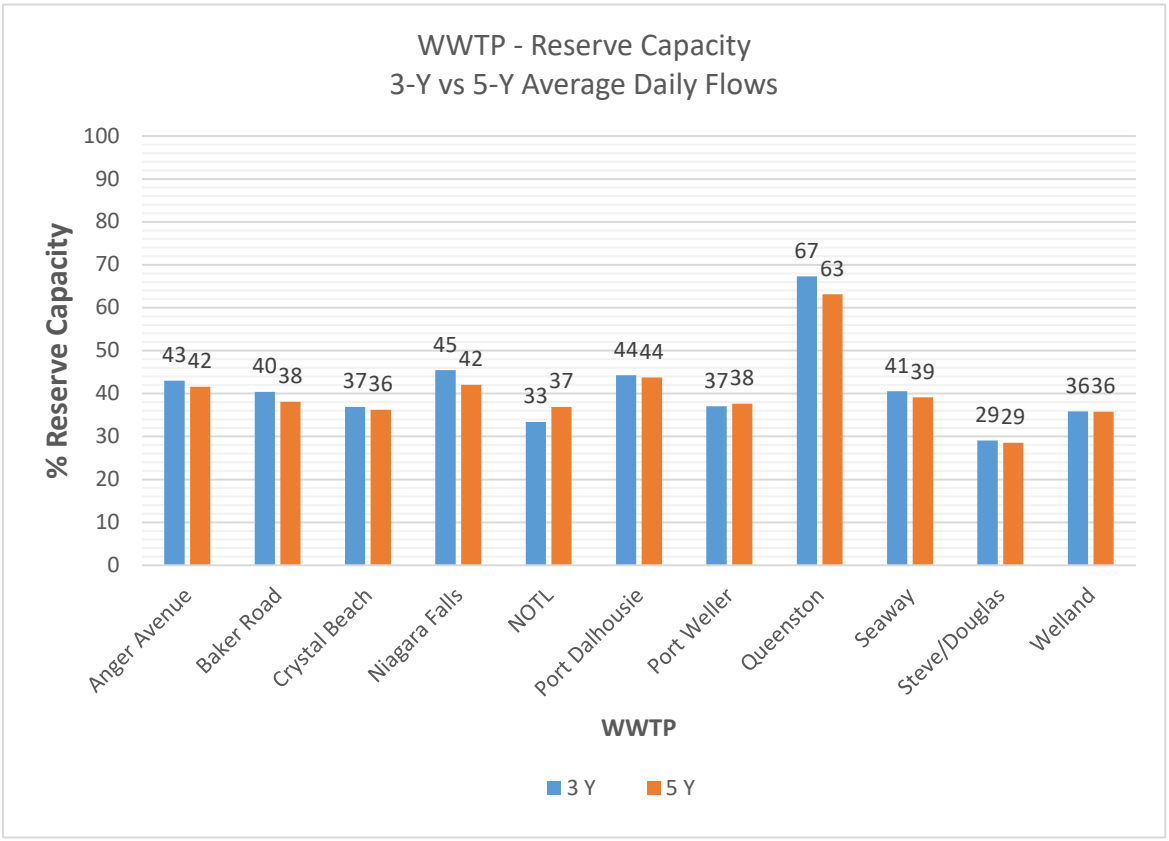
Appendix 1 and 2 provide the annual average daily flows, five and three-year average flows from 2017 to 2021 for the water and wastewater treatment plants, respectively. Appendices 3 and 4 provide a summary of Niagara's six water treatment facilities and eleven wastewater treatment facilities presenting their respective reserve capacities.

It is worth noting that growth rates in recent years show an increase compared to time before, which consequently can affect the way this desktop exercise conducts the reserve capacity calculations. This can create a skewed sense of a greater reserve capacity available for the future if the annual daily flows are averaged over longer period. With a higher growth rate seen recently in the Region, it would be expected that Reserve Capacities averaged over a 3-year period are less then averaged over a 5-year period. Due to COVID over the last 2 years, there may have been some impacts on flows. However, averaging daily flows over a 5-year period versus a 3-year period in the Reserve Capacity calculations for 2021 does not show a compelling difference or significant trend.

Figure 1 shows a comparison of the percentage of remaining reserve capacities for WTPs and WWTPs when daily flows are averaged over the last 3 and 5 years.

Figure 1: Reserve Capacity – Annual Flows Averaged over 3-Year and 5-Year Period





At present, all of Niagara's WTPs and WWTPs are positioned to accept growth beyond the minimum 10-year period (Appendix 3 and Appendix 4).

Wet Weather Management

In order to accommodate the anticipated growth from Niagara 2041, the 2016 W&WW Master Servicing Plan (MSP) investigated capacity upgrades (upgrades to trunk sewers, pumping station capacities, etc.), upstream management (storage, peak shaving, diversion), and peak flow management (flow reduction, Inflow & infiltration (I&I) reduction projects) for every wastewater system. Based on this review, there are wet weather projects listed with identified areas for targeted I&I removal to offset the requirement to upgrade and expand more expensive infrastructure all the way to the WWTPs. It is crucial to achieve the I&I reductions in order to offset the capacity needs from growth, to protect the environment, and mitigate potential basement flooding.

The Region and Local Municipalities are continuing to work collaboratively to facilitate ongoing development throughout the region and provide the requisite servicing and capacity allocation in a responsible way to service the communities. In addition, the Region has been aiding Local Municipalities by funding the CSO Control Program as a part of the overall Wet Weather Management Strategy to support various I&I related projects and programs on the municipal side. This program has been reducing the impacts of I&I and has been a benefit to both, the Region and the Local Municipalities.

The available funding for the 2022 CSO Control Program has been fully utilized and subscribed with applications from the Local Municipalities. A future report on the 2022 CSO Control Program is anticipated to be presented to the Planning & Economic Development Committee in the next month.

Staff is working with the Development Industry including Public Works Officials, Building Officials, Developers, Consultants and Contractors to raise awareness on the wet weather management issues and potential upcoming changes to address this. The Region is also represented at the Expert Stakeholder Committee (ESC) for the Guideline to Undertaking Flow Monitoring of New Construction and will work with all stakeholders to move forward with a consistent approach for the review the flow monitoring of new subdivisions.

New South Niagara Falls Wastewater Treatment Plant

Although this report identifies there is short term capacity available at the existing Niagara Falls WWTP, it only considers the treatment capacity at the plant for the next 10 years. It does not consider the constraints in the existing sanitary collection system, wet weather flow issues, consideration for development demands and longer term growth, or the required infrastructure improvements to get the flows to the plant.

As part of Niagara 2041, there was an update to the Water and Wastewater Master Servicing Plan (MSP). Niagara Region retained GM BluePlan Engineering Ltd. (GMBP) to review, evaluate and develop water and wastewater servicing strategies for all servicing within the urban areas of the Region. The MSP Update used updated population and employment growth forecasts based on a 2041 planning horizon. Niagara Region is now working on the current 2021 MSP Update which is looking at potential growth out to 2051. Based on the Niagara 2051 planning review, the implementation and timing of the preferred solution for the new South Niagara Falls Wastewater Treatment Plant and Servicing Solution (SNF Servicing Solution) continues to be supported and is necessary to accommodate growth.

In Niagara Falls, there is not enough capacity in the existing sewer system nor at the existing treatment plant to meet the increasing system demands resulting from growth as well as the increased wet weather flows due to aging infrastructure and climate change. The SNF Servicing Solution is essential to unlocking the development potential in the broader South Niagara area. The ability to redirect existing flows to the south, provide additional capacity in the new trunk sewer, provide flexibility for storage in the trunk sewer, and ultimately treat the wastewater flows at the new WWTP all contribute to a significant wet weather management program. In addition, the location of the new WWTP will provide flexibility for the potential for additional wet weather management through potential connections of other service areas such as Chippawa. Through the analysis undertaken as part of the Class EA process, it is estimated that the new South Niagara Wastewater Solutions strategy, will result in a reduction of over 60% of wet weather volume overflow to the environment.

This new WWTP is integral to the overall growth servicing strategy that supports the anticipated residential and employment growth in the Niagara Falls, NOTL, and Thorold South service areas. This total growth is estimated to be over 75,000 people and jobs in the area out to the year 2051 with the new WWTP servicing approximately half of this growth along with the existing residents and businesses in South Niagara Falls and Thorold South. The new WWTP and collection system strategy is also considering

potential long term growth beyond 2051. The capital program to support the new WWTP will provide greater flexibility for development servicing in St. Catharines, Niagara Falls, Thorold, and Niagara-on-the-Lake.

Alternatives Reviewed

An alternative to use a 3-year average daily flow in the reserve capacity calculation was reviewed. Since no significant difference or trend was found for the 2021 Reserve Capacity calculations, a 5-year average daily flow continued to be used.

Relationship to Council Strategic Priorities

The report aligns with Council's Priority of Responsible Growth and Infrastructure Planning by highlighting the reserve capacity available for growth at all Regional Water and Wastewater Treatment Facilities.

The report also provides MECP and local municipal partners operational summary and reserve capacity projections for Region's Water and Wastewater Treatment facilities

Other Pertinent Reports

- PW 39-2021, September 9, 2021, South Niagara Falls Wastewater Treatment Plant – Budget and Property
- PDS 22-2021, April 14, 2021, 2020 Reserve Water and Wastewater Treatment Capacities
- PW 22-2017, May 30, 2017, 2016 Water and Wastewater Master Servicing Plan Update

Prepared by:
Ilija Stetic, B.Sc., PMP
Project Manager
Planning and Development Services

Recommended by:
Michelle Sergi, MCIP, RPP
Commissioner
Planning and Development Services

Submitted by:
Ron Tripp, P.Eng.
Chief Administrative Officer

This report was prepared in consultation with Phill Lambert, Director Infrastructure Planning and Development Engineering, John Brunet, AD Water Operations and Maintenance and Jason Oatley, Manager WW Quality & Compliance.

Appendices

Appendix 1	Annual Average Daily Flow 2017 to 2021 WTP
Appendix 2	Annual Average Daily Flow 2017 to 2021 WWTP
Appendix 3	Water Reserve Capacity Calculations for 2021
Appendix 4	Wastewater Reserve Capacity Calculations for 2021

Appendix 1: WTP Annual Average Daily Flow 2017 - 2021

Water Treatment Plant	Rated Capacity (m^3/d)	Average Daily Flow (m3/d)					5 Year Average 2017 / 21	3 Year Average 2019 / 21
		2017	2018	2019	2020	2021		
Decew Falls WTP	227,300	54,349	56,090	53,303	53,390	50,824	53,591	52,506
Grimsby WTP	44,000	14,032	14,919	14,029	15,726	14,872	14,716	14,876
Niagara Falls WTP	145,584	44,924	44,835	43,400	40,145	40,125	42,686	41,223
Port Colborne WTP	36,000	8,735	8,864	7,282	6,870	6,387	7,628	6,846
Rosehill WTP	50,026	12,395	12,872	11,188	11,024	11,710	11,838	11,307
Welland WTP	65,000	21,594	22,538	22,579	24,670	24,675	23,211	23,975

Appendix 2: WWTP Annual Average Daily Flow 2017 - 2021

Wastewater Treatment Plant	Rated Capacity (m^3/d)	Average Daily Flow (m3/d)					5 Year Average 2017 / 21	3 Year Average 2019 / 21
		2017	2018	2019	2020	2021		
Anger Avenue WWTP	24,500	15,000	14,624	15,146	13,580	13,171	14,304	13,966
Baker Road WWTP	31,280	20,897	19,975	20,910	17,952	17,081	19,363	18,648
Crystal Beach WWTP	9,100	5,915	5,874	6,276	5,688	5,256	5,802	5,740
Niagara Falls WWTP	68,300	44,684	41,489	41,360	35,242	35,197	39,594	37,266
NOTL WWTP	8,000	4,561	4,687	5,237	5,142	5,602	5,046	5,327
Port Dalhousie WWTP	61,350	34,823	35,095	36,681	34,113	31,793	34,501	34,196
Port Weller WWTP	56,180	32,090	36,881	39,211	33,751	33,176	35,022	35,379
Queenston WWTP	500	234	198	213	135	142	185	163
Seaway WWTP	19,600	12,082	12,580	13,472	11,299	10,200	11,927	11,657
Stevensville/Douglastown	2,289	1,635	1,670	1,729	1,592	1,552	1,636	1,624
Welland WWTP	54,550	35,407	34,643	37,137	33,617	34,288	35,019	35,014

Appendix 3: WTP Reserve Capacities for 2021

Water Treatment Plant	Permit To Take Water [1]	Rated Treatment Capacity	Theoretical Ave Day Capacity	90% of Ave Day Capacity [2]	5-Year Ave Day Flow	Peaking Factor	Total Capacity Used	Reserve Treatment Capacity 90% MLD	Design Flow Rate 275 Lpcd	Reserve Serviceable Population Equivalents	10-Year Forecast Population Res & Emp	Surplus Population 10-Year Projection
	MLD											
DeCew Falls	227.0	227.3	150.8	135.7	53.6	1.507	36%	82.1	275	298,545	30,398	268,147
Grimsby	44.0	44.0	26.9	24.2	14.7	1.637	55%	9.5	275	34,545	14,771	19,774
Niagara Falls	145.5	145.6	91.6	82.4	42.7	1.590	47%	39.8	275	144,727	23,782	120,945
Port Colborne	45.5	36.0	22.7	20.4	7.6	1.589	34%	12.8	275	46,545	1,552	44,993
Rosehill	78.0	50.0	33.0	29.7	11.8	1.514	36%	17.9	275	65,091	6,375	58,716
Welland	110.0	65.0	43.7	39.3	23.2	1.487	53%	16.1	275	58,545	12,292	46,253

Note 1: Original MOE approved quantity of raw water permitted (Permit To Take Water).
Note 2: Region's W&WW MSP (GM BluePlan, 2017) requires planning process for expansion when plant capacity exceeds 80%, and expansion should be completed when capacity exceeds 90%.

Appendix 4: WWTP Reserve Capacity for 2021

Wastewater Treatment Plant	MECP Rated Capacity	90% of Plant Capacity[1]	5-Year Average Daily Flow	Total Capacity Used	Reserve Treatment 90%Capacity	Design Flow Rate [2]	Reserve Serviceable Population	10-Year Forecast Population	Surplus Population 10-Year
	m^3/d				m^3/d	365 Lpcd	Equivalents	Res & Emp	Projection
Anger Avenue (Fort Erie)	24,500	22,050	14,304	58%	7,746	365	21,221	4,277	16,944
Baker Road (Grimsby)	31,280	28,152	19,363	62%	8,789	365	24,080	16,791	7,289
Crystal Beach (Fort Erie)	9,100	8,190	5,802	64%	2,388	365	6,544	1,443	5,101
Niagara Falls [3]	68,300	61,470	39,594	58%	21,876	365	59,933	19,980	39,953
NOTL	8,000	7,200	5,046	63%	2,154	365	5,902	2,644	3,258
Port Dalhousie (St. Catharines)	61,350	55,215	34,501	56%	20,714	365	56,751	15,005	41,746
Port Weller (St. Catharines)	56,180	50,562	35,022	62%	15,540	365	42,576	10,052	32,524
Queenston (NOTL) [4]	500	450	185	37%	265	365	727	99	628
Seaway (Port Colborne)	19,600	17,640	11,927	61%	5,713	365	15,653	1,622	14,031
Stevensville/Douglastown	2,289	2,060	1,636	71%	424	365	1,163	795	368
Welland	54,550	49,095	35,019	64%	14,076	365	38,566	12,912	25,654

Note 1: Region's W&WW MSP (GM BluePlan, 2017) requires planning process for expansion when plant capacity exceeds 80%, and expansion should be completed when capacity exceeds 90%.
Note 2: Design Flow Rate incorporated 90 L/c/d of extraneous flow allowance
Note 3: The Niagara Falls WWTP assessment includes the sewage flows from the St. David's area of Niagara-on-the-Lake.
Note 4: The Queenston WWTP in Niagara-on-the-Lake has a unique capacity commitment of 226 m^3/d for the following properties: Niagara Parks Commission (75 m^3/d), Niagara Falls Bridge Commission (63 m^3/d), Shalamar Campground (38 m^3/d) and Ontario Power Generation (50 m^3/d). Due to these commitments and limited UAB, limited residential growth is expected within the next 10 years within the tributary area.

Administration
Office of the Regional Clerk
1815 Sir Isaac Brock Way, PO Box 1042, Thorold, ON L2V 4T7
Telephone: 905-980-6000 Toll-free: 1-800-263-7215 Fax: 905-687-4977
www.niagararegion.ca

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PDS 4-2022, April 6, 2022

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Development Applications Monitoring Report – 2021 Year End
PDS 4-2022

Regional Council, at its meeting held on April 14, 2022, passed the following recommendation of its Planning and Economic Development Committee:

That Report PDS 4-2022, dated April 6, 2022, respecting Development Applications Monitoring report - 2021 Year End, **BE RECEIVED** for information and **BE CIRCULATED** to the Local Area Municipalities, Niagara Peninsula Conservation Authority, Niagara Home Builders Association, Niagara Industrial Association, local Chambers of Commerce and School Boards.

A copy of PDS 4-2022 is enclosed for your reference.

Yours truly,

Ann-Marie Norio
Regional Clerk
:cv

CLK-C 2022-061

Distribution List

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cc: M. Sergi, Commissioner, Planning and Development Services
N. Oakes, Executive Assistant, Planning and Development Services
A. Shanks, Development Planner, Planning and Development Services

Subject: Development Applications Monitoring Report – 2021 Year End

Report to: Planning and Economic Development Committee

Report date: Wednesday, April 6, 2022

Recommendations

1. That this Report **BE RECEIVED** for information; and
2. That this Report **BE CIRCULATED** to the Local Area Municipalities, Niagara Peninsula Conservation Authority, Niagara Home Builders Association, Niagara Industrial Association, local Chambers of Commerce and School Boards.

Key Facts

- The purpose of this report is to inform Regional Council of 2021 development application activity in Niagara Region.
- Regional Development Planning and Engineering staff reviewed 826 development applications in 2021 (39% increase from 2020 application volumes).
- Regional Development Planning and Engineering staff provided comments for 848 pre-consultation meetings in 2021 (54% increase from 2020).
- The Region received $1,794,233 in review fees for development applications in 2021 (33% increase from 2020 fees).
- The related 2021 End of Year Growth and 5 Year Growth Trend Report (Report PDS-9-2022) provides information on growth in Niagara in 2021. Development application volumes typically equate to an increase in housing starts, completions, and building permits in later years. Accordingly, it is anticipated that the increased development application volumes experienced in 2021 will impact growth trends in the future.

Financial Considerations

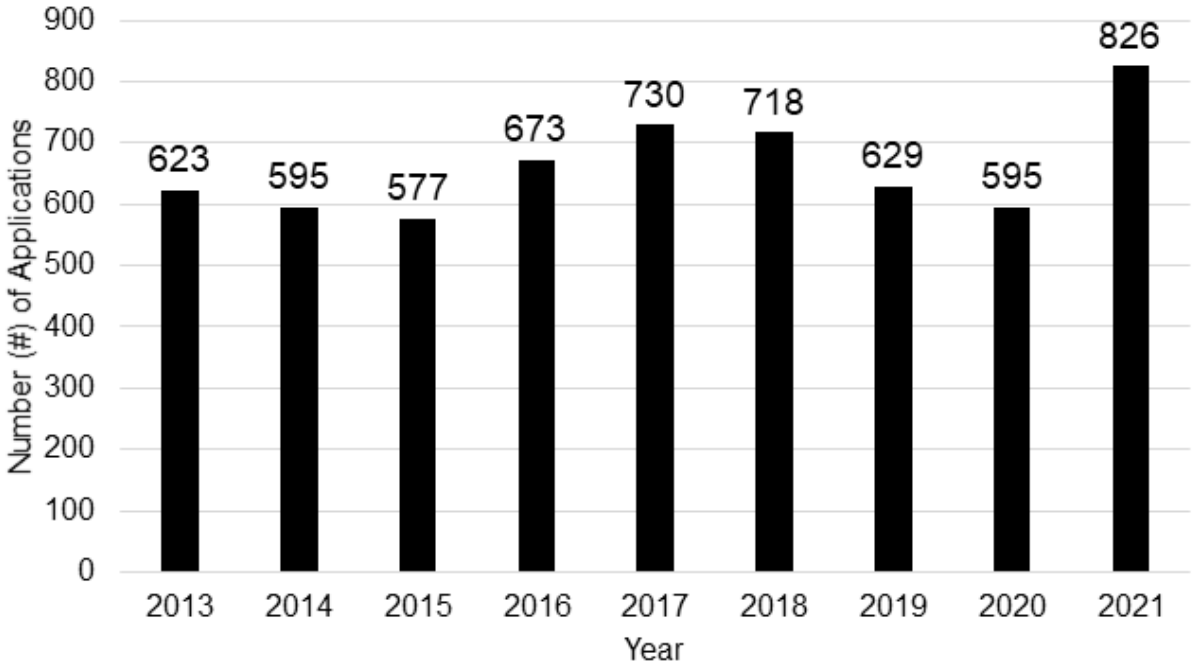
There are no direct financial implications associated with this report.

Analysis

Development Applications

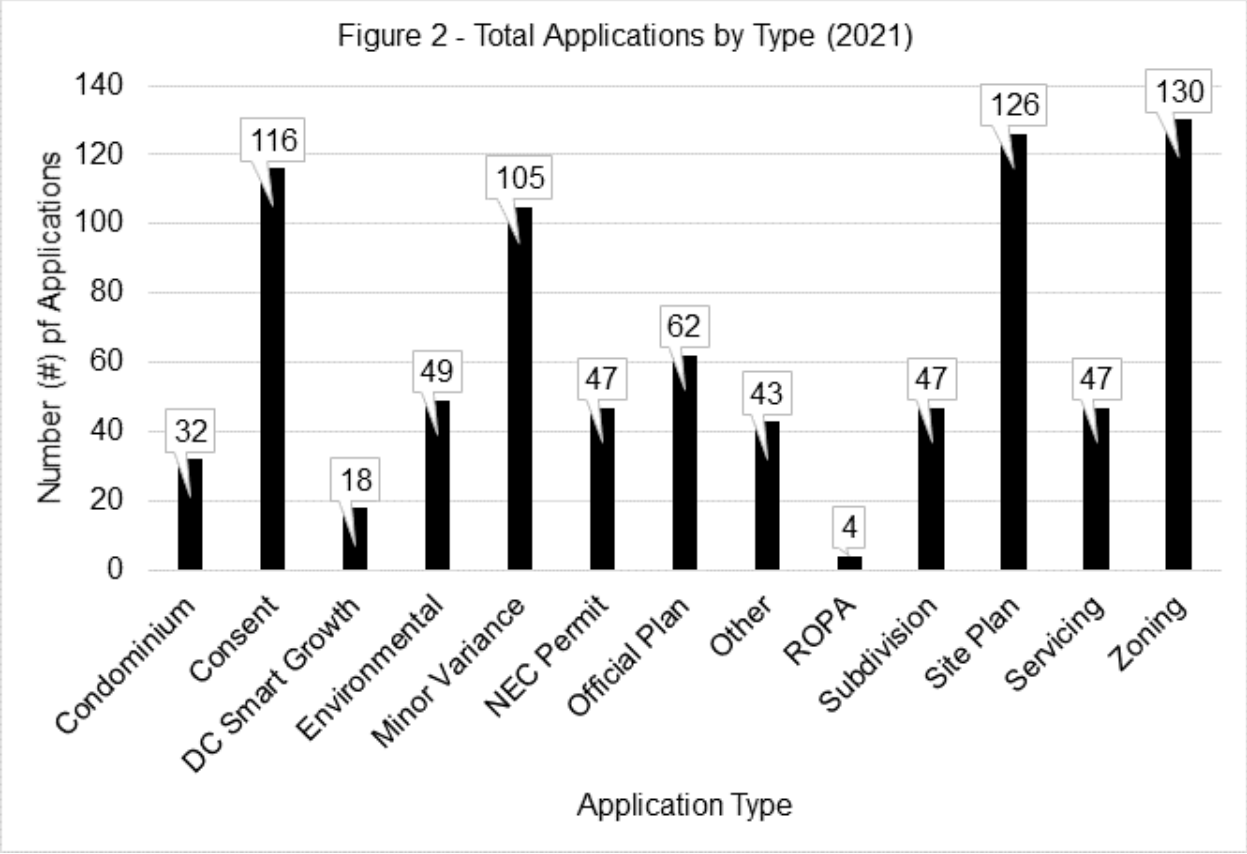
Regional Development Services staff reviewed 826 development applications in 2021, representing a 39% increase from 595 applications reviewed in 2020. Figure 1 illustrates the number of applications considered by Development Planning and Engineering staff from 2013 to 2021. Development applications are circulated to the Region based on Provincial legislation requirements, including the Niagara Escarpment Commission legislation, and the existing 2019 Memorandum of Understanding (MOU) between the Region and Local Area Municipalities for planning in Niagara. Development Services has the ability to waive its review function on certain types of minor development applications in local municipalities. This represents an effort to increase efficiency in the planning review function in Niagara.

Figure 1 - Total Applications (2013-2021)



Lower volumes in 2020 were attributable to the beginning of the COVID-19 pandemic, as a result of a short pause in the processing of development applications while municipalities adjusted to working remotely and holding virtual meetings. 2021 volumes rebounded significantly and were greater than those experienced in any year since 2013, representing a 13% increase from the previous peak of 730 applications in 2017.

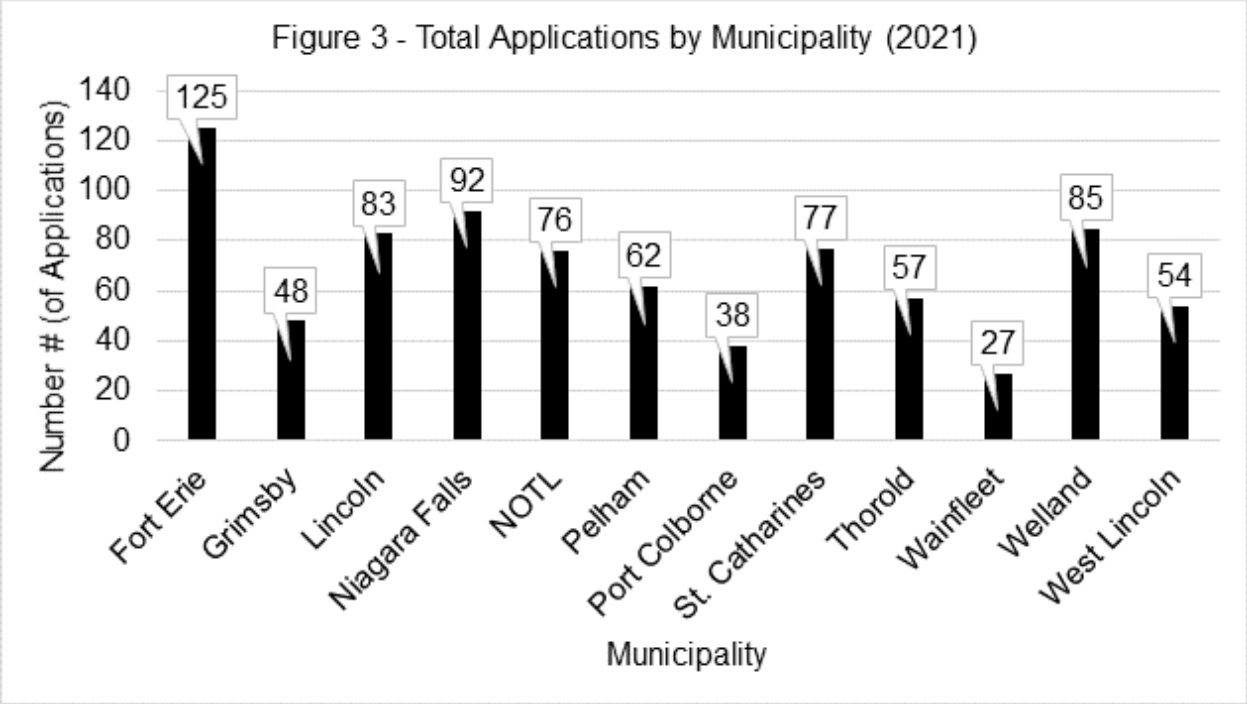
Figure 2 below provides the breakdown of development applications, by type, reviewed by Regional staff in 2021. Some complex development proposals often require multiple planning approvals. As an example, subdivision and condominium applications may also need amendments to the municipal Official Plan and/or Zoning By-law to facilitate the development. The categories with the most applications considered by Regional staff in 2021 were Zoning By-law Amendment (130), followed closely by Site Plan (126), Consent (i.e. severances) (116), and Minor Variance (105).



The distribution of applications circulated to the Region by municipality during 2021 is shown on Figure 3. Municipalities with the most applications received by the Region were Fort Erie (125), Niagara Falls (92), Welland (85), and Lincoln (83). Nearly every

municipality (with the exception of Niagara Falls) experienced an increase in applications considered from 2020 to 2021.

Regional staff were also involved in reviewing several complex development applications in 2021, as highlighted in Appendix 1 of this report. This often requires review that is more extensive as these applications typically affect a broad range of issues (i.e. environmental impacts, traffic impacts and urban design considerations, etc.). For several of these applications, Regional staff also assisted with urban design peer review, at the request of local municipal staff, as well as preparing design alternatives and contributing to discussions with developers, most notably through the participation in several design charrettes aimed at improving design outcomes.



Pre-consultation Meetings

Development Planning and Engineering staff attend regular pre-consultation meeting sessions two days each month in each local municipality. These meetings are to determine complete application submission requirements and assist in the processing of applications. The COVID-19 pandemic required planning staff at the Region and the local municipalities to adapt to an online meeting format starting in April 2020. Developers, property owners, local staff and agencies were able to participate effectively in these virtual pre-consultation meetings. The use of virtual pre-consultation

meetings has been well received by development proponents and their consultants as it affords efficiency and time savings, such as the ability to attend “back to back” pre-consultation meetings in different municipalities without the need to travel.

Figure 4 illustrates the number of pre-consultation meetings attended by Development Planning and Engineering staff from 2013 to 2021. In 2021, Regional staff attended 848 pre-consultation meetings, which is a 54% increase from the 2020 total (552), and a 37% increase from the previous yearly high from 2017 (622). The number of pre-consultation meetings is generally an indicator of anticipated future development application volumes; accordingly, staff expect development application activity to remain high in 2022.

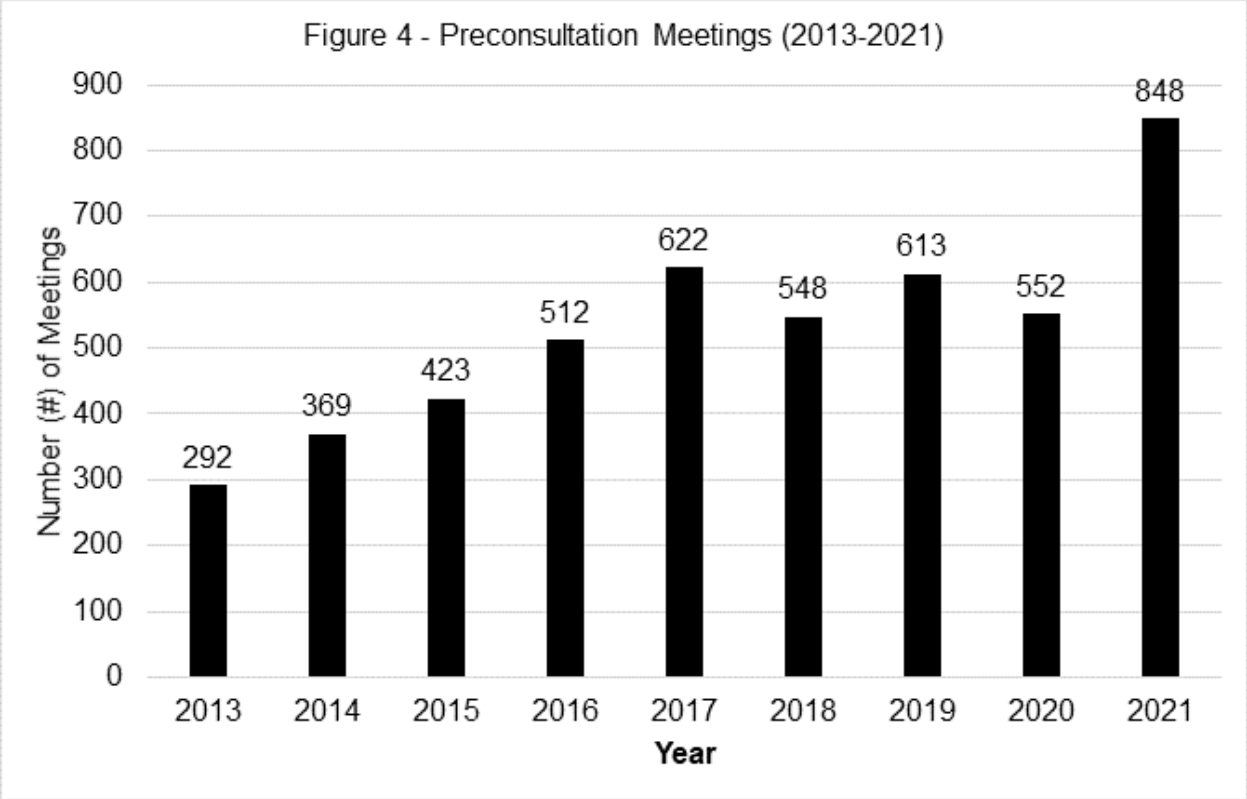
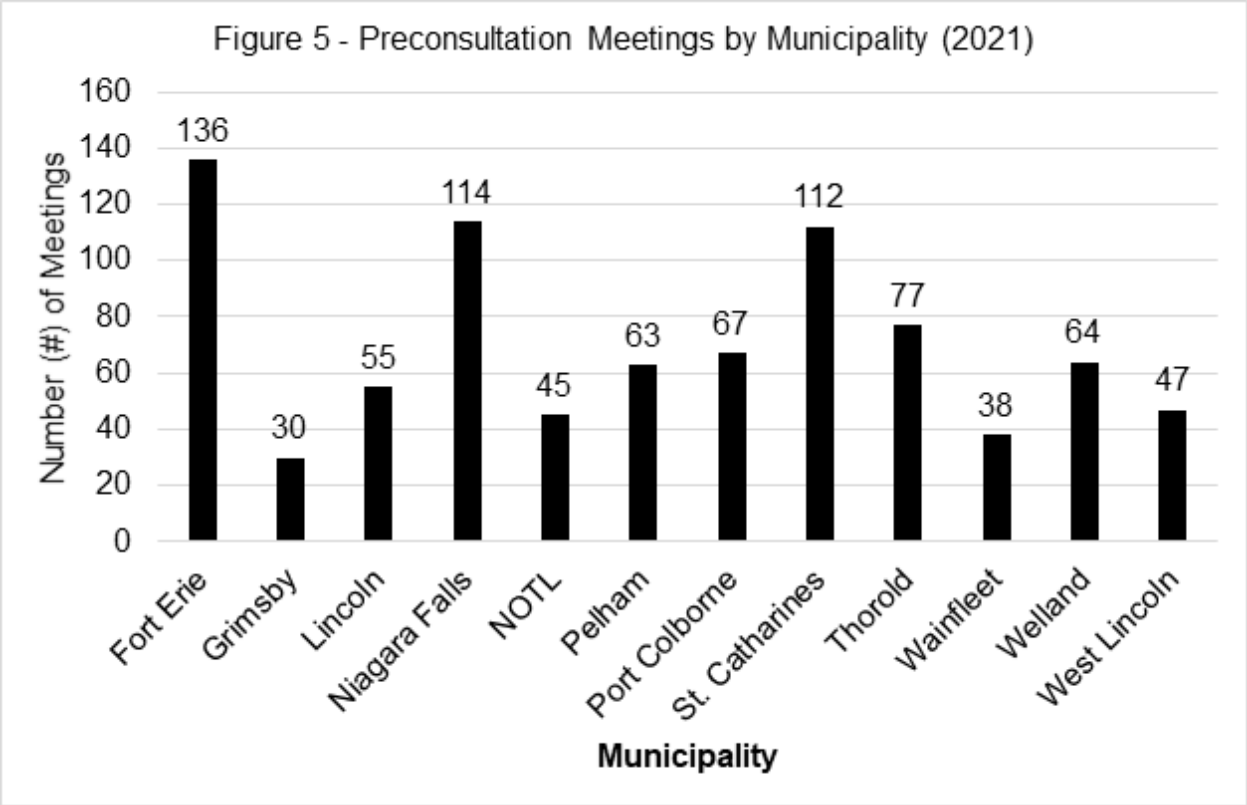
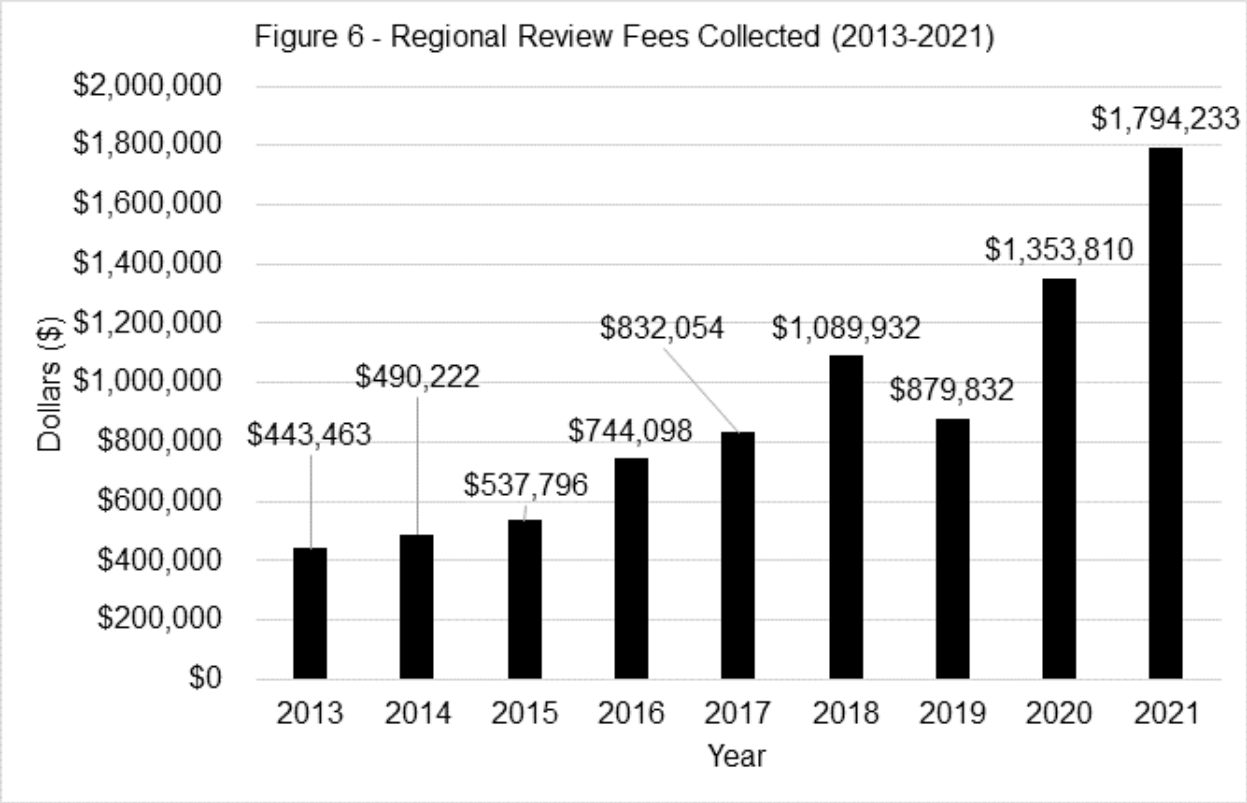


Figure 5 illustrates the number of pre-consultation meeting by municipality in 2021 that included Regional staff. The municipalities with the highest levels of pre-consultation activity were Fort Erie (136) and Niagara Falls (114), followed by St. Catharines (112), Thorold (77), and Port Colborne (67).



Regional Review Fees

Regional review fees are intended to offset Regional costs for the development review service. Figure 6 summarizes the fees collected between 2013 and 2021 for the Regional review of development applications. The 2021 total of $1,794,233 represents a 33% increase from 2020. This relates to the increased number of development applications received between 2020 and 2021, as well as the large number of complex applications received (i.e. Regional Official Plan Amendment, Zoning By-law Amendment and Site Plan), which generally have higher review fees. As the total volume of development applications is expected to remain high in 2022, development review fees are also expected to remain high.



The increased fees are also due in part to the receipt of a Regional Official Plan Amendment (ROPA) application in November 2021 for a new quarry in Niagara Falls (Upper's Quarry). The Region is also currently processing the ROPA application for the proposed expansion of the Port Colborne Quarry (Pit 3), and has held a pre-consultation meeting for the proposed expansion of another quarry, which is expected to proceed in 2022. In addition, staff anticipate potentially receiving a further ROPA application in 2022 for an expansion of another existing quarry based on correspondence from the quarry operator. Quarry applications are the most complex, and are very time intensive to process, with many technical studies that often require peer reviews to assist staff in areas in which the department does not have in-house expertise. The application fees approved by Regional Council reflect the complexity and staff resources involved in reviewing quarry applications. As a best practice, the Region, with the participation of the affected local area municipality and the Niagara Peninsula Conservation Authority, has implemented a Joint Agency Review Team (JART) to share resources, including a single peer reviewer for each technical study, in order to maximize efficiencies.

2022 Outlook

Staff anticipate development application volumes will remain high in 2022, as trends in the fourth quarter of 2021 showed an increase in applications by 29% compared to the fourth quarter of 2020. Additionally, as noted previously, staff consider the high number of pre-consultation meetings attended by Regional staff in 2021 to be an indicator of a high volume of development applications in the future.

The increased level of development in recent years represents a 'new normal' for the Region. Regional Development Services has adjusted its approach and practices to be solution-oriented and proactive in response to these increased development volumes. By providing ongoing support to our local municipalities, the Region strives to realize complete community planning outcomes that encourage the best possible development throughout the Region. This includes the urban design function within Development Planning, which serves to elevate the quality of development within Niagara through both the review of development applications, as well as providing support to local municipal planning teams in approaches and programs aimed at achieving well-designed built environments.

In addition, at a policy level, the Planning and Development Services Department partners with local area municipalities in undertaking district and secondary planning to proactively establish integrated land use planning policies that provides direction for the development of complete communities, and facilitates the receipt of future development applications which achieve Regional and local municipal Council goals and desired development outcomes.

Alternatives Reviewed

As this report is for information purposes, there are no alternatives reviewed.

Relationship to Council Strategic Priorities

This report provides information on development application activity that contributes to strong economic prosperity throughout the communities within the Niagara Region. This relates to Council's Strategic Priority of Supporting Business and Economic Growth, as well as Sustainable and Engaging Government through ensuring high quality, efficient and coordinated core services.

Other Pertinent Reports

- PDS-24-2021 Development Applications Monitoring Report – 2020 Year End

Prepared by:
Amy Shanks
Development Planner
Planning and Development Services

Recommended by:
Michelle Sergi, MCIP, RPP
Commissioner
Planning and Development Services

Submitted by:
Ron Tripp, P.Eng.
Chief Administrative Officer

This report was prepared in consultation with Cheryl Selig, MCIP, RPP, Acting Manager, Development Planning and Pat Busnello, MCIP, RPP, Acting Director, Development Approvals.

Appendices

Appendix 1 Current Major Development Applications

Appendix 1: Current Major Development Applications

Planning and Development Services Staff participated in the review of a number of major development applications in 2021. A summary of some of these major development applications are provided in the table below.

Municipality	Application	Developer	Details	Status
Fort Erie	**7 Central Avenue** Type: Official Plan Amendment, Zoning By-law Amendment and Site Plan	Compass Land Developments Ltd.	Applications are for a 12-storey mixed use building with 230 residential units and 879.9 m² commercial space.	• Regional comments were provided on January 7, 2022.
Grimsby	**West Lincoln Memorial Hospital** Type: Site Plan	Hamilton Health Sciences	Application relates to the comprehensive redevelopment of the existing hospital.	• Regional comments were provided for Phase 1 of the Site Plan on April 1, 2021. • Construction is planned to begin in 2022, with the new hospital opening in early 2025.
Grimsby	**Century Condos 6 Doran and 21-23 Main Street** Type: Local Official Plan Amendment, Zoning By-law Amendment and Site Plan	DeSantis Homes	Applications are for a 4-storey mixed use building with 92 residential units with 2 commercial units totaling 463m² on the first floor.	• A comprehensive public Urban Design Charrette with Town, Region and Applicant was completed in early 2021. • Site plan approved.

Municipality	Application	Developer	Details	Status
Lincoln	**3221 North Service Road** Type: Zoning By-law Amendment	LJM Developments	Application proposes 2 residential towers (25 and 23 storeys, respectively) that share a common 6-storey podium, with a total of 431 residential units. The site is located in the Prudhommes Secondary Plan Area adjacent to the proposed Prudhommes Landing development.	• Regional comments were provided for the third submission on October 15, 2021. • A comprehensive public Urban Design Charrette with Town, Region and Applicant was completed in Spring 2021.
Lincoln	**Prudhommes Landing 3245, 3293, 3305, 3319, 3325, 3335 and 3339 North Service Road** Type: Zoning By-law Amendment	Prudhommes General Partner Inc.	Application proposes various amendments to the previously approved zoning for the Prudhommes Landing site to reflect an updated concept plan prepared by the developer that proposes approximately 2,090 residential units in a range of low, medium and high density as well as mixed-use housing forms, employment, commercial, natural environment, park and open space uses. In addition to proposed adjustments to the approved zone boundaries, the amendment proposes flexibility for additional height and units in the high-rise residential areas at the east end of the site.	• Regional comments were provided on February 9, 2022.

Municipality	Application	Developer	Details	Status
Niagara Falls	**New South Niagara Hospital** Type: Site Plan	**Niagara Health System**	Application relates to the Campus Planning for new Niagara South Hospital site.	• Campus Plan was finalized in September 2019. • Project was incorporated into Ministry of Health Functional Program Submission. • Stage 1 of the Site Plan has been completed for issuance of RFP.
Niagara Falls	**Riverfront Residential Community** Type: Zoning By-law Amendment and Draft Plan of Subdivision	GR (CAN) Investments Ltd.	Applications are for an estimated total of 1,045 residential units (consisting of single-detached, semi-detached, townhouse and apartment units), 1.86 hectares of parkland and open space, and 17 hectares of natural area. Regional conditions of approval include servicing, natural heritage requirements, site remediation, etc.	• Draft Plan and Zoning By-law Amendment approved. • Developer proceeding to address conditions of draft approval for first phase.

Municipality	Application	Developer	Details	Status
Niagara Falls	**Upper's Quarry** Type: Regional Official Plan Amendment, Local Official Plan Amendment, Zoning By-law Amendment	Walker Aggregates Inc.	Applications are proposed to permit the establishment of a new quarry on the property.	• The Region, with the participation of the City and the NPCA, has implemented a Joint Agency Review Team (JART) to review the application. External agencies and the public have also been circulated for comment. • Public Open House scheduled for March 23, 2022.
Niagara-on-the-Lake	**Stone Eagle Winery** Type: Regional Official Plan Amendment, Zoning By-law Amendment	Solmar Inc.	Applications are proposed to permit a new estate winery and secondary uses (wine retail, indoor and outdoor hospitality areas, restaurant/function room, and kitchen and dry food services). The Regional Official Plan Amendment is proposed to permit a new private sanitary connection to serve the proposed winery.	• Staff are reviewing the applications, and have circulated external agencies and the public for comment. • Public Open House scheduled for March 3, 2022 • Statutory Public Meeting (for the Regional Official Plan Amendment) scheduled for April 6, 2022.

Municipality	Application	Developer	Details	Status
Pelham	**Park Place North** Type: Local Official Plan Amendment, Zoning By-law Amendment, Draft Plan of Subdivision	Mountainview Homes	Applications are to permit the creation of two blocks, with zoning permissions for an apartment dwelling, nursing home, senior citizens home, or townhouse dwellings. The development will have approximately 180 to 287 dwelling units in total, depending on the concept plan selected to be built.	• Regional comments were provided on January 21, 2021, August 31, 2021 and January 3, 2022. • Applications were approved by Town Council on January 24, 2022.
Port Colborne	**Port Colborne Quarry – Pit 3 Expansion** Type: Regional Official Plan Amendment, Local Official Plan Amendment, Zoning By-law Amendment	Port Colborne Quarries Inc. (Rankin Construction Inc.)	Applications are proposed to permit an expansion of the existing Port Colborne Quarry onto lands to the east of the existing Pit 3.	• The Region, with the participation of the City and the NPCA, has implemented a Joint Agency Review Team (JART) to review the application. External agencies and the public have also been circulated for comment. • Public Open House held on September 9, 2021.

Municipality	Application	Developer	Details	Status
Thorold	**1149 Kottmeier Road** Type: Zoning By-law Amendment and Draft Plan of Subdvision	800460 Ontario Limited	Applications are for the creation of 52 single-detached lots and 42 street townhouse dwellings.	• Regional comments were provided on September 13, 2021. • Applications were approved by City Council on November 2, 2021.
St. Catharines	**88 James Street** Type: Site Plan	88 James Street Holdings Inc.	Application is for a 30-storey mixed use building with 276 dwelling units and 452.2 m^2 commercial space.	• Regional comments provided to City on May 27, 2021 and September 24, 2021.

Municipality	Application	Developer	Details	Status
Welland	**John Deere – Dain West Subdivision** Type: Regional Official Plan Amendment, Local Official Plan Amendment, Zoning By-law Amendment, Draft Plan of Subdivision	Empire Homes	Application is for a mixed use subdivision that allows for a maximum development of 870 residential dwelling units (consisting of detached, semi-detached and townhouse dwellings), a 4 hectare mixed-use employment block, a stormwater management pond, an elementary school, parks and open space on approximately 74 hectares of land.	• Applications were approved by City Council on May 4, 2021. • Local Official Plan Amendment and Regional Official Plan Amendment approved by Regional Council on June 24, 2021. • Developer proceeding to address conditions of draft approval.
West Lincoln	**Smithville West** Type: Zoning By-law Amendment and Draft Plan of Subdivision	Marz Homes	Applications are to permit the creation of 46 single-detached lots and 9 future development blocks, totalling approximately 268 units.	• Regional comments were provided on December 4, 2020 and July 23, 2021. • Applications were approved by Township Council on May 28, 2021 (Zoning By-law Amendment) and November 25, 2021 (Draft Plan of Subdivision).

Administration
Office of the Regional Clerk
1815 Sir Isaac Brock Way, PO Box 1042, Thorold, ON L2V 4T7
Telephone: 905-980-6000 Toll-free: 1-800-263-7215 Fax: 905-687-4977
www.niagararegion.ca

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PW 11-2022, April 5, 2022

LOCAL AREA MUNICIPALITIES

SENT ELECTRONICALLY

Inspection Programs and Condition of Niagara Region Trunk Sanitary Sewer Infrastructure
PW 11-2022

Regional Council, at its meeting held on April 14, 2022, passed the following recommendation of its Public Works Committee:

That Report PW 11-2022, dated April 5, 2022, respecting Inspection Programs and Condition of Niagara Region Trunk Sanitary Sewer Infrastructure, **BE RECEIVED** for information and **BE CIRCULATED** to the Local Area Municipalities.

A copy of PW 11-2022 is enclosed for your reference.

Yours truly,

Ann-Marie Norio
Regional Clerk
:cv

CLK-C 2022-065

cc: B. Zvaniga, Interim Commissioner, Public Works
N. Coffer, Executive Assistant, Public Works
G. Epp, Acting Associate Director, Water Wastewater Asset Management

Subject: Inspection Programs and Condition of Niagara Region Trunk Sanitary Sewer Infrastructure

Report to: Public Works Committee

Report date: Tuesday, April 5, 2022

Recommendations

1. That this Report **BE RECEIVED** for information; and
2. That this Report **BE CIRCULATED** to the Local Area Municipalities.

Key Facts

- The purpose of this report is to outline current inspections programs for linear sanitary sewer assets and report known structural or inflow and infiltration (I/I) issues, as directed by Public Works Committee on January 11, 2022.
- Niagara Region owns and maintains 145 kilometers of trunk sanitary gravity sewers, 161 kilometers of sanitary force mains, and 2,093 sanitary access chambers across 11 municipalities.
- Niagara Region inspects approximately 85 per cent of its conventional trunk sanitary gravity system once every three years. The remaining 15 per cent is large diameter trunk sewers which are inspected once every 10 to 15 years.
- Niagara Region monitors sewer flows at 147 permanent locations and 57 temporary locations. Flow monitoring information is used for municipal Pollution Prevention and Control Plans (PPCPs), Master Servicing Plans (MSPs), Inflow and Infiltration (I&I) studies, billing, development planning, and capital project design.

Financial Considerations

The total replacement cost of Regional trunk sanitary gravity mains and sanitary force mains is over 1.1 billion dollars based on the 2016 Asset Management Plan, inflated to 2022 dollars. Sanitary gravity main and force main assets are designed for a useful service life that ranges between 60 and 100 years and sanitary access chambers are designed for a useful service life of 50 to 100 years. Asset service life and condition are influenced by various factors such as material, sewage characteristics, location, use, and the environment that it is installed in. The Region has several inspection and maintenance programs included in the approved operating budget to maximize useful life and maintain asset performance. These programs are detailed in Table 1.

Table 1: Sanitary Gravity Main Inspection and Maintenance Programs

Program Name	Frequency	Cost
Conventional Trunk Sanitary Gravity Sewer CCTV Inspections (up to 1350mm)	Annual Program	$175,000
Sanitary Gravity Sewer Flushing	Annual Program	$100,000
Large Diameter Trunk Sanitary Gravity Sewer CCTV Inspection (1350mm and larger)	Once every 10 to 15 years	$210,000
Sanitary Access Chamber Inspection	Once every 10 to 15 years	$210,000
Suspended Pipe Inspection (These are elevated pipes that cross highways or water bodies)	Once every 10 to 15 years	$30,000

Analysis

Niagara Region owns and maintains 145 kilometers of trunk sanitary gravity mains, 161 kilometers of sanitary force mains, and 2,093 sanitary access chambers across 11 municipalities. Appendix 1 contains a summary of linear assets by municipality. Existing programs for these assets can be grouped into five categories; inspection, flow monitoring, combined sewer overflow (CSO) control and wet weather management, maintenance, and rehabilitation and replacement.

Inspection

Trunk sanitary gravity sewers are large pipes that receive wastewater flows from smaller sewers and convey wastewater using the force of gravity. Niagara Region assesses the condition and performance of trunk sanitary gravity sewers using Closed Circuit Television (CCTV) camera equipment. Key observations are encoded into CTSpec which is a sewer inspection system that is built on National Association of Sewer Service Companies (NASSCO) industry standards.

Sanitary gravity mains with a diameter of 1350mm or less are inspected once every three years. These mains account for 85 per cent of all Regional trunk gravity mains. Trunk sanitary gravity mains that have a diameter greater than or equal to 1350mm are inspected once every 10 to 15 years. These large diameter sewers account for 15 per cent of all Regional trunk sanitary gravity mains. The difference in inspection frequency

is due to the specialized equipment necessary to access and inspect sewers that have continuous high flow levels. Table 2 details the total length of sewers inspected over the past four years.

Table 2: CCTV Program Summary

Measurement in Meters	2018	2019	2020	2021
Inspection Length (M)	54,151	49,621	37,905	18,500*

*2021 marked the end of one inspection contract and the start of a new contract. Delays in the procurement process due to competing priorities resulted in a gap in inspection contracts. As a result, the length of sewers inspected in 2021 was less than in prior years.

Sanitary gravity sewer condition reporting is split into two groups, structural defects and service defects. Structural defects include collapses, cracks, pipe offsets, and other defects that impact the integrity of the pipe. Structural condition ratings range from 1 to 5, with 1 representing a new pipe with no defects, and 5 being a pipe that has one or more of the most severe defects. Appendix 2 provides a graphic overview of the current structural condition of Regional trunk sanitary gravity mains.

Service or operational defects are defects that affect the performance of the pipe. These defects include debris, roots, and other blockages. Service condition ratings range from 1 to 5, with 1 representing a new pipe with no defects, and 5 is a pipe that has one or more of the most severe blockages. Appendix 3 provides a graphic overview of the current service condition for Regional trunk sanitary gravity mains.

Fourteen per cent of sanitary trunk gravity mains have no data because these pipes were inspected fifteen years ago as part of a large diameter inspection contract and data was not imported into the sewer inspection system. Large diameter sewers can be extremely deep and have high and fast flows. Performing assessments of these sewers requires specialized equipment. A contract will be released later this year to re-inspect large diameter sanitary gravity sewers.

Sanitary force mains are pressurized sewer pipes that convey pumped wastewater from a lower elevation to a higher elevation or across areas where deep excavation is not feasible. The cost of inspecting sanitary force mains is high because temporary flow bypass is required and gaining access to the pipe often exceed the costs of physical

inspection. As a result, sanitary force main condition is calculated based on age and break history. Appendix 4 provides a graphic overview of sanitary force main condition.

Sanitary access chambers are access shafts that provide access to sanitary gravity sewer pipes. Sanitary access chambers are inspected every 10 to 15 years. The last time the Region completed a system-wide access chamber inspection program was in 2009. Condition information grades from the 2009 system-wide inspection are shown in Appendix 5.

Thirty-eight per cent of sanitary access chambers have not been inspected because of accessibility issues but the condition of many of these chambers are observed during CCTV pipe inspections. Service condition for another six per cent could not be obtained because of chamber size or configuration. A graphic breakdown is shown in Appendix 6. Deeper chambers may have stairs and landings that restrict inspection equipment.

Flow Monitoring

Since 2013, Niagara Region has continued to support Local Area Municipalities by offering remote access to customized SCADA screens offering both real-time status and historical data for wastewater collection system infrastructure servicing their municipality. Nine of the eleven serviced municipalities currently utilize this tool to assist them in making informed decisions during wet weather events. Niagara has since expanded the functionality of this tool by offering municipalities the option of creating automated alarming to notify of alarm events impacting critical collection system locations in their area.

Niagara Region monitors sewer flows at 147 permanent locations and 57 temporary locations. Flow monitoring information is used for municipal Pollution Prevention and Control Plans (PPCPs), Master Servicing Plans (MSPs) including the 2021 Water and Wastewater MSP, Inflow and Infiltration (I&I) studies, billing, development planning, and capital project design. Over the past four years, Niagara Region has participated in the following plans:

- 2018 Niagara Falls PPCP
- 2019 Fort Erie PPCP
- 2019 Grimsby Lincoln West Lincoln PPCP
- 2019 St. Catharines PPCP
- 2019 Welland PPCP
- 2021 Niagara Region MSP

CSO Control Program & Wet Weather Management

The Regional Combined Sewer Overflow (CSO) Control Program is a collaborative initiative between the Region and Municipal Partners and is managed by the Infrastructure Planning & Development Engineering group in Planning & Development Services. The CSO Program is part of the Wet Weather Management (WWM) Group, which has local municipal representation for all serviced areas. This group meets to review the CSO Program and cost-sharing funding for projects that deal with I&I issues on the municipal sanitary systems and includes funding as well Regional participation in projects like the PPCPs listed above. PPCPs will consider flow monitoring for the entire sanitary collection system including local municipal sewers as well as Regional sanitary trunk sewers and Regional sewage pumping stations to determine specific areas of greater I&I and direction for further study and remediation.

The widely accepted CSO Control Program goal is to work on targeted I&I reduction to lower the risk of basement flooding and reduce overflows to the environment as well as gaining back existing capacity, postponing upgrades/expansions of wastewater infrastructure, and providing capacity for growth.

The CSO Funding Program has been in place since 2007 and is intended to facilitate shared funding with the local Municipal partners to help mitigate the impacts of wet weather events on the Region-wide sanitary system and the environment. A total of approximately $68 million dollars of funding has been awarded from 2007- 2021 for 388 projects with LAMs.

Maintenance

When Regional asset defects are identified, it is triaged and resolved according to the level of risk. Major structural defects such as collapses or holes are repaired using annual maintenance budgets. Service defects such as roots, debris, grease deposits, or calcite are removed through the annual sewer flushing program. Table 3 details the total length of sewers cleaned over the past four years.

Table 3: Sewer Flushing Program Summary

Measurement in Meters	2018	2019	2020	2021
Flushing Length (M)	20,950	12,613	11,010	6,400*

*2021 marked the end of one flushing contract and the start of a new contract. Delays in the procurement process due to competing priorities resulted in a gap in sewer flushing contracts. As a result, the total length of sewer flushing in 2021 was less than in prior years.

Rehabilitation or Replacement

Defects requiring sewer replacement or rehabilitation such as sewer relining are prioritized using the Corporate Asset Management Risk Assessment (CAMRA) model and added to the capital program. Over the past four years, over 17 million dollars has been spent relining the Stamford Interceptor Trunk Sewer in Niagara Falls and Oaks Park Trunk Sewer in Fort Erie. Table 4 details the total length of sewers that have been relined or replaced over the past four years.

Table 4: Sewer Relining and Replacement Summary

Measurement in Meters	2018	2019	2020	2021
Sanitary Gravity Main Relining Length (M)	1,278	1,563	690	1,558
Sanitary Gravity Main Replacement Length (M)	867	1,008	6	7
Sanitary Force Main Replacement Length (M)	1,128	3,184	1,597	1,673

Alternatives Reviewed

Since the late 1990's, Niagara Region has relied on camera-based technologies such as CCTV camera inspections for gravity pipe condition assessments. Camera-based technologies are well-established and cost-effective condition assessment methods that can be used on gravity pipes of various sizes and materials. The drawbacks of this technology are that it cannot inspect pipes that are submerged and it can only inspect internal pipe surface conditions.

Alternative technologies such as acoustic and free-swimming leak detection equipment have been used to inspect sanitary force mains and sewers that are continuously submerged but success has been limited. Acoustic technology was used in 2012 to inspect a portion of the River Road Trunk Sanitary Sewer but this inspection was unsuccessful. In 2015, free-swimming technologies were used successfully to inspect the condition of 2,000 meters of the St Davids #1 (Cannery) Sewage Pumping Station force main. This technology was also used to inspect the Victoria Avenue Sewage Pumping Station force main however this inspection was unsuccessful.

Due to sewer size, flow and access, it is not always economically feasible to conduct complete inspections of the entire wastewater system. A balance must be struck between the collection of condition information and the cost and risk of inspection.

Relationship to Council Strategic Priorities

Information presented in this report relates directly to Council's Strategic Priority 4.1 of committing to "high quality, efficient and coordinated core services"

Prepared by:
Greg Epp, CAMP, C.Tech
Associate Director, W-WW
Asset Management (Acting)
Public Works Department

Recommended by:
Bruce Zvaniga P. Eng
Commissioner of Public Works (Interim)
Public Works Department

Submitted by:
Ron Tripp, P.Eng.
Chief Administrative Officer

This report was prepared in consultation with Glenn Fulton, CET, Asset Performance Supervisor; Derek Falardeau-Mercier, P. Eng., Senior Technical Project Manager, Craig Courteau, P. Eng., Associate Director W-WW Integrated Systems, Phill Lambert, P. Eng., Director of Infrastructure Planning and Development Engineering and reviewed by Joseph Tonellato, P. Eng., Director W-WW.

Appendices

Appendix 1	Sanitary Sewer Network Statistics
Appendix 2	Sanitary Trunk Gravity Main Structural Condition
Appendix 3	Sanitary Trunk Gravity Main Service Condition
Appendix 4	Sanitary Force Main Structural Condition
Appendix 5	Sanitary Access Chamber Structural Condition
Appendix 6	Sanitary Access Chamber Service Condition

PW 11-2022 Appendix 1

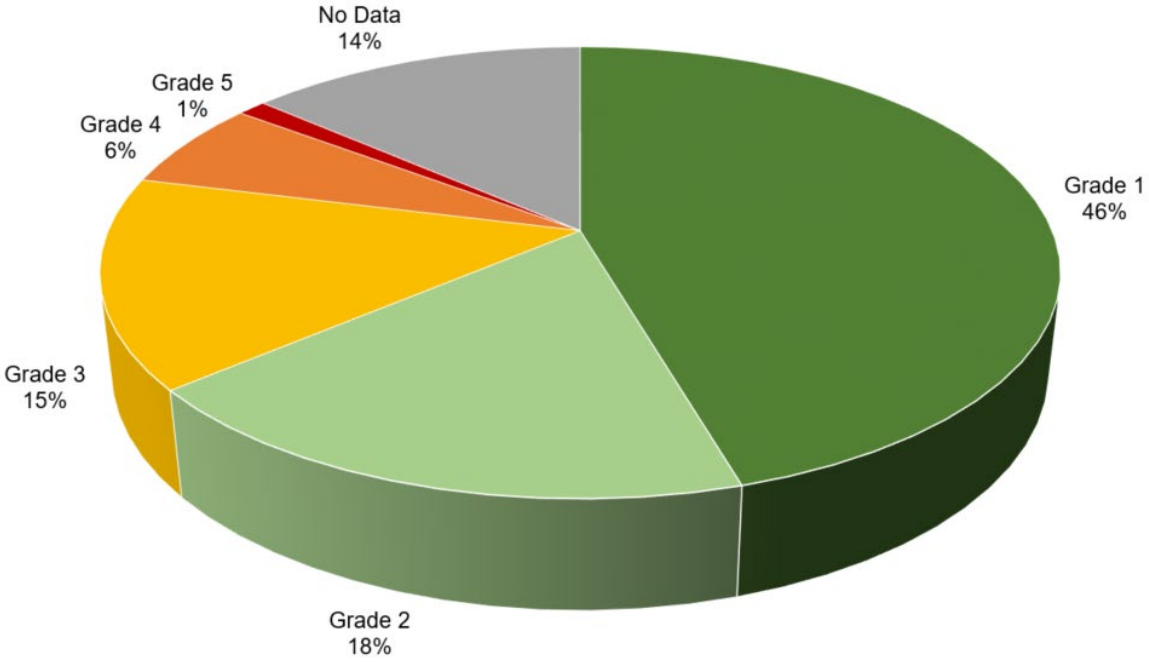
Sanitary Sewer Network Statistics

Wastewater Network	Fort Erie	NOTL	Grimsby	Niagara Falls	St. Catharines	Port Colborne
Number of Local Area Municipal Connections to Niagara Region Sewers	66	23	42	70	137	31
Niagara Region Average Sanitary Gravity Main Age (Years)	40.43	35.14	36.32	43.59	49.74	45.34
Niagara Region Average Sanitary Force Main Age Average (Years)	12.28	15.22	24.58	15.79	18.66	21.51
Approximate Local Area Municipal Sanitary Gravity Main Length (Km)	199.26	93.47	112.00	432.16	560.76	90.20
Niagara Region Sanitary Gravity Main Length (Km)	16.27	8.96	11.11	21.32	35.64	0.97
Approximate Local Area Municipal Sanitary Force Main Length (Km)	0.00	3.45	1.34	1.08	3.95	0.84
Niagara Region Sanitary Force Main Length (Km)	20.05	15.46	13.80	29.45	6.32	19.09
Number of Niagara Regional Access Chambers (Maintenance Holes & Underground Enclosures)	284	152	198	332	435	75
Number of Local Area Municipal Access Chambers (Maintenance Holes & Underground Enclosures)	2743	1678	2058	6065	8216	1135

Wastewater Network	Welland	Thorold	Lincoln	West Lincoln	Pelham
Number of Local Area Municipal Connections to Niagara Region Sewers	83	36	20	5	31
Niagara Region Average Sanitary Gravity Main Age (Years)	36.18	41.35	41.89	18.67	32.66
Niagara Region Average Sanitary Force Main Age Average (Years)	23.11	23.29	26.77	12.81	13.07
Approximate Local Area Municipal Sanitary Gravity Main Length (Km)	235.79	102.22	85.57	33.15	66.51
Niagara Region Sanitary Gravity Main Length (Km)	28.02	5.76	7.56	0.34	5.27
Approximate Local Area Municipal Sanitary Force Main Length (Km)	1.59	0.00	3.64	0.18	0.48
Niagara Region Sanitary Force Main Length (Km)	13.54	8.90	13.90	14.01	6.91
Number of Niagara Regional Access Chambers (Maintenance Holes & Underground Enclosures)	275	118	127	31	79
Number of Local Area Municipal Access Chambers (Maintenance Holes & Underground Enclosures)	3913	1448	1255	501	989

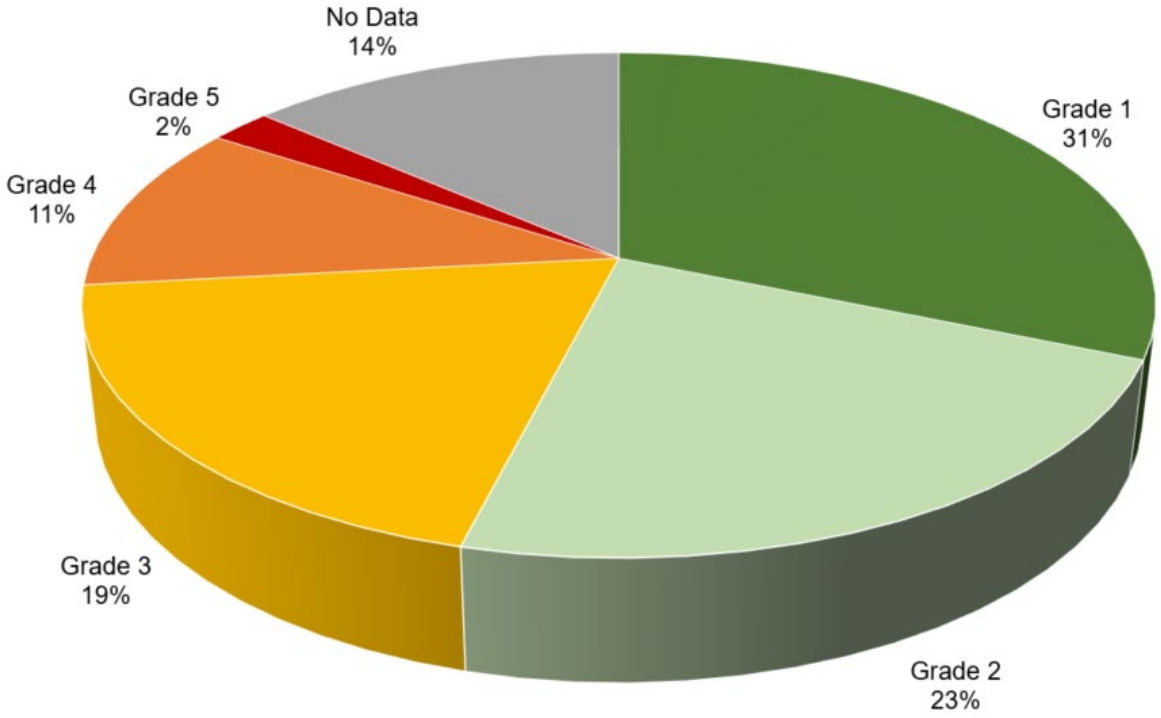
PW 11-2022 – Appendix 2

Sanitary Trunk Gravity Main Structural Condition



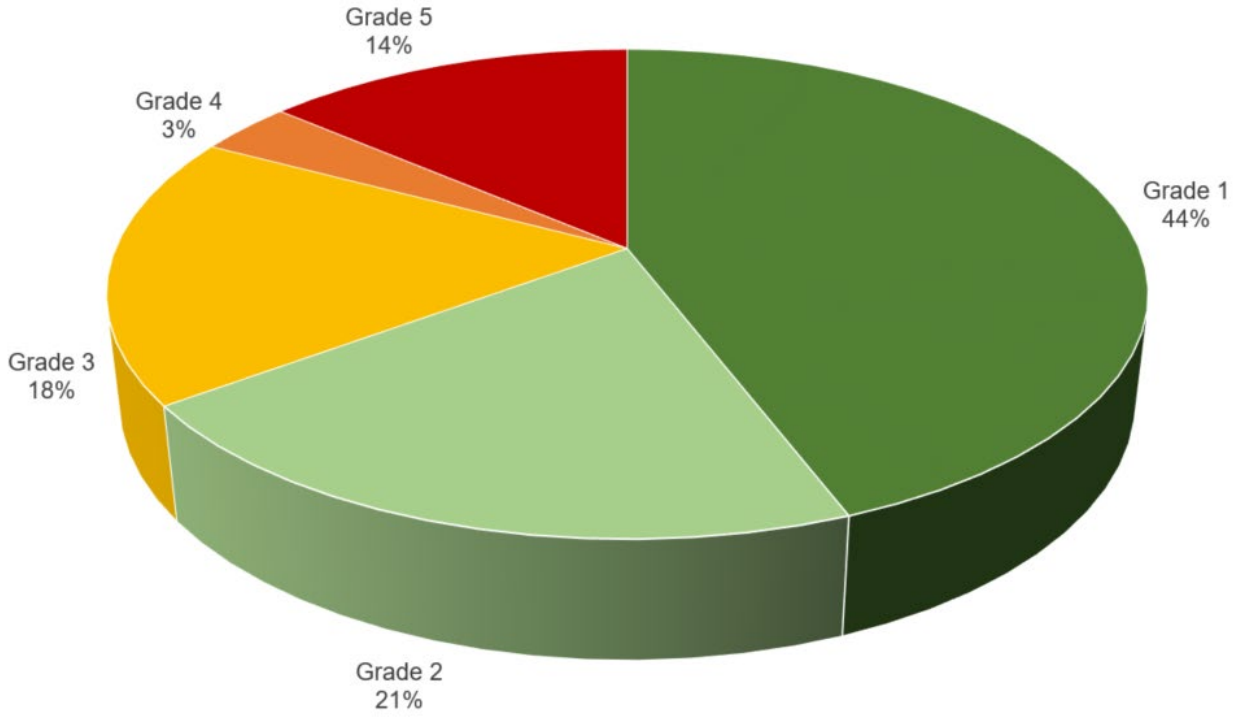
PW 11-2022 – Appendix 3

Sanitary Trunk Gravity Main Service Condition



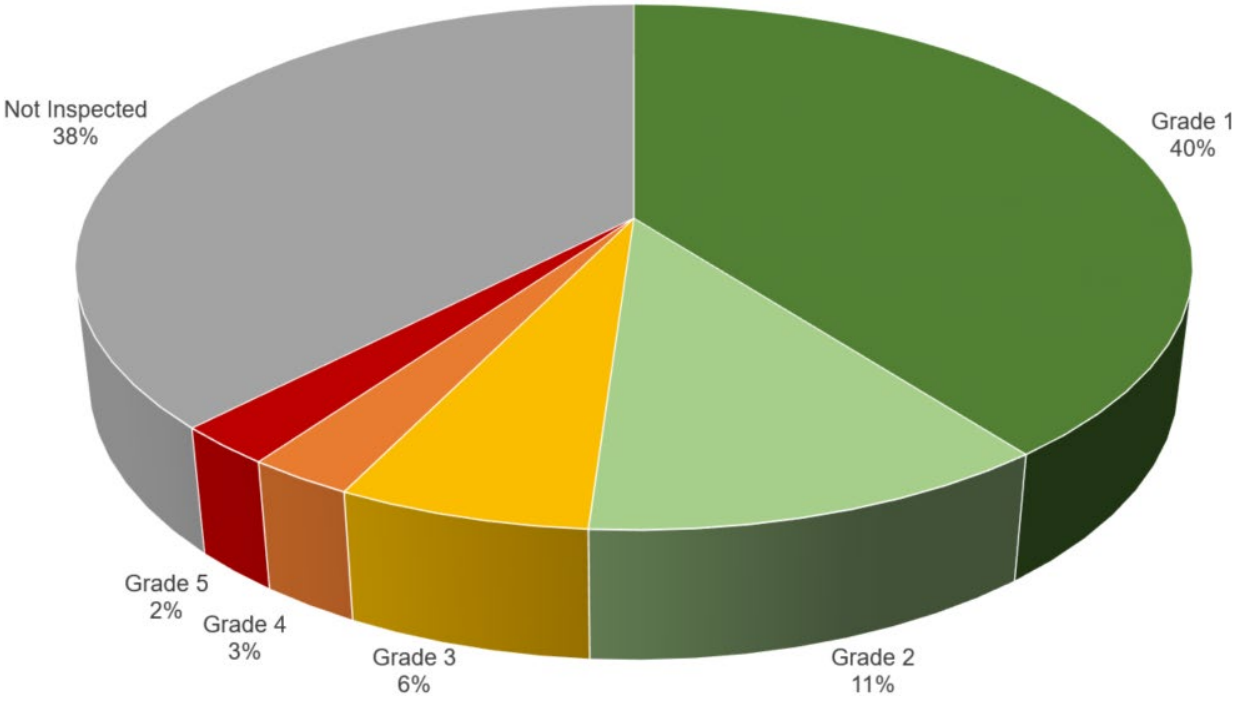
PW 11-2022 – Appendix 4

Sanitary Force Main Structural Condition



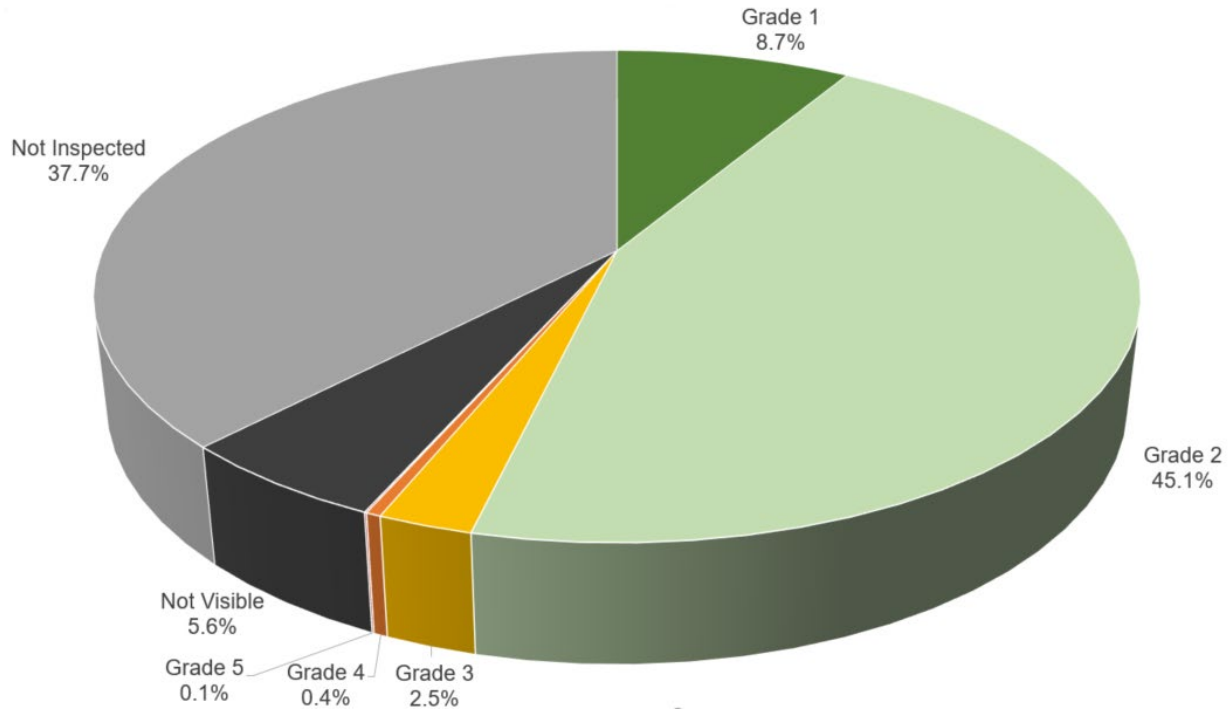
PW 11-2022 - Appendix 5

Sanitary Access Chamber Structural Condition



PW 11-2022 – Appendix 6

Sanitary Access Chamber Service Condition



Administration
Office of the Regional Clerk
1815 Sir Isaac Brock Way, PO Box 1042, Thorold, ON L2V 4T7
Telephone: 905-980-6000 Toll-free: 1-800-263-7215 Fax: 905-687-4977
www.niagararegion.ca

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PW 14-2022, April 5, 2022

LOCAL AREA MUNICIPALITIES

SENT ELECTRONICALLY

Inspection of Regional Water Infrastructure
PW 14-2022

Regional Council, at its meeting held on April 14, 2022, passed the following recommendation of its Public Works Committee:

That Report PW 14-2022, dated April 5, 2022, respecting Inspection of Regional Water Infrastructure, **BE RECEIVED** and the following recommendations **BE APPROVED**:

1. That staff **BE DIRECTED** to consult with the area municipalities to review options for reinstating a water loss committee to collectively review strategies for targeted investigation and reduction of water loss, with a goal of providing an update to the 2007 Regional Water Loss report;
2. That Report PW 14-2022 **BE CIRCULATED** to the Local Area Municipalities; and
3. That staff **BE DIRECTED** to provide a progress report for the June Public Works Committee meeting.

A copy of PW 14-2022 is enclosed for your reference.

Yours truly,

Ann-Marie Norio
Regional Clerk
:cv
CLK-C 2022-064

cc: B. Zvaniga, Interim Commissioner, Public Works
N. Coffer, Executive Assistant, Public Works
E. Shisler, Water Process Specialist, Water Wastewater Services

Subject: Inspection of Regional Water Infrastructure

Report to: Public Works Committee

Report date: Tuesday, April 5, 2022

1. That staff **BE DIRECTED** to consult with the area municipalities to review options for reinstating a water loss committee to collectively review strategies for targeted investigation and reduction of water loss, with a goal of providing an update to the 2007 Regional Water Loss report; and
2. That this Report **BE CIRCULATED** to the Local Area Municipalities.

Key Facts

- In 2021, Niagara Region delivered 56,065 ML of treated water through six water treatment plants and 313 km of watermain across 11 municipalities.
- Operations staff monitor variations in flow and pressure throughout the system, and immediately report suspected main breaks to Regional and Area Municipal staff as observations warrant. Breaks on transmission mains are repaired immediately.
- Distribution flow is monitored using 25 flow meters across Niagara, which are verified and calibrated on a semi-annual basis by a third party contractor. These flows are used not only for billing calculations, but also long-term planning associated with servicing, development planning and capital project design.
- Between 2004 and 2007 a Water Loss Reduction Task Force comprised of Regional and Area Municipal representatives was formed to share experiences regarding water loss levels and strategies for reduction.
- Niagara's water transmission system is comprised of large diameter water mains of various pipe material. Approximately 89 per cent of these transmission mains are non-metallic, which is not favourable to acoustic leak detection. Leak detection involving invasive technologies or system shutdowns will potentially impact thousands of customers and may not be feasible on trunk systems.

Financial Considerations

Watermains are designed for a useful service life greater than 80 years and appurtenances such as valves are designed for a useful service life of 25 years. Access chambers are designed for a useful service life of 50 to 100 years. Asset service life and condition are influenced by various factors such as material, quality, location, use, and

the environment that it is installed in. As thresholds for these criteria are met, watermains are selected for replacement through Capital funds.

The annual cost of calibration, for flow meters used for billing, is approximately $18,000. A breakdown of these costs is provided in Table 2 below (Analysis: Calibration and Verification).

A comprehensive review of water loss along all of Niagara Region's transmission mains would be approximately $3,000 to $25,000 per km of main depending on the diameter of main and the water loss technology used. This estimate is based on the Region's previous work regarding water loss strategies, and is contingent on watermain material, location and configuration of the transmission system. A summary of leak detection strategies is presented in the Analysis section below.

Analysis

Niagara Region owns and maintains 313 km of watermain and 973 underground enclosures across 11 municipalities. Appendix 1 contains a detailed summary by municipality.

Table 1 below identifies the total length of pipe in the Regional network, by pipe material.

Table 1: KM of Watermain by Pipe Material

Material	KMs of Watermain	Percent of System	Life Expectancy (Years)	Average Age (Years)
Concrete Pressure Pipe	137	44	70-80	43
PVC Plastic Pipe	108	35	75	17
Asbestos Cement Pipe	32	10	60-70	49
Ductile Iron	14	4	60-70	29
Cast Iron	10	3	60-70	58
Other	11	4	60-70	37

Operational Monitoring and Break Response

Niagara operates six (6) water treatment plants. Operators at these facilities monitor variations in flow and pressure throughout the system and immediately report suspected main breaks to Regional and Area Municipal staff as observations warrant. As breaks

are suspected, Niagara Region initiates the resources to investigate. Region staff often support Area Municipalities in locating and confirming breaks on Local infrastructure. To troubleshoot these events, Regional staff rely on trends from a variety of online instruments which measure flow, pressure, level etc. In the event that a failure is on Region infrastructure, Niagara Region maintenance staff use contractors for immediate repair of the main from a preapproved list of external parties detailed in the Water and Wastewater Emergency Response Procedure.

Inspection and Maintenance

Underground enclosures (valve chambers) are routinely inspected by internal maintenance personnel through routine preventative maintenance programs, such as the valve turning program. As required, maintenance personnel inspect and report on valve chamber condition and general operation to support troubleshooting of operational or distribution issues. For example, in January 2022, maintenance personnel inspected chambers along transmission watermains in the City of Port Colborne to provide feedback to the City on concerns related to main breaks in the local distribution system. At the time of inspection, all visible piping and valves were in good working order.

Investigations Completed to Date

Through Capital Project scoping and design, many studies and condition assessments have been completed to evaluate the integrity of transmission mains, valves and appurtenances. In addition to these studies, the following specific water loss investigations have occurred:

2004 to 2007: Water Loss Reduction Task Force and Regional Water Loss Assessment Project

In 2004 the “Water Loss Reduction Task Force” comprised of Regional and Area Municipal representatives was formed. The purpose of this group was to share experiences regarding water loss levels and strategies for reduction. Through the “Water Loss Assessment Project” water balances were completed based on the data provided by the Region and Area Municipalities. The study was completed by Veritec Consulting Inc. and was finalized in 2007. The Regional Water Loss Assessment Project report is included in Appendix 2.

2011 - 2015: City of Port Colborne – Integration of Water Loss Analysis Tools into a SCADA System

Between 2011 and 2014 a study was developed and conducted in the City of Port Colborne to develop off-line and real time tools to integrate the City's water usage data with flow data from four district metered areas (DMAs). Niagara Region provided in-kind (SCADA) support for this project, which was also funded through the Showcasing Water Innovation Program. The goal of this project was to provide the City with flow monitoring to aid in locating and remediating unaccounted for water.

2020: Niagara Region Billing Meter Verification Demonstration to Town of Fort Erie

In response to questions from the Town of Fort Erie, the Region invited Town staff to witness a third party calibration process at the Rosehill Water Treatment Plant for the billing meters impacting the Town. Following this demonstration, Niagara Region shared verification certificates with Town staff.

2021 – 2022; Niagara Region – Water and Wastewater Billing Flowmeter Audit

This project is currently underway to review, confirm and make recommendations for improvements for all processes that contribute to the volumes used for billing. This work includes an audit of the accuracy and suitability of the Region's billing flow meters and a comparison of current methods, including meter type and installation against best practices.

Calibration and Verification

Water meters are essential for process automation and are calibrated on a semi-annual basis. The cost for these calibrations is shown in Table 2 below.

Table 2: Calibration of Flow Meters

Program Name	Frequency	Cost
Calibration of Non Mechanical Flow Meters	Semi-annual	≈ $15,200
Calibration of Mechanical Flow Meters	Semi-annual	≈ $2,200

When establishing the frequency of calibration required, Niagara Region takes into account whether or not the meter is used to meet legal requirements, industry standards for calibration, manufacturer recommendations and the conditions of use such as importance of collected data for use in other processes such as billing. There are 25 water meters used for billing, all of which are calibrated on a semi-annual frequency.

Water QMS Risk Assessment

An internal risk assessment is required every 36 months for each of Niagara Region's water systems, with complementary risk assessment reviews to be completed at 12 and 24 months between the assessments. A full risk assessment for the Water QMS was completed in 2021, with reviews to follow in 2022 and 2023.

Through the risk assessment exercise, the Water-Wastewater Asset Management group assesses risk associated with watermains using the risk scoring criteria outlined in the Corporate Asset Management Risk Assessment (CAMRA) model. Criteria for consideration includes factors such as; likelihood of failure, impact on users and the environment, financial risks and risks associated with compliance or social reputation of Niagara Region. There were no high-scoring risks identified during the 2021 full risk assessment. Any previously identified high-scoring risks have been mitigated through capital projects, operational adjustments, or through continual improvement initiatives.

Leak Detection Technologies for Transmission Mains

The three (3) most common methods of leak detection for transmission systems are in-line acoustic monitoring, non invasive acoustic monitoring and district metering. Costs associated with these methods vary depending on diameter and type of technology used and are detailed under the Financial Considerations section of this report.

For both in-line and non invasive acoustic monitoring, sensors discern the acoustic activity associated with leaks by sending acoustic pulses to receivers attached to pipe appurtenances. Leak location is estimated by the arrival time of the pulses. When in-line acoustic monitoring is used, condition and configuration of the pipe i.e. tubercles, valves, bends and pipe appurtenances may obstruct equipment, and terrain changes may make installation and removal of equipment difficult. In-line monitoring can be disruptive to operations. While non-invasive installations pose less disruption to service and flow, this type of installation is sensitive to interferences. With increasing pipe diameter, there is less accuracy of the sensors to detect leakage. All acoustic leak detection is sensitive to pipe material and diameter. Acoustic methods work best with

smaller diameter metallic pipes, and are less accurate with large diameter transmission mains. Approximately 89 per cent of Niagara Region's transmission mains are non-metallic, and all are large diameter.

District metering is an audit of the meters within a portion of the distribution system. Meters are installed to measure flow into and throughout a defined portion of the system, and flows are monitored to determine if leakage may be an issue. The installation of meters that detect bidirectional flow can also aid in locating leaks.

Due to the size and configuration of Niagara Region watermains it may not be economically feasible to conduct a complete inspection of the entire transmission system. Regional infrastructure valves for shutting down sections of main are often located a considerable distance apart, and isolation and draining of sections at a time can put a significant number of residents and businesses out of service. In addition to these concerns, pressure transients caused by putting a main back into service could cause breaks within the Area Municipal system.

Currently staff focus on areas where mains are known to be aged, have a higher occurrence of failure or the pipe material is most conducive to water loss investigation. Both infrastructure age and failure are well documented through the QMS Risk Assessment Process.

Alternatives Reviewed

The alternatives to reinstating a water loss committee to collectively review strategies for targeted investigation and reduction of water loss are:

1. Do nothing. Niagara Region could continue with current practices but this may be less effective in addressing the opportunities to further reduce any water loss.

2. Council could direct staff to procure external resources to undertake a comprehensive water loss assessment. This is not recommended without first re-establishing the water loss committee with Local Area Municipal staff participation to ensure that any assessment is comprehensive and has access to all available information.

Relationship to Council Strategic Priorities

Recommendations presented in this report relate directly to Council's Strategic Priority 4.1 of committing to "high quality, efficient and coordinated core services". Through coordinated efforts, the Region and Area Municipalities can collaborate on water loss reduction strategies.

Prepared by:
Erin Shisler
Water Process Specialist
W-WW Services

Recommended by:
Bruce Zvaniga P.Eng.
Commissioner of Public Works (Interim)
Public Works Department

Submitted by:
Ron Tripp, P.Eng.
Chief Administrative Officer

This report was prepared in consultation with John Brunet, Associate Director, Water Operations and Maintenance, and reviewed by Joe Tonellato, Director, W-WW Services.

Appendices

Appendix 1 Niagara Region – Watermain Statistics

Appendix 2 2007 Regional Water Loss Assessment Project

PW 14-2022 Appendix 1 - Niagara Region Water Main Statistics

Water	FE	NOTL	Grimsby	NF	STC	PC	Welland	Thorold	Lincoln	West Lincoln	Pelham	Total
No. of connections to local infrastructure	79	109	26	97	144	25	117	50	54	3	35	739
Average age of infrastructure (water mains)	29.26	25.36	30.80	44.00	34.00	26.00	44.50	24.60	28.74	20.04	40.50	34
Km of Local water main	275.79	200.06	135.03	483.26	593.77	111.57	273.47	117.74	112.00	34.84	85.34	2423
KM of Regional water main	50.90	43.14	20.46	47.13	53.90	7.80	29.22	20.28	18.38	12.58	9.56	313
KM of water mains replaced over the past 10 years (2011)	5.50	0.06	2.50	0.08	12.77	1.41	0.74	2.57	0.06	0.52	0.00	26
KM of mains to be replaced over next 10 years	10.44	3.51	1.70	0.00	0.03	1.62	0.00	0.00	3.53	7.42	0.00	28
No. of Regional Underground Enclosures	129	98	76	133	180	30	149	74	57	32	15	973
No. of LAM Underground Enclosures	0	0	854	0	101	7	0	1	11	0	1	975

Region of Niagara

Regional Water Loss Assessment Project

JUNE 2007

FINAL REPORT

VERITEC Consulting Inc.

Executive Summary

With increasing regulatory requirements dealing with water quality, water takings, and full cost recovery the need to understand the performance of water systems has never been more prevalent. Efficient management (and operational control) of water distribution system includes managing real *and* apparent water losses. In November 2004, representatives from both the Region and its area municipalities attended a two day workshop on current industry best practices for dealing with water loss assessment, validation, measurement and control. The group identified that a proper assessment (and validation) of the water loss levels within each AM's water system should be initiated.

The Region contracted Veritec Consulting Inc. to complete water balances for each of the area municipalities. This report highlights the results of the water balances completed for each participating area municipality.

Balances were completed using PIFastCalc for Canada, a licensed software tool incorporating the standard water balance procedure and terminology adopted by both the AWWA and Canadian InfraGuide. PIFastCalc also calculates many benchmarking Performance Indicators (PIs). With respect to validation PIFastCalc for Canada incorporates confidence intervals that highlight data quality.

Non-Revenue Water (NRW) is a "Basic" financial PI. Excluding demands in the City of Welland, the project identifies that collectively, the percentage of NRW in the Region is approximately 14% (i.e, 86% of water sold by the Region is accounted for by billed consumption in the area municipalities). The components of NRW are:

- ✓ Unbilled, Authorized Consumption,
- ✓ Apparent Losses, and
- ✓ Real Losses

Individually the percentage of NRW in the area municipalities ranges from 0% to 37%. Percentages of NRW, however, should not be used to compare and contrast the performance of one system versus another.

The Infrastructure Leakage Index (ILI) is a ratio of the volumes of Current Annual Real Losses (CARL) to Unavoidable Annual Real Losses (UARL). Unavoidable losses vary from system to system based on their characteristics (e.g. kilometers of water main, average system pressures, etc.). Calculated values of ILIs may facilitate the comparison of systems with respect to others as well as benchmark individual performance for annual comparisons.

The World Bank Institute and AWWA have developed general descriptions, guidelines, and recommendations based on the Infrastructure Leakage Index and these may be reviewed by each municipality based on its calculated ILI.

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Appendices

1.0 INTRODUCTION

With increasing regulatory requirements dealing with water quality, water takings, and full cost recovery the need to understand the performance of water systems has never been more prevalent. Efficient water system(s) management and operational control includes managing real *and* apparent water losses. The now defunct term "unaccounted-for-water" undermined efficiency in so far as the term "unaccounted-for" failed to identify causes or solutions. The term non-revenue water underlines inefficiencies and highlights the real cost(s) of water losses.

Recognizing both costs and regulatory requirements, successful water loss programs must be two-fold; firstly, establishing the level of water losses and secondly, establishing programs to control and/or reduce these losses. The former justifies the investment in water loss reduction and control programs and may be used to track and report on project successes as well as identify program short-comings.

In 2004, the Regional Municipality of Niagara created a working group consisting of Regional staff and representatives of its twelve area municipalities (AMs). The purpose of the *"Water Loss Reduction Task Force"* is to share experiences regarding water loss levels and strategies. In November 2004, a two day workshop on current industry best practices for dealing with water loss assessment, validation, measurement and control was sponsored by the Region.

The task force identified that a proper assessment and validation of the water loss levels within each AM's water system should be initiated. The AWWA and the Canadian InfraGuide have both adopted the International Water Association's (IWA) Standard Water Balance.

Using PIFastCalc for Canada V1, a licensed software package purchased by the Region on behalf of its area municipalities, water balances were completed based on the data provided by the area municipalities themselves.

The following report summarizes the data collected as well as the results of the water balances with respect to the benchmarking performance indicators calculated within the software package. Individual copies of the PIFastCalc outputs are included in the appendices.

2.0 PROJECT METHODOLOGY

The goal of the Water Loss Assessment Project is to provide an appreciation of the components of water loss across the region and to identify areas in which losses can be addressed and ultimately reduced. Traditionally many distribution systems describe water losses as the percentage of unaccounted-for-water based on the simple calculation illustrated below:

$$\% \text{ of Unaccounted-For-Water} = \frac{\text{Billed Consumption}}{\text{Water Purchased}}$$

The IWA/AWWA Standard Water Balance (Figure 1) accounts for the total volume of water supplied by identifying the various components[1] of both consumption as well as water losses using either measured or estimated quantities

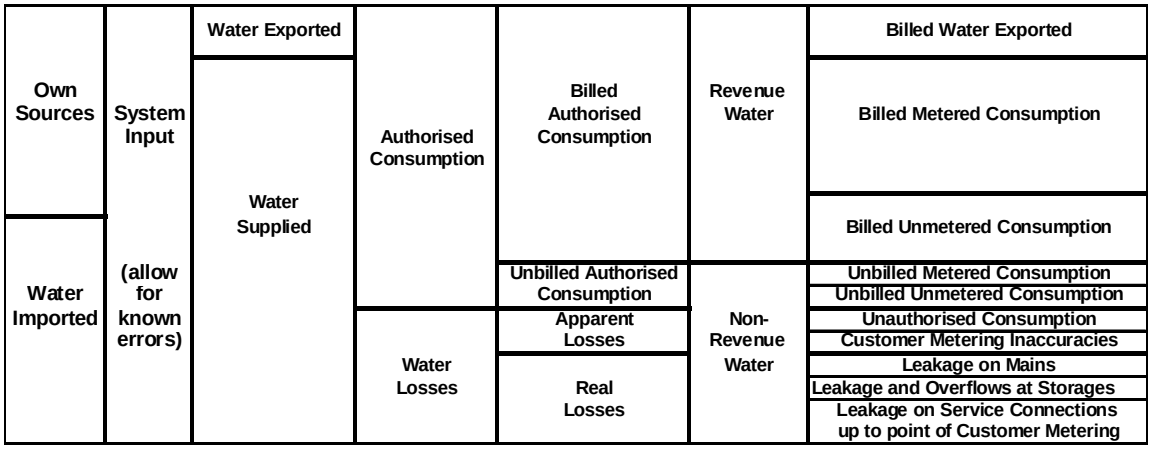


Figure 1: Overview of the Components of the IWA/AWWA Standard Water Balance

PIFastCalcs is a licensed software package, purchased by the Region on behalf of its area municipalities, underlying the water loss assessment program. As evidenced in Figure 2 on the following page the standard water balance methodology is incorporated into the software. Based on the water balance, PIFastCalcs automatically calculates "Performance Indicators" (PIs) to assess both real and apparent water losses. And these performance indicators benchmark current losses allowing each area municipality to compare its own performance year-to-year as well as with other systems (locally and internationally).

Tools (e.g., process reliability bands and 95 % confidence limits) highlight the potential need to further evaluate and/or verify data as well as track the overall effect of uncertainty regarding the data used to derive the water balance.

[1] Appendix A includes the standard terminology of each of the balance's components as included in PIFastCalcs.

'LEAKS' Suite of LEAKAGE EVALUATION and ASSESSMENT KNOW-HOW SOFTWARE													
WATER BALANCE AND PERFORMANCE INDICATORS PROGRAM 'PIFastCalcs'					Standard	Version 1a	2nd Dec 2005		Canada	
ANNUAL WATER BALANCE CALCULATION IN IWA STANDARD FORMAT, WITH 95% CONFIDENCE LIMITS					Data entry	Defaults	Calculated Values		From another Worksheet	
Note:Calculations should be based on a 12-month period for all aspects of the worksheet to function correctly					Currency -	$C	Volume units -	Ml	ond	m3
Utility	Enter Licensee's name when issuing software	Bulk supply [BS] or Distribution System [DS]?	DS			tn		-	365	days
System		Do most customers have storage tanks?			Calculation by			Date		
Process Reliability Band	WATER BALANCE CALCULATIONS			Volume in period	95% Confidence Limit as +/- %	Variance	FINANCIAL PERFORMANCE INDICATORS FOR NON-REVENUE WATER			
	IWA Terminology						% of System Input Volume	Calculated Value of NRW as % of System Running Costs in Period		
	COMPONENTS OF WATER BALANCE			Ml				Assessed marginal cost of individual components of Non-Revenue Water	Assessed Unit Value of individual components of Non-Revenue Water	% of cost of running system
	WOS: Volume from Own Sources (corrected for known systematic errors)					0	0.0%			
	WI: Water Imported (corrected for known systematic errors)					0	0.0%			
	SIV: SYSTEM INPUT VOLUME			0.0	0.0%	0	0.0%			
	BACE:Water Exported					0	0.0%			
	WS: WATER SUPPLIED - SIV - BACE			0.0	0.0%	0	0.0%			
	BACM1: Billed Authorised Consumption: Metered					0	0.0%			
	BACM2: Billed Authorised Consumption: Metered					0	0.0%			
	BACM3: Billed Authorised Consumption: Metered					0	0.0%			
	BACU: Billed Authorised Consumption:Unmetered					0	0.0%	$C/m3	$Cx1000	%
	NRW: NON-REVENUE WATER			0.0	0.0%	0	0.0%	0.0000	0.0	0.0%
	UACM: Unbilled Authorised Consumption: Metered		of WS			0	0.0%		0.0	0.0%
	UACU: Unbilled Authorised Consumption: Unmetere Estimated as	1.250%	of WS	0.0	100.0%	0	0.0%		0.0	0.0%
	WL WATER LOSSES			0.0	0.0%	0	0.0%	0.0000	0.0	0.0%
	UC: Unauthorised Consumption: Estimated at	0.250%	of WS	0.0	100.0%	0	0.0%		0.0	0.0%
	ALMUR1: Apparent Loss - meter under-registration		of BACM1	0.0		0	0.0%		0.0	0.0%
	ALMUR2: Apparent Loss - meter under-registration		of BACM2	0.0		0	0.0%		0.0	0.0%
	ALMUR3: Apparent Loss - meter under-registration		of BACM3 and UACM	0.0		0	0.0%		0.0	0.0%
	ALDCD Customer meter data handling errors					0	0.0%		0.0	0.0%
	AL: Sum of APPARENT LOSSES			0.0	0.0%	0	0.0%	0.0000	0.0	0.0%
	RL: REAL LOSSES			0.0	0.0%	0	0.0%		0.0	0.0%
	% of period system pressurized -	100.0%	365.0 days			Cost of running system in period -				$Cx1000
	CARL: CURRENT ANNUAL REAL LOSSES (when system is pressurized)			0.00	Ml/day					

Figure 2: Copy of the "Water Balance & PIs" worksheet from PIFastCalc V1a

3.0 RESULTS: PHASE I – DATA COLLECTION

The following section summarizes the data collected with respect to the various components of the standard water balance.

3.1.0`Water Supply

The Regional Municipality of Niagara itself is responsible for bulk water supply, treatment, transmission, and storage. Therefore the Region directly provided a monthly summary of metered volumes for each of its thirty-three billing meters. Based on the billing equations provided (Table 1) the data was used to derive the total volume of water supplied to each area municipality per month.

Figure 3 illustrates the breakdown of nearly 74.5 million cubic meters sold in 2005.

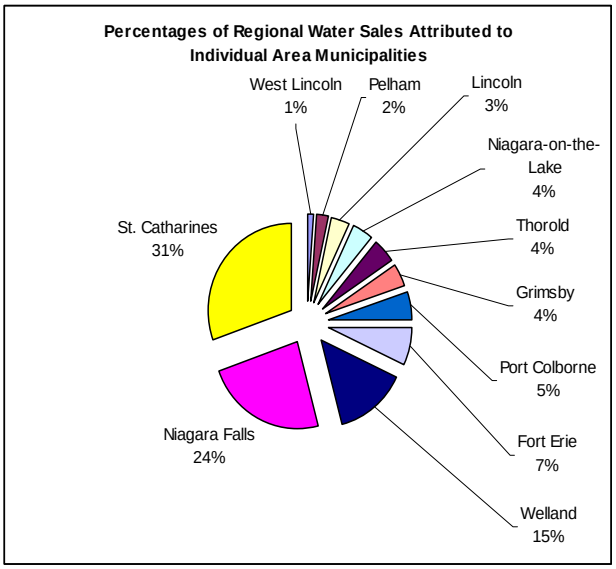


Figure 3: Water Supply in Niagara Region

The Region also provided copies of the meter calibration tests completed in 2005 (Appendix B)[2]. Meters for accuracy reports were provided are highlighted in Table 1.

Table 1
Regional Billing Equations

Area Municipality	Billing Equation (Accuracy Reports provided for highlighted meters)
Fort Erie	2T1+2T2-2S
Grimsby	6T1-6D1-**6D2**
Lincoln	5D7+5D8+6D1
Niagara Falls	1T1+1T2-**1D1**-**1D2**-**1D3**-**1D4**
Niagara-on-the-Lake	5D5+5D6+**1D1+1D2+1D3**+5D9
Pelham	3D1+3D2
Port Colborne	4T1+4T2
St. Catharines	(5T1+5T2+5T3+5T4+5T5)-**5D1**-**5D2**-**5D3**-5D4-**5D5**-**5D6**-5D7-5D8-5D9
Thorold	1D4+**5D1-5D2+5D3**+5D4
Welland	3T1+3T2+3T3-3D1-3D2
West Lincoln	**6D2**

[2] Veritec distinguished between calibration reports for the meter vs. loop calibration reports.

Table 2 summarizes the results of the meter accuracy tests. Each meter is tested at several flow rates. The range of accuracies recorded for each individual flow rate was between 96.5 and 101.6 percent[3]. Based on this data, and that meter accuracy reports for all the meters were not available, the confidence interval used in the PIFastCalcs software for the Region's meters is +/- 3%.

Table 2
Summary of Supply Meter Accuracy Results

Meter ID	Date Tested	% Accuracy					
		As Found			As Left		
		Avg.	Min.	Max.	Avg.	Min.	Max.
6D2	5/24/2005	99.7	97.0	101.0			
1D1	5/4/2005	97.0	94.3	101.0	99.3	96.5	101.0
	10/13/2005	99.7	99.7	101.0			
1D2	5/4/2005	99.8	97.0	100.6			
1D3	5/20/2005	101	100.8	101.3			
1D4	5/4/2005	49.8	9.8	101.3	100.2	98.2	101.1
	10/13/2005	0.0	0.0	0.0	100.4	99.9	100.9
5D1	5/20/2005	100.1	99.7	100.6			
5D2	5/20/2005	99.4	98.8	100.0			
5D3	5/24/2005	100.7	99.3	101.6			
5D5	5/202005	100.0	99.7	100.4			
5D6	5/20/2005	99.4	97.5	101.0			
OVERALL [4]		70.5 (100.0)	0.0 (97.0)	101.6 (101.6)	100.0	96.5	101.1

Accuracy reports did highlight problems with the Mewburn Road meter. This meter records flows out of the Niagara Falls system and into the Niagara-on-the-Lake system. Figure 4 suggests that the meter was failing to record demands in N-O-T-L prior to being calibrated in May '05 and that it began failing again within weeks of the calibration. The failure of this meter may lead to overestimating supply to Niagara Falls and underestimating supply to N-O-T-L[5].

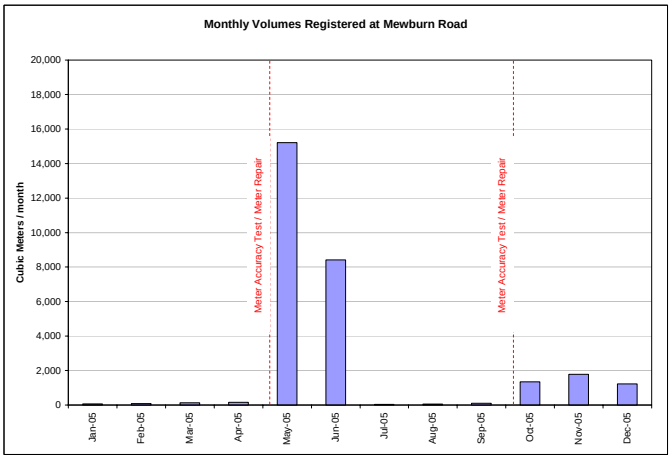


Figure 4: Monthly Volumes from Mewburn Rd.

[3] Excludes meters that required calibration.
[4] Overall results for the "As Found" are summarized both with (and without) the meters requiring calibration.
[5] Based on the original billing equations provided it also appears that flows recorded at 1D4 were subtracted from Niagara Falls but were not added to Niagara-on-the-Lake. It is likely that issues

Data for the remainder of the balances were collected from the individual area municipalities. Table No. 3 on the following page summarizes, based on the input parameters of the PIFastCalc software, which area municipalities provided supporting data for each of these parameters.

3.2.0 Billed, Authorized Consumption – Metered (BACM)

All municipalities provided at least partial data with respect to BACM[6]. The information provided ranged from complete billing databases to a single figure identified as the annual volume of water sold.

With respect to establishing the water balances, errors introduced into the value of BACM may include the following:

- ✓ Meter Accuracy,
- ✓ Data Handling,
- ✓ Estimated Readings, and
- ✓ Meter Lag Times

Meter accuracy and data handling errors are specifically addressed within the framework of the IWA Standard Water Balance and therefore are not evaluated with respect to the defining confidence in the value of BACM.

Estimated readings and meter lag times may be used to indicate confidence in the value of BACM. The percentage of estimated reads reported by the AMs ranged from none (or, at least, no data was provided) to 16.4 % in St. Catharines. Municipal methods for estimating ranged from using the previous month, an average of the previous six months, or even doubling the previous bill (to get the customer's attention). It is impossible to quantify or address errors due to estimated reads without copies of the billing database.

Meter lag times introduce a difference between *when* water is consumed and *when* it is billed. As an example, in an analysis of the Niagara Falls billing approximately 7.6 % of billing in 2004 relates to water consumed prior to the start of the year, and similarly, 7.3 % of 2004's consumption is derived based on meter readings recorded in 2005 (assuming that water is consumed equally throughout the period between meter readings). On an annual basis, it is often assumed these values will counter balance each other. Where possible, based on the datasets provided, meter lag times were addressed.

surrounding this meter account for N-O-T-L reporting more water sold within the municipality than purchased from Region.

[6] Billing data for Welland contained a limited number of accounts (~530). Much of Welland remains un-metered and customers are billed a flat rate. There was not deemed enough data to complete a water balance for Welland.

Table 3
Summary of Data Collected by PIFastCalc Input Parameters

Input Parameters for PIFastCalc (refer to Appendix A for Definition of Terminology)		Fort Erie	Grimsby	Lincoln	Niagara Falls	N-O-T-L	Pelham	Port Colborne	St. Catharines	Thorold	Wainfleet	Welland	West Lincoln
WOS	Volume from Own Sources	**All water supplied via the Regional Municipality of Niagara**											
WI	**Water Imported**	√	√	√	√	√	√	√	√	√	√	√	√
BACE	**Billed, Authorized Consumption Exported**	√	√	√	√	√	√	√	√	√	√	√	√
Assessed marginal cost of RL		√	√	√	√	√	√	√	√	√	√	√	√
BACM	Billed, Authorized Consumption Metered	√	√	√	‘04	P	P	√	‘04	P			√
BACU	Billed, Authorized Consumption Un-metered	-	√										-
UACM	Unbilled, Authorized Consumption Metered												
UACU	Unbilled, Authorized Consumption Un-metered	√	√					√					
UC	Unauthorized Consumption	√	√					√		-			√
ALMUR	Apparent Loss – meter under-registration		√			√		√					
ALDCD	Apparent Loss – customer meter data handling errors												
Lm	Mains Length	√	√	√	√	√	√	√	√	√		√	√
Nh	Number of Hydrants	√	√	√	√	√	√	√	√	?			√
Nb	Number of Separately Billed Properties	√	√	√	√	√	√	√	√	√		√	√
R	Ratio of billed Service Connections to Billed Properties												
Nu	Number of Unbilled Service Connections	√					√			√			√
Lp	Average pipe length, property line to billing meter	√	√		√	√			√	√			√
P	Average pressure when system pressurized	√	√		√	√		√	√				√
Retail Cost / m^3 (excluding base rate)	Assessed marginal cost of UACM	√	√				√	√		√			
	Assessed marginal cost of UACU												
	Assessed marginal cost of UC												
	Assessed marginal cost of ALMUR												
	Assessed marginal cost of ALDCD												
Costs of Running system over period (excluding capital projects)			√	√		√				√		√	√

3.3.0 Billed, Authorized Consumption – Un-metered (BACU)

With the exception of identifying 179 flat rate customers in one specific municipality no details were provided with respect to what the flat rate was or what the estimated consumption was equal to. The remaining AMs provided no details regarding the volume of BACU. There are several flat rate customers in Welland.

3.4.0 Unbilled, Authorized Consumption – Metered (UACM)

The Town of Grimsby identified street sweeping and sewer flushing as components of UACM. Assumedly the town provides a mobile hydrant meter but does not invoice the contractors who would be working for the Town.

3.5.0 Unbilled, Authorized Consumption – Unmetered (UACU)

Identified sources of Unbilled, Authorized Consumption – Unmetered primarily relate to hydrant usage for the following:

- ✓ Water Main Construction and Repairs (e.g. dewatering & flushing),
- ✓ Water Service Repairs,
- ✓ Fire Fighting & Training, and
- ✓ Street Cleaning & Sewer Flushing (i.e., re-filling equipment)

Figure 3 illustrates calculated estimates provided by Grimsby.

Components of Authorised Consumption	Components in Ml				Total	Additional information on sources of data and basis of estimates E = estimated R = Based on recordings
	Billed Metered	Billed Unmetered	Unbilled Metered	Unbilled Unmetered		
Hydrant Usage (mobile meter)			2.12		2.12	R = Based on recordings, less Avertex
New Construction/Rehab				2.45	2.45	E = estimated; 6 jobs x 3/job x 500 gpm x 1 hr.
Fire/Training				13.64	13.64	E = estimated; 1 fire/yr. 2,000 Imp. Gal; Training 68 hrs/yr @ 1,000 gpm = 3,000,000 Imp. Gal
Hydrant Flushing				18.18	18.18	E = estimated; dead-end 20 locations x 6/yr. x 3,000 Imp Gal + 3,000,000 Imp. Gal
Hydroguard				2.95	2.95	E = estimated; 20 gpm x 6-4 hrs./day (50% of this in winter)
Recreation				0.47	0.47	E = estimated; 3 parks approx. 6 gpm x 2 hrs/day x 5 months

Figure 3: Portion of the "Consumption" worksheet extracted from Grimsby's Balance

Table 4 on the following page illustrates that Grimsby and Port Colborne provided breakdowns of their estimates that equate to 1.17% and 6.7 % of Water Supply, respectively. Thorold, Niagara-on-the-Lake, and Fort Erie identified relevant sources of UACU in their system and the latter provided an overall estimate equal to 5 % of Water Supply. The default estimate in PIFastCalcs is equal to 1.25% of Water Supplied.
In the absence of estimates made by the municipality themselves the balances accept the default estimate. The 95 % confidence limits of +/- 100 % and process reliability band of "D" highlight the uncertainty with regards to this component.

3.6.0 Unauthorized Consumption (UC)

Common components of unauthorized consumption are by-pass tampering, unauthorized use of fire services, and unauthorized use of hydrants.

The default estimate in PIFastCalcs is equal to 0.25 % of Water Supply (+/- 100%). Both Grimsby and Fort Erie estimated 1 % whereas West Lincoln estimated 0.02 %. Port

Colborne suggests approximately 5 household per year tamper with the meter by-pass but did not estimate the amount of loss. In the absence of a provided estimate the default value is accepted.

Table 4
Summary of Data Collected Pertaining to UACU

	Estimates in ML/year √ indicates the AM recognizes this as a use but did not provide an estimate									
	Fort Erie	Grimsby	Lincoln	Niagara Falls	N-O-T-L	Pelham	Port Colborne	St. Catharine	Thorold	West Lincoln
Water Main Construction & Repairs		7.8					1.8			
Water Service Repairs							94.2			
Water Quality	√						86.4		√	
Hydrant Flushing	√	18.4					13.1			
Blow-offs					√				√	
Fire Fighting / Training	√	13.6			√		44.4		√	
Sewer Flushing	√						14.6		√	
Street Cleaning	√								√	
Recreation		0.6					6.4			
TOTAL	197	40.4	-	-	-		260.9	-	-	-

3.7.0 Apparent Losses – Meter Under-Registration (ALMUR)

As meters deteriorate with age and usage they are more likely to under-register water use. Because of the relative small number of meter accuracy reports provided an aggregated analysis of the tests provided by Grimsby, Niagara-on-the-Lake, and Port Colborne (Appendix C) was completed. The results of this analysis are summarized below.

Table 5
Calculated Values of Meter Under-Registration & 95% Confidence Limits

	% Under Registration	95 % Confidence Limits
Meters < 1"	0.5	7
Meters > 1"	1.0	7

Most municipalities provided a breakdown of consumption based on accounts for which meters are read based on cycles (e.g., 3 or 4 times per year) and those that are read monthly. In these cases the former group was associated with meters smaller than one inch and the latter with meters larger than one inch. If no breakdown was provided a 70/30 ratio was estimated and an overall value of 0.6% under-registration was assumed (with 95% confidence limits equal to +/- 7 %).

3.8.0 Apparent Losses – Customer Data Handling (ALDCD)

Across the Region, numerous methods are employed to retrieve and manage meter readings. Meter reads are collected using customer reading cards, physical meter reads, roll dial remotes, touchpads, and radio-reads. Billing software packages include: Easyroute, USTI Water System, Vadium, Vailtech, and AS400. Niagara Falls maintains a customized database.

Sources of customer data handling errors are numerous and may collectively introduce significant error. Specifically, examples of the data handling errors which were identified included:

- ✓ In Niagara Falls approximately 2% of records in the raw database were duplicates.
- ✓ In Grimsby the summary spreadsheets of 2004 and 2005 contained inconsistent data pertaining to periods where meter reads bridged the calendar year; representing a potential error of approximately 1%.
- ✓ In West Lincoln the original data submitted mismatched data billed monthly in 2004 with data billed quarterly in 2005. The 2005 summary provided included regional billing data from 2004.
- ✓ Simple errors in arithmetic or difference in numbers, depending on the source used

These examples are of errors that have been identified and corrected within the balance but undoubtedly there are errors that remain undetected – either because they are inherent in the data provided or because not all the data was provided

3.9.0 Length of Water Mains (Lm)

The total length of water mains in the reporting AMs is equal to approximately 2,000 kilometers.

Age and material are not specifically required in the water balance. Nonetheless most municipalities provided data on materials and Figure 4 provides an overall breakdown of the mains across the Region.

It is assumed that the inventory of water mains is most likely accurate to within +/- 2 %.

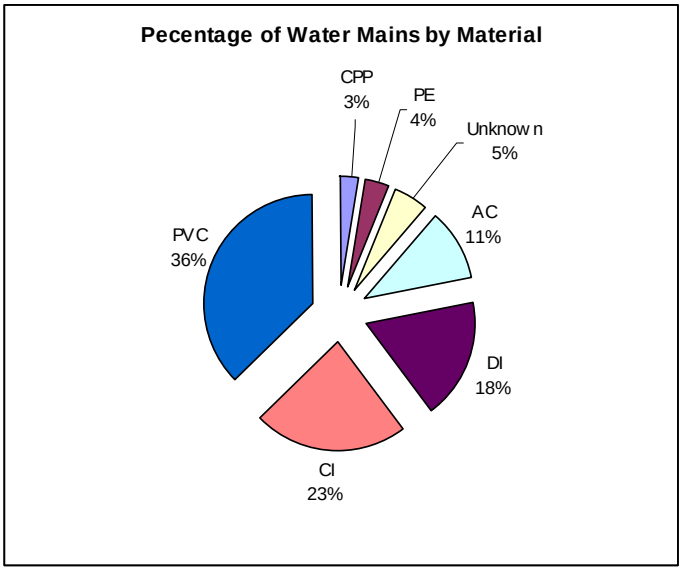


Figure No. 4 – Water Main Materials

Some inaccuracies may be as a result of some AM including Regional water mains while others may not. Additionally, databases may be out of date with regards to new construction.

3.10.0 Number of Hydrants (Nh)

There are approximately 10,500 hydrants in total. All of the AMs provided this data.

3.11.0 Number of Separately Billed Properties (Nb)

PIFastCalc uses two values, the Number of Separately Billed Properties and the Ratio of Service Connections to Billed Properties (R) to calculate the Number of Billed Service Connections (Ns). Most AMs provided the number of billed services directly and a ratio of 1:1 is used. The total number of separately billed properties is equal to 113,228 – equivalent to the number of meters.

3.12.0 Number of Unbilled Service Connections (Nu)

Unbilled service connections may include the following:

- ✓ Fire connections, and
- ✓ Un-metered municipal connections

Most AM did not provide any data with regards to the number of unbilled service connections. Table 6 summarizes the data that was provided.

Table 6
Summary of Reported Unbilled Service Connections

Area Municipality	Number of Unbilled Service Connections (Nu)
Fort Erie	100
Port Colborne	28
Thorold	25
West Lincoln	6

3.13.0 Average Pipe Length – Property Line to Meter (Lp)

Private service pipe length is an important consideration in the calculation of the performance indicators assessing real losses. This is because it is generally accepted that the majority of leaks occur on service connections. Table 7 summarizes the reported data.

Table 7
Summary of Reported Lengths (in meters) – Property Line to Meter (Lp)

Area Municipality	Lp	Area Municipality	Lp
Fort Erie	10	St. Catharines	7
Grimsby	10	Thorold	10
Niagara Falls	18	West Lincoln	9
N-O-T-L	8.5		

3.14.0 Average System Pressure (P)

The average system pressure entered in PIFastCalc should be a weighted average determined, for example, based on a list of static hydrant pressures many AM record during hydrant inspections. Table 8 summarizes the data provided which in some cases was simply a range of pressures.

Table 8
Summary of Reported Pressures (in PSI)

	Pressure(s)
Fort Erie	75
Grimsby	75
Lincoln	-
Port Colborne	58
Niagara Falls	94
Niagara-on-the-Lake	
Zone 1	44 – 69
Zone 2	56 – 97
Zone 3	45 – 102
Zone 4	66 – 92
St. Catharines	
Zone 1	50 – 100
Zones 2 & 3	50 – 80
Thorold	62
West Lincoln	62

3.15.0 Assessed Marginal Costs

Within PIFastCalc several marginal costs are used to attempt to more accurately reflect the actual costs of various components of NRW.

Unbilled, authorized consumption is typically valued at the cost which the AM purchases the water from the Region. Justification of this is that the AM, by not billing the customer, is assuming the costs. The costs of apparent losses is equal to the rate which the AM charges customers because this water is in fact being consumed by customers (sewer surcharges may also be applicable). Unauthorized consumption such as theft may be valued at a rate equal to the retail costs of water without the applicable sewer

surcharge. Real losses are valued at the wholesale costs of water because this water is not consumed or used by anyone – eliminating the real losses eliminates the demand!

Many AM may have never considered assessed marginal costs based on the components of the IWA Water Audit and therefore could not identify costs according to this breakdown.

3.15.1 Assessed Marginal Costs of UACM

The rate(s) at which the individual AMs re-sell water vary. If base rates apply it may be difficult to directly distinguish the marginal costs of UACM. Table 9 summarizes the data collected.

Table 9
Summary of Reported Water Rates

	Rate(s)
Grimsby	$0.73/m^3
Port Colborne	$0.756/m^3
Thorold	$47.76 for the first 27 m^3 ($1.769/m^3)
	$0.742/m^3 in excess
West Lincoln	$1.109/m^3

3.15.2 Assessed Marginal Costs of UACU

In most cases the assessed marginal cost of unbilled, authorized consumption will be the same regardless of whether it is metered or un-metered. Possible exceptions may include considerations of sewer surcharges related to water consumption.

3.15.3 Assessed Marginal Costs of UC

No data.

3.15.4 Assessed Marginal Costs of ULMUR

No data.

3.15.5 Assessed Marginal Costs of ALDCD

No data.

3.15.6 Assessed Marginal Costs of RL

The assessed marginal cost of real losses is equal to the wholesale water rate at which the AM purchase water from the Region. This rate was equal to $0.40/m^3 and $0.446/m^3 in 2004 and 2005, respectively.

3.16.0 Costs of Running the System Over the Period of the Balance

The costs of running the system should be determined based on the operational costs plus the internal manpower costs minus the capitalized costs of self-constructed assets. Reported costs are summarized in Table 10 on the following page.

Table 10
Summary of Reported Costs ($) of Running Water System(s)

	Reported Costs
Grimsby	$3,166,740
Lincoln	$3,505,747
Thorold	$2,648,400
West Lincoln	$ 372,750

4.0 RESULTS: PHASE II – WATER BALANCES

The following sections highlight the results of the individual water balances included in Appendices F through O.

4.1.0 Financial Performance Indicators

4.1.1 Non-Revenue Water as a Percentage of System Input Volume

Percentage of Non-Revenue Water by Volume is considered a "Basic Level" Financial Performance Indicator. NRW may be particularly misleading with regards to comparing one system to another.

Region wide the combined volume of BACM reported accounts for approximately 85% of the water purchased from the region by the reporting area municipalities. Individually the percentage of NRW within the area municipalities ranges from -1.3 % to 36.8 %.

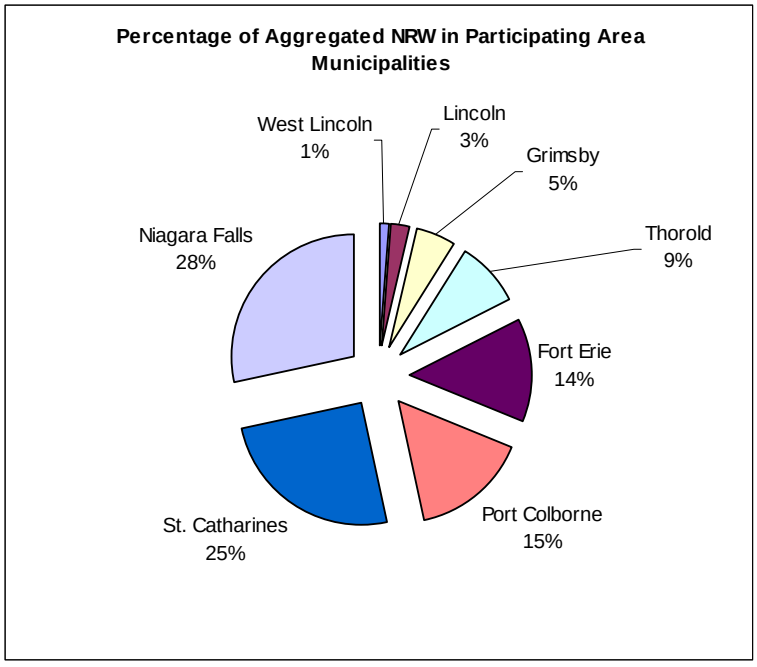


Figure 5: Percentage of Aggregated NRW in Participating Area Municipalities

Figure 6 illustrates the values of NRW in each area municipality. Confidence intervals are derived based on the confidence attributed to both the Region's billing and the billing meters. The negative value calculated for Niagara-on-the-Lake may be accounted-for in part due to meter error discussed on page 5 of this report.

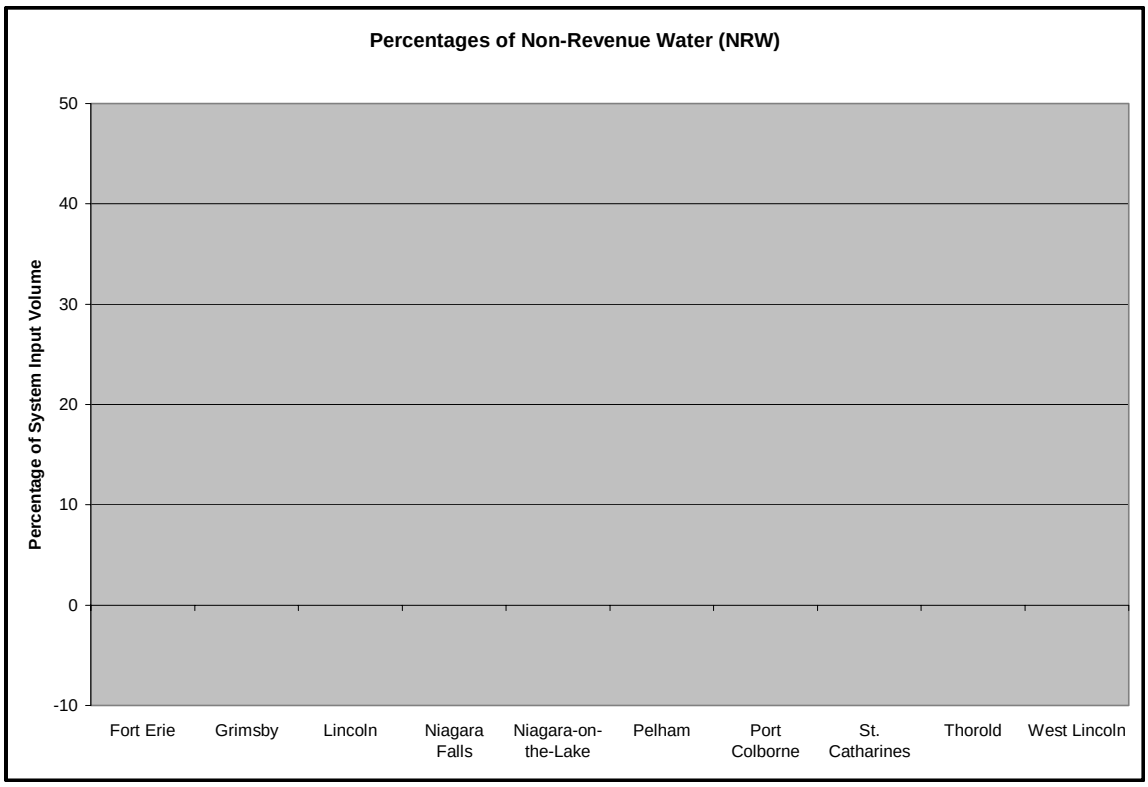
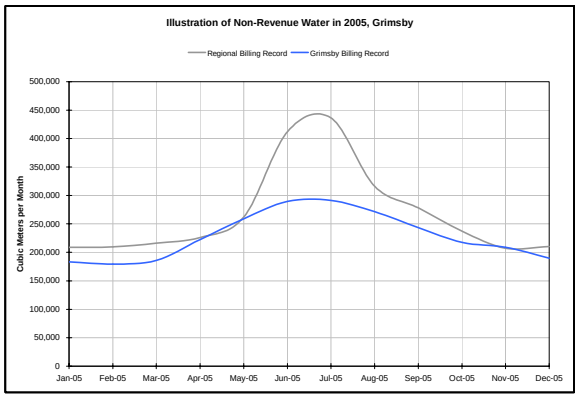
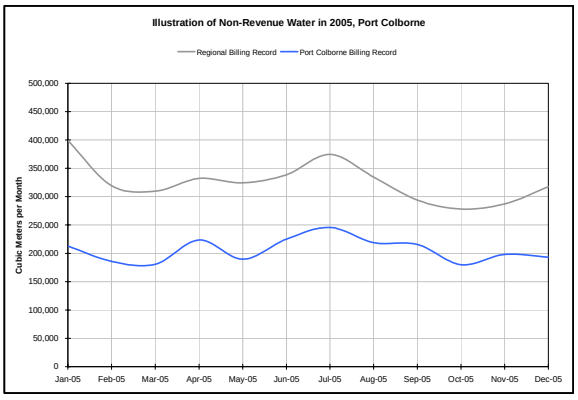


Figure 6: Non – Revenue Water as a Percentage of System Input Volume

Insofar as trends in NRW may be more telling than an annual volume, a monthly analysis was completed for those municipalities that provided sufficient data (Appendix D). Figures 7a & 7b illustrate two examples of monthly variations in NRW which suggest different potential causes.





Figures 7a & b – Trends in Non-Revenue Based on Monthly Volumes Purchased & BACM

Figure 7a (Grimsby) suggests excessive unbilled water use in the summer period accounting for approximately 5 % of Water Supplied annually. Use of estimated reads, based on average annual consumption, may also account for Grimsby's trend. Figure 7b (Port Colborne) suggests unbilled water use underlying billed consumption throughout the year. This underlying water use may be attributable to several factors including leakage.

4.1.2 Non-Revenue Water as % of System Input by Value

As identified any Section 3.16 of this report many municipalities did not provide the costs of running the system during the period of the balance. Table 11 summarizes the results.

Table 11
Non-Revenue Water as % of System Input by Value

	% of Non-Revenue Water as % of System Input by Value
Fort Erie	8.4 % (+/- 25.2 %)
Grimsby	3.6 % (+/- 35.6 %)
Lincoln	14.7 % (+/- 12.8 %)
Thorold	13.1 % (+/- 25.0 %)

4.2.0 Operational Performance Indicators

4.2.1 Apparent Losses as a % of Water Supply

The recommended Performance Indicator for Apparent Losses is the % of Apparent Losses relative to Water Supply. Apparent losses include meter under-registration, errors in customer data handling, and unauthorized consumption. The values calculated for each of the municipalities are identified below.

Table 12
Summary of Apparent Losses by Area Municipality

	% of Apparent Losses	95 % Confidence Limits
Fort Erie	1.4	35.1%
Grimsby	2.1	36.6%
Lincoln	0.8	31.9%
Niagara Falls	0.7	36.6%
Niagara-on-the-Lake	0.9	30.0%
Pelham	0.8	33.6%
Port Colborne	0.7	18.7%
St. Catharines	0.8	33.5%
Thorold	0.7	34.1%
West Lincoln	0.6	6.0%

Differences in apparent losses primarily reflect the estimated percentages of unauthorized consumption (page 9). Values of meter-under registration were assumed equal in all the

municipalities and no municipalities provided any estimates regarding data handling errors. Therefore, because Fort Erie and Grimsby estimated unauthorized consumption to be higher than the default value their apparent losses are greater.

4.2.2 Current Annual Real Losses in litres/service connection/day

Figure 8a illustrates the Current Annual Real Losses (CARL) in each of the area municipalities. CARL are calculated by subtracting authorized consumption and apparent losses from the total volume of water supplied. The recommended Performance Indicator for Real Losses (Figure 8b) expresses the value of CARL in litres/service connection/day, when the system is pressurized[7].

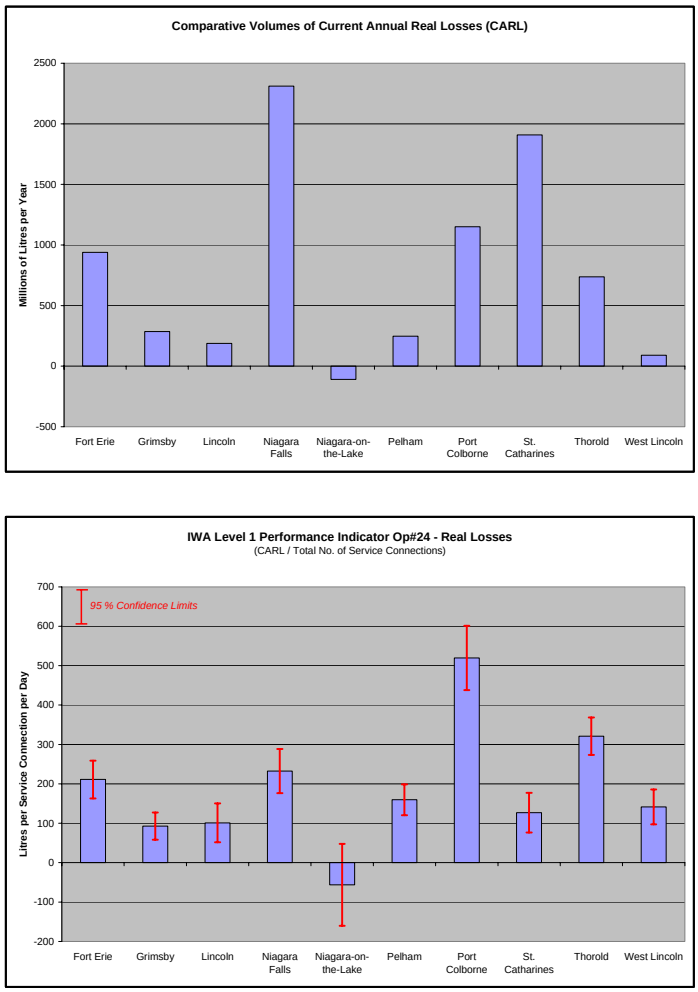


Figure 8a & b: Comparative, calculated values of Current Annual Real Losses expressed in (a) ML/yr, and (b) litres/service connection/day when pressurized

As illustrated in Figures 8a and b the volume of real losses in itself may be misleading in comparing area municipalities because it fails to account for the relative size of the

[7] In the case of all these audits the systems are pressurized 100% of the time.

distribution systems. By expressing losses in terms of litres/connection per day when the system is pressurized the volume of losses is put into context. Nonetheless the expression of CARL in these terms is considered a Level 1 (or basic) performance indicator because it does not account for differences in system pressure which significantly influence water losses due to leakage.

4.2.3 Infrastructure Leakage Index (ILI)

The advanced (Level 3) operational performance indicator for real losses is the Infrastructure Leakage Index (ILI). The ILI is a ratio of the CARL to Unavoidable Annual Real Losses.

Unavoidable Annual Real Losses (UARL)

Some "measure" of water loss due to leakage is unavoidable in all water distribution systems. Background leakage, including small leaks and weeps, is unavoidable in that individual sources are either undetectable and/or the cost-to-benefit does not justify repair/replacement. In addition there are unavoidable losses due to reported/unreported leakage. These losses relate to the time between when leak(s) occurs and is repaired.

Unavoidable losses are controllable through various best-management-practices (e.g., speed and quality of repairs, active leakage control). The calculated values of UARL assume best-management-practices. Appendix E provides a summary of the component analysis for calculating UARL.

Based on the assumptions described in Appendix E, the value of UARL in each area municipality is calculated based on the following:

- total length of water mains
- total number of service connections
- total length of customer supply pipe, and
- the average system pressure

Figure 9, on the following page, illustrates the components of CARL in each of the area municipalities. Potentially recoverable losses represent the difference between CARL and UARL.

The Infrastructure Leakage Index (ILI) provides guidance as to how well real losses are being managed (in terms of repairs, active leakage control and infrastructure management) at the current operating pressure[8].

[8] The ILI does not imply that pressure management in a system is optimal, or economic. If system pressures are excessive, or subject to surges, then pressure management may result in additional benefits for real losses management - in particular, a reduction in new burst frequency and annual repair costs, and a reduction in flow rates of existing leaks. So even if a low ILI is being achieved, there may still be opportunities to reduce annual real losses by improved pressure management.

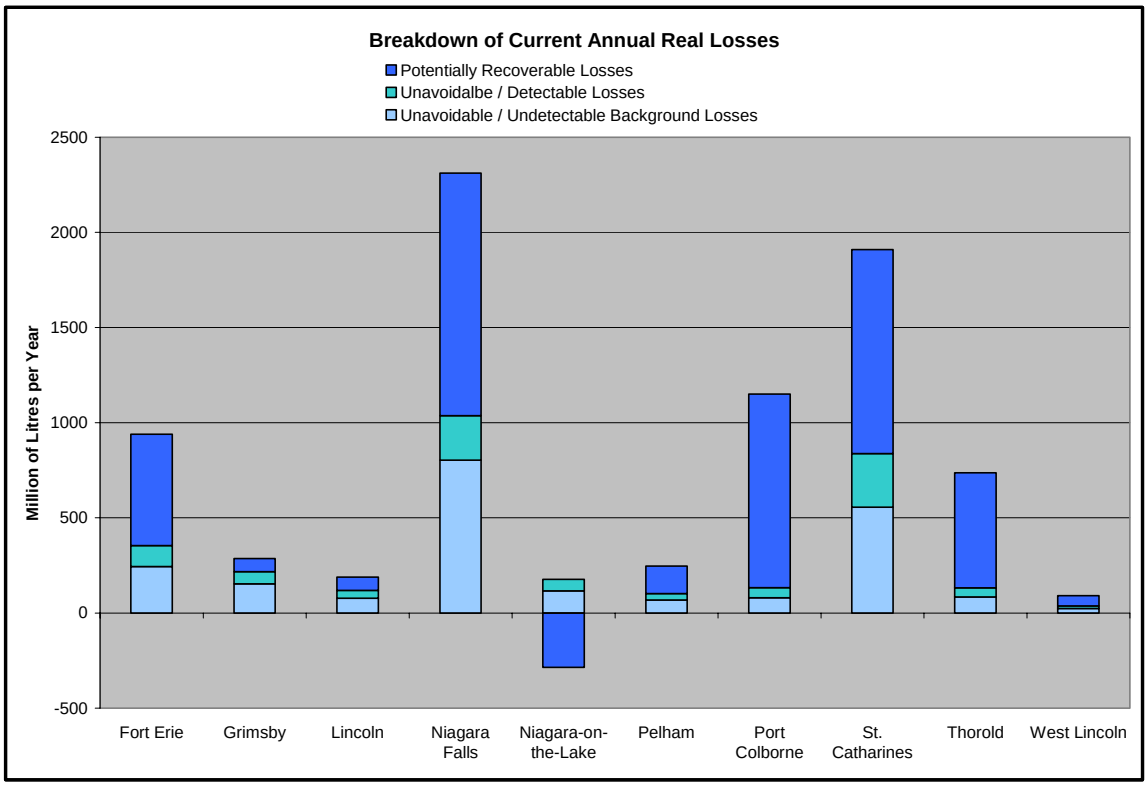


Figure 9: Illustration of the components making up the Current Annual Real Losses (CARL)

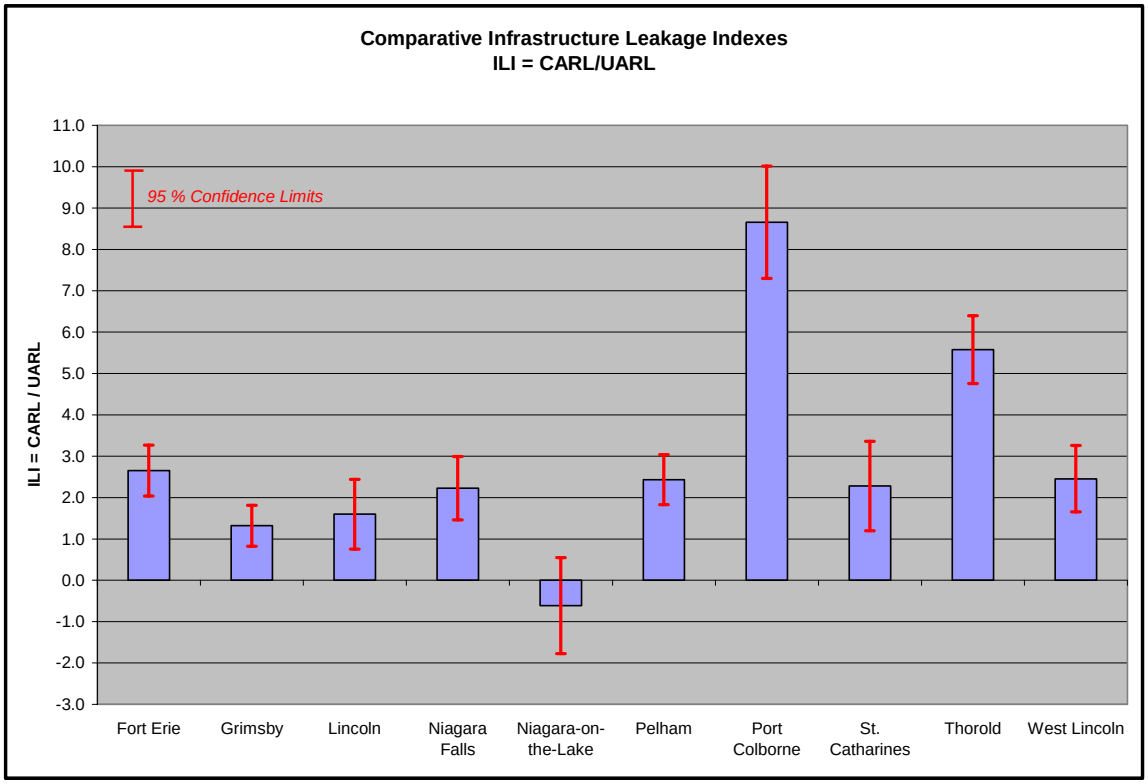


Figure 10: Illustration of Calculated ILI for each area municipality

An ILI equal to 2, for example, suggest Current Annual Real Losses (CARL) are two-times greater than the Unavoidable Annual Real Losses (UARL) if best-management-practices were followed. Figure 10 on the preceding page illustrates the calculated ILIs of each of the participating area municipalities.

Based on the calculated ILIs and on the guidelines provided by both the World Bank Institute and the AWWA the following section provides some general discussion of the real losses in the area municipalities.

5.0 DISCUSSION

5.1.0 World Bank Institute Target Matrix / Banding

PIFastCalc identifies where the calculated ILI fits into a target matrix developed by the World Bank Institute and incorporated into its NRW training modules. These guidelines are included in the individual reports in Appendices F through O and summarized in the following table. In the WBI's target matrix, general descriptions are made which describe a system's performance in real loss management based on its calculated ILI.

Table 13
General Description of Real Loss Management Performance

ILI Range	Band	Area Municipality	ILI	General description of Real Loss Management Performance
< 2	A	Niagara-on-the-Lake	-0.6	Further loss reduction may be uneconomic unless there are shortages; careful analysis needed to identify cost-effective improvement
		Grimsby	1.3	
		Lincoln	1.6	
2 to 4	B	Niagara Falls	2.2	Potential for marked improvements; consider pressure management, better active leakage control practices, and better network maintenance
		St. Catharines	2.3	
		Pelham	2.4	
		West Lincoln	2.5	
		Fort Erie	2.7	
4 to 8	C	Thorold	5.6	Poor leakage record; tolerable only if water is plentiful and cheap; even then, analyze level and nature of leakage and intensify leakage reduction efforts
>8	D	Port Colborne	8.7	Very inefficient use of resources; leakage reduction programs imperative and high priority

5.2.0 AWWA General Guidelines

Table 14, on the following page, summarizes the general guidelines developed by AWWA's Water Loss Committee which again categorize system based on the calculated ILI.

Table 14
AWWA General Guidelines Pertaining to Infrastructure Leakage Index

ILI Range	Band	Area Municipality	ILI	Water Resource Considerations	Operational Considerations	Financial Considerations
< 2	A	Niagara-on-the-Lake	-0.6	Available resources are greatly limited and are very difficult / environmentally unsound to develop	Operating with system leakage above this level would require expansion of existing infrastructure and/or additional water resources to meet demand	Water resources are costly to develop or purchase; ability to increase revenues via water rates is greatly limited because of regulation or low ratepayer affordability
		Grimsby	1.3			
		Lincoln	1.6			
2 to 4	B	Niagara Falls	2.2	Water resources are believed to be sufficient to meet long-term needs, but demand management interventions (leakage management, water conservation) are included in long-term planning	Existing water supply infrastructure capability is sufficient to meet long-term demand as long as reasonable leakage management controls are in place	Water resources can be developed or purchased at reasonable expense; periodic water rate increases can be feasibly imposed and are tolerated by the customer population
		St. Catharines	2.3			
		Pelham	2.4			
		West Lincoln	2.5			
		Fort Erie	2.7			
4 to 8	C	Thorold	5.6	Water resources are plentiful, reliable, and easily abstracted	Superior reliability, capacity and integrity of the supply infrastructure make it relatively immune to shortages	Cost to purchase or obtain/treat water is low, as are rates charged to customers
>8	D	Port Colborne	8.7	Although operational and financial considerations may allow a long-term ILI greater than 8.0, such a level of leakage is not an effective utilization of water as a resource. Setting a target level greater than as an incremental goal to a smaller long-term target – is discouraged		

6.0 RECOMMENDATIONS

The water balances have been completed based on the data provided. In all cases it is advisable to update and complete the data.

With regards to managing real losses (leakage and overflows from systems up to the point of customer metering or consumption) best management practices recognize the following:

- ✓ Pressure Management
- ✓ Speed and Quality of Repairs
- ✓ Active Leakage Control, and
- ✓ Pipeline and Assets Management

PIFastCalc's recommendations are based on the World Bank Institute's ILI Bands. Individual municipalities are grouped in these bands in Tables 13 and 14. Table 15 is reproduced from the ILI Guidelines worksheet within the software.

Table 15
WBI Recommendations

WBI Recommendations for BANDS	A	B	C	D
Investigate pressure management options	Yes	Yes	Yes	
Investigate speed and quality of repairs	Yes	Yes	Yes	
Check economic intervention frequency	Yes	Yes		
Introduce/improve active leakage control		Yes	Yes	
Identify options for improved maintenance		Yes	Yes	
Assess Economic Leakage Level	Yes	Yes		
Review break frequencies		Yes	Yes	
Review asset management policy		Yes	Yes	Yes
Deal with deficiencies in manpower, training and communications			Yes	Yes
5-year plan to achieve next lowest band			Yes	Yes
Fundamental peer review of all activities				Yes

Appendix A

IWA Water Balance Terminology

Volume from Own Sources:	The volume of water input to a system from the Water Supplier's own sources
Water Imported or Exported:	The volume(s) of bulk transfers across operational boundaries
System Input Volume:	The volume input to that part of the water supply system to which the water balance calculation relates, corrected for known errors. Equal to VOLUME FROM OWN SOURCES plus WATER IMPORTED
Water Supplied:	Equal to the SYSTEM INPUT VOLUME minus WATER EXPORTED
Authorized Consumption:	Volume of metered and/or un-metered water taken by registered customers, the water supplier and others who are implicitly or explicitly authorized to do so by the water supplier, for residential, commercial and industrial purposes. Authorized consumption may include items such as fire fighting and training, flushing of mains and sewers, street cleaning, watering of municipal gardens, public fountains, frost protection, building water, etc. These may be billed or unbilled, metered or un-metered.
Water Losses:	The difference between SYSTEM INPUT and AUTHORISED CONSUMPTION. Water losses can be considered as a total volume for the whole system, or for partial systems such as raw water mains, transmission or distribution systems, or individual zones. In the above definition of Water Losses, 'Authorized Consumption' includes bulk exports of water across operational boundaries. When doing the Water Balance calculation, a convenient alternative method of calculating Water Losses is 'Water Supplied - (Authorized Consumption - Water Exported)'
Apparent Losses:	Includes all types of inaccuracies associated with customer metering, plus unauthorized consumption (theft or illegal use). Over-registration of customer meters, leads to under-estimation of REAL LOSSES. Under-registration of customer meters, leads to over-estimation of REAL LOSSES.
Real Losses:	Physical water losses from the pressurized system, up to the point of measurement of customer use. The annual volume lost through all types of leaks, breaks and overflows depends on frequencies, flow rates, and average duration of individual leaks, breaks and overflows. Although physical losses after the point of customer flow measurement or assumed consumption are excluded from the assessment of REAL LOSSES,

	this does not necessarily mean that they are not significant or worthy of attention for demand management purposes.
Revenue Water:	Those components of SYSTEM INPUT which are billed and produce revenue (also known as BILLED AUTHORISED CONSUMPTION). Equal to BILLED WATER EXPORTED, BILLED METERED CONSUMPTION and BILLED UNMETERED CONSUMPTION
Non- Revenue Water:	Those components of SYSTEM INPUT which are not billed and do not produce revenue. Equal to UNBILLED AUTHORISED CONSUMPTION, APPARENT LOSSES and REAL LOSSES
Unbilled, Authorized Consumption:	Those components of AUTHORISED CONSUMPTION which are not billed and do not produce revenue. Equal to UNBILLED METERED CONSUMPTION and UNBILLED UNMETERED CONSUMPTION

Appendix B

Supply Meter Accuracy Test Reports

Coulter Water Meter Service Inc.

P.O. Box 216, Strathroy, Ontario N7G 3J2 (519) 245-5860

Service Order/Report

New P.O. 301678 **Old P.O.** 30513 **Invoice No** 28792 **REGNIA** ***Service Date*** 5/24/2005

Invoiced To REG. MUNICIPALITY OF NIAGARA
2201 ST. DAVIDS ROAD
P.O. BOX 1042
THOROLD ONTARIO
L2V 4T7 CANADA

Job Address PARK ROAD @ MUD STREET
Acct No METER #15
Occupant AREA #3
Contact PAUL COLEMAN 905-684-5353
Cust Contact TONY ACCETTOLA

Service Provided By: J. OSTROWALKER

Meter Mfg INVENSYS
Size Type 4" W-1000
Reg Unit D/R 1M3
Serial No 1243994

Location MODULE TESTED IN-SHOP
Test Fittings MODULE EXCHANGE
Chamber N
Job Completed ☑

Meter Running On Arrival ☐
Meter Sealed On Arrival ☐
Bypass Sealed On Arrival ☐
If NO, Was It Open ☐
Mtr Running On Departure ☐
tr Valves Sealed On Departure ☐
Broken Valves Tagged ☐

Meter Reading

	As Found	After Service
HF OUT		
HF IN	932213	932222
LF OUT		
LF IN		

Static PSI 0 **Residual PSI** 0 **At** 0 **Rate Of Flow** 0 **At**

TEST RESULTS

As Found

R.O.F.	QTY	HIGH	LOW	TOTAL	%
500 GPM	4110.00	4105.00	0.00	4105.00	99.88
150 GPM	2004.50	2020.00	0.00	2020.00	100.77
50 GPM	1010.00	1020.00	0.00	1020.00	100.99
10 GPM	1010.00	980.00	0.00	980.00	97.03

Meter Runs At Min. Flow ☐

After Service

R.O.F.	QTY	HIGH	LOW	TOTAL	%
	0.00	0.00	0.00	0.00	#Num!
	0.00	0.00	0.00	0.00	#Num!
	0.00	0.00	0.00	0.00	#Num!
	0.00	0.00	0.00	0.00	#Num!

Meter Runs At Min. Flow ☐

Comments METER PRETESTED WITHIN AWWA SPECIFICATION C701 FOR CLASS II TURBINE METERS.

SERVICING: $247.00

Coulter Water Meter Service Inc.

P.O. Box 216, Strathroy, Ontario N7G 3J2 (519) 245-5860

Service Order/Report

New P.O. 301743 **Old P.O.** 303511 **Invoice No** 28793 **REGNIA** ***Service Date*** 5/4/2005

Invoiced To REG. MUNICIPALITY OF NIAGARA
2201 ST. DAVIDS ROAD
P.O. BOX 1042
THOROLD ONTARIO
L2V 4T7 CANADA

Service Provided By: S. PATE / D. JONES

Job Address BEVAN HEIGHTS
Acct No METER #3
Occupant AREA #1
Contact HERB MARACLE 905-295-4831
Cust Contact TONY ACCETTOLA

Meter Mfg INVENSYS
Size Type 6" F/S
Reg Unit ECR 5M3
Serial No 16436770

Location CORNER OF BEVAN & MELROSE
Test Fittings 2" TEST PORT
Chamber Y
Job Completed ☑

Meter Running On Arrival ☑
Meter Sealed On Arrival ☑
Bypass Sealed On Arrival ☑
If NO, Was It Open ☐
Mtr Running On Departure ☑
Mtr Valves Sealed On Departure ☑
Broken Valves Tagged ☐

Meter Reading

	As Found	After Service
HF OUT		
HF IN	000825	000834
LF OUT		
LF IN	056290	256296

Static PSI 100 **Residual PSI** 20 **At** 200 **Rate Of Flow** 8 **At** 12:00 PM

TEST RESULTS

As Found						After Service					
R.O.F.	QTY	HIGH	LOW	TOTAL	%	R.O.F.	QTY	HIGH	LOW	TOTAL	%
8 GPM	1000.00	0.00	1010.00	1010.00	101.00	8 GPM	1000.00	0.00	1010.00	1010.00	101.00
200 GPM	3000.00	2049.00	780.00	2829.00	94.30	200 GPM	3000.00	2140.00	830.00	2970.00	99.00
100 GPM	1000.00	431.00	535.00	966.00	96.60	100 GPM	1000.00	485.00	520.00	1005.00	100.50
60 GPM	1000.00	200.00	760.00	960.00	96.00	60 GPM	1000.00	240.00	725.00	965.00	96.50

Meter Runs At Min. Flow ☑ **Meter Runs At Min. Flow** ☑

Comments PRETESTED AND CALIBRATED METER TO WITHIN AWWA SPECIFICATION C703 FOR FIRE SERVICE TYPE METERS.

SERVICING: $420.00

Coulter Water Meter Service Inc.

P.O. Box 216, Strathroy, Ontario N7G 3J2 (519) 245-5860

Service Order/Report

New P.O. 303511 **Old P.O.** 303511 **Invoice No** 29175 **REGNIA** ***Service Date*** 10/13/2005

Invoiced To REG. MUNICIPALITY OF NIAGARA
2201 ST. DAVIDS ROAD
P.O. BOX 1042
THOROLD ONTARIO
L2V 4T7 CANADA

Job Address BEVAN HEIGHTS
Acct No METER #3
Occupant AREA #1
Contact HERB MARACLE 905-295-4831
Cust Contact TONY ACCETTOLA

Service Provided By: PARSONS / OSTROWALKER

Meter Mfg INVENSYS
Size Type 6" F/S
Reg Unit ECR 5M3
Serial No 16436770

Location CORNER OF BEVAN & MELROSE
Test Fittings 2" TEST PORT
Chamber Y
Job Completed ☑

Meter Running On Arrival ☑
Meter Sealed On Arrival ☑
Bypass Sealed On Arrival ☑
If NO, Was It Open ☐
Mtr Running On Departure ☑
'r Valves Sealed On Departure ☑
Broken Valves Tagged ☐

Meter Reading

	As Found	After Service
HF OUT		
HF IN	001065	001070
LF OUT		
LF IN	073001	073004

Static PSI 100 **Residual PSI** 20 **At** 443 **Rate Of Flow** 40 **At** 1:15 PM

TEST RESULTS

As Found

R.O.F.	QTY	HIGH	LOW	TOTAL	%
.51 LPS	1000.40	0.00	1010.00	1010.00	100.96
28 LPS	4210.00	3560.00	600.00	4160.00	98.81
12.6 LPS	2007.00	1400.00	590.00	1990.00	99.15
2.8 LPS	1003.00	40.00	960.00	1000.00	99.70

Meter Runs At Min. Flow ☑

After Service

R.O.F.	QTY	HIGH	LOW	TOTAL	%
	0.00	0.00	0.00	0.00	#Num!
	0.00	0.00	0.00	0.00	#Num!
	0.00	0.00	0.00	0.00	#Num!
	0.00	0.00	0.00	0.00	#Num!

Meter Runs At Min. Flow ☐

Comments METER PRETESTED WITHIN SPECIFICATIONS,

SERVICING: $420.00

Coulter Water Meter Service Inc.

P.O. Box 216, Strathroy, Ontario N7G 3J2 (519) 245-5860

Service Order/Report

New P.O. 301743 **Old P.O.** 303511 **Invoice No** 28793 **REGNIA** ***Service Date*** 5/4/2005

Invoiced To REG. MUNICIPALITY OF NIAGARA
2201 ST. DAVIDS ROAD
P.O. BOX 1042
THOROLD ONTARIO
L2V 4T7 CANADA

Job Address PORT ROBINSON TRANSFER STATION
Acct No METER #2
Occupant AREA #1
Contact HERB MARACLE 905-295-4831
Cust Contact TONY ACCETTOLA

Service Provided By: S. PATE / D. JONES

Meter Mfg INVENSYS
Size Type 6" F/S
Reg Unit HSPU 1M3
Serial No 1413619

Location 1795 THOROLD TOWN LINE
Test Fittings 2" TEST PORT
Chamber Y
Job Completed ☑

Meter Running On Arrival ☑
Meter Sealed On Arrival ☑
Bypass Sealed On Arrival ☑
If NO, Was It Open ☐
Mtr Running On Departure ☑
Mtr Valves Sealed On Departure ☑
Broken Valves Tagged ☐

Meter Reading

	As Found	After Service
HF OUT		
HF IN	061815	061825
LF OUT		
LF IN	20612.3	20615.0

Static PSI 100 **Residual PSI** 30 **At** 450 **Rate Of Flow** 40 **At** 5:30 PM

TEST RESULTS

As Found

R.O.F.	QTY	HIGH	LOW	TOTAL	%
8 GPM	100.00	0.00	100.50	100.50	100.50
450 GPM	5000.00	4415.00	638.00	5053.00	101.06
200 GPM	3000.00	2220.00	798.00	3018.00	100.60
55 GPM	1000.00	275.00	695.00	970.00	97.00

Meter Runs At Min. Flow ☑

After Service

R.O.F.	QTY	HIGH	LOW	TOTAL	%
	0.00	0.00	0.00	0.00	#Num!
	0.00	0.00	0.00	0.00	#Num!
	0.00	0.00	0.00	0.00	#Num!
	0.00	0.00	0.00	0.00	#Num!

Meter Runs At Min. Flow ☐

Comments METER PRETESTED WITHIN AWWA SPECIFICATION C703 FOR FIRE SERVICE TYPE METERS.

SERVICING: $420.00

Coulter Water Meter Service Inc.

P.O. Box 216, Strathroy, Ontario N7G 3J2 (519) 245-5860

Service Order/Report

New P.O. 303511 **Old P.O.** 303511 **Invoice No** 29175 REGNIA ***Service Date*** 10/13/2005

Invoiced To REG. MUNICIPALITY OF NIAGARA
2201 ST. DAVIDS ROAD
P.O. BOX 1042
THOROLD ONTARIO
L2V 4T7 CANADA

Job Address PORT ROBINSON TRANSFER STATION
Acct No METER #2
Occupant AREA #1
Contact HERB MARACLE 905-295-4831
Cust Contact TONY ACCETTOLA

Service Provided By: PARSONS / OSTROWALKER

Meter Mfg INVENSYS
Size Type 6" F/S
Reg Unit HSPU 1M3
Serial No 1413619

Location 1795 THOROLD TOWN LINE
Test Fittings 2" TEST PORT
Chamber Y
Job Completed ☑

Meter Running On Arrival ☑
Meter Sealed On Arrival ☑
Bypass Sealed On Arrival ☑
If NO, Was It Open ☐
Mtr Running On Departure ☑
r Valves Sealed On Departure ☑
Broken Valves Tagged ☐

Meter Reading

	As Found	After Service
HF OUT		
HF IN	072485	72491
LF OUT		
LF IN	17476.1	17478.7

Static PSI 100 **Residual PSI** 25 **At** 570 **Rate Of Flow** 65 **At** 11:15 PM

TEST RESULTS

As Found

R.O.F.	QTY	HIGH	LOW	TOTAL	%
.32 LPS	100.20	0.00	99.00	99.00	98.80
36 LPS	5503.00	4875.00	642.50	5517.50	100.26
12.6 LPS	2625.00	1875.00	780.50	2655.50	101.16
2.8 LPS	1005.00	35.00	963.50	998.50	99.35

Meter Runs At Min. Flow ☑

After Service

R.O.F.	QTY	HIGH	LOW	TOTAL	%
	0.00	0.00	0.00	0.00	#Num!
	0.00	0.00	0.00	0.00	#Num!
	0.00	0.00	0.00	0.00	#Num!
	0.00	0.00	0.00	0.00	#Num!

Meter Runs At Min. Flow ☐

Comments METER PRETESTED WITHIN SPECIFICATIONS.

SERVICING: $420.00

Coulter Water Meter Service Inc.

P.O. Box 216, Strathroy, Ontario N7G 3J2 (519) 245-5860

Service Order/Report

New P.O. 301678 **Old P.O.** 303511 **Invoice No** 28793 **REGNIA** ***Service Date*** 5/4/2005

Invoiced To REG. MUNICIPALITY OF NIAGARA
2201 ST. DAVIDS ROAD
P.O. BOX 1042
THOROLD ONTARIO
L2V 4T7 CANADA

Service Provided By: S. PATE / D. JONES

Job Address MEWBURN ROAD
Acct No METER #4
Occupant AREA #1
Contact HERB MARACLE 905-295-4831
Cust Contact TONY ACCETTOLA

Meter Mfg INVENSYS
Size Type 4" SRH
Reg Unit ECR 5M3
Serial No 1502170

Location MEWBURN RD SOUTH OF QEW
Test Fittings 2" TEST PORT
Chamber Y
Job Completed ☑

Meter Running On Arrival ☑
Meter Sealed On Arrival ☑
Bypass Sealed On Arrival ☑
If NO, Was It Open ☐
Mtr Running On Departure ☑
Mtr Valves Sealed On Departure ☑
Broken Valves Tagged ☐

Meter Reading

	As Found	After Service
HF OUT		
HF IN	130104	130113
LF OUT		
LF IN		

Static PSI 100 **Residual PSI** 80 **At** 100 **Rate Of Flow** 30 **At** 2:30 PM

TEST RESULTS

As Found

R.O.F.	QTY	HIGH	LOW	TOTAL	%
4 GPM	100.00	0.00	78.00	78.00	78.00
100 GPM	1000.00	101.00	0.00	101.00	10.10
50 GPM	1000.00	1013.00	0.00	1013.00	101.30
24 GPM	1000.00	98.00	0.00	98.00	9.80

Meter Runs At Min. Flow ☐

After Service

R.O.F.	QTY	HIGH	LOW	TOTAL	%
4 GPM	100.00	0.00	101.00	101.00	101.00
100 GPM	1000.00	1005.00	0.00	1005.00	100.50
50 GPM	1000.00	1011.00	0.00	1011.00	101.10
24 GPM	1000.00	982.00	0.00	982.00	98.20

Meter Runs At Min. Flow ☑

Comments PRETESTED, REPAIRED AND CALIBRATED METER TO WITHIN AWWA SPECIFICATION C702 FOR COMPOUND METERS. SMALL SIDE COORDINATOR GEAR CLUSTER WORN. REPLACED COORDINATOR.

PARTS AND REPAIR TIME TO BE INVOICED SEPARATE.

SERVICING: $394.00

Coulter Water Meter Service Inc.

P.O. Box 216, Strathroy, Ontario N7G 3J2 (519) 245-5860

Service Order/Report

New P.O. 303511 **Old P.O.** 303511 **Invoice No** 29175 **REGNIA** ***Service Date*** 10/13/2005

Invoiced To REG. MUNICIPALITY OF NIAGARA
2201 ST. DAVIDS ROAD
P.O. BOX 1042
THOROLD ONTARIO
L2V 4T7 CANADA

Job Address MEWBURN ROAD
Acct No METER #4
Occupant AREA #1
Contact HERB MARACLE 905-295-4831
Cust Contact TONY ACCETTOLA

Service Provided By: PARSONS / OSTROWALKER

Meter Mfg INVENSYS
Size Type 4" SRH
Reg Unit ECR 5M3
Serial No 1502170

Location MEWBURN RD SOUTH OF QEW
Test Fittings 2" TEST PORT
Chamber Y
Job Completed ☑

Meter Running On Arrival ☐
Meter Sealed On Arrival ☑
Bypass Sealed On Arrival ☑
If NO, Was It Open ☐
Mtr Running On Departure ☑
r Valves Sealed On Departure ☑
Broken Valves Tagged ☐

Meter Reading

	As Found	After Service
HF OUT	146765	146770
HF IN	146767	146770
LF OUT		
LF IN		

Static PSI 110 **Residual PSI** 100 **At** 100 **Rate Of Flow** 65 **At** 3:15 PM

TEST RESULTS

As Found

R.O.F.	QTY	HIGH	LOW	TOTAL	%
.25 LPS	100.00	0.00	0.00	0.00	0.00
6.3 LPS	1000.00	0.00	0.00	0.00	0.00
3.2 LPS	1000.00	0.00	0.00	0.00	0.00
1.3 LPS	1000.00	0.00	0.00	0.00	0.00

Meter Runs At Min. Flow ☐

After Service

R.O.F.	QTY	HIGH	LOW	TOTAL	%
.25 LPS	100.30	0.00	100.70	100.70	100.40
6.3 LPS	1001.00	1000.00	0.00	1000.00	99.90
3.2 LPS	1001.00	1010.00	0.00	1010.00	100.90
1.3 LPS	1005.00	1010.00	0.00	1010.00	100.50

Meter Runs At Min. Flow ☑

Comments PRETESTED, REPAIRED AND CALIBRATED METER TO WITHIN SPECIFICATIONS.

SEE SEPARATE INVOICE FOR PARTS AND REPAIR TIME.

SERVICING: $394.00

Coulter Water Meter Service Inc.

P.O. Box 216, Strathroy, Ontario N7G 3J2 (519) 245-5860

Service Order/Report

New P.O. 302638 **Old P.O.** 30513 **Invoice No** 28792 **REGNIA** ***Service Date*** 5/20/2005

Invoiced To REG. MUNICIPALITY OF NIAGARA
2201 ST. DAVIDS ROAD
P.O. BOX 1042
THOROLD ONTARIO
L2V 4T7 CANADA

Job Address SCHMON PKWY @ ST. DAVIDS ROAD
Acct No METER #10
Occupant AREA #3
Contact PAUL COLEMAN 905-684-5353
Cust Contact TONY ACCETTOLA

Service Provided By: J. OSTROWALKER

Meter Mfg INVENSYS
Size Type 10" W-5500
Reg Unit HSPU 10M3
Serial No 1194818

Location MODULE TESTED IN SHOP
Test Fittings MODULE EXCHANGE
Chamber N
Job Completed ☑

Meter Running On Arrival ☐
Meter Sealed On Arrival ☐
Bypass Sealed On Arrival ☐
If NO, Was It Open ☐
Mtr Running On Departure ☐
tr Valves Sealed On Departure ☐
Broken Valves Tagged ☐

Meter Reading

	As Found	After Service
HF OUT		
HF IN	663420X	663424X
LF OUT		
LF IN		

Static PSI 0 **Residual PSI** 0 **At** 0 **Rate Of Flow** 0 **At**

TEST RESULTS

As Found

R.O.F.	QTY	HIGH	LOW	TOTAL	%
600 GPM	10128.00	10150.00	0.00	10150.00	100.22
200 GPM	10039.00	10010.00	0.00	10010.00	99.71
100 GPM	10981.00	11050.00	0.00	11050.00	100.63
50 GPM	5003.00	5000.00	0.00	5000.00	99.94

Meter Runs At Min. Flow ☐

After Service

R.O.F.	QTY	HIGH	LOW	TOTAL	%
	0.00	0.00	0.00	0.00	#Num!
	0.00	0.00	0.00	0.00	#Num!
	0.00	0.00	0.00	0.00	#Num!
	0.00	0.00	0.00	0.00	#Num!

Meter Runs At Min. Flow ☐

Comments METER PRETESTED WITHIN AWWA SPECIFICATION C701 FOR CLASS II TURBINE METERS.

SERVICING: $341.00

Coulter Water Meter Service Inc.

P.O. Box 216, Strathroy, Ontario N7G 3J2 (519) 245-5860

Service Order/Report

New P.O. 301678 **Old P.O.** 30513 **Invoice No** 28792 **REGNIA** ***Service Date*** 5/20/2005

Invoiced To REG. MUNICIPALITY OF NIAGARA
2201 ST. DAVIDS ROAD
P.O. BOX 1042
THOROLD ONTARIO
L2V 4T7 CANADA

Job Address TUPPER DRIVE REVERSE
Acct No METER #10
Occupant AREA #3
Contact PAUL COLEMAN
Cust Contact TONY ACCETTOLA

Service Provided By: J. OSTROWALKER

Meter Mfg INVENSYS
Size Type 10" W-5500
Reg Unit HSPU 10M3
Serial No 1111559

Location MODULE TESTED IN-SHOP
Test Fittings MODULE EXCHANGE
Chamber N
Job Completed ☑

Meter Running On Arrival ☐
Meter Sealed On Arrival ☐
Bypass Sealed On Arrival ☐
If NO, Was It Open ☐
Mtr Running On Departure ☐
tr Valves Sealed On Departure ☐
Broken Valves Tagged ☐

Meter Reading

	As Found	After Service
HF OUT		
HF IN	008335X	008338X
LF OUT		
LF IN		

Static PSI 0 **Residual PSI** 0 **At** 0 **Rate Of Flow** 0 **At**

TEST RESULTS

As Found

R.O.F.	QTY	HIGH	LOW	TOTAL	%
600 GPM	12199.00	12050.00	0.00	12050.00	98.78
200 GPM	10003.00	10000.00	0.00	10000.00	99.97
100 GPM	10402.00	10300.00	0.00	10300.00	99.02
50 GPM	5001.00	5000.00	0.00	5000.00	99.98

Meter Runs At Min. Flow ☐

After Service

R.O.F.	QTY	HIGH	LOW	TOTAL	%
	0.00	0.00	0.00	0.00	#Num!
	0.00	0.00	0.00	0.00	#Num!
	0.00	0.00	0.00	0.00	#Num!
	0.00	0.00	0.00	0.00	#Num!

Meter Runs At Min. Flow ☐

Comments METER PRETESTED WITHIN AWWA SPECIFICATION C701 FOR CLASS II TURBINE METERS.

SERVICING: $341.00

Coulter Water Meter Service Inc.

P.O. Box 216, Strathroy, Ontario N7G 3J2 (519) 245-5860

Service Order/Report

New P.O. 301678 **Old P.O.** 30513 **Invoice No** 28792 **REGNIA** ***Service Date*** 5/24/2005

Invoiced To REG. MUNICIPALITY OF NIAGARA
2201 ST. DAVIDS ROAD
P.O. BOX 1042
THOROLD ONTARIO
L2V 4T7 CANADA

Job Address FRONT ST THOROLD FLUORIDE
Acct No METER #9
Occupant AREA #3
Contact PAUL COLEMAN 905-684-5353
Cust Contact TONY ACCETTOLA

Service Provided By: J. OSTROWALKER

Meter Mfg INVENSYS
Size Type 6" W-2000
Reg Unit HSPU 1M3
Serial No 28871662

Location MODULE TESTED IN-SHOP
Test Fittings MODULE EXCHANGE
Chamber N
Job Completed ☑

Meter Running On Arrival ☐
Meter Sealed On Arrival ☐
Bypass Sealed On Arrival ☐
If NO, Was It Open ☐
Mtr Running On Departure ☐
.tr Valves Sealed On Departure ☐
Broken Valves Tagged ☐

Meter Reading

	As Found	After Service
HF OUT		
HF IN	507107	507127
LF OUT		
LF IN		

Static PSI 0 **Residual PSI** 0 **At** 0 **Rate Of Flow** 0 **At**

TEST RESULTS

As Found

R.O.F.	QTY	HIGH	LOW	TOTAL	%
600 GPM	5053.00	5135.00	0.00	5135.00	101.62
200 GPM	2133.00	2155.00	0.00	2155.00	101.03
100 GPM	1008.00	1015.00	0.00	1015.00	100.69
20 GPM	1002.00	995.00	0.00	995.00	99.30

Meter Runs At Min. Flow ☐

After Service

R.O.F.	QTY	HIGH	LOW	TOTAL	%
600 GPM	5042.00	5105.00	0.00	5105.00	101.25
200 GPM	2024.00	2035.00	0.00	2035.00	100.54
100 GPM	1007.00	1010.00	0.00	1010.00	100.30
20 GPM	1001.00	985.00	0.00	985.00	98.40

Meter Runs At Min. Flow ☐

Comments PRETESTED AND CALIBRATED METER TO WITHIN AWWA SPECIFICATION C701 FOR CLASS II TURBINE METERS.

SERVICING: $341.00

Coulter Water Meter Service Inc.

P.O. Box 216, Strathroy, Ontario N7G 3J2 (519) 245-5860

Service Order/Report

New P.O. 302638 **Old P.O.** 30513 **Invoice No** 28792 **REGNIA** ***Service Date*** 5/20/2005

Invoiced To REG. MUNICIPALITY OF NIAGARA
2201 ST. DAVIDS ROAD
P.O. BOX 1042
THOROLD ONTARIO
L2V 4T7 CANADA

Job Address GLENDALE AVENUE @ COON ROAD
Acct No METER #7
Occupant AREA #3
Contact PAUL COLEMAN 905-684-5353
Cust Contact TONY ACCETTOLA

Service Provided By: J. OSTROWALKER

Meter Mfg INVENSYS
Size Type 10" W-5500
Reg Unit HSPU 10M3
Serial No 1182334

Location MODULE TESTED IN-SHOP
Test Fittings MODULE EXCHANGE
Chamber N
Job Completed ☑

Meter Running On Arrival ☐
Meter Sealed On Arrival ☐
Bypass Sealed On Arrival ☐
If NO, Was It Open ☐
Mtr Running On Departure ☐
tr Valves Sealed On Departure ☐
Broken Valves Tagged ☐

Meter Reading

	As Found	After Service
HF OUT		
HF IN	939682X	939686X
LF OUT		
LF IN		

Static PSI 0 **Residual PSI** 0 **At** 0 **Rate Of Flow** 0 **At**

TEST RESULTS

As Found

R.O.F.	QTY	HIGH	LOW	TOTAL	%
600 GPM	10125.00	10100.00	0.00	10100.00	99.75
200 GPM	10006.00	10000.00	0.00	10000.00	99.94
100 GPM	10006.00	10050.00	0.00	10050.00	100.44
50 GPM	5820.00	5800.00	0.00	5800.00	99.66

Meter Runs At Min. Flow ☐

After Service

R.O.F.	QTY	HIGH	LOW	TOTAL	%
	0.00	0.00	0.00	0.00	#Num!
	0.00	0.00	0.00	0.00	#Num!
	0.00	0.00	0.00	0.00	#Num!
	0.00	0.00	0.00	0.00	#Num!

Meter Runs At Min. Flow ☐

Comments METER PRETESTED WITHIN AWWA SPECIFICATION C701 FOR CLASS II TURBINE METERS.

SERVICING: $341.00

Coulter Water Meter Service Inc.

P.O. Box 216, Strathroy, Ontario N7G 3J2 (519) 245-5860

Service Order/Report

New P.O. 301678 **Old P.O.** 30513 **Invoice No** 28792 **REGNIA** ***Service Date*** 5/20/2005

Invoiced To REG. MUNICIPALITY OF NIAGARA
2201 ST. DAVIDS ROAD
P.O. BOX 1042
THOROLD ONTARIO
L2V 4T7 CANADA

Job Address SUNNY'S GAS BAR
Acct No METER #8
Occupant AREA #3
Contact PAUL COLEMAN 905-684-5353
Cust Contact TONY ACCETTOLA

Service Provided By: J. OSTROWLAKER

Meter Mfg NEPTUNE
Size Type 2" T10
Reg Unit D/R IG
Serial No 4745830

Location FULL METER TESTED IN-SHOP
Test Fittings FULL METER EXCHANGE
Chamber N
Job Completed ☑

Meter Running On Arrival ☐
Meter Sealed On Arrival ☐
Bypass Sealed On Arrival ☐
If NO, Was It Open ☐
Mtr Running On Departure ☐
tr Valves Sealed On Departure ☐
Broken Valves Tagged ☐

Meter Reading

	As Found	After Service
HF OUT		
HF IN	000888	000893
LF OUT		
LF IN		

Static PSI 0 **Residual PSI** 0 **At** 0 **Rate Of Flow** 0 **At**

TEST RESULTS

As Found

R.O.F.	QTY	HIGH	LOW	TOTAL	%
100 GPM	1000.00	990.00	0.00	990.00	99.00
50 GPM	1000.00	1010.00	0.00	1010.00	101.00
25 GPM	1000.00	1000.00	0.00	1000.00	100.00
2 GPM	1000.00	975.00	0.00	975.00	97.50

Meter Runs At Min. Flow ☐

After Service

R.O.F.	QTY	HIGH	LOW	TOTAL	%
	0.00	0.00	0.00	0.00	#Num!
	0.00	0.00	0.00	0.00	#Num!
	0.00	0.00	0.00	0.00	#Num!
	0.00	0.00	0.00	0.00	#Num!

Meter Runs At Min. Flow ☐

Comments METER PRETESTED WITHIN AWWA SPECIFICATION C700 FOR DISPLACEMENT TYPE METERS.

SERVICING: $105.00

Appendix C

Draft Customer Meter Accuracy Report

Analysis background

Customer meters are the cash register of the utility and are responsible for ensuring an equitable distribution of water volume and income throughout various different customer classes within a utility and as such it is extremely important to analyze the accuracy of the meters on a regular basis and where necessary make repairs or replace groups of meters. In addition to being the cash register meters are responsible for a large amount of consumption data which can be used for other engineering functions such as hydraulic models and in this case the annual water balance which is used to disaggregate components of consumption, apparent loss and real loss in order to identify appropriate and efficient intervention programs for each loss type and volume.

Using AWWA test flows and volumetric participation to identify weighted average accuracy for water balance purposes

Data has been imported into our analysis programs and analyzed using the volume weighted percentages suggested in AWWA manual M36 table 2-7 for small meters and table 2-10 for large meters. It should be noted that further improvements to this analysis could be made by data logging samples of meter consumption profiles and applying them to the weighted average calculations as opposed to using the suggested values in M36[1] and M6[2].

AWWARF Project No. 418 Residential Water Use Patterns of 1993 states; *"Standards for domestic 5/8in. and 3/4in. water meters are based on a flow range of 0.25gpm to 20gpm. The range is assumed to be typical of the average domestic consumer. However, limited surveys of these domestic water use rates have not, until now, adequately substantiated this range."* Although the project concluded that *"overall patterns of water use across the range of hours and flow rates were remarkably stable across geographic regions"*

Based on AWWA published data the following weighted % volumes have been used for the 5/8 inch and ¾ inch meter weighted accuracy calculations. There were no 1 inch meters in the test sample so these have not been considered. In order to check if the volumes used in the M36 report are representative Veritec has undertaken a detailed analysis of 1200 data logged residential consumption profiles consisting of meters 5/8 to 1 inch in diameter, which were undertaken as part of the national AWWARF REUWS study in 1999[3].

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[1] *"Water audits and leak detection" American water works association (AWWA) manual of water supply practices M36 second edition 1999 page 20 table 2-7 (5/8 inch meters)*

[2] *"Water meters-selection installation testing and maintenance" AWWA manual of water supply practices M6 fourth edition 1999 page 60*

[3] *"Residential end uses of water" American Water Works Association Research Foundation 1999*

Percent of Time	Range (gpm)		Average (gpm)	Percent of Volume
15%	Low	0.50 to 1	0.75	2%
70%	Medium	1 to 10	5.00	63.8%
15%	High	10 to 15	12.50	34.2%

Table 1 percent of volume calculations used for small meters taken from AWWA M6 and M36 table 2-7

The results shown below in *Table* **2** clearly indicate that the M36 results are in the right order of magnitude and that the volumes actually passed at the flow rates used to generate the low flow test results are very small compared to those volumes which pass at the medium and high test flow rates. It is important to note that this data set included 100 profiles from an Eastern Ontario utility.

Flow range GPM	Volume	%
0 – 0.25	4,978.79	0.05
0.26 – 0.50	63,756.66	0.59
0.51 – 0.75	121,274.58	1.13
0.76 – 1.0	192,455.03	1.79
1.01 – 10.0	7,835,760.04	72.77
> 10	2,549,331.51	23.68
Total	10,767,556.61	100.00

Table 2 volumes consumed at different flow ranges from AWWARF REUS

The percent of volume at each flow rate changes for larger meter sizes and based on the same AWWA publication material available the following percent of volume were used for the estimations of weighted meter accuracy for large meters;

- Low 10%
- Medium 65%
- High 25%

It should be noted that larger customer meters are generally subject to a wider variation of flow profile as the nature of demand can differ – Veritec therefore reiterates the need to check a sample of flow profiles for the larger meter class.

Statistics of the sample set and the meter population

Customer meter test data ranging from 5/8 inch to 6 inch was made available from 3 cities within the Niagara Region as shown below:

- Town of Grimsby
- Niagara on the Lake
- Port Colborne

No information was provided as to whether or not the test samples were representative of random samples so for Veritec analysis we have assumed they are. Veritec recommends stratified random sampling of various meter sizes for future more detailed analysis of economic meter maintenance.

Data supplied broken into small and large meter classes was as follows:

- Small meters are classed as 1 inch and less – 11 samples
- Large meters classed as 1.5 inch and more – 26 samples

The total meter population for the Niagara Region is as follows:

- Small meters - 104,848
- Large meters - 8,380

Results

The tables below show the first look at the weighted meter accuracy by volume for small meters in *Table* **3** and for large meters *Table* **4**.

Both sets of meters have an overall meter accuracy which is within the AWWA recommended range. However upon review of the low flow accuracy it can be seen that on average it is significantly below the recommended AWWA range however using the volume weighted % contribution the lower flows have little impact on the overall average.

Test Flow Rate	Test High	Test Medium	Test Low
No. of Test Results	11	11	11
Average Accuracy	98.46%	99.84%	84.28%
Variance	0.001	0.000	0.089
Standard Dev	2.47%	1.80%	29.78%
95% Confidence	1.46%	1.06%	17.60%
Average Meter Error at each flow rate	-1.54%	-0.16%	-15.72%
% of Consumption Volume Passed at Test Flow	34.2%	63.8%	2.0%
Contribution to Overall Average Meter Error	-0.53%	-0.10%	-0.31%

Overall Meter Error	-0.94%
Overall Meter Accuracy	99.06%

Table 3 *First look meter accuracy for small meters*

Veritec would suggest that the cities continue to review meter accuracy using this component based approach paying particular attention to the medium flow range which has most impact on the overall meter accuracy.

Once this starts to deteriorate then it is time to consider meter replacement in the case of the smaller meters and meter replacement or repair in the case of the larger meters.

Test Flow Rate	Test High	Test Medium	Test Low
No. of Test Results	26	26	26
Average Accuracy	100.10%	99.50%	92.54%
Variance	0.001	0.001	0.035
Standard Dev	2.25%	2.47%	18.59%
95% Confidence	0.87%	0.95%	7.15%
Average Meter Error at each flow rate	0.10%	-0.50%	-7.46%
% of Consumption Volume Passed at Test Flow	25.0%	65.0%	10.0%
Contribution to Overall Average Meter Error	0.03%	-0.32%	-0.75%
Overall Meter Error	-1.04%		
Overall Meter Accuracy	98.96%		

Table 4 First look meter accuracy for large meters

Confidence

Confidence in the test results has been calculated first for each of the test flow rates used in this analysis and then secondly confidence in the overall meter accuracy has been calculated for use in the annual water balance.

Both small and large meter tests sets display a small variance around the mean for the medium and high flow rates and a larger variance around the mean for the low flow results.

The small meter test sample has one stuck meter at the low flow rate which makes a big difference to the small test set. ***Table 5*** below shows the difference in confidence if this meter is removed from the sample.

Test Flow Rate	Test High	Test Med	Test Low
No. of Test Results	10	10	10
Average Accuracy	98.48%	100.24%	92.71%
Variance	0.001	0.000	0.012
Standard Dev	2.60%	1.31%	10.83%
95% Confidence	1.61%	0.81%	6.71%
Average Meter Error at each flow rate	-1.52%	0.24%	-7.30%
% of Consumption Volume Passed at Test Flow Rate	34.2%	63.8%	2.0%
Contribution to Overall Average Meter Error	-0.52%	0.15%	-0.15%
Overall Meter Error	-0.51%		
Overall Meter Accuracy	99.49%		

Table 5 Confidence is increased in low flow tests if the stuck meter is removed

Confidence in that range of tests improves from 17.6% as shown in *Table* **3** to 6.7% as shown in ***Table 5***.

This example indicates the influence that one stuck meter can have on a sample test set, particularly when the test sample is small. Veritec would recommend that a larger set of data is used for future more detailed analysis and that stuck meters are removed from the test sets and the issue of stuck meters is dealt with as a separate component of the water balance. Further details can be supplied upon request.

Analysis by percentage meter error	
Total pop (N)	104,848
Sample count (n)	10
Average registration % (AWWA method)	99.49%
Average meter error %	0.51%
Sample variance off % under-reg	0.0126
N-n	104,838
n-1	9
Var(Ybar)	0.001396929
Sqrt(Var(Ybar))	0.037375507
Zstat for 95%	1.96
CI limits +/- of meter error %	7.33%

Table 6 Confidence in overall meter accuracy for small meters for annual water balance

As there has been no analysis of stuck meter frequency or response time to replace stuck meters the stuck meter has been removed from the test set and overall confidence increases from +/-17 to +/-7.3%. However this is still a large range and could be improved by a larger test sample.

Analysis by percentage meter error	
Total pop (N)	8,380
Sample count (n)	26
Average registration % (AWWA method)	98.96%
Average meter error %	1.04%
Sample variance off % under-reg	0.0357
N-n	8,354
n-1	25
Var(Ybar)	0.001423053
Sqrt(Var(Ybar))	0.037723377
Zstat for 95%	1.96
CI limits +/- of meter error %	7.39%

Table 7 Confidence in overall meter accuracy for large meters for annual water balance

There were no stuck meters in the large meter test sample and therefore the overall average accuracy and the confidence have been taken at face value.

Recommendations

This analysis serves as a first look at the impact of weighted overall meter accuracy by small and large meter category and allows volumes of apparent loss to be calculated in the annual water balance along with the confidence in

those volumes. Should the Region wish to refine this analysis in order to improve confidence in the apparent loss volumes and also to build a stronger business case for the correct meter accuracy intervention plan then Veritec would suggest that ongoing analysis include the following tasks:

- Undertake flow profiling of key meter sizes and classes to determine weighted volume components for low, medium and high flow rates
- Undertake stratified random sampling and analysis of key meter sizes
- Increase sample size to in excess of 30 for each class to be analyzed
- Treat stuck meters separately and look at utility response time to change out to calculate volume for annual water balance

Appendix D

Non-Revenue Water Trends

Illustration of Non-Revenue Water in 2005 *, Fort Erie

(* All meters appear to be read monthly)

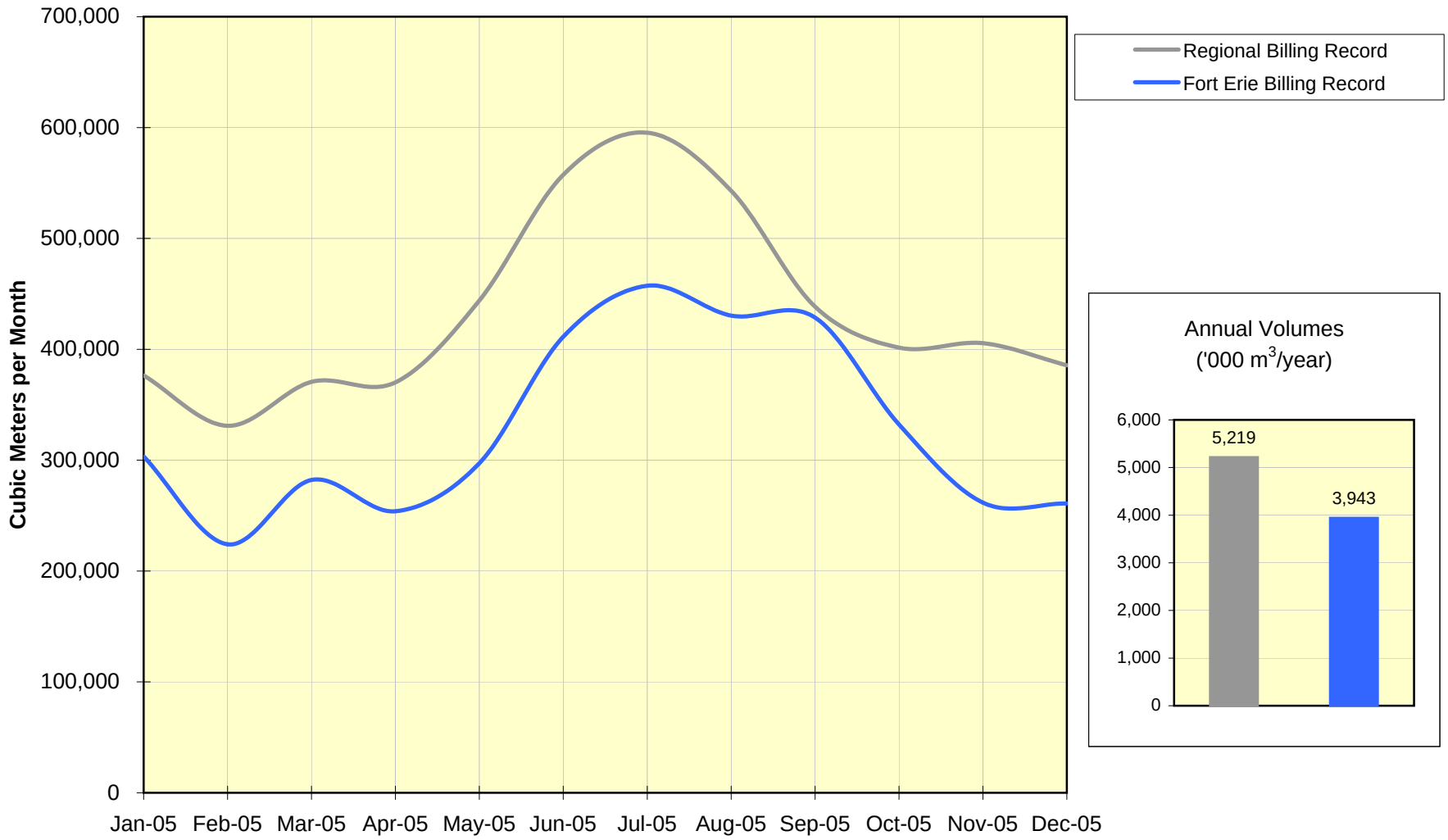


Illustration of Non-Revenue Water in 2005 * , Grimsby

(* Monthly Billing for Grimsby based on a combination of monthly reads and 3 times annually reads)

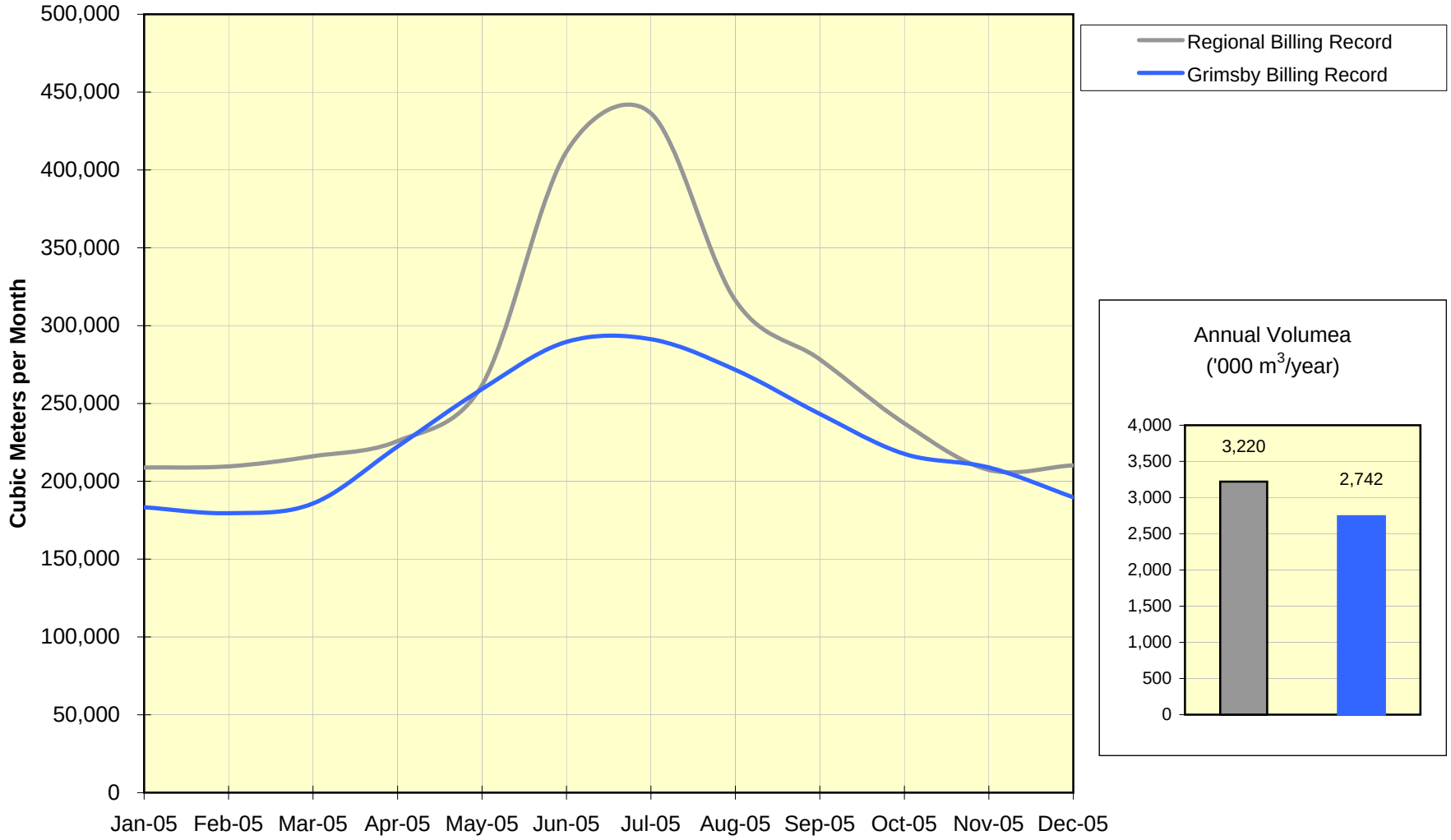
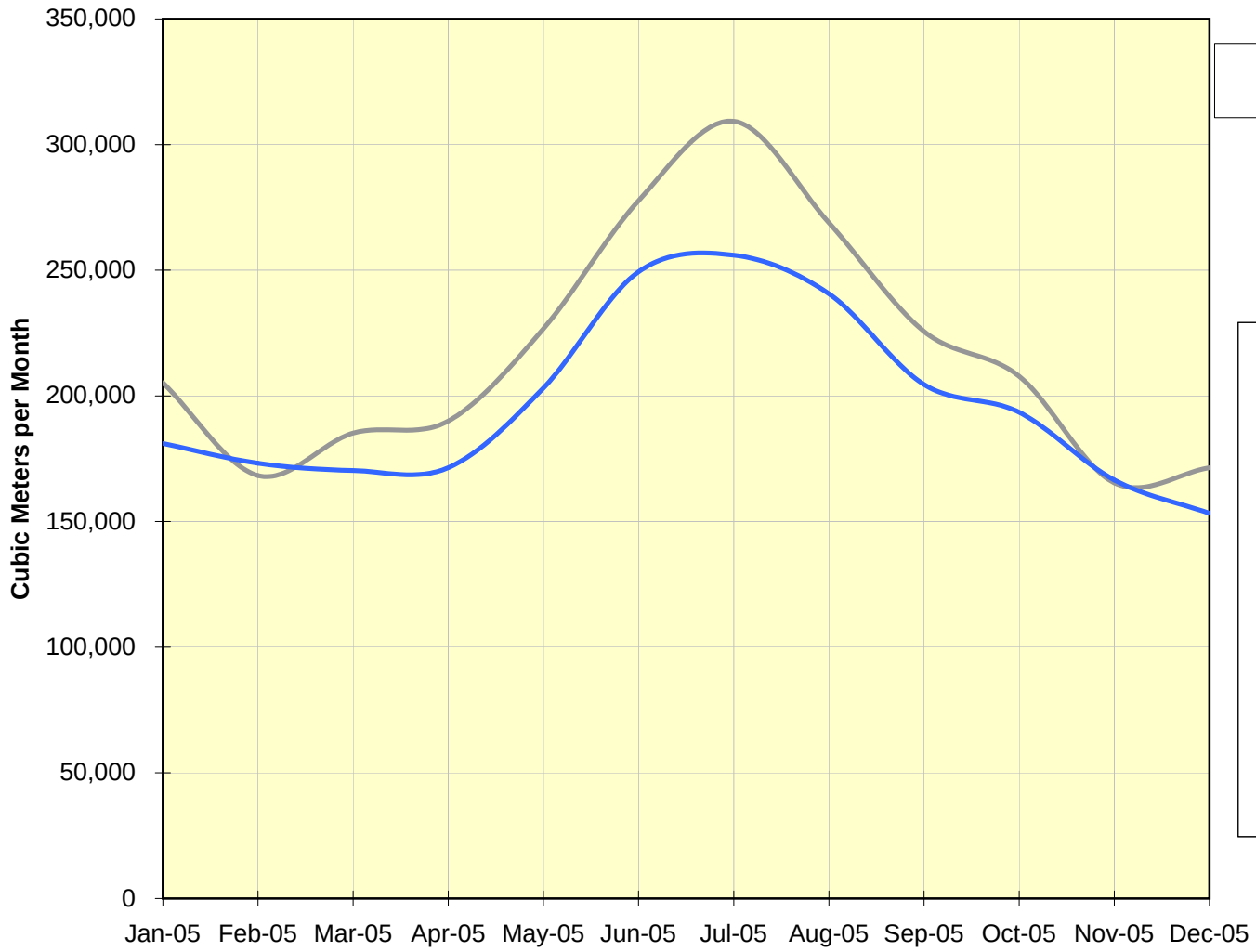


Illustration of Non-Revenue Water in 2005 *, Lincoln

(* All meters appear to be read monthly)



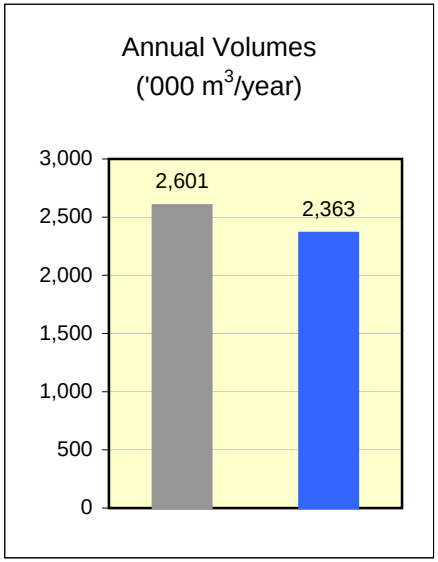


Illustration of Non-Revenue Water in 2004 *, Niagara Falls

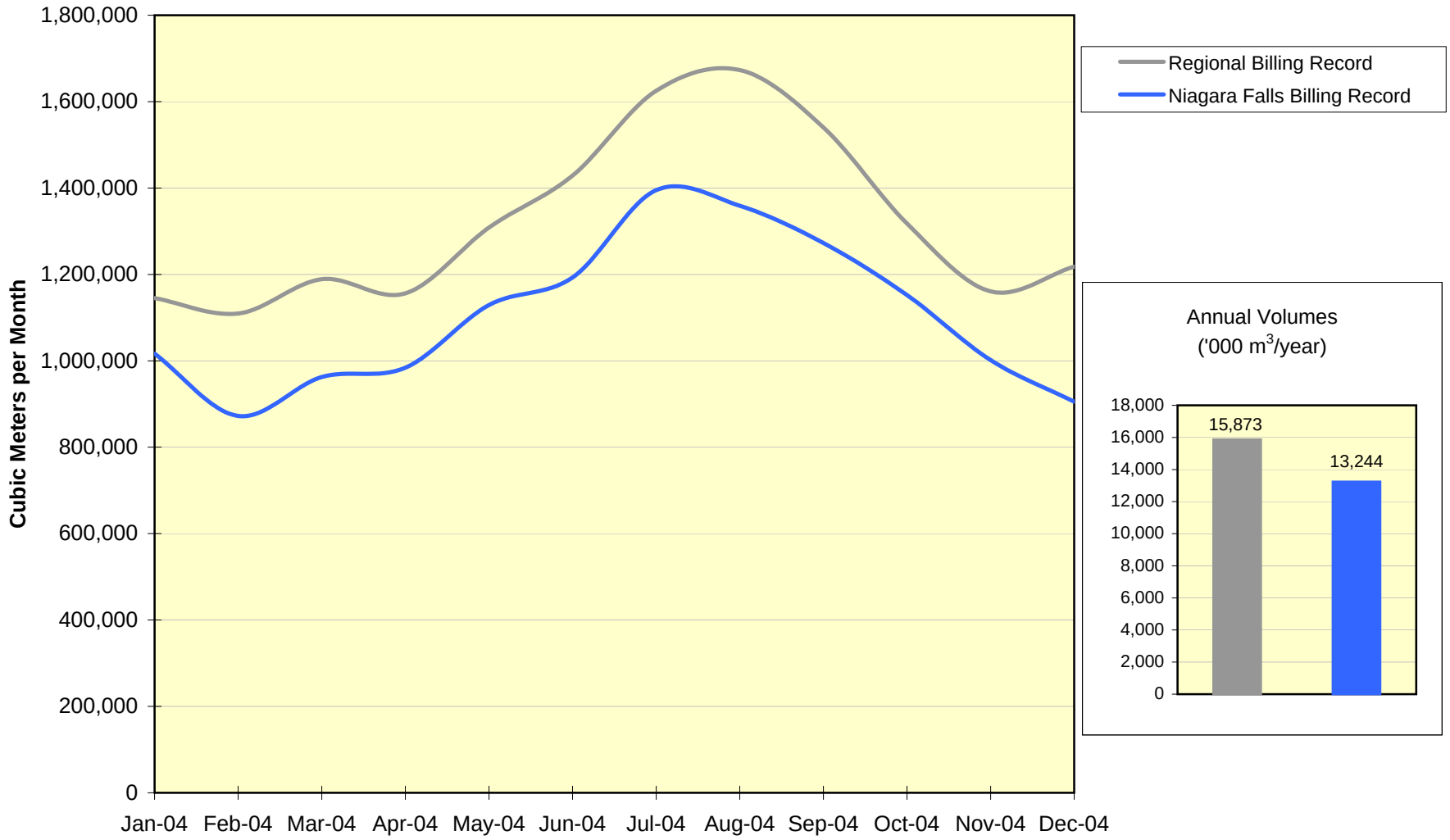


Illustration of Non-Revenue Water in 2005 *, Niagara-on-the-Lake

(No metering data beyond annual value provided)

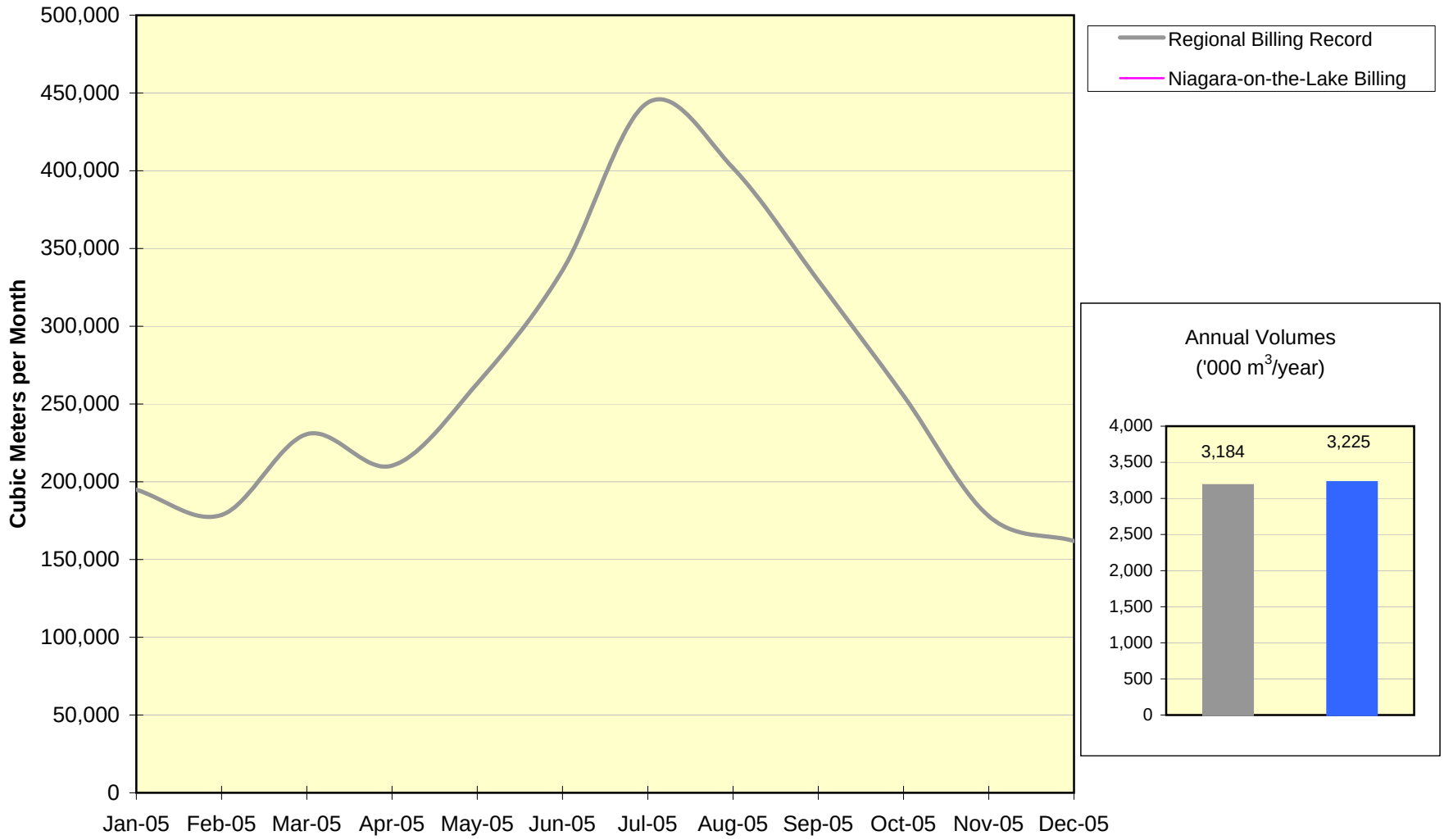


Illustration of Non-Revenue Water in 2005 *, Pelham

(* No metering data beyond annual value provided)

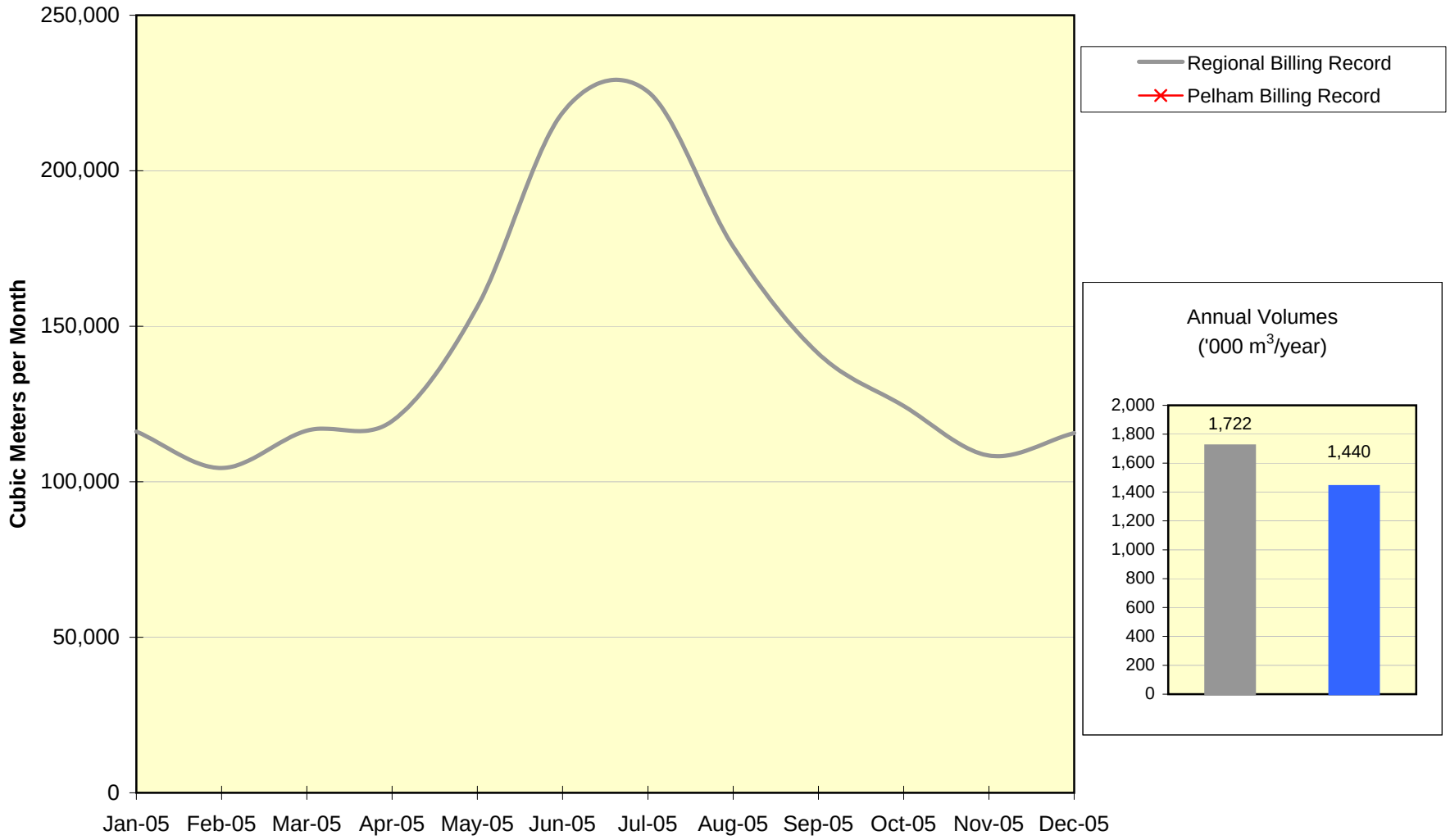
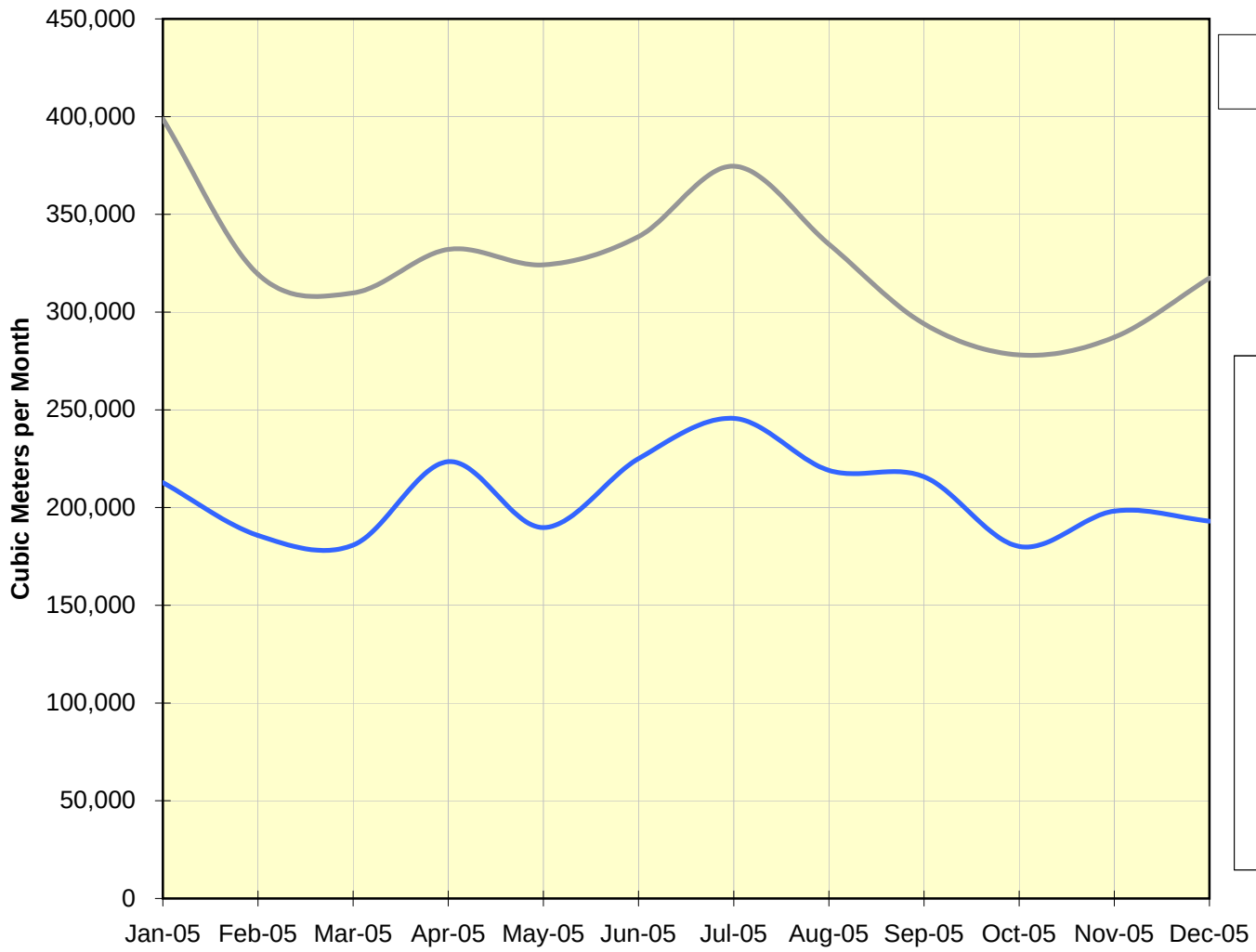


Illustration of Non-Revenue Water in 2005 *, Port Colborne

(* Monthly Billing for Port Colborne based on a combination of monthly reads and quarterly reads)



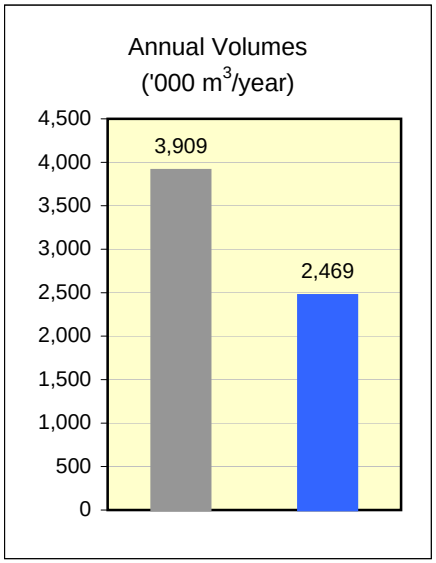


Illustration of Non-Revenue Water in 2004*, St. Catharines

(* Monthly Billing for West Lincoln based on a combination of monthly reads and quarterly reads)

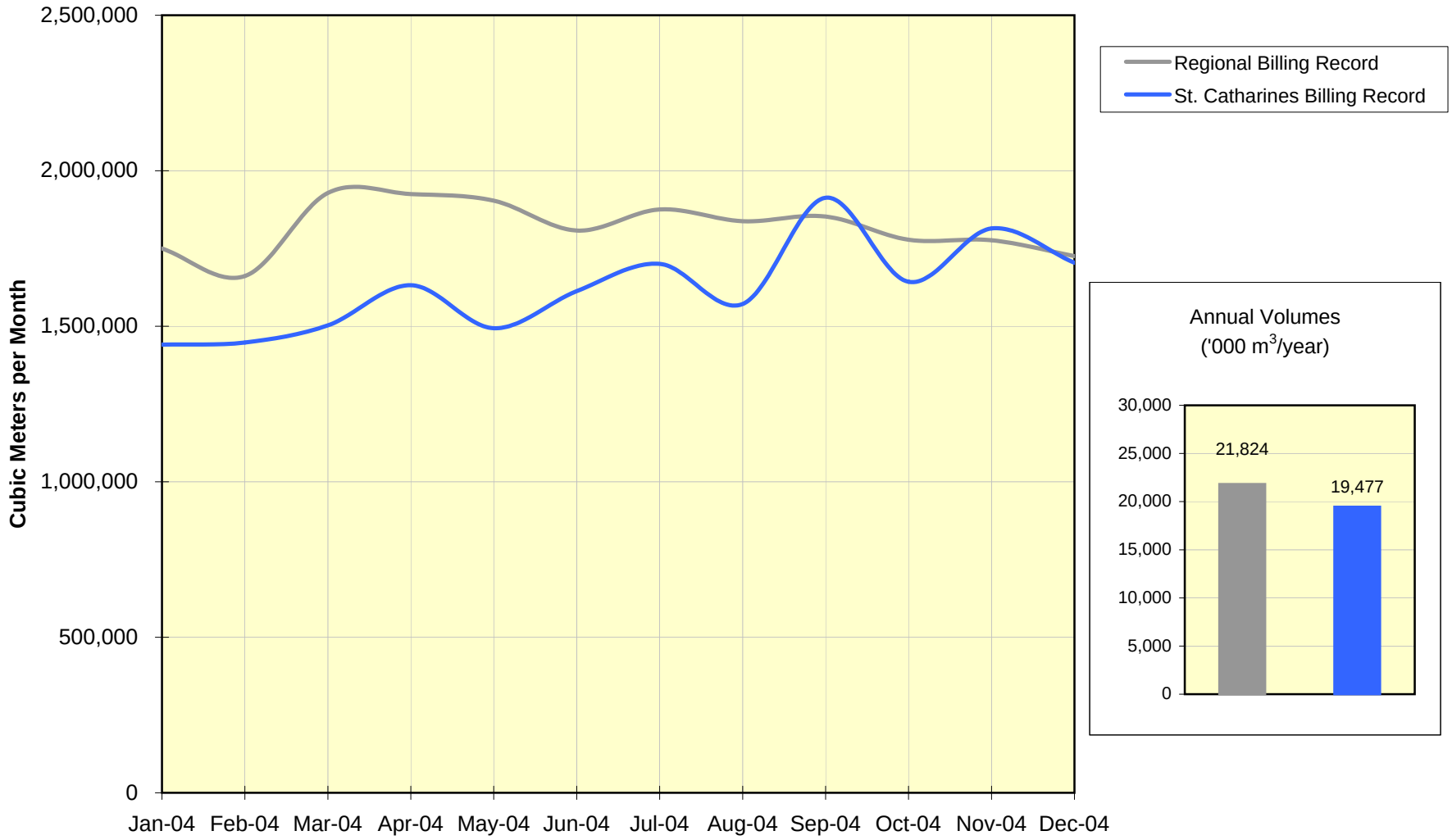


Illustration of Non-Revenue Water in 2005 *, Thorold
(No metering data beyond annual value provided)

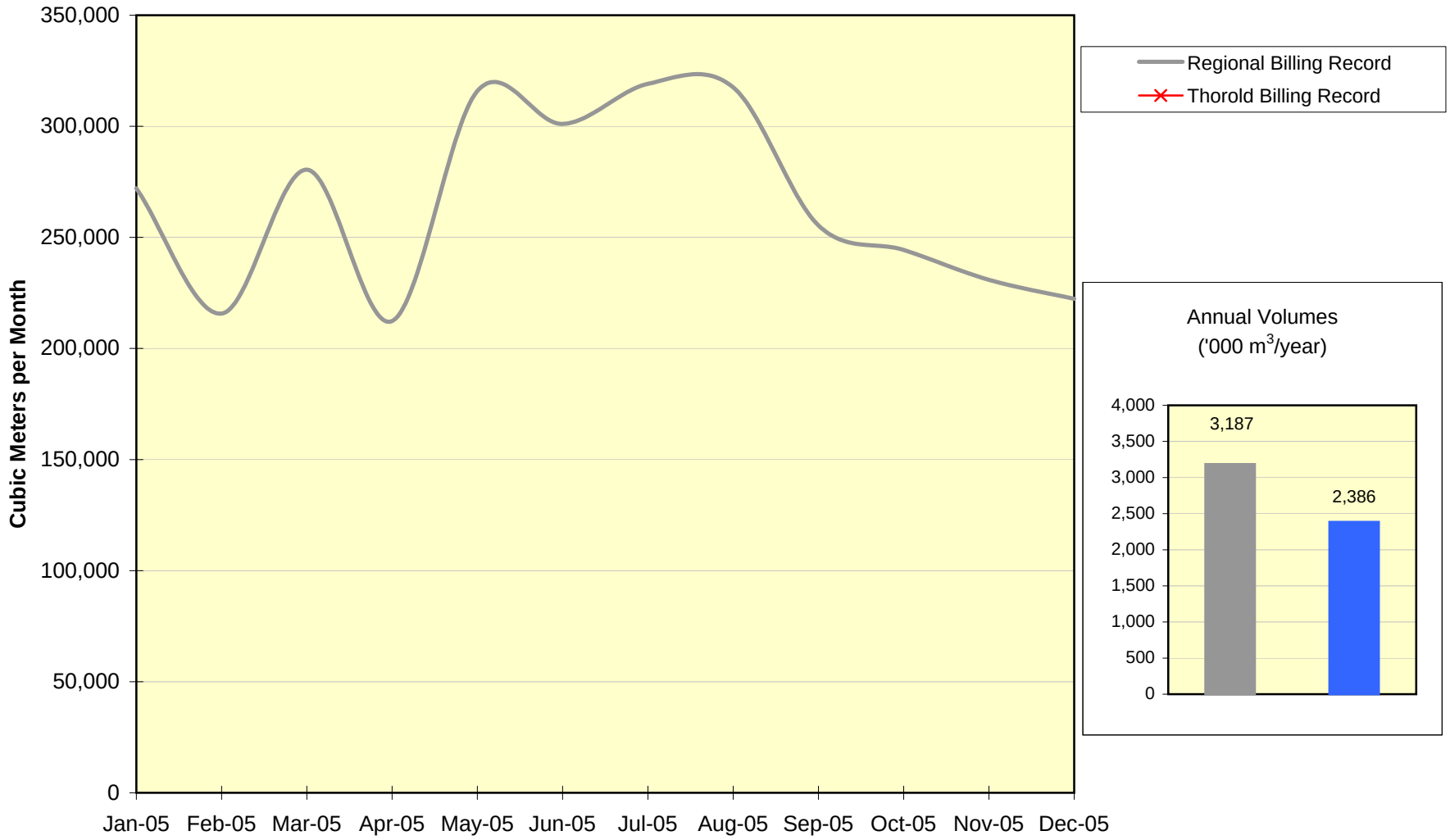


Illustration of Non-Revenue Water in 2005 *, Welland
(No data provided for 2005 / partial data for 2004)

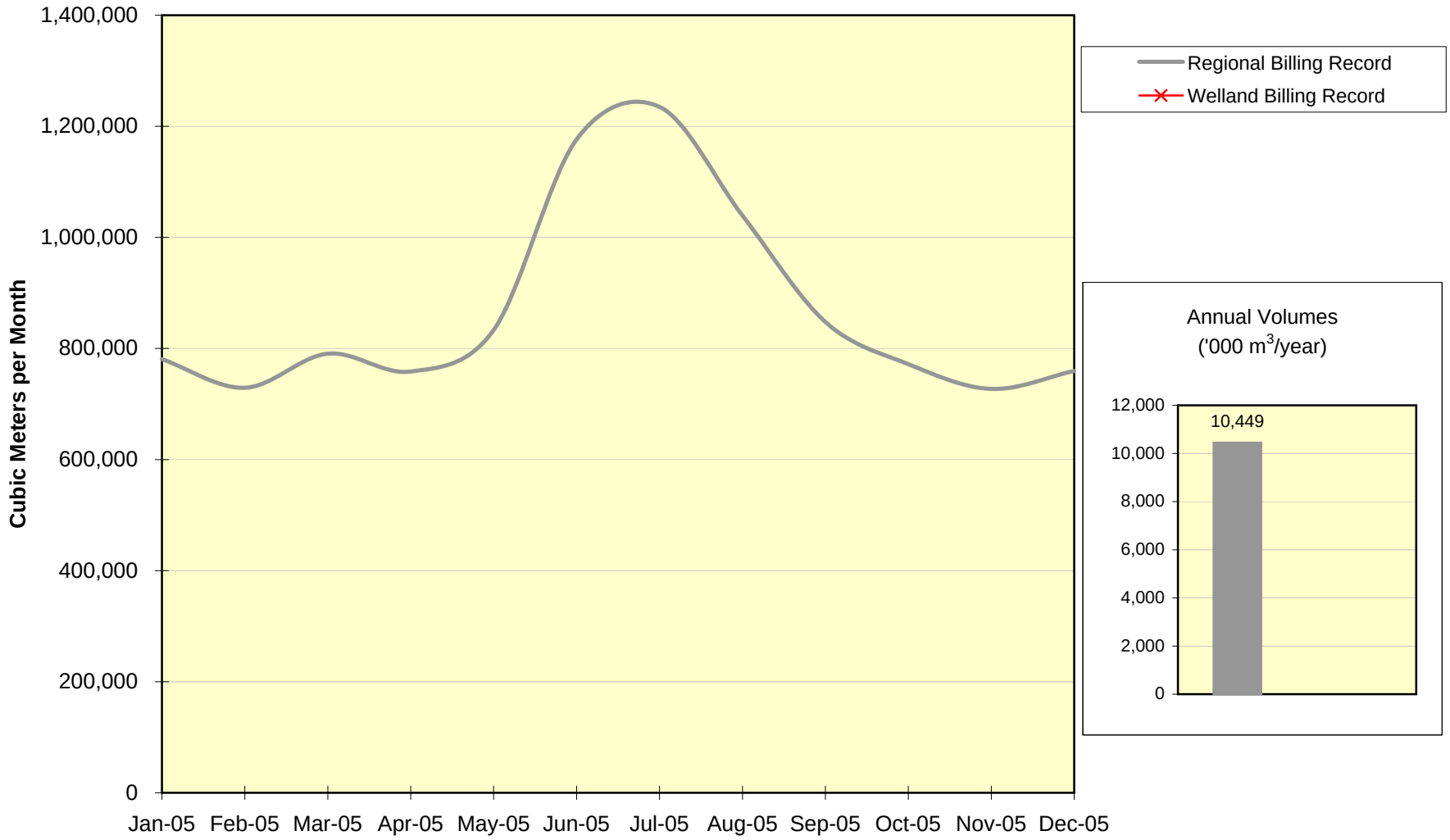
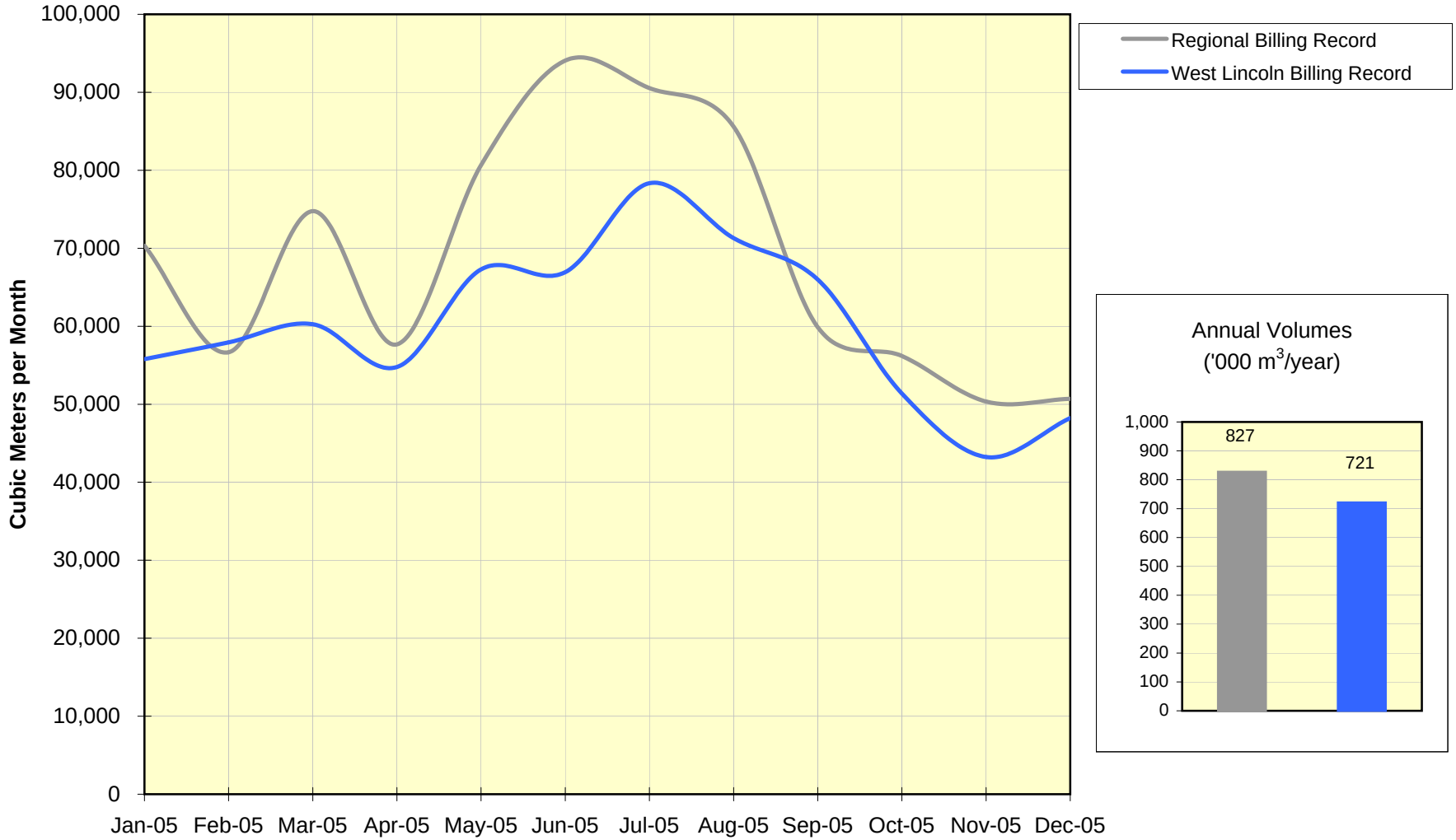


Illustration of Non-Revenue Water in 2005 *, West Lincoln

(* Monthly Billing for West Lincoln based on a combination of monthly reads and quarterly reads)



Appendix E

Component Analysis to Calculate UARL

Appendix D: Component Analysis to Calculate Unavoidable Annual Real Losses

Mains: assumed new burst frequency 13/100 km mains/year at 50m pressure

- 95% of events reported, 5% unreported
- Reported mains leaks average 864 m^3 loss each (12 m^3/hr for 3 days, or equivalent)
- So loss/km/year from reported mains leaks = 864 x 13 x 0.95/100 = **107** m^3/km/year
- Unreported mains leaks average 7200 m^3 loss each (6 m^3/hr for 50 days, or equivalent)
- So loss/km/year from unreported mains leaks = 7200x 13 x 0.05/100 = **47** m^3/km/year
- Background leakage: 20 l/km/hour for 365 days = **175** m^3/km/year

Total for mains at 50m pressure = **329** m^3/km/year

Service Connections: assumed new leak frequency 5/1000 connections/year at 50m pressure

- Data split into 'main to property line' (3/1000 conns/year at 50m pressure) and 'after property line' (2/1000 conns/year, for 15m average length of unmetered underground private pipe)
- 75% of events reported, 25% unreported
- Assumed flow rate for all new leaks is 1.6 m3/hr at 50m pressure

Service Connections, Main to property line

- Reported leaks (main to property line) average 307 m^3 loss each (1.6 m^3/hr for 8 days)
- So loss/conn/year from these reported leaks = (307 x 3 x 0.75)/1000 = **0.7** m^3/conn/year
- Unreported leaks (main to property line) average 3840 m^3 loss each (1.6 m^3/hr for 100 days)
- So loss/conn/year from these unreported leaks = (3840 x 3 x 0.25)/1000 = **2.9** m^3/conn/year
- Background leakage (main to property line) =1.25 l/conn/hr for 365 days = **11.0** m^3/conn/year

Total for service connections, main to property line = **14.6** m^3/conn/year

Service Connections, private underground pipe between property line and meter

- Reported leaks (15m private pipe) average 346 m^3 loss each (1.6 m^3/hr for 9 days)
- So loss/conn/year from these reported leaks = (346 x 2 x 0.75)/15 = **35** m^3/km/year
- Unreported leaks (15m private pipe) average 3878 m^3 loss each (1.6 m^3/hr for 101 days)
- So loss/conn/year from these unreported leaks = (3878 x 2 x 0.25)/15 = **129** m^3/km/year
- Background leakage = 0.5 l/conn/hr for 15m/connection for 365 days = **292** m^3/km/year

Total for 15m private pipe, property line to customer meters = **456** m^3/km/year

Table A1: Summary of Unavoidable Annual Real Losses Component Analysis at 50m pressure

Infrastructure Component	Background Leakage	Reported Leaks	Unreported Leaks	Total	Units
Mains	175	107	47	329	M^3/km mains/yr
Service Connections, mains to property line	11.0	0.7	2.9	14.6	M3/service connection /yr
Underground pipe, where customer meter is located after property line	292	35	129	456	M3/km of pipe/ year

In Table 4 of Lambert et al (1999), the above figures were multiplied by 1000 (to convert to litres), divided by 365 (to convert to average daily values) and divided by 50 metres (to present the figures 'per litre per day per metre of pressure', assuming a linear pressure:leakage relationship). These are shown Table A2 below.

Table A2: Summary of Unavoidable Annual Real Losses Components in AQUA Paper Format

Infrastructure Component	Background Leakage	Reported Leaks	Unreported Leaks	Total	Units
Mains	9.6	5.8	2.6	18.0	l/km mains/day/ metre of pressure
Service Connections, mains to property line	0.60	0.04	0.16	0.80	l/service conn/ day/m. pressure
Underground pipe, where customer meter is located after property line	16.0	1.9	7.1	25.0	l/km of pipe/ day/ metre of pressure

Appendix F

PIFastCalc Output
Fort Erie

'LEAKS' Suite of LEAKAGE EVALUATION and ASSESSMENT KNOW-HOW SOFTWARE

WATER BALANCE AND PERFORMANCE INDICATORS PROGRAM 'PIFastCalcs'

					Standard	Version 1a	2nd Dec 2005		Canada	
ANNUAL WATER BALANCE CALCULATION IN IWA STANDARD FORMAT, WITH 95% CONFIDENCE LIMITS					Data entry	Defaults	Calculated Values		From another Worksheet	
Note:Calculations should be based on a 12-month period for all aspects of the worksheet to function correctly					Currency =	$C	Volume units =	Ml	and	m^3
Utility	Town of Fort Erie	Bulk supply (BS) or Distribution System (DS)?	DS		01/01/2005	to	01/01/2006	=	365	days
System	Whole System	Do most customers have storage tanks?	No		Calculation by	Steve Genser		Date	4-Dec-06	

Process Reliability Band	WATER BALANCE CALCULATIONS IWA Terminology COMPONENTS OF WATER BALANCE				Volume in period Ml	95% Confidence Limit as +/- %	Variance	FINANCIAL PERFORMANCE INDICATORS FOR NON-REVENUE WATER % of System Input Volume	Calculated Value of NRW as % of System Running Costs in Period Assessed marginal cost of individual components of Non-Revenue Water $C/m3	Assessed Unit Value of individual components of Non Revenue Water $Cx1000	% of cost of running system %
	WOS: Volume from Own Sources (corrected for known systematic errors)						0	0.0%			
A	WI: Water Imported (corrected for known systematic errors)				5218.8	3.0%	6381	100.0%			
	SIV: SYSTEM INPUT VOLUME				5218.8	3.0%	6381	100.0%			
	BACE:Water Exported						0	0.0%			
	WS: WATER SUPPLIED = SIV - BACE				5218.8	3.0%	6381	100.0%			
A/B	BACM1: Billed Authorised Consumption: Metered	Residential			3404.8	1.5%	679	65.2%			
A	BACM2: Billed Authorised Consumption: Metered	Large Commercial			538.3	1.5%	17	10.3%			
	BACM3: Billed Authorised Consumption: Metered						0	0.0%			
	BACU: Billed Authorised Consumption:Unmetered						0	0.0%	$C/m3	$Cx1000	%
	NRW: NON-REVENUE WATER				1275.7	12.9%	7077	24.4%	0.4771	608.7	0.0%
A	UACM: Unbilled Authorised Consumption: Metered		0.00%	of WS			0	0.0%	0.4460	0.0	0.0%
C/D	UACU: Unbilled Authorised Consumption: Unmetered:	Estimated as	5.000%	of WS	260.9	50.0%	4431	5.0%	0.4460	116.4	0.0%
	WL WATER LOSSES				1014.7	20.7%	11508	19.4%	0.4851	492.3	0.0%
C/D	UC: Unauthorised Consumption:	Estimated as	1.000%	of WS	52.2	50.0%	177	1.0%	0.7300	38.1	0.0%
B/C	ALMUR1: Apparent Loss - meter under-registration:	Residential	0.50%	of BACM1	17.1	7.0%	0	0.3%	1.5500	26.5	0.0%
B/C	ALMUR2: Apparent Loss - meter under-registration:	Large Commercial	1.00%	of BACM2	5.4	7.0%	0	0.1%	1.5500	8.4	0.0%
	ALMUR3: Apparent Loss - meter under-registration:			of BACM3 and UACM	0.0		0	0.0%	1.5500	0.0	0.0%
D	ALDCD Customer meter data handling errors						0	0.0%	1.5500	0.0	0.0%
	AL: Sum of APPARENT LOSSES				74.7	35.0%	178	1.4%	0.9774	73.0	0.0%
	RL: REAL LOSSES				940.0	22.5%	11685	18.0%	0.4460	419.2	0.0%
A	% of period system pressurized =	100.0%	365.0	days			Cost of running system in period =				$Cx1000
	CARL: CURRENT ANNUAL REAL LOSSES (when system is pressurized)				2.58	Ml/day					

Process Reliability Band	SYSTEM INFRASTRUCTURE AND PRESSURE DATA		Valid for UARL& ILI calc?	95% CLs as +/- %
A	Lm: Mains Length, km	303.10	Yes	1.0%
A	Nh: Number of Fire Hydrants	1475		1.0%
A/B	Nb: Number of Separately Billed Properties	12098		2.0%
A/B	R: Ratio of billed Service Connections (Ns, main to property line) to Billed Props (Nb)	1.000		2.0%
	Ns: No. of billed Service Connections	12098		2.8%
B	Nu: Number of Unbilled Service Connections	101		10.0%
	Nt: Total Number of Service Conns (= Ns + Nu), mains to property line	12199	Yes	2.8%
	DC: Density of Connections/ km of mains = Ns/Lm	40.2		3.0%
B	Lp: Average pipe length, property line to meter (m)	10.2		2.4%
	Lp: Total pipe length, property line to meter (km)	123.40		3.7%
B	P: Average pressure when system pressurised (psi)	75.0	Yes	5.0%
	P: Average pressure when system pressurised (m)	53.0		5.0%

ASSESSMENT OF UNAVOIDABLE REAL LOSSES, AND VOLUME AND COST OF POTENTIALLY RECOVERABLE REAL LOSSES

Notes: If Lm and Lp are in km and pressure P is in metres

UBL in litres/hour = (20 x Lm + 1.25 x Nt + 33 x Lp) x $(P/50)^{1.5}$

UARL in litres/day = (18 x Lm + 0.8 x Nt + 25 x Lp) x P

COMPONENT OF REAL LOSSES	Ml per day	Ml in period	$Cx1000 in period	95% CLs as +/- %
UBL: UNAVOIDABLE BACKGROUND LEAKAGE	0.67	243	108.5	7.7%
UARL: UNAVOIDABLE ANNUAL REAL LOSSES	0.97	354	158.0	5.3%
CARL: CURRENT ANNUAL REAL LOSSES	2.58	940	419.2	22.5%
POTENTIALLY RECOVERABLE REAL LOSSES = CARL - UARL	1.61	586	261.3	36.3%

IWA BEST PRACTICE PERFORMANCE INDICATOR		UNITS OF PERFORMANCE INDICATOR	Best estimate	95% CLs as +/- %	Lowest Estimate	Highest Estimate
Non Revenue Water Basic (IWA Level 1, Fin36)		% of System Input by Volume	24.4	13.3%	21.2	27.7
Non Revenue Water Basic (IWA Level 1, Fin37)		% of System Input by Value		13.3%		
Apparent Losses (IWA Op23)	Best Op23 PI >	% of Water Supplied (Distribution Systems)	1.4	35.1%	0.9	1.9
		% of System Input Volume (Bulk Supply Systems)	1.4	35.1%	0.9	1.9
Real Losses Basic (IWA Level 1, Op24)	Best Op24 PI >	Litres/service connection/day, when system pressurised	211	22.7%	163	259
		m3/km of mains/day, when system pressurised	8.5	22.6%	6.6	10.4
Real Losses Detailed (IWA Level 3, Op 25)		Infrastructure Leakage Index ILI (non-dimensional)	2.65	23.1%	2.04	3.27

Comments:

Region Billing Equation = 2T1 + 2T2 -2S (Accuracy ranges between 97 and 101.6 percent)

Process Reliability Bands:

A - actual data
B - calculated based on actual data
C - calculated estimate
D - no data / default

Combinations, for example, B/C may be used to illustrate a calculated estimate based on partial data

No costs for operating the system provided.

Total length of watermain allow for 3 m per hydrant

'LEAKS' Suite of LEAKAGE EVALUATION and ASSESSMENT KNOW-HOW SOFTWARE

WATER BALANCE AND PERFORMANCE INDICATORS PROGRAM 'PIFastCalcs'

DETAILED CALCULATION OF COMPONENTS OF AUTHORISED AND UNAUTHORISED CONSUMPTION

Data entry | Calculated Values | From another Worksheet

Utility: Town of Fort Erie

System: Whole System

01/01/2005 to 01/01/2006 = 365 days

Calculation by: Steve Genser

Date: 04/12/2006

Components of Authorised Consumption	Components in Ml				Total	Additional information on sources of data and basis of estimates E = estimated R = Based on recordings
	Billed Metered	Billed Unmetered	Unbilled Metered	Unbilled Unmetered		
Residential	3404.80				3404.80	(R) From billing records
Commercial	538.32				538.32	(R) From billing records
					0.00	
Fire Fighting					260.94	
Street Cleaning					0.00	
Hydrant Usage				260.94	0.00	(E) 5% of WS
Sewer Flushing					0.00	
W/M Cleaning					0.00	
Flushing					0.00	
					0.00	
					0.00	
					0.00	
					0.00	
					0.00	
					0.00	
					0.00	
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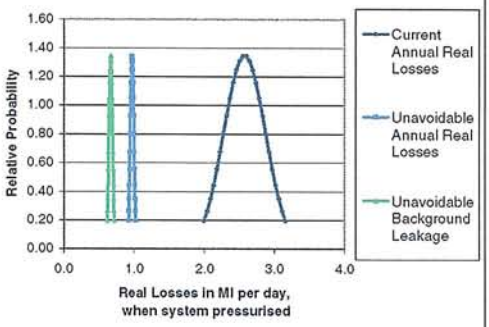
					0.00	
					0.00	
					0.00	
					0.00	
					0.00	
					0.00	
					0.00	
Authorised consumption sub-totals	3943.11	0.00	0.00	260.94	4204.05	Ml
Authorised Unbilled Unmetered Consumption =				5.000%	of Water Supplied, transfer this figure to Cell E21 of 'WaterBalance&Pis' Worksheet	

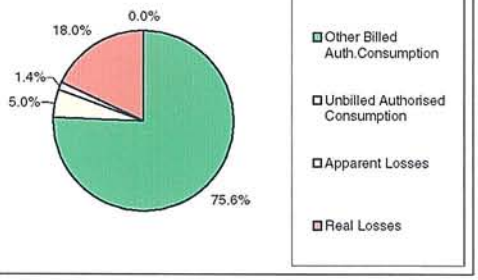
Components of Unauthorised Consumption	Ml	Method of estimation
By-pass tampering	26.09	(E) 0.5% of WS
Hydrant Usage	26.09	(E) 0.5% of WS
Unauthorised consumption sub-total	52.19	Ml
Unauthorised consumption =	1.000%	of Water Supplied, transfer this figure to Cell E23 of 'WaterBalance&Pis' Worksheet

WATER BALANCE AND PERFORMANCE INDICATORS PROGRAM 'PIFastCalcs'		Standard	Version 1a	2nd Dec 2005	Canada
Utility	Town of Fort Erie	01/01/2005 to 01/01/2006	365	days	
System	Whole System				

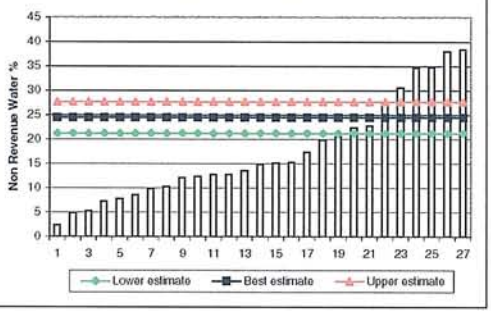
Real Losses and 95% Confidence Limits



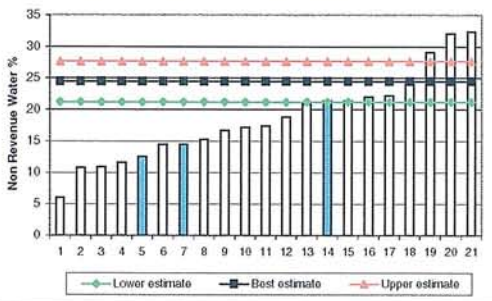
Water Balance Components as % of System Input Volume



NRW % by Volume; Comparison with International Data Set
IWA Level 1 (Basic) Financial PI for Non-Revenue Water (Fin36)
Non-Revenue Water as % of System Input Volume

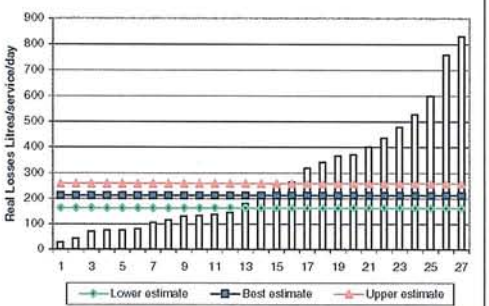


NRW % by Volume; Comparison with North American Data Set
IWA Level 1 (Basic) Financial PI for Non-Revenue Water (Fin36)
NRW as % of System Input Volume: Canadian data in blue



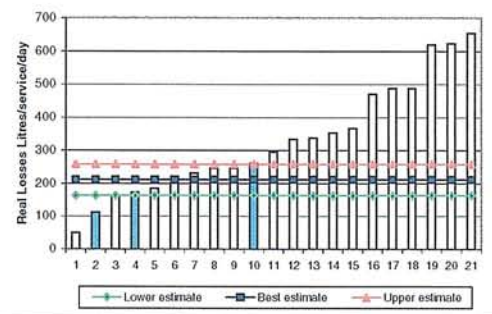
Real Losses in litres/service connection/day
(when system is pressurised)
Compared with International data set
IWA Level 1 (Basic) Operational PI for Real Losses (Op24)

Use Litres/service conn./day if Density of Connections > 20 per km of mains
All international data set have density of connections > 20 per km of mains

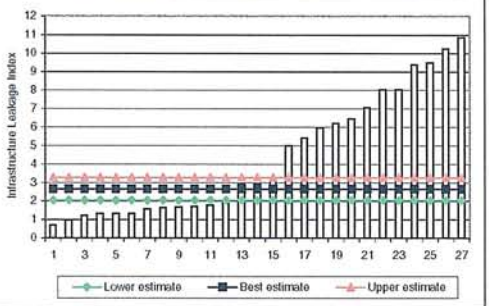


Real Losses in litres/service connection/day
when system is pressurised
Compared with North American data set, Canadian data in blue
IWA Level 1 (Basic) Operational PI for Real Losses (Op24)

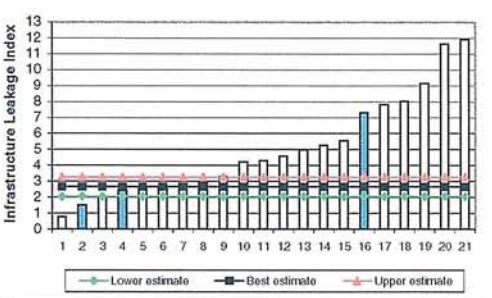
Use Litres/service conn./day if Density of Connections > 20 per km of mains
All European data set have density of connections > 20 per km of mains



Infrastructure Leakage Index ILI for Real Losses
Compared with International data set
IWA Level 3 (Detailed) Operational PI for Real Losses (Op25)



Infrastructure Leakage Index ILI for Real Losses
Compared with North American data set, Canadian data in blue
IWA Level 3 (Detailed) Operational PI for Real Losses (Op25)



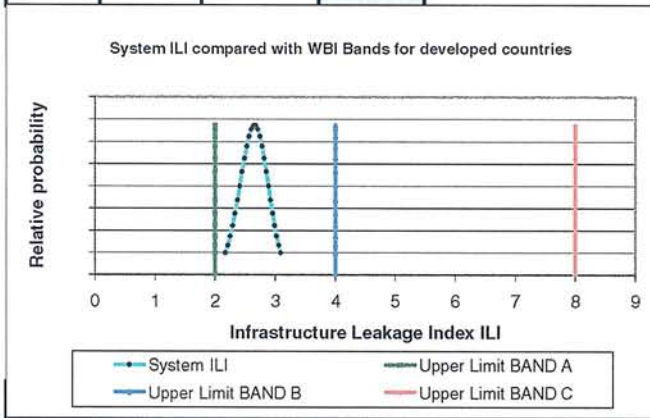
'LEAKS' Suite of LEAKAGE EVALUATION and ASSESSMENT KNOW-HOW SOFTWARE						
WATER BALANCE AND PERFORMANCE INDICATORS PROGRAM 'PIFastCalcs'						
PIFastCalcs	Standard	Version 1a	2nd Dec 2005	Canada	Master.0000	Enter Licensee's name when issuing software

THIS WORKSHEET COMPARES THE CALCULATED SYSTEM ILI WITH WORLD BANK INSTITUTE GUIDELINES

World Bank Institute (WBI) Guidelines

The World Bank Institute has recently introduced, into its NRW Training Modules, a target matrix for Real Losses management performance, based on real losses in volume/service connection/day for a range of average operating pressures, and classified into Bands A to D. The targets assume that customer meters are located at the property boundary, with an average connection density of around 40 per km mains. Bands A to D in the WBI target matrix can also be shown as an equivalent range of ILIs, which can be applied to a wider range of connection densities and customer meter locations, as shown below. Band limits in terms of ILIs, general descriptions of each Band, and appropriate recommended actions are as follows:

Developing Countries ILI range	Developed Countries ILI range	BAND	Calculated ILI for this System	General description of Real Loss Management Performance Categories for Developed and Developing Countries
Less than 4	Less than 2	A		Further loss reduction may be uneconomic unless there are shortages; careful analysis needed to identify cost-effective improvement
4 to < 8	2 to < 4	B	2.7	Potential for marked improvements; consider pressure management, better active leakage control practices, and better network maintenance
8 to < 16	4 to < 8	C		Poor leakage record; tolerable only if water is plentiful and cheap; even then, analyze level and nature of leakage and intensify leakage reduction efforts
16 or more	8 or more	D		Very inefficient use of resources; leakage reduction programs imperative and high priority



WBI Recommendations for BANDS	A	B	C	D
Investigate pressure management options	Yes	Yes	Yes	
Investigate speed and quality of repairs	Yes	Yes	Yes	
Check economic intervention frequency	Yes	Yes		
Introduce/improve active leakage control		Yes	Yes	
Identify options for improved maintenance		Yes	Yes	
Assess Economic Leakage Level	Yes	Yes		
Review break frequencies		Yes	Yes	
Review asset management policy		Yes	Yes	Yes
Deal with deficiencies in manpower, training and communications			Yes	Yes
5-year plan to achieve next lowest band			Yes	Yes
Fundamental peer review of all activities				Yes

GUIDELINE 2: The AWWA Water Loss Committee general guidelines for setting a target ILI (in lieu of having a determination of a system-specific economic level of leakage). Source of information: Table 7 in the AWWA Water Loss Committee Report in the AWWA Journal, August 2003

Note: since this table was published, simplified methods of calculating an economic frequency of intervention for active leakage control by regular survey have been been developed and are included in the ALCCalc software. This has allowed the development of the ELLCalc software to calculate short-term ELL for an active leakage control policy of regular survey. Data from England & Wales (where many Water Companies are recognised as having achieved ELL) suggests that in developed couintries, the ELL (in terms of ILI) is unlikely to exceed 3.0, even where water is plentiful and inexpensive.

Target ILI Range	This System ILI	Water Resources Considerations	Operational Considerations	Financial Considerations
1.0 - 3.0	2.7	Available resources are greatly limited and are very difficult and/or environmentally unsound to develop	Operating with system leakage above this level would require expansion of existing infrastructure and/or additional water resources to meet the demand	Water resources are costly to develop or purchase; ability to increase revenues via water rates is greatly limited because of regulation or low ratepayer affordability
3.0 - 5.0		Water resources are believed to be sufficient to meet long-term needs, but demand management interventions (leakage management,water conservation) are included in the long-term planning	Existing water supply infrastructure capability is sufficient to meet long-term demand as long as reasonable leakage management controls are in place	Water resources can be developed or purchased at reasonable expense; periodic water rate increases can be feasibly imposed and are tolerated by the customer population
5.0 - 8.0		Water resources are plentiful, reliable, and easily abstracted	Superior reliability, capacity and integrity of the water supply infrastructure make it relatively immune to shortages	Cost to purchase or obtain/treat water is low, as are rates charged to customers
Greater than 8.0		Although operational and financial considerations may allow a long-term ILI greater than 8.0, such a level of leakage is not an effective utilization of water as a resource. Setting a target level greater than 8.0 - other than as an incremental goal to a smaller long-term target - is discouraged.		

Note: Simplified methods of calculating an economic frequency of intervention for active leakage control by regular survey have been been developed and are included in the **ALCCalcs** Standard software. This has allowed the development of the **ELLCalcs** standard software to calculate short-term Economic Leakage Level for an active leakage control policy of regular survey.

Important Footnote: the Infrastructure Leakage Index (ILI) provides guidance as to how well real losses are being managed (in terms of repairs, active leakage control and infrastructure management) at the current operating pressure. However, calculation of the ILI does not imply that pressure management in a system is optimal, or economic. If system pressures are excessive, or subject to surges, then pressure management may result in additional benefits for real losses management - in particular, a reduction in new burst frequency and annual repair costs, and a reduction in flow rates of existing leaks. So even if a low ILI is being achieved, there may still be opportunities to reduce annual real losses by improved pressure management. The **PressCalcs** Standard Software provides more detailed information on this topic.

'LEAKS' Suite of LEAKAGE EVALUATION and ASSESSMENT KNOW-HOW SOFTWARE									
WATER BALANCE AND PERFORMANCE INDICATORS PROGRAM 'PIFastCalcs'				Standard	Version 1a	2nd Dec 2005		Canada	Master.0000
OPTIONAL DATA ENTRY SHEET FOR ANNUAL SYSTEM RUNNING COSTS				Data entry		Calculated Values		From another Worksheet	
Utility	Town of Fort Erie	01/01/2005	to	1/1/2006		Number of Days in Period	365	days	
System	Whole System	Calculation by		Steve Genser		Date of calculation =		7-Sep-06	

Total running costs as calculated below =	0.0	$Cx1000	Transfer this figure to Cell L30 of 'WaterBalance&Pis' Worksheet

Note: The following definitions of annual system running costs should be considered as guidelines only. They are based on the 'Financial Definitions' in pages 19 and 20 of the IWA 'Manual of Best Practice 'Performance Indicators for Water Supply Services', (Alegre H, Hirner W, Baptista J.M. and Parena R, July 2000, ISBN 1 900222 27 2, IWA Publishing; this report should be consulted for further guidance as necessary.

Operational Costs		Sub-total $Cx1000	Group total $Cx1000	INCLUDES
Imported water	Raw water		0.0	BULK SUPPLY IMPORTS: total payments for imported raw water
	Treated water			BULK SUPPLY IMPORTS: total payments for imported treated water
Energy	Raw water		0.0	POWER: all energy costs for water supply electricity and fuel for motive machinery
	Treatment			
	Transmission			
	Distribution			
External services: Outsourcing	Outsourcing		0.0	Outsourcing of technical or administrative services, such as consultants, contractors undertaking operational tasks, meter reading and accounting fees
	Software licences and IT support			Licence fees on computer software and technical support by software companies
	Associated Companies			Costs of associated companies that are not included in other items
	Third party services			Operating costs of providing water services to third parties (other than the regulated water supply function) that are not included in other items
Leasing and Rentals	Premises		0.0	Payments for leasing or renting premises
	Vehicles			Payments for leasing or renting vehicles
	Mobile Plant			Payments for leasing or renting mobile plant
	Fixed Plant			Payments for leasing or renting fixed plant
	Equipment			Payments for leasing or renting equipment
Purchases	Water treatment chemicals		0.0	All water treatment chemicals for water supply that are not in HIRED AND CONTRACTED SERVICES and which are required for operation of sources, treatment plants,transmission and distribution systems
	Other than chemicals and energy			All materials and consumables other than energy and water treatment chemicals for water supply, that are not in HIRED AND CONTRACTED SERVICES and which are required for operation of sources, treatment plants,transmission and distribution systems
Taxes, levies and fees	All kinds		0.0	Any operating licences paid to a Government or municipal authority, abstraction charges, local authority rates
Exceptional earnings and losses	All kinds		0.0	Any exceptional income or expenditure from donations, investment subsidies, compensations or adjustments related to sales/writing off of fixed assets
Other Operating Expenditures	Other direct costs		0.0	Any other operating costs (but excluding interest and taxation, on an aggregated basis)
	General and support expenditures			The aggregate direct cost of GENERAL AND SUPPORT ACTIVITIES (Manpower costs excluded)
	Customer services			Costs directly associated with customer services that are not included in previous items, related to customer accounting, reading of meters, debt revovery, costs of disconnections, customers'enquiries and complaints handling.
	Scientific services			Costs directly associated with scientific and laboratory services and with the monitoring of quality that are not included in previous items
	Other business activities			Costs directly associated with other business activities that are not included in previous items, except for cost depreciation
	Doubtful debts			Charge/credit to the profit and loss account for bad and doubtful debts
Sum of Operational Costs	All the above operational costs		0.0	
Internal manpower costs	Employment costs		0.0	The sum of the total manpower costs of permanent and temorary personnel, including employment-related social costs and benefits paid by the employer
Capitalised cost of self-constructed assets	Negative allocation		0.0	The summation of the amounts in each of the above cost categories that have been incurred in the construction of new or rehabilitated assets
Total Running Costs	Sum of Operational costs and Internal Manpower Costs, minus capitalised cost of self-constructed assets		0.0	

Comments:

Appendix G

PIFastCalc Output Grimsby

'LEAKS' Suite of LEAKAGE EVALUATION and ASSESSMENT KNOW-HOW SOFTWARE

WATER BALANCE AND PERFORMANCE INDICATORS PROGRAM 'PIFastCalcs'

				Standard	Version 1a	2nd Dec 2005		Canada	
ANNUAL WATER BALANCE CALCULATION IN IWA STANDARD FORMAT, WITH 95% CONFIDENCE LIMITS				Data entry	Defaults	Calculated Values		From another Worksheet	
Note:Calculations should be based on a 12-month period for all aspects of the worksheet to function correctly				Currency =	$C	Volume units =	Ml	and	m^3
Utility	Town of Grimsby	Bulk supply (BS) or Distribution System (DS)?	DS	01/01/2005	to	01/01/2006	=	365	days
System	Whole System	Do most customers have storage tanks?	No	Calculation by	Steve Genser		Date	4-Dec-06	

Process Reliability Band	WATER BALANCE CALCULATIONS				Volume in period	95% Confidence Limit as +/- %	Variance	FINANCIAL PERFORMANCE INDICATORS FOR NON-REVENUE WATER			
	IWA Terminology							% of System Input Volume	Calculated Value of NRW as % of System Running Costs in Period		
	COMPONENTS OF WATER BALANCE				Ml				Assessed marginal cost of individual components of Non-Revenue Water	Assessed Unit Value of individual components of Non Revenue Water	% of cost of running system
	WOS: Volume from Own Sources (corrected for known systematic errors)						0	0.0%			
A	WI: Water Imported (corrected for known systematic errors)				3219.6	3.0%	2429	100.0%			
	SIV: SYSTEM INPUT VOLUME				3219.6	3.0%	2429	100.0%			
	BACE:Water Exported						0	0.0%			
	WS: WATER SUPPLIED = SIV - BACE				3219.6	3.0%	2429	100.0%			
A/B	BACM1: Billed Authorised Consumption: Metered	Residential			2092.2	1.5%	256	65.0%			
B	BACM2: Billed Authorised Consumption: Metered	ICI			735.1	1.5%	32	22.9%			
	BACM3: Billed Authorised Consumption: Metered						0	0.0%			
	BACU: Billed Authorised Consumption:Unmetered						0	0.0%	$C/m3	$Cx1000	%
	NRW: NON-REVENUE WATER				392.3	26.0%	2717	12.2%	0.6811	267.2	8.4%
A	UACM: Unbilled Authorised Consumption: Metered		0.07%	of WS	2.1		0	0.1%	0.4460	0.9	0.0%
C	UACU: Unbilled Authorised Consumption: Unmetered:	Estimated as	1.170%	of WS	37.7	50.0%	92	1.2%	0.4460	16.8	0.5%
	WL WATER LOSSES				352.5	29.5%	2809	10.9%	0.7077	249.5	7.9%
	UC: Unauthorised Consumption:	Estimated as	1.500%	of WS	48.3	50.0%	152	1.5%	1.6600	80.2	2.5%
B	ALMUR1: Apparent Loss - meter under-registration:	Residential	0.50%	of BACM1	10.5	7.0%	0	0.3%	2.3200	24.4	0.8%
B	ALMUR2: Apparent Loss - meter under-registration:	ICI	1.00%	of BACM2	7.4	7.0%	0	0.2%	2.3200	17.2	0.5%
	ALMUR3: Apparent Loss - meter under-registration:			of BACM3 and UACM	0.0		0	0.0%		0.0	0.0%
D	ALDCD Customer meter data handling errors						0	0.0%		0.0	0.0%
	AL: Sum of APPARENT LOSSES				66.2	36.5%	152	2.1%	1.8388	121.8	3.8%
	RL: REAL LOSSES				286.3	37.3%	2961	8.9%	0.4460	127.7	4.0%
A	% of period system pressurized =	100.0%	365.0	days			Cost of running system in period =			3166.7	$Cx1000
	CARL: CURRENT ANNUAL REAL LOSSES (when system is pressurized)				0.78	Ml/day					

Process Reliability Band	SYSTEM INFRASTRUCTURE AND PRESSURE DATA		Valid for UARL& ILI calc?	95% CLs as +/- %
A	Lm: Mains Length, km	128.30	Yes	1.0%
A	Nh: Number of Fire Hydrants	841		1.0%
B	Nb: Number of Separately Billed Properties	8449		2.0%
B	R: Ratio of billed Service Connections (Ns, main to property line) to Billed Props (Nb)	1.000		2.0%
	Ns: No. of billed Service Connections	8449		2.8%
C	Nu: Number of Unbilled Service Connections			
	Nt: Total Number of Service Conns (= Ns + Nu), mains to property line	8449	Yes	2.8%
	DC: Density of Connections/ km of mains = Ns/Lm	65.9		3.0%
B	Lp: Average pipe length, property line to meter (m)	10.2		2.4%
	Lp: Total pipe length, property line to meter (km)	86.18		3.7%
B	P: Average pressure when system pressurised (psi)	75.0	Yes	5.0%
	P: Average pressure when system pressurised (m)	53.0		5.0%

ASSESSMENT OF UNAVOIDABLE REAL LOSSES, AND VOLUME AND COST OF POTENTIALLY RECOVERABLE REAL LOSSES

Notes: If Lm and Lp are in km and pressure P is in metres

UBL in litres/hour = (20 x Lm + 1.25 x Nt + 33 x Lp) x $(P/50)^{1.5}$

UARL in litres/day = (18 x Lm + 0.8 x Nt + 25 x Lp) x P

COMPONENT OF REAL LOSSES	Ml per day	Ml in period	$Cx1000 in period	95% CLs as +/- %
UBL: UNAVOIDABLE BACKGROUND LEAKAGE	0.42	153	68.3	7.7%
UARL: UNAVOIDABLE ANNUAL REAL LOSSES	0.60	217	96.9	5.3%
CARL: CURRENT ANNUAL REAL LOSSES	0.78	286	127.7	37.3%
POTENTIALLY RECOVERABLE REAL LOSSES = CARL - UARL	0.19	69	30.8	155.3%

IWA BEST PRACTICE PERFORMANCE INDICATOR		UNITS OF PERFORMANCE INDICATOR	Best estimate	95% CLs as +/- %	Lowest Estimate	Highest Estimate
Non Revenue Water Basic (IWA Level 1, Fin36)		% of System Input by Volume	12.2	26.2%	9.0	15.4
Non Revenue Water Basic (IWA Level 1, Fin37)		% of System Input by Value	8.4	26.2%	6.2	10.6
Apparent Losses (IWA Op23)	Best Op23 PI >	% of Water Supplied (Distribution Systems)	2.1	36.6%	1.3	2.8
		% of System Input Volume (Bulk Supply Systems)	2.1	36.6%	1.3	2.8
Real Losses Basic (IWA Level 1, Op24)	Best Op24 PI >	Litres/service connection/day, when system pressurised	93	37.4%	59	128
		m3/km of mains/day, when system pressurised	6.1	37.3%	3.8	8.4
Real Losses Detailed (IWA Level 3, Op 25)		Infrastructure Leakage Index ILI (non-dimensional)	1.32	37.6%	0.82	1.81

Comments:

Region supplied calculated based on three meters, i.e., 6T1 - 6D1 - 6D2 with meter calibration reports dated as follows:
6T1 - August 15 and Nov. 2, 2005
6D1 - no calibation provided
6D2 - May 24, 2005

Process Reliability Bands:

A - actual data
B - calculated based on actual data
C - calculated estimate
D - no data / default

Water Rates: $70.42 for the first 30.3 cubic meters; $3.28 per 4.55 cubic meters in excess of 30.3 cubic meters
Purchase water from the region at $.0446 per cubic meter
In 2004 ILI Survey quoted as $1.54 per cubic meter applied to apparent losses therefore increase suggests $1.67 per cubic meter.

Total length of watermain allow for 3 m per hydrant (i.e., 841 hydrants x 3m = 2.523 km)

'LEAKS' Suite of LEAKAGE EVALUATION and ASSESSMENT KNOW-HOW SOFTWARE

WATER BALANCE AND PERFORMANCE INDICATORS PROGRAM 'PIFastCalcs'

DETAILED CALCULATION OF COMPONENTS OF AUTHORISED AND UNAUTHORISED CONSUMPTION

Data entry | Calculated Values | From another Worksheet

Utility: Town of Grimsby

System: Whole System

01/01/2005 to 01/01/2006 = 365 days

Calculation by: Steve Genser

Date: 04/12/2006

Components of Authorised Consumption	Components in Ml				Total	Additional information on sources of data and basis of estimates E = estimated R = Based on recordings
	Billed Metered	Billed Unmetered	Unbilled Metered	Unbilled Unmetered		
					0.00	80% have remotes, 65% roll dial remote, 14 touch pad remote, 1% radio
					0.00	20% old imp gall with no remote
					0.00	7.44% of billing by cards
					0.00	4.2% of bills estimated
Residential	2092.22				2092.22	R = Based on recordings
Commercial	320.53				320.53	R = Based on recordings
Industrial	109.80				109.80	R = Based on recordings
Institutional	110.31				110.31	R = Based on recordings
Irrigation	6.36				6.36	R = Based on recordings
Region	34.13				34.13	R = Based on recordings
Town	22.78				22.78	R = Based on recordings
Hamilton-Wentworth	45.91				45.91	R = Based on recordings
via invoice	85.31				85.31	R = Based on recordings
					0.00	
Hydrant Usage (mobile meter)			2.12		2.12	R = Based on recordings, less Avertex
New Construction/Rehab				2.45	2.45	E = estimated; 6 jobs x 3/job x 500 gpm x 1 hr.
Fire/Training				13.64	13.64	E = estimated; 1 fire/yr. 2,000 Imp. Gal; Training 68 hrs/yr @ 1,000 gpm = 3,000,000 Imp. Gal
Hydrant Flushing				18.18	18.18	E = estimated; dead-end 20 locations x 6/yr. x 3,000 Imp Gal + 3,000,000 Imp. Gal
Hydroguard				2.95	2.95	E = estimated; 20 gpm x 6-4 hrs./day (50% of this in winter)
Recreation				0.47	0.47	E = estimated; 3 parks approx. 6 gpm x 2 hrs/day x 5 months
					0.00	
					0.00	
					0.00	
					0.00	
					0.00	
					0.00	
					0.00	
					0.00	
					0.00	
					0.00	
					0.00	
Authorised consumption sub-totals	2827.33	0.00	2.12	37.70	2867.14	Ml

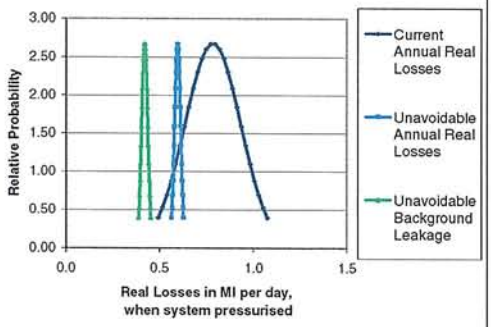
Authorised Unbilled Unmetered Consumption = 1.171% of Water Supplied, transfer this figure to Cell E21 of 'WaterBalance&Pis' Worksheet

Components of Unauthorised Consumption	Ml	Method of estimation
Hydrant Usage	16.10	Estimated as 0.5% of overall usage
By-passes	16.10	Estimated as 0.5% of overall usage
Unauthorised consumption sub-total	32.20	Ml

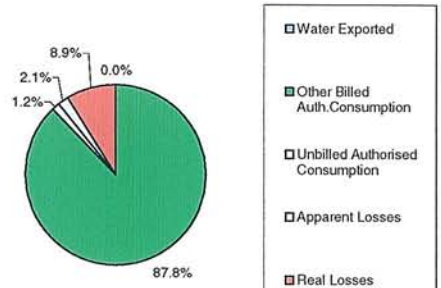
Unauthorised consumption = 1.000% of Water Supplied, transfer this figure to Cell E23 of 'WaterBalance&Pis' Worksheet

WATER BALANCE AND PERFORMANCE INDICATORS PROGRAM 'PIFastCalcs'		Standard	Version 1a	2nd Dec 2005	Canada
Utility	Town of Grimsby	01/01/2005 to 01/01/2006	365	days	
System	Whole System				

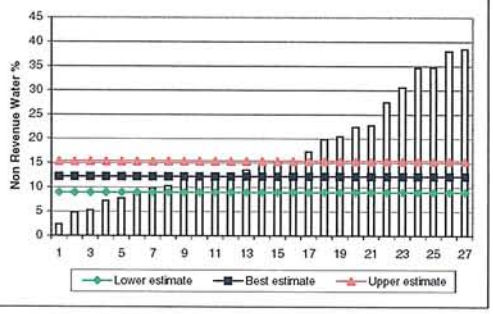
Real Losses and 95% Confidence Limits



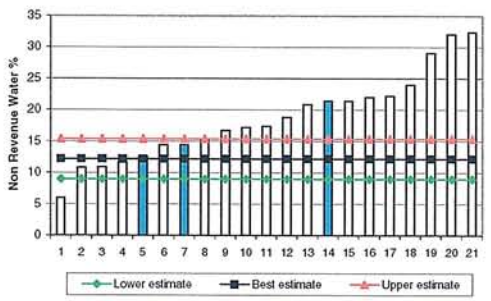
Water Balance Components as % of System Input Volume



NRW % by Volume; Comparison with International Data Set
IWA Level 1 (Basic) Financial PI for Non-Revenue Water (Fin36)
Non-Revenue Water as % of System Input Volume

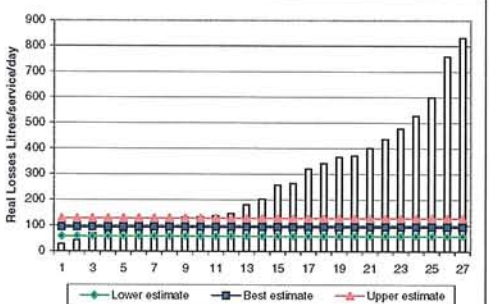


NRW % by Volume; Comparison with North American Data Set
IWA Level 1 (Basic) Financial PI for Non-Revenue Water (Fin36)
NRW as % of System Input Volume: Canadian data in blue



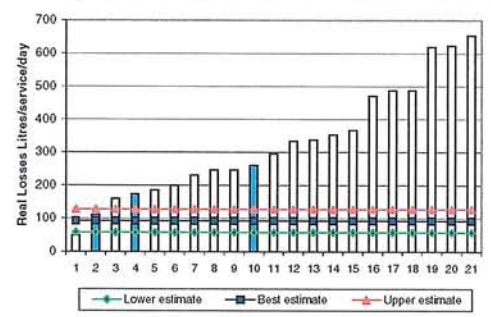
Real Losses in litres/service connection/day
(when system is pressurised)
Compared with International data set
IWA Level 1 (Basic) Operational PI for Real Losses (Op24)

Use Litres/service conn./day if Density of Connections > 20 per km of mains
All international data set have density of connections > 20 per km of mains

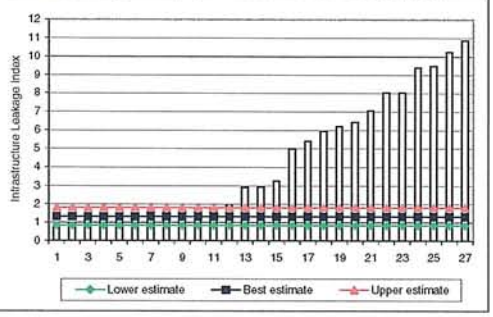


Real Losses in litres/service connection/day
when system is pressurised
Compared with North American data set, Canadian data in blue
IWA Level 1 (Basic) Operational PI for Real Losses (Op24)

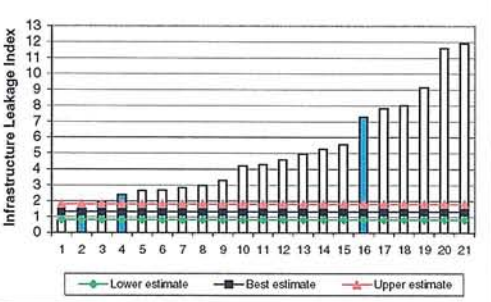
Use Litres/service conn./day if Density of Connections > 20 per km of mains
All European data set have density of connections > 20 per km of mains



Infrastructure Leakage Index ILI for Real Losses
Compared with International data set
IWA Level 3 (Detailed) Operational PI for Real Losses (Op25)



Infrastructure Leakage Index ILI for Real Losses
Compared with North American data set, Canadian data in blue
IWA Level 3 (Detailed) Operational PI for Real Losses (Op25)



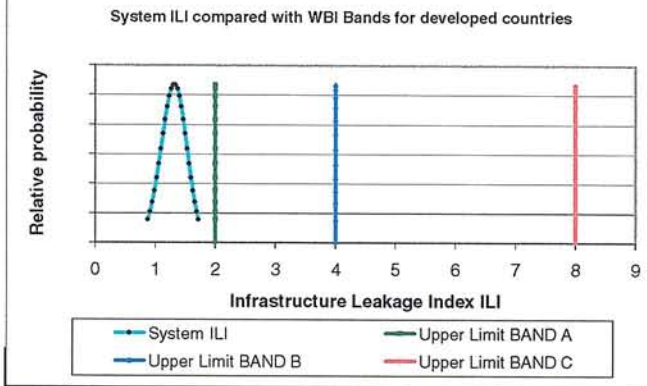
'LEAKS' Suite of LEAKAGE EVALUATION and ASSESSMENT KNOW-HOW SOFTWARE						
WATER BALANCE AND PERFORMANCE INDICATORS PROGRAM 'PIFastCalcs'						
PIFastCalcs	Standard	Version 1a	2nd Dec 2005	Canada	Master.0000	Town of Grimsby

THIS WORKSHEET COMPARES THE CALCULATED SYSTEM ILI WITH WORLD BANK INSTITUTE GUIDELINES

World Bank Institute (WBI) Guidelines

The World Bank Institute has recently introduced, into its NRW Training Modules, a target matrix for Real Losses management performance, based on real losses in volume/service connection/day for a range of average operating pressures, and classified into Bands A to D. The targets assume that customer meters are located at the property boundary, with an average connection density of around 40 per km mains. Bands A to D in the WBI target matrix can also be shown as an equivalent range of ILIs, which can be applied to a wider range of connection densities and customer meter locations, as shown below. Band limits in terms of ILIs, general descriptions of each Band, and appropriate recommended actions are as follows:

Developing Countries ILI range	Developed Countries ILI range	BAND	Calculated ILI for this System	General description of Real Loss Management Performance Categories for Developed and Developing Countries
Less than 4	Less than 2	A	1.3	Further loss reduction may be uneconomic unless there are shortages; careful analysis needed to identify cost-effective improvement
4 to < 8	2 to < 4	B		Potential for marked improvements; consider pressure management, better active leakage control practices, and better network maintenance
8 to < 16	4 to < 8	C		Poor leakage record; tolerable only if water is plentiful and cheap; even then, analyze level and nature of leakage and intensify leakage reduction efforts
16 or more	8 or more	D		Very inefficient use of resources; leakage reduction programs imperative and high priority



WBI Recommendations for BANDS	A	B	C	D
Investigate pressure management options	Yes	Yes	Yes	
Investigate speed and quality of repairs	Yes	Yes	Yes	
Check economic intervention frequency	Yes	Yes		
Introduce/improve active leakage control		Yes	Yes	
Identify options for improved maintenance		Yes	Yes	
Assess Economic Leakage Level	Yes	Yes		
Review break frequencies		Yes	Yes	
Review asset management policy		Yes	Yes	Yes
Deal with deficiencies in manpower, training and communications			Yes	Yes
5-year plan to achieve next lowest band			Yes	Yes
Fundamental peer review of all activities				Yes

GUIDELINE 2: The AWWA Water Loss Committee general guidelines for setting a target ILI (in lieu of having a determination of a system-specific economic level of leakage). Source of information: Table 7 in the AWWA Water Loss Committee Report in the AWWA Journal, August 2003

Note: since this table was published, simplified methods of calculating an economic frequency of intervention for active leakage control by regular survey have been been developed and are included in the ALCCalc software. This has allowed the development of the ELLCalc software to calculate short-term ELL for an active leakage control policy of regular survey. Data from England & Wales (where many Water Companies are recognised as having achieved ELL) suggests that in developed couintries, the ELL (in terms of ILI) is unlikely to exceed 3.0, even where water is plentiful and inexpensive.

Target ILI Range	This System ILI	Water Resources Considerations	Operational Considerations	Financial Considerations
1.0 - 3.0	1.3	Available resources are greatly limited and are very difficult and/or environmentally unsound to develop	Operating with system leakage above this level would require expansion of existing infrastructure and/or additional water resources to meet the demand	Water resources are costly to develop or purchase; ability to increase revenues via water rates is greatly limited because of regulation or low ratepayer affordability
3.0 - 5.0		Water resources are believed to be sufficient to meet long-term needs, but demand management interventions (leakage management,water conservation) are included in the long-term planning	Existing water supply infrastructure capability is sufficient to meet long-term demand as long as reasonable leakage management controls are in place	Water resources can be developed or purchased at reasonable expense; periodic water rate increases can be feasibly imposed and are tolerated by the customer population
5.0 - 8.0		Water resources are plentiful, reliable, and easily abstracted	Superior reliability, capacity and integrity of the water supply infrastructure make it relatively immune to shortages	Cost to purchase or obtain/treat water is low, as are rates charged to customers
Greater than 8.0		Although operational and financial considerations may allow a long-term ILI greater than 8.0, such a level of leakage is not an effective utilization of water as a resource. Setting a target level greater than 8.0 - other than as an incremental goal to a smaller long-term target - is discouraged.		

Note: Simplified methods of calculating an economic frequency of intervention for active leakage control by regular survey have been been developed and are included in the **ALCCalcs** Standard software. This has allowed the development of the **ELLCalcs** standard software to calculate short-term Economic Leakage Level for an active leakage control policy of regular survey.

Important Footnote: the Infrastructure Leakage Index (ILI) provides guidance as to how well real losses are being managed (in terms of repairs, active leakage control and infrastructure management) at the current operating pressure. However, calculation of the ILI does not imply that pressure management in a system is optimal, or economic. If system pressures are excessive, or subject to surges, then pressure management may result in additional benefits for real losses management - in particular, a reduction in new burst frequency and annual repair costs, and a reduction in flow rates of existing leaks. So even if a low ILI is being achieved, there may still be opportunities to reduce annual real losses by improved pressure management. The **PressCalcs** Standard Software provides more detailed information on this topic.

'LEAKS' Suite of LEAKAGE EVALUATION and ASSESSMENT KNOW-HOW SOFTWARE									
WATER BALANCE AND PERFORMANCE INDICATORS PROGRAM 'PIFastCalcs'				Standard	Version 1a	2nd Dec 2005		Canada	Master.0000
OPTIONAL DATA ENTRY SHEET FOR ANNUAL SYSTEM RUNNING COSTS				Data entry		Calculated Values		From another Worksheet	
Utility	Town of Grimsby	01/01/2005	to	1/1/2006		Number of Days in Period	365	days	
System	Whole System	Calculation by		A.N. Other		Date of calculation =			

Total running costs as calculated below =	0.0	$Cx1000	Transfer this figure to Cell L30 of 'WaterBalance&Pis' Worksheet

Note: The following definitions of annual system running costs should be considered as guidelines only. They are based on the 'Financial Definitions' in pages 19 and 20 of the IWA 'Manual of Best Practice 'Performance Indicators for Water Supply Services', (Alegre H, Hirner W, Baptista J.M. and Parena R, July 2000, ISBN 1 900222 27 2, IWA Publishing; this report should be consulted for further guidance as necessary.

Operational Costs		Sub-total $Cx1000	Group total $Cx1000	INCLUDES
Imported water	Raw water		0.0	BULK SUPPLY IMPORTS: total payments for imported raw water
	Treated water			BULK SUPPLY IMPORTS: total payments for imported treated water
Energy	Raw water		0.0	POWER: all energy costs for water supply electricity and fuel for motive machinery
	Treatment			
	Transmission			
	Distribution			
External services: Outsourcing	Outsourcing		0.0	Outsourcing of technical or administrative services, such as consultants, contractors undertaking operational tasks, meter reading and accounting fees
	Software licences and IT support			Licence fees on computer software and technical support by software companies
	Associated Companies			Costs of associated companies that are not included in other items
	Third party services			Operating costs of providing water services to third parties (other than the regulated water supply function) that are not included in other items
Leasing and Rentals	Premises		0.0	Payments for leasing or renting premises
	Vehicles			Payments for leasing or renting vehicles
	Mobile Plant			Payments for leasing or renting mobile plant
	Fixed Plant			Payments for leasing or renting fixed plant
	Equipment			Payments for leasing or renting equipment
Purchases	Water treatment chemicals		0.0	All water treatment chemicals for water supply that are not in HIRED AND CONTRACTED SERVICES and which are required for operation of sources, treatment plants,transmission and distribution systems
	Other than chemicals and energy			All materials and consumables other than energy and water treatment chemicals for water supply, that are not in HIRED AND CONTRACTED SERVICES and which are required for operation of sources, treatment plants,transmission and distribution systems
Taxes, levies and fees	All kinds		0.0	Any operating licences paid to a Government or municipal authority, abstraction charges, local authority rates
Exceptional earnings and losses	All kinds		0.0	Any exceptional income or expenditure from donations, investment subsidies, compensations or adjustments related to sales/writing off of fixed assets
Other Operating Expenditures	Other direct costs		0.0	Any other operating costs (but excluding interest and taxation, on an aggregated basis)
	General and support expenditures			The aggregate direct cost of GENERAL AND SUPPORT ACTIVITIES (Manpower costs excluded)
	Customer services			Costs directly associated with customer services that are not included in previous items, related to customer accounting, reading of meters, debt revovery, costs of disconnections, customers'enquiries and complaints handling.
	Scientific services			Costs directly associated with scientific and laboratory services and with the monitoring of quality that are not included in previous items
	Other business activities			Costs directly associated with other business activities that are not included in previous items, except for cost depreciation
	Doubtful debts			Charge/credit to the profit and loss account for bad and doubtful debts
Sum of Operational Costs	All the above operational costs		0.0	
Internal manpower costs	Employment costs		0.0	The sum of the total manpower costs of permanent and temorary personnel, including employment-related social costs and benefits paid by the employer
Capitalised cost of self-constructed assets	Negative allocation		0.0	The summation of the amounts in each of the above cost categories that have been incurred in the construction of new or rehabilitated assets
Total Running Costs	Sum of Operational costs and Internal Manpower Costs, minus capitalised cost of self-constructed assets		0.0	

Comments:

Appendix H

PIFastCalc Output Lincoln

'LEAKS' Suite of LEAKAGE EVALUATION and ASSESSMENT KNOW-HOW SOFTWARE

WATER BALANCE AND PERFORMANCE INDICATORS PROGRAM 'PIFastCalcs'

ANNUAL WATER BALANCE CALCULATION IN IWA STANDARD FORMAT, WITH 95% CONFIDENCE LIMITS

Note:Calculations should be based on a 12-month period for all aspects of the worksheet to function correctly

					Standard	Version 1a	2nd Dec 2005		Canada	
					Data entry	Defaults	Calculated Values		From another Worksheet	
					Currency =	$C	Volume units =	Ml	and	m^3
Utility	Town of Lincoln	Bulk supply (BS) or Distribution System (DS)?	DS		01/01/2005	to	01/01/2006	=	365	days
System	Whole System	Do most customers have storage tanks?	No		Calculation by	Steve Genser		Date	4-Dec-06	

Process Reliability Band	WATER BALANCE CALCULATIONS				Volume in period	95% Confidence Limit as +/- %	Variance	FINANCIAL PERFORMANCE INDICATORS FOR NON-REVENUE WATER			
	IWA Terminology							% of System Input Volume	Calculated Value of NRW as % of System Running Costs in Period		
	COMPONENTS OF WATER BALANCE				Ml				Assessed marginal cost of individual components of Non-Revenue Water	Assessed Unit Value of individual componentis of Non Revenue Water	% of cost of running system
	WOS: Volume from Own Sources (corrected for known systematic errors)						0	0.0%			
A	WI: Water Imported (corrected for known systematic errors)				2604.7	3.0%	1589	100.0%			
	SIV: SYSTEM INPUT VOLUME				2604.7	3.0%	1589	100.0%			
	BACE:Water Exported						0	0.0%			
	WS: WATER SUPPLIED = SIV - BACE				2604.7	3.0%	1589	100.0%			
A/B	BACM1: Billed Authorised Consumption: Metered	Total			2362.9	1.5%	327	90.7%			
	BACM2: Billed Authorised Consumption: Metered						0	0.0%			
	BACM3: Billed Authorised Consumption: Metered						0	0.0%			
	BACU: Billed Authorised Consumption:Unmetered				0.0		0	0.0%	$C/m3	$Cx1000	%
	NRW: NON-REVENUE WATER				241.8	35.5%	1916	9.3%	0.5216	126.1	3.6%
A	UACM: Unbilled Authorised Consumption: Metered		0.00%	of WS			0	0.0%	0.4460	0.0	0.0%
D	UACU: Unbilled Authorised Consumption: Unmetered:	Estimated as	1.250%	of WS	32.6	100.0%	276	1.3%	0.4460	14.5	0.4%
	WL WATER LOSSES				209.2	43.9%	2192	8.0%	0.5334	111.6	3.2%
D	UC: Unauthorised Consumption:	Estimated as	0.250%	of WS	6.5	100.0%	11	0.3%	1.3260	8.6	0.2%
B/C	ALMUR1: Apparent Loss - meter under-registration:	Total	0.60%	of BACM1	14.3	7.0%	0	0.5%	1.3260	18.9	0.5%
	ALMUR2: Apparent Loss - meter under-registration:			of BACM2	0.0		0	0.0%	1.3260	0.0	0.0%
	ALMUR3: Apparent Loss - meter under-registration:			of BACM3 and UACM	0.0		0	0.0%	1.3260	0.0	0.0%
D	ALDCD Customer meter data handling errors						0	0.0%	1.3260	0.0	0.0%
	AL: Sum of APPARENT LOSSES				20.8	31.7%	11	0.8%	1.3260	27.5	0.8%
	RL: REAL LOSSES				188.5	48.8%	2204	7.2%	0.4460	84.0	2.4%
A	% of period system pressurized =	100.0%	365.0	days			Cost of running system in period =			3505.7	$Cx1000
	CARL: CURRENT ANNUAL REAL LOSSES (when system is pressurized)				0.52	Ml/day					

Process Reliability Band	SYSTEM INFRASTRUCTURE AND PRESSURE DATA		Valid for UARL& ILI calc?	95% CLs as +/- %
A	Lm: Mains Length, km	91.50	Yes	1.0%
A	Nh: Number of Fire Hydrants	532		1.0%
A/B	Nb: Number of Separately Billed Properties	5110		2.0%
A/B	R: Ratio of billed Service Connections (Ns, main to property line) to Billed Props (Nb)	1.000		2.0%
	Ns: No. of billed Service Connections	5110		2.8%
C	Nu: Number of Unbilled Service Connections	0		
	Nt: Total Number of Service Conns (= Ns + Nu), mains to property line	5110	Yes	2.8%
	DC: Density of Connections/ km of mains = Ns/Lm	55.8		3.0%
B	Lp: Average pipe length, property line to meter (m)	10.2		2.4%
	Lp: Total pipe length, property line to meter (km)	52.12		3.7%
C	P: Average pressure when system pressurised (psi)	65.0	Yes	20.0%
	P: Average pressure when system pressurised (m)	46.0		20.0%

ASSESSMENT OF UNAVOIDABLE REAL LOSSES, AND VOLUME AND COST OF POTENTIALLY RECOVERABLE REAL LOSSES

Notes: If Lm and Lp are in km and pressure P is in metres

UBL in litres/hour = (20 x Lm + 1.25 x Nt + 33 x Lp) x $(P/50)^{1.5}$

UARL in litres/day = (18 x Lm + 0.8 x Nt + 25 x Lp) x P

COMPONENT OF REAL LOSSES	Ml per day	Ml in period	$Cx1000 in period	95% CLs as +/- %
UBL: UNAVOIDABLE BACKGROUND LEAKAGE	0.21	77	34.3	30.1%
UARL: UNAVOIDABLE ANNUAL REAL LOSSES	0.32	118	52.7	20.1%
CARL: CURRENT ANNUAL REAL LOSSES	0.52	188	84.0	48.8%
POTENTIALLY RECOVERABLE REAL LOSSES = CARL - UARL	0.19	70	31.4	135.0%

IWA BEST PRACTICE PERFORMANCE INDICATOR		UNITS OF PERFORMANCE INDICATOR	Best estimate	95% CLs as +/- %	Lowest Estimate	Highest Estimate
Non Revenue Water Basic (IWA Level 1, Fin36)		% of System Input by Volume	9.3	35.6%	6.0	12.6
Non Revenue Water Basic (IWA Level 1, Fin37)		% of System Input by Value	3.6	35.6%	2.3	4.9
Apparent Losses (IWA Op23)	Best Op23 PI >	% of Water Supplied (Distribution Systems)	0.8	31.9%	0.5	1.1
		% of System Input Volume (Bulk Supply Systems)	0.8	31.9%	0.5	1.1
Real Losses Basic (IWA Level 1, Op24)	Best Op24 PI >	Litres/service connection/day, when system pressurised	101	48.9%	52	150
		m3/km of mains/day, when system pressurised	5.6	48.9%	2.9	8.4
Real Losses Detailed (IWA Level 3, Op 25)		Infrastructure Leakage Index ILI (non-dimensional)	1.60	52.8%	0.75	2.44

Comments:

Supply via Regional Municipality of Niagara meters 5D7 (Vineland), 5D8 (Vineland Service), and 6D1 (Beamsville). Calibration reports dated:

5D7; August 15 / November 2, 2005
5D8; August 15 / November 2, 2005
6D1; no report

Process Reliability Bands:

A - actual data
B - calculated based on actual data
C - calculated estimate
D - no data / default

Combinations, for example, B/C may be used to illustrate a calculated estimate based on partial data

No breakdown of consumption provided by the Town of Lincoln, i.e., quoted single value of billed authorized consumption for the year. Confidence reflects lack of information and possibilty of lag time, etc.

Total length of watermain allow for 3 m per hydrant

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WATER BALANCE AND PERFORMANCE INDICATORS PROGRAM 'PIFastCalcs'

DETAILED CALCULATION OF COMPONENTS OF AUTHORISED AND UNAUTHORISED CONSUMPTION

Data entry		Calculated Values		From another Worksheet		
Utility	Town of Lincoln	01/01/2005	to	01/01/2006 =	365	days
System	Whole System	Calculation by	Steve Genser		Date	2nd July 2005

Components of Authorised Consumption	Components in Ml: Billed Metered	Billed Unmetered	Unbilled Metered	Unbilled Unmetered	Total	Additional information on sources of data and basis of estimates E = estimated R = Based on recordings
					0.00	
					0.00	
					0.00	
					0.00	
					0.00	
					0.00	
					0.00	
					0.00	
					0.00	
					0.00	
					0.00	
					0.00	
					0.00	
					0.00	
					0.00	
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					0.00	
					0.00	
					0.00	
					0.00	
					0.00	
					0.00	
					0.00	
					0.00	
					0.00	
					0.00	
					0.00	
Authorised consumption sub-totals	0.00	0.00	0.00	0.00	0.00 Ml	

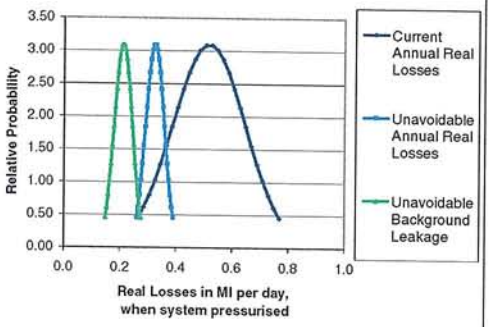
Authorised Unbilled Unmetered Consumption = 0.000% of Water Supplied, transfer this figure to Cell E21 of 'WaterBalance&Pis' Worksheet

Components of Unauthorised Consumption	Ml	Method of estimation
Unauthorised consumption sub-total	0.00	Ml

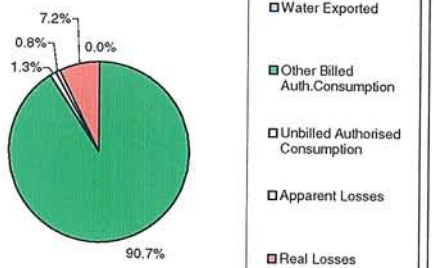
Unauthorised consumption = 0.000% of Water Supplied, transfer this figure to Cell E23 of 'WaterBalance&Pis' Worksheet

WATER BALANCE AND PERFORMANCE INDICATORS PROGRAM 'PIFastCalcs'			Standard	Version 1a	2nd Dec 2005	Canada
Utility	Town of Lincoln	01/01/2005 to	01/01/2006	365	days	
System	Whole System					

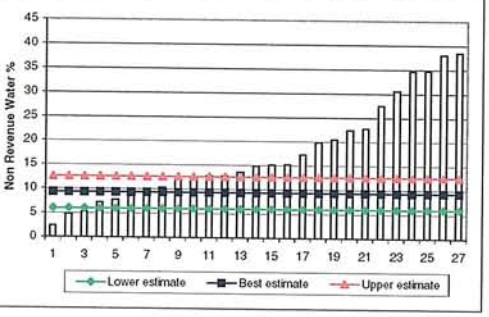
Real Losses and 95% Confidence Limits



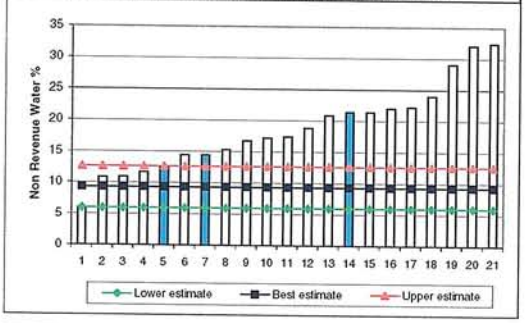
Water Balance Components as % of System Input Volume



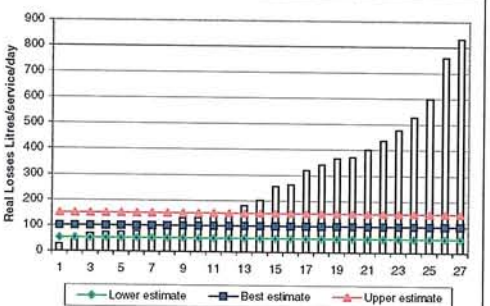
NRW % by Volume; Comparison with International Data Set
IWA Level 1 (Basic) Financial PI for Non-Revenue Water (Fin36)
Non-Revenue Water as % of System Input Volume



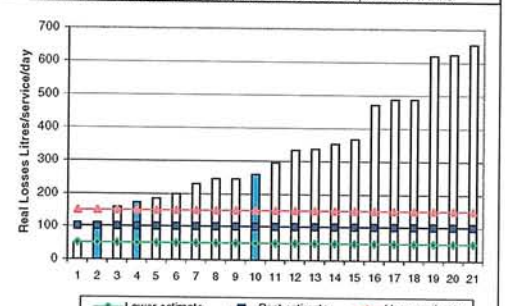
NRW % by Volume; Comparison with North American Data Set
IWA Level 1 (Basic) Financial PI for Non-Revenue Water (Fin36)
NRW as % of System Input Volume: Canadian data in blue



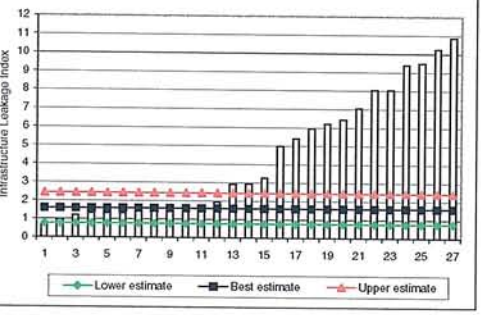
Real Losses in litres/service connection/day
(when system is pressurised)
Compared with International data set
IWA Level 1 (Basic) Operational PI for Real Losses (Op24)
Use Litres/service conn./day if Density of Connections > 20 per km of mains
All international data set have density of connections > 20 per km of mains



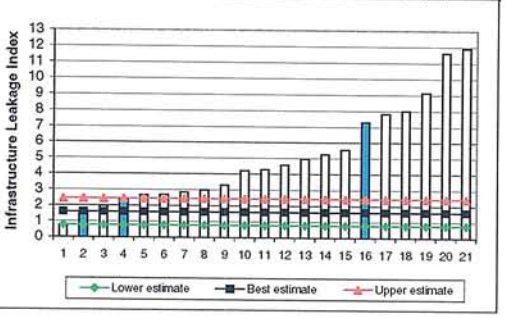
Real Losses in litres/service connection/day
when system is pressurised
Compared with North American data set, Canadian data in blue
IWA Level 1 (Basic) Operational PI for Real Losses (Op24)
Use Litres/service conn./day if Density of Connections > 20 per km of mains
All European data set have density of connections > 20 per km of mains



Infrastructure Leakage Index ILI for Real Losses
Compared with International data set
IWA Level 3 (Detailed) Operational PI for Real Losses (Op25)



Infrastructure Leakage Index ILI for Real Losses
Compared with North American data set, Canadian data in blue
IWA Level 3 (Detailed) Operational PI for Real Losses (Op25)



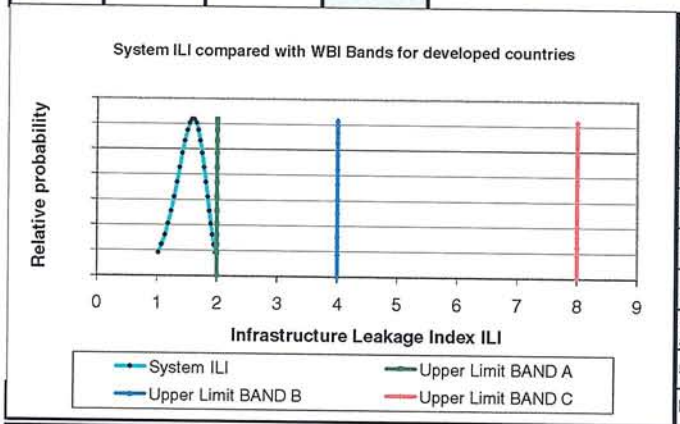
'LEAKS' Suite of LEAKAGE EVALUATION and ASSESSMENT KNOW-HOW SOFTWARE						
WATER BALANCE AND PERFORMANCE INDICATORS PROGRAM 'PIFastCalcs'						
PIFastCalcs	Standard	Version 1a	2nd Dec 2005	Canada	Master.0000	Town of Lincoln

THIS WORKSHEET COMPARES THE CALCULATED SYSTEM ILI WITH WORLD BANK INSTITUTE GUIDELINES

World Bank Institute (WBI) Guidelines

The World Bank Institute has recently introduced, into its NRW Training Modules, a target matrix for Real Losses management performance, based on real losses in volume/service connection/day for a range of average operating pressures, and classified into Bands A to D. The targets assume that customer meters are located at the property boundary, with an average connection density of around 40 per km mains. Bands A to D in the WBI target matrix can also be shown as an equivalent range of ILIs, which can be applied to a wider range of connection densities and customer meter locations, as shown below. Band limits in terms of ILIs, general descriptions of each Band, and appropriate recommended actions are as follows:

Developing Countries ILI range	Developed Countries ILI range	BAND	Calculated ILI for this System	General description of Real Loss Management Performance Categories for Developed and Developing Countries
Less than 4	Less than 2	A	1.6	Further loss reduction may be uneconomic unless there are shortages; careful analysis needed to identify cost-effective improvement
4 to < 8	2 to < 4	B		Potential for marked improvements; consider pressure management, better active leakage control practices, and better network maintenance
8 to < 16	4 to < 8	C		Poor leakage record; tolerable only if water is plentiful and cheap; even then, analyze level and nature of leakage and intensify leakage reduction efforts
16 or more	8 or more	D		Very inefficient use of resources; leakage reduction programs imperative and high priority



WBI Recommendations for BANDS	A	B	C	D
Investigate pressure management options	Yes	Yes	Yes	
Investigate speed and quality of repairs	Yes	Yes	Yes	
Check economic intervention frequency	Yes	Yes		
Introduce/improve active leakage control		Yes	Yes	
Identify options for improved maintenance		Yes	Yes	
Assess Economic Leakage Level	Yes	Yes		
Review break frequencies		Yes	Yes	
Review asset management policy		Yes	Yes	Yes
Deal with deficiencies in manpower, training and communications			Yes	Yes
5-year plan to achieve next lowest band			Yes	Yes
Fundamental peer review of all activities				Yes

GUIDELINE 2: The AWWA Water Loss Committee general guidelines for setting a target ILI (in lieu of having a determination of a system-specific economic level of leakage). Source of information: Table 7 in the AWWA Water Loss Committee Report in the AWWA Journal, August 2003

Note: since this table was published, simplified methods of calculating an economic frequency of intervention for active leakage control by regular survey have been been developed and are included in the ALCCalc software. This has allowed the development of the ELLCalc software to calculate short-term ELL for an active leakage control policy of regular survey. Data from England & Wales (where many Water Companies are recognised as having achieved ELL) suggests that in developed couintries, the ELL (in terms of ILI) is unlikely to exceed 3.0, even where water is plentiful and inexpensive.

Target ILI Range	This System ILI	Water Resources Considerations	Operational Considerations	Financial Considerations
1.0 - 3.0	1.6	Available resources are greatly limited and are very difficult and/or environmentally unsound to develop	Operating with system leakage above this level would require expansion of existing infrastructure and/or additional water resources to meet the demand	Water resources are costly to develop or purchase; ability to increase revenues via water rates is greatly limited because of regulation or low ratepayer affordability
3.0 - 5.0		Water resources are believed to be sufficient to meet long-term needs, but demand management interventions (leakage management,water conservation) are included in the long-term planning	Existing water supply infrastructure capability is sufficient to meet long-term demand as long as reasonable leakage management controls are in place	Water resources can be developed or purchased at reasonable expense; periodic water rate increases can be feasibly imposed and are tolerated by the customer population
5.0 - 8.0		Water resources are plentiful, reliable, and easily abstracted	Superior reliability, capacity and integrity of the water supply infrastructure make it relatively immune to shortages	Cost to purchase or obtain/treat water is low, as are rates charged to customers
Greater than 8.0		Although operational and financial considerations may allow a long-term ILI greater than 8.0, such a level of leakage is not an effective utilization of water as a resource. Setting a target level greater than 8.0 - other than as an incremental goal to a smaller long-term target - is discouraged.		

Note: Simplified methods of calculating an economic frequency of intervention for active leakage control by regular survey have been been developed and are included in the **ALCCalcs** Standard software. This has allowed the development of the **ELLCalcs** standard software to calculate short-term Economic Leakage Level for an active leakage control policy of regular survey.

Important Footnote: the Infrastructure Leakage Index (ILI) provides guidance as to how well real losses are being managed (in terms of repairs, active leakage control and infrastructure management) at the current operating pressure. However, calculation of the ILI does not imply that pressure management in a system is optimal, or economic. If system pressures are excessive, or subject to surges, then pressure management may result in additional benefits for real losses management - in particular, a reduction in new burst frequency and annual repair costs, and a reduction in flow rates of existing leaks. So even if a low ILI is being achieved, there may still be opportunities to reduce annual real losses by improved pressure management. The **PressCalcs** Standard Software provides more detailed information on this topic.

'LEAKS' Suite of LEAKAGE EVALUATION and ASSESSMENT KNOW-HOW SOFTWARE									
WATER BALANCE AND PERFORMANCE INDICATORS PROGRAM 'PIFastCalcs'				Standard	Version 1a	2nd Dec 2005		Canada	Master.0000
OPTIONAL DATA ENTRY SHEET FOR ANNUAL SYSTEM RUNNING COSTS				Data entry		Calculated Values		From another Worksheet	
Utility	Town of Lincoln	01/01/2005	to	1/1/2006		Number of Days in Period	365	days	
System	Whole System	Calculation by		Steve Genser		Date of calculation =	12/4/2006		

Total running costs as calculated below =	0.0	$Cx1000	Transfer this figure to Cell L30 of 'WaterBalance&Pis' Worksheet

Note: The following definitions of annual system running costs should be considered as guidelines only. They are based on the 'Financial Definitions' in pages 19 and 20 of the IWA 'Manual of Best Practice 'Performance Indicators for Water Supply Services', (Alegre H, Hirner W, Baptista J.M. and Parena R, July 2000, ISBN 1 900222 27 2, IWA Publishing; this report should be consulted for further guidance as necessary.

Operational Costs		Sub-total $Cx1000	Group total $Cx1000	INCLUDES
Imported water	Raw water		0.0	BULK SUPPLY IMPORTS: total payments for imported raw water
	Treated water			BULK SUPPLY IMPORTS: total payments for imported treated water
Energy	Raw water		0.0	POWER: all energy costs for water supply electricity and fuel for motive machinery
	Treatment			
	Transmission			
	Distribution			
External services: Outsourcing	Outsourcing		0.0	Outsourcing of technical or administrative services, such as consultants, contractors undertaking operational tasks, meter reading and accounting fees
	Software licences and IT support			Licence fees on computer software and technical support by software companies
	Associated Companies			Costs of associated companies that are not included in other items
	Third party services			Operating costs of providing water services to third parties (other than the regulated water supply function) that are not included in other items
Leasing and Rentals	Premises		0.0	Payments for leasing or renting premises
	Vehicles			Payments for leasing or renting vehicles
	Mobile Plant			Payments for leasing or renting mobile plant
	Fixed Plant			Payments for leasing or renting fixed plant
	Equipment			Payments for leasing or renting equipment
Purchases	Water treatment chemicals		0.0	All water treatment chemicals for water supply that are not in HIRED AND CONTRACTED SERVICES and which are required for operation of sources, treatment plants,transmission and distribution systems
	Other than chemicals and energy			All materials and consumables other than energy and water treatment chemicals for water supply, that are not in HIRED AND CONTRACTED SERVICES and which are required for operation of sources, treatment plants,transmission and distribution systems
Taxes, levies and fees	All kinds		0.0	Any operating licences paid to a Government or municipal authority, abstraction charges, local authority rates
Exceptional earnings and losses	All kinds		0.0	Any exceptional income or expenditure from donations, investment subsidies, compensations or adjustments related to sales/writing off of fixed assets
Other Operating Expenditures	Other direct costs		0.0	Any other operating costs (but excluding interest and taxation, on an aggregated basis)
	General and support expenditures			The aggregate direct cost of GENERAL AND SUPPORT ACTIVITIES (Manpower costs excluded)
	Customer services			Costs directly associated with customer services that are not included in previous items, related to customer accounting, reading of meters, debt revovery, costs of disconnections, customers'enquiries and complaints handling.
	Scientific services			Costs directly associated with scientific and laboratory services and with the monitoring of quality that are not included in previous items
	Other business activities			Costs directly associated with other business activities that are not included in previous items, except for cost depreciation
	Doubtful debts			Charge/credit to the profit and loss account for bad and doubtful debts
Sum of Operational Costs	All the above operational costs		0.0	
Internal manpower costs	Employment costs		0.0	The sum of the total manpower costs of permanent and temorary personnel, including employment-related social costs and benefits paid by the employer
Capitalised cost of self-constructed assets	Negative allocation		0.0	The summation of the amounts in each of the above cost categories that have been incurred in the construction of new or rehabilitated assets
Total Running Costs	Sum of Operational costs and Internal Manpower Costs, minus capitalised cost of self-constructed assets		0.0	

Comments:

Appendix I

PIFastCalc Output
Niagara Falls

'LEAKS' Suite of LEAKAGE EVALUATION and ASSESSMENT KNOW-HOW SOFTWARE

WATER BALANCE AND PERFORMANCE INDICATORS PROGRAM 'PIFastCalcs'

	ANNUAL WATER BALANCE CALCULATION IN IWA STANDARD FORMAT, WITH 95% CONFIDENCE LIMITS			Standard	Version 1a	2nd Dec 2005		Canada	
				Data entry	Defaults	Calculated Values		From another Worksheet	
	Note:Calculations should be based on a 12-month period for all aspects of the worksheet to function correctly			Currency =	$C	Volume units =	Ml	and	m^3
Utility	City of Niagara Falls	Bulk supply (BS) or Distribution System (DS)?	DS	01/01/2004	to	01/01/2005	=	365	days
System	Whole System	Do most customers have storage tanks?	No	Calculation by	Steve Genser		Date	4-Dec-06	

Process Reliability Band	WATER BALANCE CALCULATIONS IWA Terminology COMPONENTS OF WATER BALANCE				Volume in period Ml	95% Confidence Limit as +/- %	Variance	FINANCIAL PERFORMANCE INDICATORS FOR NON-REVENUE WATER % of System Input Volume	Calculated Value of NRW as % of System Running Costs in Period Assessed marginal cost of individual components of Non-Revenue Water $C/m3	Assessed Unit Value of individual components of Non Revenue Water $Cx1000	% of cost of running system %
	WOS: Volume from Own Sources (corrected for known systematic errors)						0	0.0%			
A	WI: Water Imported (corrected for known systematic errors)				15872.7	3.0%	59025	100.0%			
	SIV: SYSTEM INPUT VOLUME				15872.7	3.0%	59025	100.0%			
	BACE:Water Exported						0	0.0%			
	WS: WATER SUPPLIED = SIV - BACE				15872.7	3.0%	59025	100.0%			
A/B	BACM1: Billed Authorised Consumption: Metered	Total			13243.6	1.5%	10273	83.4%			
	BACM2: Billed Authorised Consumption: Metered						0	0.0%			
	BACM3: Billed Authorised Consumption: Metered						0	0.0%			
A	BACU: Billed Authorised Consumption:Unmetered						0	0.0%			
	NRW: NON-REVENUE WATER				2629.1	19.6%	69297	16.6%	0.0000	0.0	0.0%
A	UACM: Unbilled Authorised Consumption: Metered		0.00%	of WS			0	0.0%		0.0	0.0%
D	UACU: Unbilled Authorised Consumption: Unmetered:	Estimated as	1.250%	of WS	198.4	100.0%	10247	1.3%		0.0	0.0%
	WL WATER LOSSES				2430.7	22.7%	79545	15.3%	0.0000	0.0	0.0%
D	UC: Unauthorised Consumption:	Estimated as	0.250%	of WS	39.7	100.0%	410	0.3%		0.0	0.0%
B/C	ALMUR1: Apparent Loss - meter under-registration:	Total	0.60%	of BACM1	79.9	7.0%	8	0.5%		0.0	0.0%
	ALMUR2: Apparent Loss - meter under-registration:			of BACM2	0.0		0	0.0%		0.0	0.0%
	ALMUR3: Apparent Loss - meter under-registration:			of BACM3 and UACM	0.0		0	0.0%		0.0	0.0%
D	ALDCD Customer meter data handling errors						0	0.0%		0.0	0.0%
	AL: Sum of APPARENT LOSSES				119.6	33.5%	418	0.8%	0.0000	0.0	0.0%
	RL: REAL LOSSES				2311.1	24.0%	79963	14.6%		0.0	0.0%
A	% of period system pressurized =	100.0%	365.0	days			Cost of running system in period =				$Cx1000
	CARL: CURRENT ANNUAL REAL LOSSES (when system is pressurized)				6.33	Ml/day					

Process Reliability Band	SYSTEM INFRASTRUCTURE AND PRESSURE DATA		Valid for UARL& ILI calc?	95% CLs as +/- %
A	Lm: Mains Length, km	498.00	Yes	1.0%
A	Nh: Number of Fire Hydrants	2775		1.0%
A/B	Nb: Number of Separately Billed Properties	27224		2.0%
A/B	R: Ratio of billed Service Connections (Ns, main to property line) to Billed Props (Nb)	1.000		2.0%
	Ns: No. of billed Service Connections	27224		2.9%
C	Nu: Number of Unbilled Service Connections			
	Nt: Total Number of Service Conns (= Ns + Nu), mains to property line	27224	Yes	2.9%
	DC: Density of Connections/ km of mains = Ns/Lm	54.7		3.0%
B/C	Lp: Average pipe length, property line to meter (m)	18.0		50.0%
	Lp: Total pipe length, property line to meter (km)	490.03		50.1%
B	P: Average pressure when system pressurised (psi)	93.5	Yes	20.0%
	P: Average pressure when system pressurised (m)	66.1		20.0%

ASSESSMENT OF UNAVOIDABLE REAL LOSSES, AND VOLUME AND COST OF POTENTIALLY RECOVERABLE REAL LOSSES				
Notes: If Lm and Lp are in	km	and pressure P is in	metres	
UBL in litres/hour =	(20 x Lm + 1.25 x Nt +	33 x Lp) x	$(P/50)^{1.5}$	
UARL in litres/day =	(18 x Lm + 0.8 x Nt +	25 x Lp) x	P	
COMPONENT OF REAL LOSSES	Ml per day	Ml in period	$Cx1000 in period	95% CLs as +/- %
UBL: UNAVOIDABLE BACKGROUND LEAKAGE	2.20	803		34.5%
UARL: UNAVOIDABLE ANNUAL REAL LOSSES	2.84	1037		24.6%
CARL: CURRENT ANNUAL REAL LOSSES	6.33	2311		24.0%
POTENTIALLY RECOVERABLE REAL LOSSES = CARL - UARL	3.49	1274		47.9%

IWA BEST PRACTICE PERFORMANCE INDICATOR		UNITS OF PERFORMANCE INDICATOR	Best estimate	95% CLs as +/- %	Lowest Estimate	Highest Estimate
Non Revenue Water Basic (IWA Level 1, Fin36)		% of System Input by Volume	16.6	19.9%	13.3	19.9
Non Revenue Water Basic (IWA Level 1, Fin37)		% of System Input by Value		19.9%		
Apparent Losses (IWA Op23)	Best Op23 PI >	% of Water Supplied (Distribution Systems)	0.8	33.6%	0.5	1.0
		% of System Input Volume (Bulk Supply Systems)	0.8	33.6%	0.5	1.0
Real Losses Basic (IWA Level 1, Op24)	Best Op24 PI >	Litres/service connection/day, when system pressurised	233	24.1%	176	289
		m3/km of mains/day, when system pressurised	12.7	24.0%	9.7	15.8
Real Losses Detailed (IWA Level 3, Op 25)		Infrastructure Leakage Index ILI (non-dimensional)	2.23	34.4%	1.46	2.99

Comments:

Suppy via Regional Municipality of Niagara meters 1T1, 1T2, 1D1, 1D2, 1D3, and 1D4.

Accuracy reports provided for:

1D1 - May 4, 2005 and October 13, 2005
1D2 - May 4, 2005
1D3 - May 20, 2005
1D4 - May 4, 2005 tested and repaired: then replaced on October 13, 2005

Process Reliability Bands:

A - actual data
B - calculated based on actual data
C - calculated estimate
D - no data / default

Combinations, for example, B/C may be used to illustrate a calculated estimate based on partial data

No costs for operating the system provided.

Total length of watermain allow for 3 m per hydrant

'LEAKS' Suite of LEAKAGE EVALUATION and ASSESSMENT KNOW-HOW SOFTWARE

WATER BALANCE AND PERFORMANCE INDICATORS PROGRAM 'PIFastCalcs'

DETAILED CALCULATION OF COMPONENTS OF AUTHORISED AND UNAUTHORISED CONSUMPTION			Data entry	Calculated Values	From another Worksheet
Utility	City of Niagara Falls	01/01/2004 to	01/01/2005 =	365 days	
System	Whole System	Calculation by			Date

Components of Authorised Consumption	Components in Ml: Billed Metered	Billed Unmetered	Unbilled Metered	Unbilled Unmetered	Total	Additional information on sources of data and basis of estimates E = estimated R = Based on recordings
					0.00	
					0.00	
					0.00	
					0.00	
					0.00	
					0.00	
					0.00	
					0.00	
					0.00	
					0.00	
					0.00	
					0.00	
					0.00	
					0.00	
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					0.00	
					0.00	
					0.00	
					0.00	
					0.00	
					0.00	
					0.00	
					0.00	
					0.00	
					0.00	
					0.00	
Authorised consumption sub-totals	0.00	0.00	0.00	0.00	0.00 Ml	

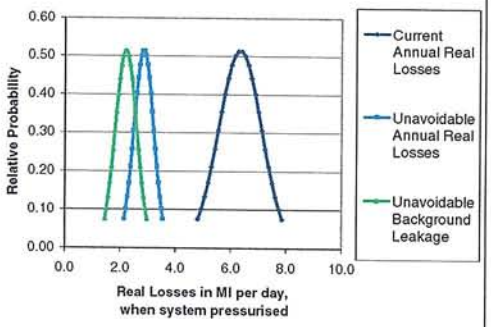
Authorised Unbilled Unmetered Consumption = 0.000% of Water Supplied, transfer this figure to Cell E21 of 'WaterBalance&Pis' Worksheet

Components of Unauthorised Consumption	Ml	Method of estimation
Unauthorised consumption sub-total	0.00 Ml	

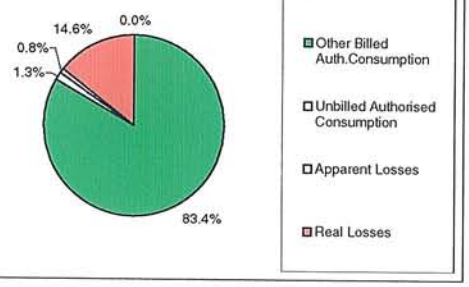
Unauthorised consumption = 0.000% of Water Supplied, transfer this figure to Cell E23 of 'WaterBalance&Pis' Worksheet

WATER BALANCE AND PERFORMANCE INDICATORS PROGRAM 'PIFastCalcs'		Standard	Version 1a	2nd Dec 2005	Canada
Utility	City of Niagara Falls	01/01/2004 to 01/01/2005	365	days	
System	Whole System				

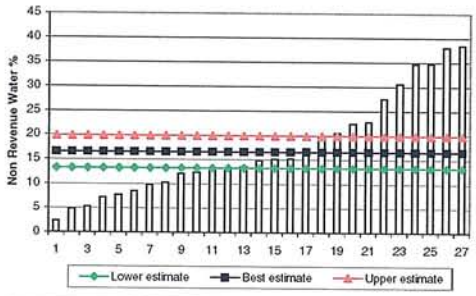
Real Losses and 95% Confidence Limits



Water Balance Components as % of System Input Volume



NRW % by Volume; Comparison with International Data Set
IWA Level 1 (Basic) Financial PI for Non-Revenue Water (Fin36)
Non-Revenue Water as % of System Input Volume



NRW % by Volume; Comparison with North American Data Set
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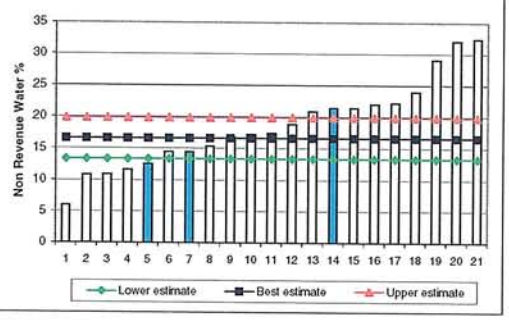
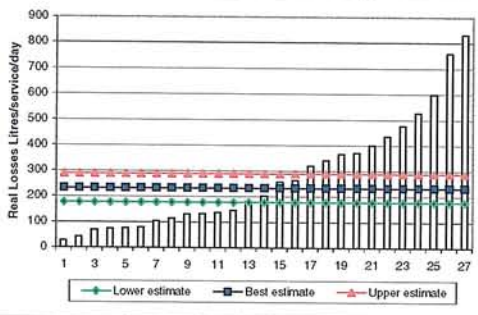
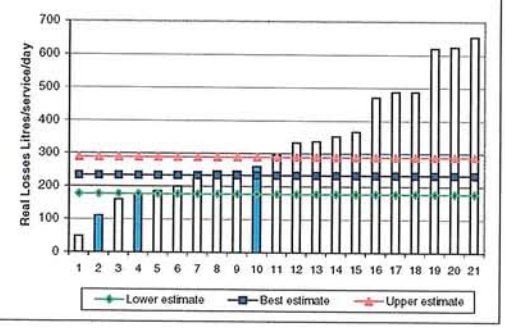
NRW as % of System Input Volume: Canadian data in blue



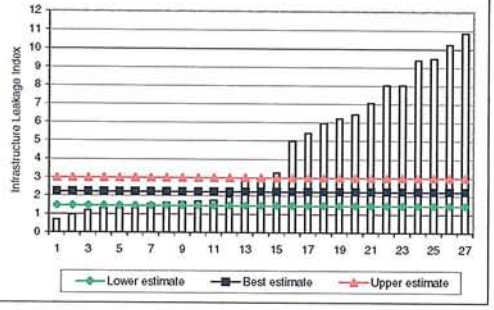
Real Losses in litres/service connection/day
(when system is pressurised)
Compared with International data set
IWA Level 1 (Basic) Operational PI for Real Losses (Op24)
Use Litres/service conn./day if Density of Connections > 20 per km of mains
All international data set have density of connections > 20 per km of mains



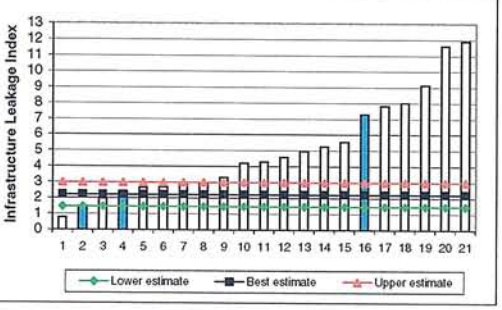
Real Losses in litres/service connection/day
when system is pressurised
Compared with North American data set, Canadian data in blue
IWA Level 1 (Basic) Operational PI for Real Losses (Op24)
Use Litres/service conn./day if Density of Connections > 20 per km of mains
All European data set have density of connections > 20 per km of mains



Infrastructure Leakage Index ILI for Real Losses
Compared with International data set
IWA Level 3 (Detailed) Operational PI for Real Losses (Op25)



Infrastructure Leakage Index ILI for Real Losses
Compared with North American data set, Canadian data in blue
IWA Level 3 (Detailed) Operational PI for Real Losses (Op25)



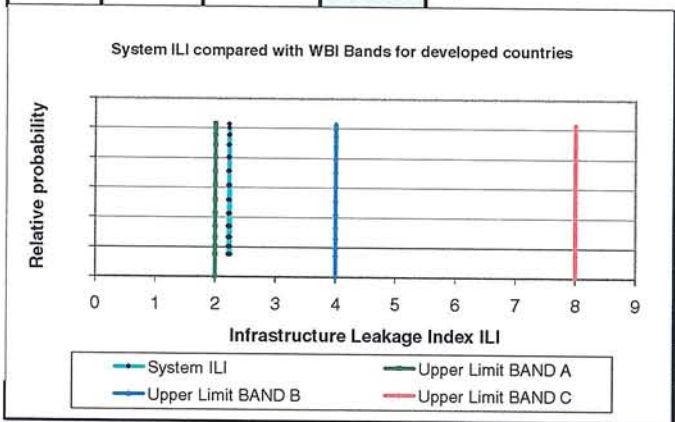
'LEAKS' Suite of LEAKAGE EVALUATION and ASSESSMENT KNOW-HOW SOFTWARE						
WATER BALANCE AND PERFORMANCE INDICATORS PROGRAM 'PIFastCalcs'						
PIFastCalcs	Standard	Version 1a	2nd Dec 2005	Canada	Master.0000	City of Niagara Falls

THIS WORKSHEET COMPARES THE CALCULATED SYSTEM ILI WITH WORLD BANK INSTITUTE GUIDELINES

World Bank Institute (WBI) Guidelines

The World Bank Institute has recently introduced, into its NRW Training Modules, a target matrix for Real Losses management performance, based on real losses in volume/service connection/day for a range of average operating pressures, and classified into Bands A to D. The targets assume that customer meters are located at the property boundary, with an average connection density of around 40 per km mains. Bands A to D in the WBI target matrix can also be shown as an equivalent range of ILIs, which can be applied to a wider range of connection densities and customer meter locations, as shown below. Band limits in terms of ILIs, general descriptions of each Band, and appropriate recommended actions are as follows:

Developing Countries ILI range	Developed Countries ILI range	BAND	Calculated ILI for this System	General description of Real Loss Management Performance Categories for Developed and Developing Countries
Less than 4	Less than 2	A		Further loss reduction may be uneconomic unless there are shortages; careful analysis needed to identify cost-effective improvement
4 to < 8	2 to < 4	B	2.2	Potential for marked improvements; consider pressure management, better active leakage control practices, and better network maintenance
8 to < 16	4 to < 8	C		Poor leakage record; tolerable only if water is plentiful and cheap; even then, analyze level and nature of leakage and intensify leakage reduction efforts
16 or more	8 or more	D		Very inefficient use of resources; leakage reduction programs imperative and high priority



WBI Recommendations for BANDS	A	B	C	D
Investigate pressure management options	Yes	Yes	Yes	
Investigate speed and quality of repairs	Yes	Yes	Yes	
Check economic intervention frequency	Yes	Yes		
Introduce/improve active leakage control		Yes	Yes	
Identify options for improved maintenance		Yes	Yes	
Assess Economic Leakage Level	Yes	Yes		
Review break frequencies		Yes	Yes	
Review asset management policy		Yes	Yes	Yes
Deal with deficiencies in manpower, training and communications			Yes	Yes
5-year plan to achieve next lowest band			Yes	Yes
Fundamental peer review of all activities				Yes

GUIDELINE 2: The AWWA Water Loss Committee general guidelines for setting a target ILI (in lieu of having a determination of a system-specific economic level of leakage). Source of information: Table 7 in the AWWA Water Loss Committee Report in the AWWA Journal, August 2003

Note: since this table was published, simplified methods of calculating an economic frequency of intervention for active leakage control by regular survey have been been developed and are included in the ALCCalc software. This has allowed the development of the ELLCalc software to calculate short-term ELL for an active leakage control policy of regular survey. Data from England & Wales (where many Water Companies are recognised as having achieved ELL) suggests that in developed couintries, the ELL (in terms of ILI) is unlikely to exceed 3.0, even where water is plentiful and inexpensive.

Target ILI Range	This System ILI	Water Resources Considerations	Operational Considerations	Financial Considerations
1.0 - 3.0	2.2	Available resources are greatly limited and are very difficult and/or environmentally unsound to develop	Operating with system leakage above this level would require expansion of existing infrastructure and/or additional water resources to meet the demand	Water resources are costly to develop or purchase; ability to increase revenues via water rates is greatly limited because of regulation or low ratepayer affordability
3.0 - 5.0		Water resources are believed to be sufficient to meet long-term needs, but demand management interventions (leakage management,water conservation) are included in the long-term planning	Existing water supply infrastructure capability is sufficient to meet long-term demand as long as reasonable leakage management controls are in place	Water resources can be developed or purchased at reasonable expense; periodic water rate increases can be feasibly imposed and are tolerated by the customer population
5.0 - 8.0		Water resources are plentiful, reliable, and easily abstracted	Superior reliability, capacity and integrity of the water supply infrastructure make it relatively immune to shortages	Cost to purchase or obtain/treat water is low, as are rates charged to customers
Greater than 8.0		Although operational and financial considerations may allow a long-term ILI greater than 8.0, such a level of leakage is not an effective utilization of water as a resource. Setting a target level greater than 8.0 - other than as an incremental goal to a smaller long-term target - is discouraged.		

Note: Simplified methods of calculating an economic frequency of intervention for active leakage control by regular survey have been been developed and are included in the **ALCCalcs** Standard software. This has allowed the development of the **ELLCalcs** standard software to calculate short-term Economic Leakage Level for an active leakage control policy of regular survey.

Important Footnote: the Infrastructure Leakage Index (ILI) provides guidance as to how well real losses are being managed (in terms of repairs, active leakage control and infrastructure management) at the current operating pressure. However, calculation of the ILI does not imply that pressure management in a system is optimal, or economic. If system pressures are excessive, or subject to surges, then pressure management may result in additional benefits for real losses management - in particular, a reduction in new burst frequency and annual repair costs, and a reduction in flow rates of existing leaks. So even if a low ILI is being achieved, there may still be opportunities to reduce annual real losses by improved pressure management. The **PressCalcs** Standard Software provides more detailed information on this topic.

'LEAKS' Suite of LEAKAGE EVALUATION and ASSESSMENT KNOW-HOW SOFTWARE

WATER BALANCE AND PERFORMANCE INDICATORS PROGRAM 'PIFastCalcs'	Standard	Version 1a	2nd Dec 2005	Canada	Master.0000
OPTIONAL DATA ENTRY SHEET FOR ANNUAL SYSTEM RUNNING COSTS		Data entry	Calculated Values	From another Worksheet	
Utility: City of Niagara Falls	01/01/2004	to 1/1/2005	Number of Days in Period	365	days
System: Whole System	Calculation by	Steve Genser	Date of calculation =	12/4/2006	

Total running costs as calculated below =	0.0	$Cx1000	Transfer this figure to Cell L30 of 'WaterBalance&Pis' Worksheet

Note: The following definitions of annual system running costs should be considered as guidelines only. They are based on the 'Financial Definitions' in pages 19 and 20 of the IWA 'Manual of Best Practice 'Performance Indicators for Water Supply Services', (Alegre H, Hirner W, Baptista J.M. and Parena R, July 2000, ISBN 1 900222 27 2, IWA Publishing; this report should be consulted for further guidance as necessary.

Operational Costs		Sub-total $Cx1000	Group total $Cx1000	INCLUDES
Imported water	Raw water		0.0	BULK SUPPLY IMPORTS: total payments for imported raw water
	Treated water			BULK SUPPLY IMPORTS: total payments for imported treated water
Energy	Raw water		0.0	POWER: all energy costs for water supply electricity and fuel for motive machinery
	Treatment			
	Transmission			
	Distribution			
External services: Outsourcing	Outsourcing		0.0	Outsourcing of technical or administrative services, such as consultants, contractors undertaking operational tasks, meter reading and accounting fees
	Software licences and IT support			Licence fees on computer software and technical support by software companies
	Associated Companies			Costs of associated companies that are not included in other items
	Third party services			Operating costs of providing water services to third parties (other than the regulated water supply function) that are not included in other items
Leasing and Rentals	Premises		0.0	Payments for leasing or renting premises
	Vehicles			Payments for leasing or renting vehicles
	Mobile Plant			Payments for leasing or renting mobile plant
	Fixed Plant			Payments for leasing or renting fixed plant
	Equipment			Payments for leasing or renting equipment
Purchases	Water treatment chemicals		0.0	All water treatment chemicals for water supply that are not in HIRED AND CONTRACTED SERVICES and which are required for operation of sources, treatment plants,transmission and distribution systems
	Other than chemicals and energy			All materials and consumables other than energy and water treatment chemicals for water supply, that are not in HIRED AND CONTRACTED SERVICES and which are required for operation of sources, treatment plants,transmission and distribution systems
Taxes, levies and fees	All kinds		0.0	Any operating licences paid to a Government or municipal authority, abstraction charges, local authority rates
Exceptional earnings and losses	All kinds		0.0	Any exceptional income or expenditure from donations, investment subsidies, compensations or adjustments related to sales/writing off of fixed assets
Other Operating Expenditures	Other direct costs		0.0	Any other operating costs (but excluding interest and taxation, on an aggregated basis)
	General and support expenditures			The aggregate direct cost of GENERAL AND SUPPORT ACTIVITIES (Manpower costs excluded)
	Customer services			Costs directly associated with customer services that are not included in previous items, related to customer accounting, reading of meters, debt revovery, costs of disconnections, customers'enquiries and complaints handling.
	Scientific services			Costs directly associated with scientific and laboratory services and with the monitoring of quality that are not included in previous items
	Other business activities			Costs directly associated with other business activities that are not included in previous items, except for cost depreciation
	Doubtful debts			Charge/credit to the profit and loss account for bad and doubtful debts
Sum of Operational Costs	All the above operational costs		0.0	
Internal manpower costs	Employment costs		0.0	The sum of the total manpower costs of permanent and temorary personnel, including employment-related social costs and benefits paid by the employer
Capitalised cost of self-constructed assets	Negative allocation		0.0	The summation of the amounts in each of the above cost categories that have been incurred in the construction of new or rehabilitated assets
Total Running Costs	Sum of Operational costs and Internal Manpower Costs, minus capitalised cost of self-constructed assets		0.0	

Comments:

Appendix J

PIFastCalc Output
Niagara-on-the-Lake

'LEAKS' Suite of LEAKAGE EVALUATION and ASSESSMENT KNOW-HOW SOFTWARE

WATER BALANCE AND PERFORMANCE INDICATORS PROGRAM 'PIFastCalcs'

ANNUAL WATER BALANCE CALCULATION IN IWA STANDARD FORMAT, WITH 95% CONFIDENCE LIMITS

Note:Calculations should be based on a 12-month period for all aspects of the worksheet to function correctly

					Standard	Version 1a	2nd Dec 2005		Canada	
					Data entry	Defaults	Calculated Values		From another Worksheet	
					Currency =	$C	Volume units =	Ml	and	m^3
Utility	Town of Niagara-on-the-Lake	Bulk supply (BS) or Distribution System (DS)?	DS		01/01/2005	to	01/01/2006	=	365	days
System	Whole System	Do most customers have storage tanks?	No		Calculation by	Steve Genser		Date	4-Dec-06	

Process Reliability Band	WATER BALANCE CALCULATIONS IWA Terminology COMPONENTS OF WATER BALANCE				Volume in period Ml	95% Confidence Limit as +/- %	Variance	FINANCIAL PERFORMANCE INDICATORS FOR NON-REVENUE WATER % of System Input Volume	Calculated Value of NRW as % of System Running Costs in Period Assessed marginal cost of individual components of Non-Revenue Water	Assessed Unit Value of individual components of Non Revenue Water	% of cost of running system
	WOS: Volume from Own Sources (corrected for known systematic errors)						0	0.0%			
A	WI: Water Imported (corrected for known systematic errors)				3193.6	6.0%	9498	100.0%			
	SIV: SYSTEM INPUT VOLUME				3193.6	6.0%	9498	100.0%			
	BACE:Water Exported						0	0.0%			
	WS: WATER SUPPLIED = SIV - BACE				3193.6	6.0%	9498	100.0%			
B/C	BACM1: Billed Authorised Consumption: Metered	Total			3225.0	1.5%	609	101.3%			
	BACM2: Billed Authorised Consumption: Metered						0	0.0%			
	BACM3: Billed Authorised Consumption: Metered						0	0.0%			
D	BACU: Billed Authorised Consumption:Unmetered						0	0.0%	$C/m3	$Cx1000	%
	NRW: NON-REVENUE WATER				-41.5	-475.2%	10107	-1.3%	0.0000	0.0	0.0%
A	UACM: Unbilled Authorised Consumption: Metered		0.00%	of WS			0	0.0%		0.0	0.0%
D	UACU: Unbilled Authorised Consumption: Unmetered:	Estimated as	1.250%	of WS	39.9	100.0%	412	1.3%		0.0	0.0%
	WL WATER LOSSES				-81.3	-247.4%	10519	-2.6%	0.0000	0.0	0.0%
D	UC: Unauthorised Consumption:	Estimated as	0.250%	of WS	8.0	100.0%	16	0.3%		0.0	0.0%
B/C	ALMUR1: Apparent Loss - meter under-registration:	Total	0.60%	of BACM1	19.5	7.0%	0	0.6%		0.0	0.0%
	ALMUR2: Apparent Loss - meter under-registration:			of BACM2	0.0		0	0.0%		0.0	0.0%
	ALMUR3: Apparent Loss - meter under-registration:			of BACM3 and UACM	0.0		0	0.0%		0.0	0.0%
D	ALDCD Customer meter data handling errors						0	0.0%		0.0	0.0%
	AL: Sum of APPARENT LOSSES				27.4	29.4%	17	0.9%	0.0000	0.0	0.0%
	RL: REAL LOSSES				-108.7	-185.1%	10536	-3.4%		0.0	0.0%
A	% of period system pressurized =	100.0%	365.0	days			Cost of running system in period =				$Cx1000
	CARL: CURRENT ANNUAL REAL LOSSES (when system is pressurized)				-0.30	Ml/day					

Process Reliability Band	SYSTEM INFRASTRUCTURE AND PRESSURE DATA		Valid for UARL & ILI calc?	95% CLs as +/- %
A	Lm: Mains Length, km	224.24	Yes	1.0%
A	Nh: Number of Fire Hydrants	1080		1.0%
A/B	Nb: Number of Separately Billed Properties	5306		2.0%
B	R: Ratio of billed Service Connections (Ns, main to property line) to Billed Props (Nb)	1.000		2.0%
	Ns: No. of billed Service Connections	5306		2.8%
C	Nu: Number of Unbilled Service Connections	0		
	Nt: Total Number of Service Conns (= Ns + Nu), mains to property line	5306	Yes	2.8%
	DC: Density of Connections/ km of mains = Ns/Lm	23.7		3.0%
B	Lp: Average pipe length, property line to meter (m)	8.5		25.0%
	Lp: Total pipe length, property line to meter (km)	45.10		25.2%
C	P: Average pressure when system pressurised (psi)	73.0	Yes	40.0%
	P: Average pressure when system pressurised (m)	51.6		40.0%

ASSESSMENT OF UNAVOIDABLE REAL LOSSES, AND VOLUME AND COST OF POTENTIALLY RECOVERABLE REAL LOSSES

Notes: If Lm and Lp are in km and pressure P is in metres

UBL in litres/hour = (20 x Lm + 1.25 x Nt + 33 x Lp) x $(P/50)^{1.5}$

UARL in litres/day = (18 x Lm + 0.8 x Nt + 25 x Lp) x P

COMPONENT OF REAL LOSSES	Ml per day	Ml in period	$Cx1000 in period	95% CLs as +/- %
UBL: UNAVOIDABLE BACKGROUND LEAKAGE	0.32	116		60.1%
UARL: UNAVOIDABLE ANNUAL REAL LOSSES	0.49	177		40.1%
CARL: CURRENT ANNUAL REAL LOSSES	-0.30	-109		-185.1%
POTENTIALLY RECOVERABLE REAL LOSSES = CARL - UARL	-0.78	-286		-74.6%

IWA BEST PRACTICE PERFORMANCE INDICATOR		UNITS OF PERFORMANCE INDICATOR	Best estimate	95% CLs as +/- %	Lowest Estimate	Highest Estimate
Non Revenue Water Basic (IWA Level 1, Fin36)		% of System Input by Volume	-1.3	475.2%	4.9	-7.5
Non Revenue Water Basic (IWA Level 1, Fin37)		% of System Input by Value		475.2%		
Apparent Losses (IWA Op23)	Best Op23 Pi >	% of Water Supplied (Distribution Systems)	0.9	30.0%	0.6	1.1
		% of System Input Volume (Bulk Supply Systems)	0.9	30.0%	0.6	1.1
Real Losses Basic (IWA Level 1, Op24)	Best Op24 Pi >	Litres/service connection/day, when system pressurised	-56	185.1%	48	-160
		m3/km of mains/day, when system pressurised	-1.3	185.1%	1.1	-3.8
Real Losses Detailed (IWA Level 3, Op 25)		Infrastructure Leakage Index ILI (non-dimensional)	-0.61	189.4%	0.55	-1.77

Comments:

Water Supplied by Niagara Region from both Decew Falls system (5D5, 5D6 & 5D9) as well as Niagara Falls WTP (1D1, 1D2, 1D3, 1D4). Calibration reports provided as follows:

5D5, 5D6 - May 20, 2005
5D9 - no report
1D1, 1D2 - May 4, and October 13, 2005
1D3 - August 10, and November 1, 2005
1D4 - May 4 and October 13, 2005 - problematic meter at its highest accounted for 6% of overall supply.

Process Reliability Bands:

A - actual data
B - calculated based on actual data
C - calculated estimate
D - no data / default

Combinations, for example, B/C may be used to illustrate a calculated estimate based on partial data

No costs for operating the system provided.

Total length of watermain allow for 3 m per hydrant

'LEAKS' Suite of LEAKAGE EVALUATION and ASSESSMENT KNOW-HOW SOFTWARE

WATER BALANCE AND PERFORMANCE INDICATORS PROGRAM 'PIFastCalcs'

DETAILED CALCULATION OF COMPONENTS OF AUTHORISED AND UNAUTHORISED CONSUMPTION

Utility	Town of Niagara-on-the-Lake		Data entry	Calculated Values		From another Worksheet	
System	Whole System	01/01/2005	to	01/01/2006	=	365	days
		Calculation by				Date	

Components of Authorised Consumption	Components in Ml: Billed Metered	Billed Unmetered	Unbilled Metered	Unbilled Unmetered	Total	Additional information on sources of data and basis of estimates E = estimated R = Based on recordings
					0.00	
					0.00	
					0.00	
					0.00	
					0.00	
					0.00	
					0.00	
					0.00	
					0.00	
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					0.00	
					0.00	
					0.00	
					0.00	
					0.00	
					0.00	
					0.00	
Authorised consumption sub-totals	0.00	0.00	0.00	0.00	0.00	Ml

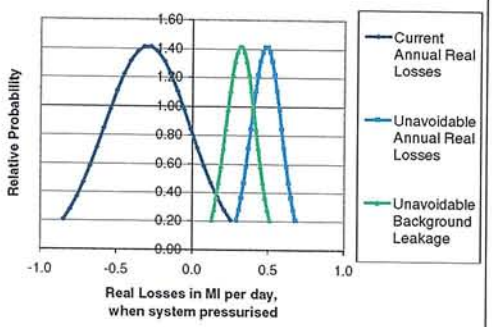
Authorised Unbilled Unmetered Consumption = 0.000% of Water Supplied, transfer this figure to Cell E21 of 'WaterBalance&Pis' Worksheet

Components of Unauthorised Consumption	Ml	Method of estimation
Unauthorised consumption sub-total	0.00	Ml

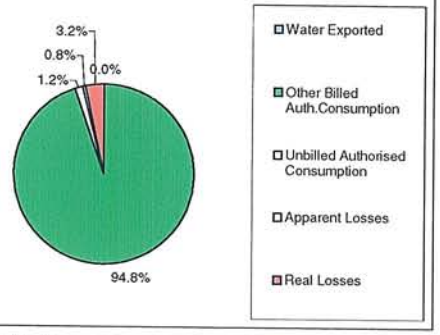
Unauthorised consumption = 0.000% of Water Supplied, transfer this figure to Cell E23 of 'WaterBalance&Pis' Worksheet

WATER BALANCE AND PERFORMANCE INDICATORS PROGRAM 'PIFastCalcs'		Standard	Version 1a	2nd Dec 2005	Canada
Utility	Town of Niagara-on-the-Lake	01/01/2005 to 01/01/2006	365	days	
System	Whole System				

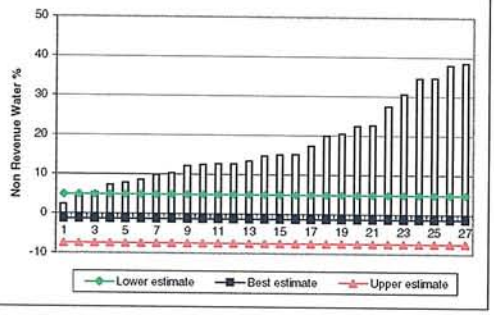
Real Losses and 95% Confidence Limits



Water Balance Components as % of System Input Volume



NRW % by Volume; Comparison with International Data Set
IWA Level 1 (Basic) Financial PI for Non-Revenue Water (Fin36)
Non-Revenue Water as % of System Input Volume



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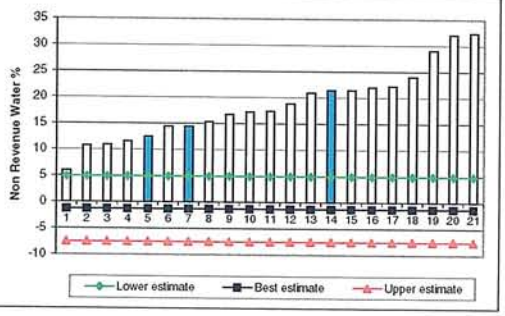
NRW as % of System Input Volume: Canadian data in blue



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(when system is pressurised)
Compared with International data set
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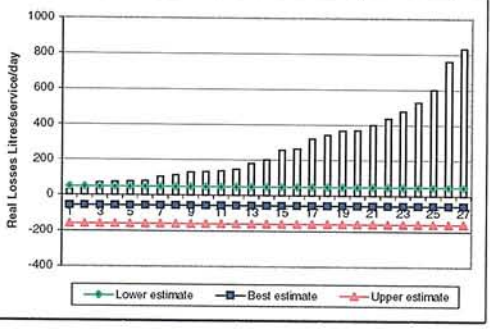

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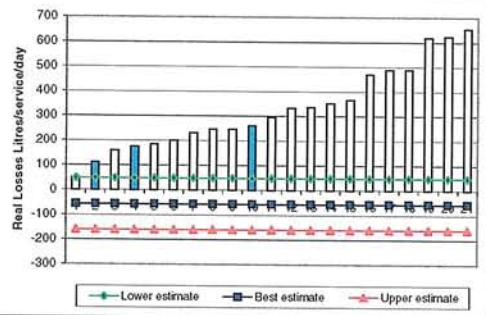

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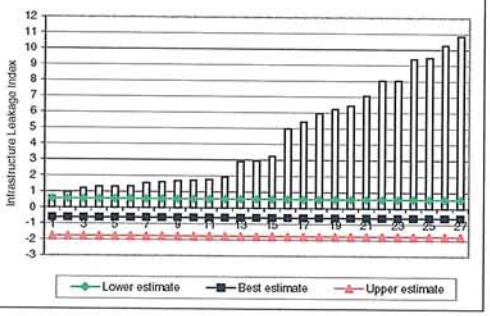

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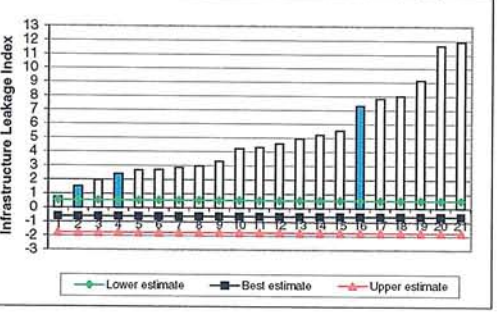

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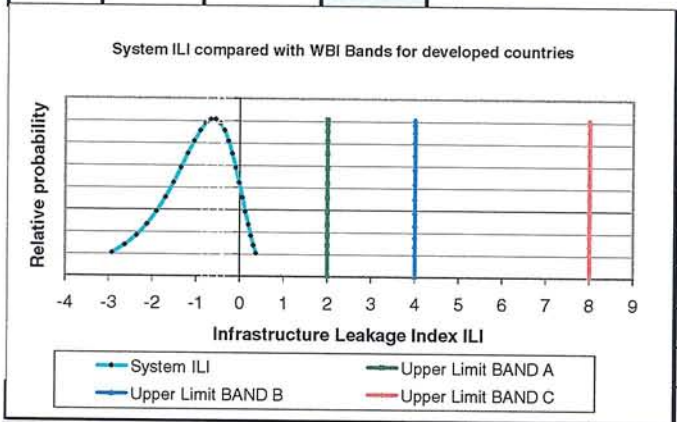
4 to < 8	2 to < 4	B		Potential for marked improvements; consider pressure management, better active leakage control practices, and better network maintenance
8 to < 16	4 to < 8	C		Poor leakage record; tolerable only if water is plentiful and cheap; even then, analyze level and nature of leakage and intensify leakage reduction efforts
16 or more	8 or more	D		Very inefficient use of resources; leakage reduction programs imperative and high priority



WBI Recommendations for BANDS	A	B	C	D
Investigate pressure management options	Yes	Yes	Yes	
Investigate speed and quality of repairs	Yes	Yes	Yes	
Check economic intervention frequency	Yes	Yes		
Introduce/improve active leakage control		Yes	Yes	
Identify options for improved maintenance		Yes	Yes	
Assess Economic Leakage Level	Yes	Yes		
Review break frequencies		Yes	Yes	
Review asset management policy		Yes	Yes	Yes
Deal with deficiencies in manpower, training and communications			Yes	Yes
5-year plan to achieve next lowest band			Yes	Yes
Fundamental peer review of all activities				Yes

GUIDELINE 2: The AWWA Water Loss Committee general guidelines for setting a target ILI (in lieu of having a determination of a system-specific economic level of leakage). Source of information: Table 7 in the AWWA Water Loss Committee Report in the AWWA Journal, August 2003

Note: since this table was published, simplified methods of calculating an economic frequency of intervention for active leakage control by regular survey have been been developed and are included in the ALCCalc software. This has allowed the development of the ELLCalc software to calculate short-term ELL for an active leakage control policy of regular survey. Data from England & Wales (where many Water Companies are recognised as having achieved ELL) suggests that in developed couintries, the ELL (in terms of ILI) is unlikely to exceed 3.0, even where water is plentiful and inexpensive.

Target ILI Range	This System ILI	Water Resources Considerations	Operational Considerations	Financial Considerations
1.0 - 3.0	-0.6	Available resources are greatly limited and are very difficult and/or environmentally unsound to develop	Operating with system leakage above this level would require expansion of existing infrastructure and/or additional water resources to meet the demand	Water resources are costly to develop or purchase; ability to increase revenues via water rates is greatly limited because of regulation or low ratepayer affordability
3.0 - 5.0		Water resources are believed to be sufficient to meet long-term needs, but demand management interventions (leakage management,water conservation) are included in the long-term planning	Existing water supply infrastructure capability is sufficient to meet long-term demand as long as reasonable leakage management controls are in place	Water resources can be developed or purchased at reasonable expense; periodic water rate increases can be feasibly imposed and are tolerated by the customer population
5.0 - 8.0		Water resources are plentiful, reliable, and easily abstracted	Superior reliability, capacity and integrity of the water supply infrastructure make it relatively immune to shortages	Cost to purchase or obtain/treat water is low, as are rates charged to customers
Greater than 8.0		Although operational and financial considerations may allow a long-term ILI greater than 8.0, such a level of leakage is not an effective utilization of water as a resource. Setting a target level greater than 8.0 - other than as an incremental goal to a smaller long-term target - is discouraged.		

Note: Simplified methods of calculating an economic frequency of intervention for active leakage control by regular survey have been been developed and are included in the **ALCCalcs** Standard software. This has allowed the development of the **ELLCalcs** standard software to calculate short-term Economic Leakage Level for an active leakage control policy of regular survey.

Important Footnote: the Infrastructure Leakage Index (ILI) provides guidance as to how well real losses are being managed (in terms of repairs, active leakage control and infrastructure management) at the current operating pressure. However, calculation of the ILI does not imply that pressure management in a system is optimal, or economic. If system pressures are excessive, or subject to surges, then pressure management may result in additional benefits for real losses management - in particular, a reduction in new burst frequency and annual repair costs, and a reduction in flow rates of existing leaks. So even if a low ILI is being achieved, there may still be opportunities to reduce annual real losses by improved pressure management. The **PressCalcs** Standard Software provides more detailed information on this topic.

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WATER BALANCE AND PERFORMANCE INDICATORS PROGRAM 'PIFastCalcs'	Standard	Version 1a	2nd Dec 2005	Canada	Master.0000
OPTIONAL DATA ENTRY SHEET FOR ANNUAL SYSTEM RUNNING COSTS		Data entry	Calculated Values	From another Worksheet	
Utility: Town of Niagara-on-the-Lake	01/01/2005	to	1/1/2006	Number of Days in Period	365 days
System: Whole System	Calculation by		Steve Genser	Date of calculation =	12/4/2006

Total running costs as calculated below =	0.0	$Cx1000	Transfer this figure to Cell L30 of 'WaterBalance&Pis' Worksheet

Note: The following definitions of annual system running costs should be considered as guidelines only. They are based on the 'Financial Definitions' in pages 19 and 20 of the IWA 'Manual of Best Practice 'Performance Indicators for Water Supply Services', (Alegre H, Hirner W, Baptista J.M. and Parena R, July 2000, ISBN 1 900222 27 2, IWA Publishing; this report should be consulted for further guidance as necessary.

Operational Costs		Sub-total $Cx1000	Group total $Cx1000	INCLUDES
Imported water	Raw water		0.0	BULK SUPPLY IMPORTS: total payments for imported raw water
	Treated water			BULK SUPPLY IMPORTS: total payments for imported treated water
Energy	Raw water		0.0	POWER: all energy costs for water supply electricity and fuel for motive machinery
	Treatment			
	Transmission			
	Distribution			
External services: Outsourcing	Outsourcing		0.0	Outsourcing of technical or administrative services, such as consultants, contractors undertaking operational tasks, meter reading and accounting fees
	Software licences and IT support			Licence fees on computer software and technical support by software companies
	Associated Companies			Costs of associated companies that are not included in other items
	Third party services			Operating costs of providing water services to third parties (other than the regulated water supply function) that are not included in other items
Leasing and Rentals	Premises		0.0	Payments for leasing or renting premises
	Vehicles			Payments for leasing or renting vehicles
	Mobile Plant			Payments for leasing or renting mobile plant
	Fixed Plant			Payments for leasing or renting fixed plant
	Equipment			Payments for leasing or renting equipment
Purchases	Water treatment chemicals		0.0	All water treatment chemicals for water supply that are not in HIRED AND CONTRACTED SERVICES and which are required for operation of sources, treatment plants,transmission and distribution systems
	Other than chemicals and energy			All materials and consumables other than energy and water treatment chemicals for water supply, that are not in HIRED AND CONTRACTED SERVICES and which are required for operation of sources, treatment plants,transmission and distribution systems
Taxes, levies and fees	All kinds		0.0	Any operating licences paid to a Government or municipal authority, abstraction charges, local authority rates
Exceptional earnings and losses	All kinds		0.0	Any exceptional income or expenditure from donations, investment subsidies, compensations or adjustments related to sales/writing off of fixed assets
Other Operating Expenditures	Other direct costs		0.0	Any other operating costs (but excluding interest and taxation, on an aggregated basis)
	General and support expenditures			The aggregate direct cost of GENERAL AND SUPPORT ACTIVITIES (Manpower costs excluded)
	Customer services			Costs directly associated with customer services that are not included in previous items, related to customer accounting, reading of meters, debt revovery, costs of disconnections, customers'enquiries and complaints handling.
	Scientific services			Costs directly associated with scientific and laboratory services and with the monitoring of quality that are not included in previous items
	Other business activities			Costs directly associated with other business activities that are not included in previous items, except for cost depreciation
	Doubtful debts			Charge/credit to the profit and loss account for bad and doubtful debts
Sum of Operational Costs	All the above operational costs		0.0	
Internal manpower costs	Employment costs		0.0	The sum of the total manpower costs of permanent and temorary personnel, including employment-related social costs and benefits paid by the employer
Capitalised cost of self-constructed assets	Negative allocation		0.0	The summation of the amounts in each of the above cost categories that have been incurred in the construction of new or rehabilitated assets
Total Running Costs	Sum of Operational costs and Internal Manpower Costs, minus capitalised cost of self-constructed assets		0.0	

Comments:

Appendix K

PIFastCalc Output Pelham

'LEAKS' Suite of LEAKAGE EVALUATION and ASSESSMENT KNOW-HOW SOFTWARE

WATER BALANCE AND PERFORMANCE INDICATORS PROGRAM 'PIFastCalcs'

ANNUAL WATER BALANCE CALCULATION IN IWA STANDARD FORMAT, WITH 95% CONFIDENCE LIMITS				Standard	Version 1a	2nd Dec 2005		Canada	
				Data entry	Defaults	Calculated Values		From another Worksheet	
Note:Calculations should be based on a 12-month period for all aspects of the worksheet to function correctly				Currency =	$C	Volume units =	Ml	and	m^3
Utility	Town of Pelham	Bulk supply (BS) or Distribution System (DS)?	DS	01/01/2005	to	01/01/2006	=	365	days
System	Whole System	Do most customers have storage tanks?	No	Calculation by	Steve Gonser		Date	8-Feb-07	

Process Reliability Band	WATER BALANCE CALCULATIONS IWA Terminology COMPONENTS OF WATER BALANCE				Volume in period Ml	95% Confidence Limit as +/- %	Variance	FINANCIAL PERFORMANCE INDICATORS FOR NON-REVENUE WATER % of System Input Volume	Calculated Value of NRW as % of System Running Costs in Period Assessed marginal cost of individual components of Non-Revenue Water	Assessed Unit Value of individual components of Non Revenue Water	% of cost of running system
	WOS: Volume from Own Sources (corrected for known systematic errors)						0	0.0%			
A	WI: Water Imported (corrected for known systematic errors)				1722.2	3.0%	695	100.0%			
	SIV: SYSTEM INPUT VOLUME				1722.2	3.0%	695	100.0%			
	BACE:Water Exported						0	0.0%			
	WS: WATER SUPPLIED = SIV - BACE				1722.2	3.0%	695	100.0%			
A/B	BACM1: Billed Authorised Consumption: Metered	Total Billed			1440.4	1.5%	122	83.6%			
	BACM2: Billed Authorised Consumption: Metered						0	0.0%			
	BACM3: Billed Authorised Consumption: Metered						0	0.0%			
A	BACU: Billed Authorised Consumption:Unmetered						0	0.0%	$C/m3	$Cx1000	%
	NRW: NON-REVENUE WATER				281.8	19.9%	816	16.4%	0.4637	130.7	12.7%
A	UACM: Unbilled Authorised Consumption: Metered		0.00%	of WS			0	0.0%	0.4460	0.0	0.0%
D	UACU: Unbilled Authorised Consumption: Unmetered:	Estimated as	1.250%	of WS	21.5	100.0%	121	1.3%	0.4460	9.6	0.9%
	WL WATER LOSSES				260.3	23.1%	937	15.1%	0.4652	121.1	11.7%
D	UC: Unauthorised Consumption:	Estimated as	0.250%	of WS	4.3	100.0%	5	0.3%	0.8300	3.6	0.3%
	ALMUR1: Apparent Loss - meter under-registration:	Total Billed	0.60%	of BACM1	8.7	7.0%	0	0.5%	0.8300	7.2	0.7%
	ALMUR2: Apparent Loss - meter under-registration:			of BACM2	0.0		0	0.0%		0.0	0.0%
	ALMUR3: Apparent Loss - meter under-registration:			of BACM3 and UACM	0.0		0	0.0%		0.0	0.0%
	ALDCD Customer meter data handling errors						0	0.0%	0.8300	0.0	0.0%
	AL: Sum of APPARENT LOSSES				13.0	33.4%	5	0.8%	0.8300	10.8	1.0%
	RL: REAL LOSSES				247.3	24.3%	942	14.4%	0.4460	110.3	10.7%
	% of period system pressurized =	100.0%	365.0	days			Cost of running system in period =			1031.7	$Cx1000
	CARL: CURRENT ANNUAL REAL LOSSES (when system is pressurized)				0.68	Ml/day					

Process Reliability Band	SYSTEM INFRASTRUCTURE AND PRESSURE DATA		Valid for UARL & ILI calc?	95% CLs as +/- %
A	Lm: Mains Length, km	68.66	Yes	1.0%
A	Nh: Number of Fire Hydrants	438		1.0%
A/B	Nb: Number of Separately Billed Properties	4237		2.0%
A/B	R: Ratio of billed Service Connections (Ns, main to property line) to Billed Props (Nb)	1.000		2.0%
	Ns: No. of billed Service Connections	4237		2.8%
C	Nu: Number of Unbilled Service Connections	4		25.0%
	Nt: Total Number of Service Conns (= Ns + Nu), mains to property line	4241	Yes	2.8%
	DC: Density of Connections/ km of mains = Ns/Lm	61.8		3.0%
B	Lp: Average pipe length, property line to meter (m)	10.2		2.4%
	Lp: Total pipe length, property line to meter (km)	43.22		3.7%
A/B	P: Average pressure when system pressurised (psi)	69.0	Yes	5.0%
	P: Average pressure when system pressurised (m)	48.8		5.0%

ASSESSMENT OF UNAVOIDABLE REAL LOSSES, AND VOLUME AND COST OF POTENTIALLY RECOVERABLE REAL LOSSES

Notes: If Lm and Lp are in km and pressure P is in metres

UBL in litres/hour = (20 x Lm + 1.25 x Nt + 33 x Lp) x $(P/50)^{1.5}$

UARL in litres/day = (18 x Lm + 0.8 x Nt + 25 x Lp) x P

COMPONENT OF REAL LOSSES	Ml per day	Ml in period	$Cx1000 in period	95% CLs as +/- %
UBL: UNAVOIDABLE BACKGROUND LEAKAGE	0.19	68	30.5	7.7%
UARL: UNAVOIDABLE ANNUAL REAL LOSSES	0.28	102	45.3	5.3%
CARL: CURRENT ANNUAL REAL LOSSES	0.68	247	110.3	24.3%
POTENTIALLY RECOVERABLE REAL LOSSES = CARL - UARL	0.40	146	65.0	41.5%

IWA BEST PRACTICE PERFORMANCE INDICATOR		UNITS OF PERFORMANCE INDICATOR	Best estimate	95% CLs as +/- %	Lowest Estimate	Highest Estimate
Non Revenue Water Basic (IWA Level 1, Fin36)		% of System Input by Volume	16.4	20.1%	13.1	19.7
Non Revenue Water Basic (IWA Level 1, Fin37)		% of System Input by Value	12.7	20.1%	10.1	15.2
Apparent Losses (IWA Op23)	Best Op23 PI >	% of Water Supplied (Distribution Systems)	0.8	33.6%	0.5	1.0
		% of System Input Volume (Bulk Supply Systems)	0.8	33.6%	0.5	1.0
Real Losses Basic (IWA Level 1, Op24)	Best Op24 PI >	Litres/service connection/day, when system pressurised	160	24.5%	121	199
		m3/km of mains/day, when system pressurised	9.9	24.3%	7.5	12.3
Real Losses Detailed (IWA Level 3, Op 25)		Infrastructure Leakage Index ILI (non-dimensional)	2.43	24.9%	1.83	3.04

Comments:

Region billing equation = 3D1 + 3D2

No Calibration Reports.

Process Reliability Bands:

A - actual data
B - calculated based on actual data
C - calculated estimate
D - no data / default

Combinations, for example, B/C may be used to illustrate a calculated estimate based on partial data

Total length of watermain allow for 3 m per hydrant

'LEAKS' Suite of LEAKAGE EVALUATION and ASSESSMENT KNOW-HOW SOFTWARE

WATER BALANCE AND PERFORMANCE INDICATORS PROGRAM 'PIFastCalcs'

DETAILED CALCULATION OF COMPONENTS OF AUTHORISED AND UNAUTHORISED CONSUMPTION			Data entry	Calculated Values		From another Worksheet
Utility	Town of Pelham	01/01/2005 to	01/01/2006 =	365	days	
System	Whole System	Calculation by				Date

Components of Authorised Consumption	Components in Ml: Billed Metered	Billed Unmetered	Unbilled Metered	Unbilled Unmetered	Total	Additional information on sources of data and basis of estimates E = estimated R = Based on recordings
					0.00	
					0.00	
					0.00	
					0.00	
					0.00	
					0.00	
					0.00	
					0.00	
					0.00	
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					0.00	
					0.00	
					0.00	
					0.00	
					0.00	
					0.00	
					0.00	
					0.00	
Authorised consumption sub-totals	0.00	0.00	0.00	0.00	0.00	Ml

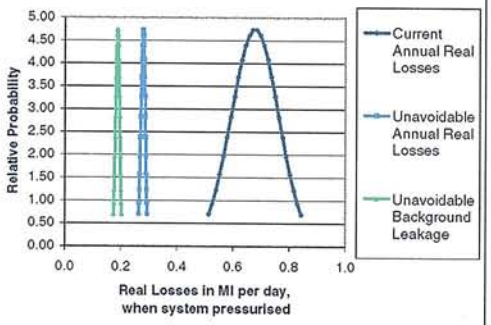
Authorised Unbilled Unmetered Consumption = 0.000% of Water Supplied, transfer this figure to Cell E21 of 'WaterBalance&Pis' Worksheet

Components of Unauthorised Consumption	Ml	Method of estimation
Unauthorised consumption sub-total	0.00	Ml

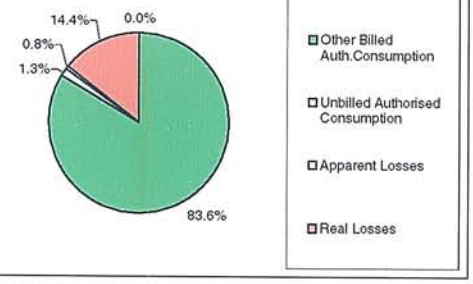
Unauthorised consumption = 0.000% of Water Supplied, transfer this figure to Cell E23 of 'WaterBalance&Pis' Worksheet

WATER BALANCE AND PERFORMANCE INDICATORS PROGRAM 'PIFastCalcs'		Standard	Version 1a	2nd Dec 2005	Canada
Utility	Town of Pelham	01/01/2005 to 01/01/2006	365	days	
System	Whole System				

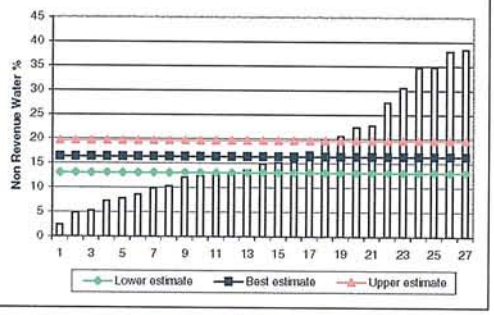
Real Losses and 95% Confidence Limits



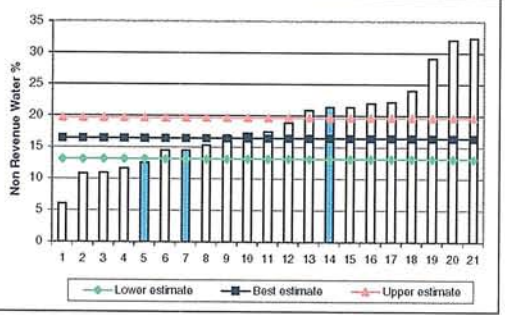
Water Balance Components as % of System Input Volume



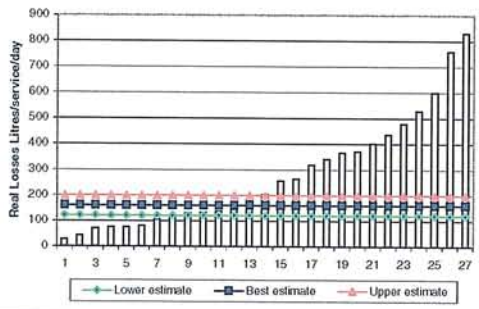
NRW % by Volume; Comparison with International Data Set
IWA Level 1 (Basic) Financial PI for Non-Revenue Water (Fin36)
Non-Revenue Water as % of System Input Volume



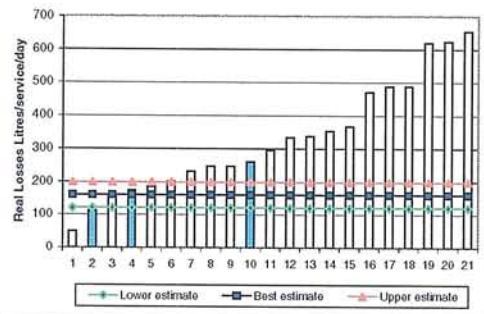
NRW % by Volume; Comparison with North American Data Set
IWA Level 1 (Basic) Financial PI for Non-Revenue Water (Fin36)
NRW as % of System Input Volume: Canadian data in blue



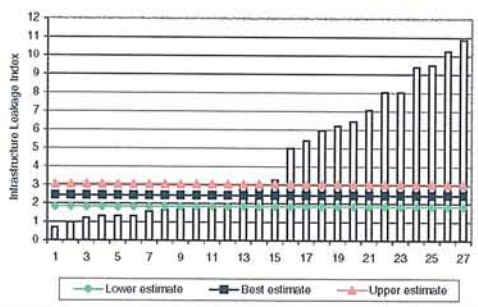
Real Losses in litres/service connection/day
(when system is pressurised)
Compared with International data set
IWA Level 1 (Basic) Operational PI for Real Losses (Op24)
Use Litres/service conn./day if Density of Connections > 20 per km of mains
All international data set have density of connections > 20 per km of mains



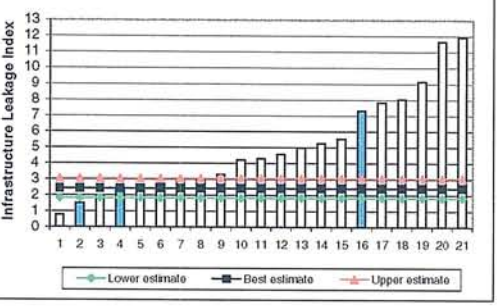
Real Losses in litres/service connection/day
when system is pressurised
Compared with North American data set, Canadian data in blue
IWA Level 1 (Basic) Operational PI for Real Losses (Op24)
Use Litres/service conn./day if Density of Connections > 20 per km of mains
All European data set have density of connections > 20 per km of mains



Infrastructure Leakage Index ILI for Real Losses
Compared with International data set
IWA Level 3 (Detailed) Operational PI for Real Losses (Op25)



Infrastructure Leakage Index ILI for Real Losses
Compared with North American data set, Canadian data in blue
IWA Level 3 (Detailed) Operational PI for Real Losses (Op25)



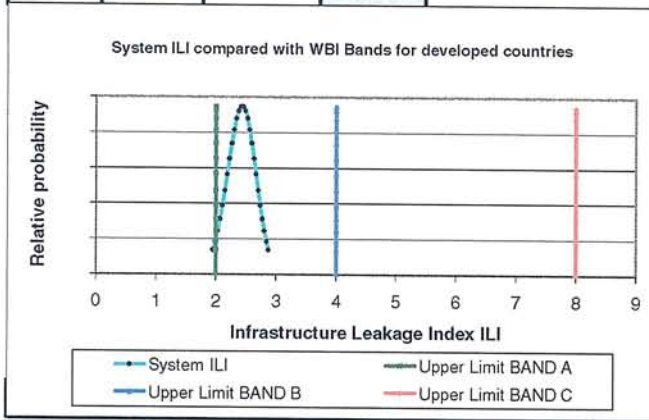
'LEAKS' Suite of LEAKAGE EVALUATION and ASSESSMENT KNOW-HOW SOFTWARE						
WATER BALANCE AND PERFORMANCE INDICATORS PROGRAM 'PIFastCalcs'						
PIFastCalcs	Standard	Version 1a	2nd Dec 2005	Canada	Master.0000	Town of Pelham

THIS WORKSHEET COMPARES THE CALCULATED SYSTEM ILI WITH WORLD BANK INSTITUTE GUIDELINES

World Bank Institute (WBI) Guidelines

The World Bank Institute has recently introduced, into its NRW Training Modules, a target matrix for Real Losses management performance, based on real losses in volume/service connection/day for a range of average operating pressures, and classified into Bands A to D. The targets assume that customer meters are located at the property boundary, with an average connection density of around 40 per km mains. Bands A to D in the WBI target matrix can also be shown as an equivalent range of ILIs, which can be applied to a wider range of connection densities and customer meter locations, as shown below. Band limits in terms of ILIs, general descriptions of each Band, and appropriate recommended actions are as follows:

Developing Countries ILI range	Developed Countries ILI range	BAND	Calculated ILI for this System	General description of Real Loss Management Performance Categories for Developed and Developing Countries
Less than 4	Less than 2	A		Further loss reduction may be uneconomic unless there are shortages; careful analysis needed to identify cost-effective improvement
4 to < 8	2 to < 4	B	2.4	Potential for marked improvements; consider pressure management, better active leakage control practices, and better network maintenance
8 to < 16	4 to < 8	C		Poor leakage record; tolerable only if water is plentiful and cheap; even then, analyze level and nature of leakage and intensify leakage reduction efforts
16 or more	8 or more	D		Very inefficient use of resources; leakage reduction programs imperative and high priority



WBI Recommendations for BANDS	A	B	C	D
Investigate pressure management options	Yes	Yes	Yes	
Investigate speed and quality of repairs	Yes	Yes	Yes	
Check economic intervention frequency	Yes	Yes		
Introduce/improve active leakage control		Yes	Yes	
Identify options for improved maintenance		Yes	Yes	
Assess Economic Leakage Level	Yes	Yes		
Review break frequencies		Yes	Yes	
Review asset management policy		Yes	Yes	Yes
Deal with deficiencies in manpower, training and communications			Yes	Yes
5-year plan to achieve next lowest band			Yes	Yes
Fundamental peer review of all activities				Yes

GUIDELINE 2: The AWWA Water Loss Committee general guidelines for setting a target ILI (in lieu of having a determination of a system-specific economic level of leakage). Source of information: Table 7 in the AWWA Water Loss Committee Report in the AWWA Journal, August 2003

Note: since this table was published, simplified methods of calculating an economic frequency of intervention for active leakage control by regular survey have been been developed and are included in the ALCCalc software. This has allowed the development of the ELLCalc software to calculate short-term ELL for an active leakage control policy of regular survey. Data from England & Wales (where many Water Companies are recognised as having achieved ELL) suggests that in developed couintries, the ELL (in terms of ILI) is unlikely to exceed 3.0, even where water is plentiful and inexpensive.

Target ILI Range	This System ILI	Water Resources Considerations	Operational Considerations	Financial Considerations
1.0 - 3.0	2.4	Available resources are greatly limited and are very difficult and/or environmentally unsound to develop	Operating with system leakage above this level would require expansion of existing infrastructure and/or additional water resources to meet the demand	Water resources are costly to develop or purchase; ability to increase revenues via water rates is greatly limited because of regulation or low ratepayer affordability
3.0 - 5.0		Water resources are believed to be sufficient to meet long-term needs, but demand management interventions (leakage management,water conservation) are included in the long-term planning	Existing water supply infrastructure capability is sufficient to meet long-term demand as long as reasonable leakage management controls are in place	Water resources can be developed or purchased at reasonable expense; periodic water rate increases can be feasibly imposed and are tolerated by the customer population
5.0 - 8.0		Water resources are plentiful, reliable, and easily abstracted	Superior reliability, capacity and integrity of the water supply infrastructure make it relatively immune to shortages	Cost to purchase or obtain/treat water is low, as are rates charged to customers
Greater than 8.0		Although operational and financial considerations may allow a long-term ILI greater than 8.0, such a level of leakage is not an effective utilization of water as a resource. Setting a target level greater than 8.0 - other than as an incremental goal to a smaller long-term target - is discouraged.		

Note: Simplified methods of calculating an economic frequency of intervention for active leakage control by regular survey have been been developed and are included in the **ALCCalcs** Standard software. This has allowed the development of the **ELLCalcs** standard software to calculate short-term Economic Leakage Level for an active leakage control policy of regular survey.

Important Footnote: the Infrastructure Leakage Index (ILI) provides guidance as to how well real losses are being managed (in terms of repairs, active leakage control and infrastructure management) at the current operating pressure. However, calculation of the ILI does not imply that pressure management in a system is optimal, or economic. If system pressures are excessive, or subject to surges, then pressure management may result in additional benefits for real losses management - in particular, a reduction in new burst frequency and annual repair costs, and a reduction in flow rates of existing leaks. So even if a low ILI is being achieved, there may still be opportunities to reduce annual real losses by improved pressure management. The **PressCalcs** Standard Software provides more detailed information on this topic.

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WATER BALANCE AND PERFORMANCE INDICATORS PROGRAM 'PIFastCalcs'			Standard	Version 1a	2nd Dec 2005	Canada	Master.0000
OPTIONAL DATA ENTRY SHEET FOR ANNUAL SYSTEM RUNNING COSTS			Data entry		Calculated Values	From another Worksheet	
Utility	Town of Pelham	01/01/2005 to	1/1/2006		Number of Days in Period	365	days
System	Whole System	Calculation by	Steve Genser		Date of calculation =	7-Sep-06	

Total running costs as calculated below =	0.0	$Cx1000	Transfer this figure to Cell L30 of 'WaterBalance&Pis' Worksheet

Note: The following definitions of annual system running costs should be considered as guidelines only. They are based on the 'Financial Definitions' in pages 19 and 20 of the IWA 'Manual of Best Practice 'Performance Indicators for Water Supply Services', (Alegre H, Hirner W, Baptista J.M. and Parena R, July 2000, ISBN 1 900222 27 2, IWA Publishing; this report should be consulted for further guidance as necessary.

Operational Costs		Sub-total $Cx1000	Group total $Cx1000	INCLUDES
Imported water	Raw water		0.0	BULK SUPPLY IMPORTS: total payments for imported raw water
	Treated water			BULK SUPPLY IMPORTS: total payments for imported treated water
Energy	Raw water		0.0	POWER: all energy costs for water supply electricity and fuel for motive machinery
	Treatment			
	Transmission			
	Distribution			
External services: Outsourcing	Outsourcing		0.0	Outsourcing of technical or administrative services, such as consultants, contractors undertaking operational tasks, meter reading and accounting fees
	Software licences and IT support			Licence fees on computer software and technical support by software companies
	Associated Companies			Costs of associated companies that are not included in other items
	Third party services			Operating costs of providing water services to third parties (other than the regulated water supply function) that are not included in other items
Leasing and Rentals	Premises		0.0	Payments for leasing or renting premises
	Vehicles			Payments for leasing or renting vehicles
	Mobile Plant			Payments for leasing or renting mobile plant
	Fixed Plant			Payments for leasing or renting fixed plant
	Equipment			Payments for leasing or renting equipment
Purchases	Water treatment chemicals		0.0	All water treatment chemicals for water supply that are not in HIRED AND CONTRACTED SERVICES and which are required for operation of sources, treatment plants,transmission and distribution systems
	Other than chemicals and energy			All materials and consumables other than energy and water treatment chemicals for water supply, that are not in HIRED AND CONTRACTED SERVICES and which are required for operation of sources, treatment plants,transmission and distribution systems
Taxes, levies and fees	All kinds		0.0	Any operating licences paid to a Government or municipal authority, abstraction charges, local authority rates
Exceptional earnings and losses	All kinds		0.0	Any exceptional income or expenditure from donations, investment subsidies, compensations or adjustments related to sales/writing off of fixed assets
Other Operating Expenditures	Other direct costs		0.0	Any other operating costs (but excluding interest and taxation, on an aggregated basis)
	General and support expenditures			The aggregate direct cost of GENERAL AND SUPPORT ACTIVITIES (Manpower costs excluded)
	Customer services			Costs directly associated with customer services that are not included in previous items, related to customer accounting, reading of meters, debt revovery, costs of disconnections, customers'enquiries and complaints handling.
	Scientific services			Costs directly associated with scientific and laboratory services and with the monitoring of quality that are not included in previous items
	Other business activities			Costs directly associated with other business activities that are not included in previous items, except for cost depreciation
	Doubtful debts			Charge/credit to the profit and loss account for bad and doubtful debts
Sum of Operational Costs	All the above operational costs		0.0	
Internal manpower costs	Employment costs		0.0	The sum of the total manpower costs of permanent and temorary personnel, including employment-related social costs and benefits paid by the employer
Capitalised cost of self-constructed assets	Negative allocation		0.0	The summation of the amounts in each of the above cost categories that have been incurred in the construction of new or rehabilitated assets
Total Running Costs	Sum of Operational costs and Internal Manpower Costs, minus capitalised cost of self-constructed assets		0.0	

Comments:

Appendix L

PIFastCalc Output Port Colborne

'LEAKS' Suite of LEAKAGE EVALUATION and ASSESSMENT KNOW-HOW SOFTWARE

WATER BALANCE AND PERFORMANCE INDICATORS PROGRAM 'PIFastCalcs'

ANNUAL WATER BALANCE CALCULATION IN IWA STANDARD FORMAT, WITH 95% CONFIDENCE LIMITS

Note:Calculations should be based on a 12-month period for all aspects of the worksheet to function correctly

					Standard	Version 1a	2nd Dec 2005		Canada	
					Data entry	Defaults	Calculated Values		From another Worksheet	
					Currency =	$C	Volume units =	Ml	and	m^3
Utility	Town of Port Colborne	Bulk supply (BS) or Distribution System (DS)?	DS		01/01/2005	to	01/01/2006	=	365	days
System	Whole System	Do most customers have storage tanks?	No		Calculation by	Steve Genser		Date	4-Dec-06	

Process Reliability Band	WATER BALANCE CALCULATIONS				Volume in period	95% Confidence Limit as +/- %	Variance	FINANCIAL PERFORMANCE INDICATORS FOR NON-REVENUE WATER			
	IWA Terminology							% of System Input Volume	Calculated Value of NRW as % of System Running Costs in Period		
	COMPONENTS OF WATER BALANCE				Ml				Assessed marginal cost of individual components of Non-Revenue Water	Assessed Unit Value of individual components of Non Revenue Water	% of cost of running system
	WOS: Volume from Own Sources (corrected for known systematic errors)						0	0.0%			
A	WI: Water Imported (corrected for known systematic errors)				3909.0	3.0%	3580	100.0%			
	SIV: SYSTEM INPUT VOLUME				3909.0	3.0%	3580	100.0%			
	BACE:Water Exported						0	0.0%			
	WS: WATER SUPPLIED = SIV - BACE				3909.0	3.0%	3580	100.0%			
A/B	BACM1: Billed Authorised Consumption: Metered	Residential			1546.9	1.5%	140	39.6%			
A	BACM2: Billed Authorised Consumption: Metered	Large Users			922.9	1.5%	50	23.6%			
	BACM3: Billed Authorised Consumption: Metered						0	0.0%			
	BACU: Billed Authorised Consumption:Unmetered						0	0.0%	$C/m3	$Cx1000	%
	NRW: NON-REVENUE WATER				1439.2	8.4%	3770	36.8%	0.4616	664.3	0.0%
A	UACM: Unbilled Authorised Consumption: Metered		0.00%	of WS			0	0.0%	0.4460	0.0	0.0%
B	UACU: Unbilled Authorised Consumption: Unmetered:	Estimated as	6.700%	of WS	261.9	50.0%	4464	6.7%	0.4460	116.8	0.0%
	WL WATER LOSSES				1177.3	15.1%	8234	30.1%	0.4651	547.5	0.0%
C	UC: Unauthorised Consumption:	Estimated as	0.250%	of WS	9.8	50.0%	6	0.3%	0.7560	7.4	0.0%
B	ALMUR1: Apparent Loss - meter under-registration:	Residential	0.50%	of BACM1	7.8	7.0%	0	0.2%	1.5810	12.3	0.0%
B	ALMUR2: Apparent Loss - meter under-registration:	Large Users	1.00%	of BACM2	9.3	7.0%	0	0.2%	1.5810	14.7	0.0%
	ALMUR3: Apparent Loss - meter under-registration:			of BACM3 and UACM	0.0		0	0.0%	1.5810	0.0	0.0%
D	ALDCD Customer meter data handling errors						0	0.0%	1.5810	0.0	0.0%
	AL: Sum of APPARENT LOSSES				26.9	18.5%	6	0.7%	1.2809	34.4	0.0%
	RL: REAL LOSSES				1150.4	15.5%	8240	29.4%	0.4460	513.1	0.0%
	% of period system pressurized =	100.0%	365.0	days			Cost of running system in period =				$Cx1000
	CARL: CURRENT ANNUAL REAL LOSSES (when system is pressurized)				3.15	Ml/day					

Process Reliability Band	SYSTEM INFRASTRUCTURE AND PRESSURE DATA		Valid for UARL& ILI calc?	95% CLs as +/- %
A	Lm: Mains Length, km	138.00	Yes	1.0%
A	Nh: Number of Fire Hydrants	591		1.0%
A/B	Nb: Number of Separately Billed Properties	5807		2.0%
A/B	R: Ratio of billed Service Connections (Ns, main to property line) to Billed Props (Nb)	1.040		2.0%
	Ns: No. of billed Service Connections	6039		2.0%
B	Nu: Number of Unbilled Service Connections	28		10.0%
	Nt: Total Number of Service Conns (= Ns + Nu), mains to property line	6067	Yes	2.0%
	DC: Density of Connections/ km of mains = Ns/Lm	44.0		3.0%
B	Lp: Average pipe length, property line to meter (m)	10.2		2.4%
	Lp: Total pipe length, property line to meter (km)	61.60		3.7%
A	P: Average pressure when system pressurised (psi)	58.0	Yes	2.0%
	P: Average pressure when system pressurised (m)	41.0		2.0%

ASSESSMENT OF UNAVOIDABLE REAL LOSSES, AND VOLUME AND COST OF POTENTIALLY RECOVERABLE REAL LOSSES

Notes: If Lm and Lp are in km and pressure P is in metres

UBL in litres/hour = $(20 \times Lm + 1.25 \times Nt + 33 \times Lp) \times (P/50)^{1.5}$

UARL in litres/day = $(18 \times Lm + 0.8 \times Nt + 25 \times Lp) \times P$

COMPONENT OF REAL LOSSES	Ml per day	Ml in period	$Cx1000 in period	95% CLs as +/- %
UBL: UNAVOIDABLE BACKGROUND LEAKAGE	0.22	81	36.0	3.4%
UARL: UNAVOIDABLE ANNUAL REAL LOSSES	0.36	133	59.3	2.6%
CARL: CURRENT ANNUAL REAL LOSSES	3.15	1150	513.1	15.5%
POTENTIALLY RECOVERABLE REAL LOSSES = CARL - UARL	2.79	1018	453.8	17.5%

IWA BEST PRACTICE PERFORMANCE INDICATOR		UNITS OF PERFORMANCE INDICATOR	Best estimate	95% CLs as +/- %	Lowest Estimate	Highest Estimate
Non Revenue Water Basic (IWA Level 1, Fin36)		% of System Input by Volume	36.8	8.9%	33.5	40.1
Non Revenue Water Basic (IWA Level 1, Fin37)		% of System Input by Value		8.9%		
Apparent Losses (IWA Op23)	Best Op23 PI >	% of Water Supplied (Distribution Systems)	0.7	18.7%	0.6	0.8
		% of System Input Volume (Bulk Supply Systems)	0.7	18.7%	0.6	0.8
Real Losses Basic (IWA Level 1, Op24)	Best Op24 PI >	Litres/service connection/day, when system pressurised	519	15.7%	438	601
		m3/km of mains/day, when system pressurised	22.8	15.5%	19.3	26.4
Real Losses Detailed (IWA Level 3, Op 25)		Infrastructure Leakage Index ILI (non-dimensional)	8.66	15.7%	7.30	10.02

Comments:

Region billing equation = 4T1 + 4T2

Loop Calibration Reports dated October 28, 2005 highlight the following errors:

22.9 % of full scale = +26.7% error
45.8 % of full scale = + 0.1% error
76.4 % of full scale = no error
91.6 % of full scale = no error

Process Reliability Bands:

A - actual data
B - calculated based on actual data
C - calculated estimate
D - no data / default

Combinations, for example, B/C may be used to illustrate a calculated estimate based on partial data

Total length of watermain allow for 3 m per hydrant (i.e., 591 hydrants x 3m = 1.773 km)

'LEAKS' Suite of LEAKAGE EVALUATION and ASSESSMENT KNOW-HOW SOFTWARE

WATER BALANCE AND PERFORMANCE INDICATORS PROGRAM 'PIFastCalcs'

DETAILED CALCULATION OF COMPONENTS OF AUTHORISED AND UNAUTHORISED CONSUMPTION

Data entry | Calculated Values | From another Worksheet

Utility: Town of Port Colborne

System: Whole System

01/01/2005 to 01/01/2006 = 365 days

Calculation by: Steve Genser

Date: 04/12/2006

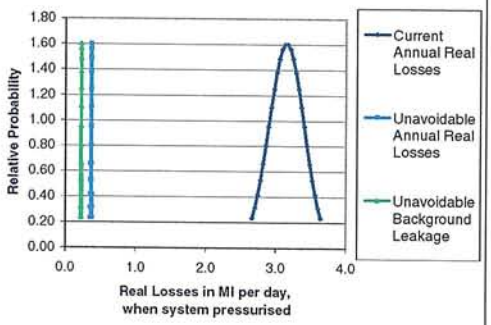
Components of Authorised Consumption	Components in Ml				Total	Additional information on sources of data and basis of estimates E = estimated R = Based on recordings
	Billed Metered	Billed Unmetered	Unbilled Metered	Unbilled Unmetered		
Residential	1546.89				1546.89	R = 4 month billing cycle
Large Users						
PC General #52598	22.78				22.78	R = monthly meter reads
PC General #52605	5.85				5.85	R = monthly meter reads
PC General #52613	2.27				2.27	R = monthly meter reads
Riocan Holdings #53679	1.41				1.41	R = monthly meter reads
Riocan Holdings #53695	0.54				0.54	R = monthly meter reads
City of PC #54396	1.00				1.00	R = monthly meter reads
City of PC #54403	5.40				5.40	R = monthly meter reads
City of PC #54586	0.64				0.64	R = monthly meter reads
City of PC #54635	5.04				5.04	R = monthly meter reads
Inco #54734	23.63				23.63	R = monthly meter reads
Inco #54768	19.42				19.42	R = monthly meter reads
Inco #63545	26.64				26.64	R = monthly meter reads
Region #57291	1.02				0.00	R = monthly meter reads
Region #64816	10.43				10.43	R = monthly meter reads
Region #64874	2.16				2.16	R = monthly meter reads
Robin Hood	36.08				36.08	R = monthly meter reads
Mermaid Ent	52.10				52.10	R = monthly meter reads
PC Poultry	284.53				284.53	R = monthly meter reads
H2O #55435	0.11				0.11	R = monthly meter reads
H2O #64501	0.11				0.11	R = monthly meter reads
John Boys #55443	9.20				9.20	R = monthly meter reads
John Boys #64501	3.81				3.81	R = monthly meter reads
Sunshine Trucking #55451	7.62				7.62	R = monthly meter reads
Sunshine Trucking #5500	22.27				22.27	R = monthly meter reads
KNT Water Haulage #55477	36.64				36.64	R = monthly meter reads
KNT Water Haulage	1.29				1.29	R = monthly meter reads
Canada Starch #63694	38.60				38.60	R = monthly meter reads
Canada Starch #63701	242.40				242.40	R = monthly meter reads
Jim Buccione #64056	16.70				16.70	R = monthly meter reads
Jim Buccione #64155	2.40				2.40	R = monthly meter reads
Chamber Water Haul #64072	8.78				8.78	R = monthly meter reads
Chamber Water Haul #64121	1.83				1.83	R = monthly meter reads
JBL #64139	0.06				0.06	R = monthly meter reads
JBL #64147	9.64				9.64	R = monthly meter reads
Aqualine Water #64866	20.26				20.26	R = monthly meter reads
Aqualine Water #65517	0.27				0.27	R = monthly meter reads
					0.00	
Unbilled, Authorized, Consumption					0.00	
Hydrant Flushing				0.01	0.01	E = estimated
Fire Fighting				0.04	0.04	E = estimated
Watermain Breaks				0.77	0.77	E = estimated
Frozen Services				0.03	0.03	E = estimated
Water Quality				0.09	0.09	E = estimated
Public Works				0.00	0.00	E = estimated
Fares St. Water main				0.00	0.00	E = estimated

Sports Complex				0.01	0.01	E = estimated
Water main repairs				0.06	0.06	E = estimated
Bulk Water Station				0.01	0.01	E = estimated
					0.00	
Authorised consumption sub-totals	2469.81	0.00	0.00	1.04	2470.84	Ml
Authorised Unbilled Unmetered Consumption =				0.026%	**of Water Supplied, transfer this figure to Cell E21 of 'WaterBalance&Pis' Worksheet**	

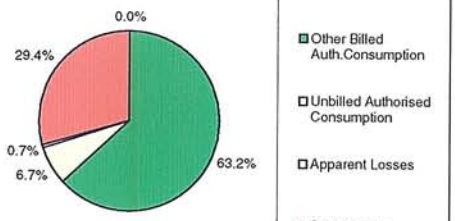
Components of Unauthorised Consumption	**Ml**	**Method of estimation**
By-pass tampering		Estimated based on five houshold per year
Unauthorised consumption sub-total	0.00	Ml
Unauthorised consumption =	0.000%	**of Water Supplied, transfer this figure to Cell E23 of 'WaterBalance&Pis' Worksheet**

WATER BALANCE AND PERFORMANCE INDICATORS PROGRAM 'PIFastCalcs'		Standard	Version 1a	2nd Dec 2005	Canada
Utility	Town of Port Colborne	01/01/2005 to 01/01/2006	365	days	
System	Whole System				

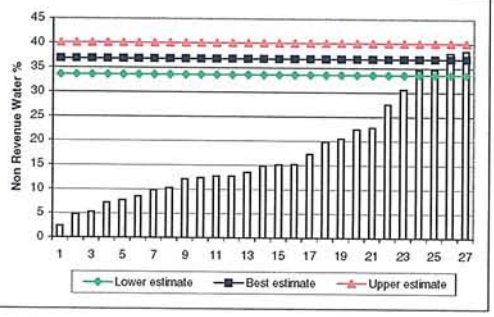
Real Losses and 95% Confidence Limits



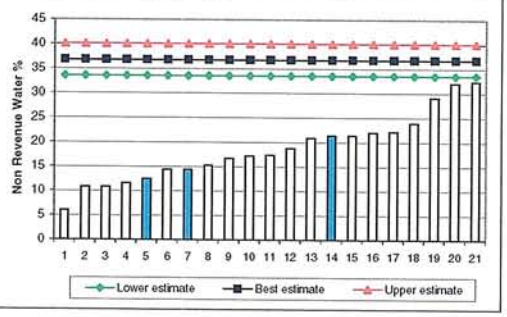
Water Balance Components as % of System Input Volume



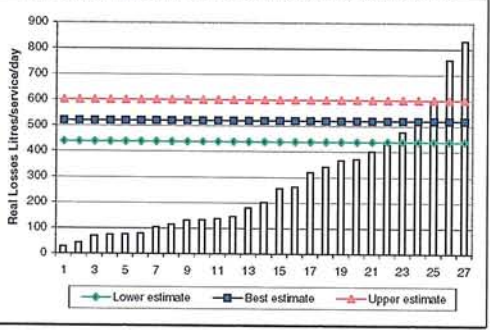
NRW % by Volume; Comparison with International Data Set
IWA Level 1 (Basic) Financial PI for Non-Revenue Water (Fin36)
Non-Revenue Water as % of System Input Volume



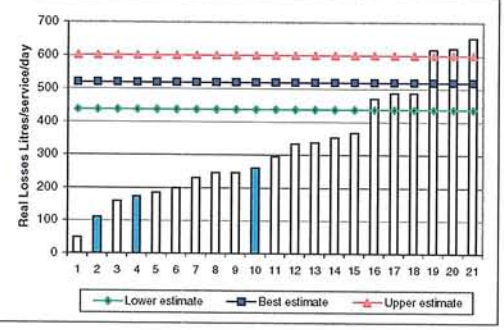
NRW % by Volume; Comparison with North American Data Set
IWA Level 1 (Basic) Financial PI for Non-Revenue Water (Fin36)
NRW as % of System Input Volume: Canadian data in blue



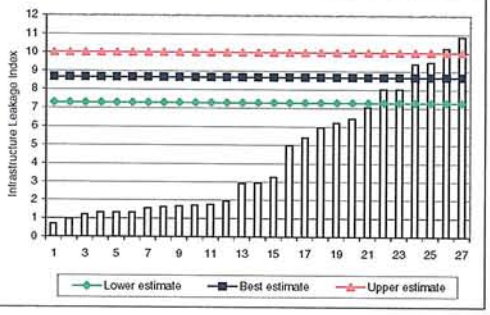
Real Losses in litres/service connection/day
(when system is pressurised)
Compared with International data set
IWA Level 1 (Basic) Operational PI for Real Losses (Op24)
Use Litres/service conn./day if Density of Connections > 20 per km of mains
All international data set have density of connections > 20 per km of mains



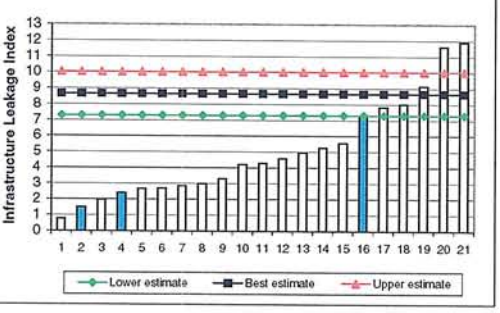
Real Losses in litres/service connection/day
when system is pressurised
Compared with North American data set, Canadian data in blue
IWA Level 1 (Basic) Operational PI for Real Losses (Op24)
Use Litres/service conn./day if Density of Connections > 20 per km of mains
All European data set have density of connections > 20 per km of mains



Infrastructure Leakage Index ILI for Real Losses
Compared with International data set
IWA Level 3 (Detailed) Operational PI for Real Losses (Op25)



Infrastructure Leakage Index ILI for Real Losses
Compared with North American data set, Canadian data in blue
IWA Level 3 (Detailed) Operational PI for Real Losses (Op25)



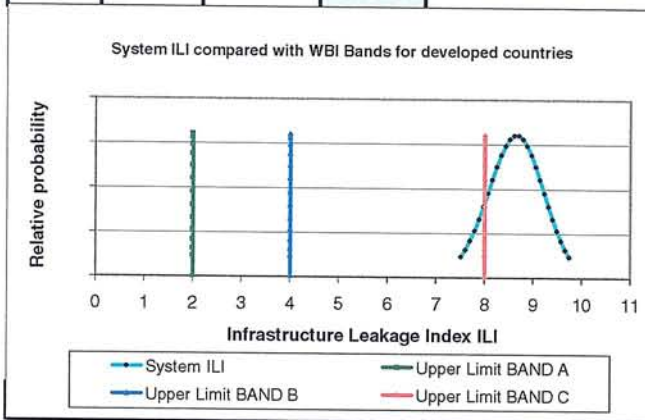
'LEAKS' Suite of LEAKAGE EVALUATION and ASSESSMENT KNOW-HOW SOFTWARE						
WATER BALANCE AND PERFORMANCE INDICATORS PROGRAM 'PIFastCalcs'						
PIFastCalcs	Standard	Version 1a	2nd Dec 2005	Canada	Master.0000	Town of Port Colborne

THIS WORKSHEET COMPARES THE CALCULATED SYSTEM ILI WITH WORLD BANK INSTITUTE GUIDELINES

World Bank Institute (WBI) Guidelines

The World Bank Institute has recently introduced, into its NRW Training Modules, a target matrix for Real Losses management performance, based on real losses in volume/service connection/day for a range of average operating pressures, and classified into Bands A to D. The targets assume that customer meters are located at the property boundary, with an average connection density of around 40 per km mains. Bands A to D in the WBI target matrix can also be shown as an equivalent range of ILIs, which can be applied to a wider range of connection densities and customer meter locations, as shown below. Band limits in terms of ILIs, general descriptions of each Band, and appropriate recommended actions are as follows:

Developing Countries ILI range	Developed Countries ILI range	BAND	Calculated ILI for this System	General description of Real Loss Management Performance Categories for Developed and Developing Countries
Less than 4	Less than 2	A		Further loss reduction may be uneconomic unless there are shortages; careful analysis needed to identify cost-effective improvement
4 to < 8	2 to < 4	B		Potential for marked improvements; consider pressure management, better active leakage control practices, and better network maintenance
8 to < 16	4 to < 8	C		Poor leakage record; tolerable only if water is plentiful and cheap; even then, analyze level and nature of leakage and intensify leakage reduction efforts
16 or more	8 or more	D	8.7	Very inefficient use of resources; leakage reduction programs imperative and high priority



WBI Recommendations for BANDS	A	B	C	D
Investigate pressure management options	Yes	Yes	Yes	
Investigate speed and quality of repairs	Yes	Yes	Yes	
Check economic intervention frequency	Yes	Yes		
Introduce/improve active leakage control		Yes	Yes	
Identify options for improved maintenance		Yes	Yes	
Assess Economic Leakage Level	Yes	Yes		
Review break frequencies		Yes	Yes	
Review asset management policy		Yes	Yes	Yes
Deal with deficiencies in manpower, training and communications			Yes	Yes
5-year plan to achieve next lowest band			Yes	Yes
Fundamental peer review of all activities				Yes

GUIDELINE 2: The AWWA Water Loss Committee general guidelines for setting a target ILI (in lieu of having a determination of a system-specific economic level of leakage). Source of information: Table 7 in the AWWA Water Loss Committee Report in the AWWA Journal, August 2003

Note: since this table was published, simplified methods of calculating an economic frequency of intervention for active leakage control by regular survey have been been developed and are included in the ALCCalc software. This has allowed the development of the ELLCalc software to calculate short-term ELL for an active leakage control policy of regular survey. Data from England & Wales (where many Water Companies are recognised as having achieved ELL) suggests that in developed couintries, the ELL (in terms of ILI) is unlikely to exceed 3.0, even where water is plentiful and inexpensive.

Target ILI Range	This System ILI	Water Resources Considerations	Operational Considerations	Financial Considerations
1.0 - 3.0		Available resources are greatly limited and are very difficult and/or environmentally unsound to develop	Operating with system leakage above this level would require expansion of existing infrastructure and/or additional water resources to meet the demand	Water resources are costly to develop or purchase; ability to increase revenues via water rates is greatly limited because of regulation or low ratepayer affordability
3.0 - 5.0		Water resources are believed to be sufficient to meet long-term needs, but demand management interventions (leakage management,water conservation) are included in the long-term planning	Existing water supply infrastructure capability is sufficient to meet long-term demand as long as reasonable leakage management controls are in place	Water resources can be developed or purchased at reasonable expense; periodic water rate increases can be feasibly imposed and are tolerated by the customer population
5.0 - 8.0		Water resources are plentiful, reliable, and easily abstracted	Superior reliability, capacity and integrity of the water supply infrastructure make it relatively immune to shortages	Cost to purchase or obtain/treat water is low, as are rates charged to customers
Greater than 8.0	8.7	Although operational and financial considerations may allow a long-term ILI greater than 8.0, such a level of leakage is not an effective utilization of water as a resource. Setting a target level greater than 8.0 - other than as an incremental goal to a smaller long-term target - is discouraged.		

Note: Simplified methods of calculating an economic frequency of intervention for active leakage control by regular survey have been been developed and are included in the **ALCCalcs** Standard software. This has allowed the development of the **ELLCalcs** standard software to calculate short-term Economic Leakage Level for an active leakage control policy of regular survey.

Important Footnote: the Infrastructure Leakage Index (ILI) provides guidance as to how well real losses are being managed (in terms of repairs, active leakage control and infrastructure management) at the current operating pressure. However, calculation of the ILI does not imply that pressure management in a system is optimal, or economic. If system pressures are excessive, or subject to surges, then pressure management may result in additional benefits for real losses management - in particular, a reduction in new burst frequency and annual repair costs, and a reduction in flow rates of existing leaks. So even if a low ILI is being achieved, there may still be opportunities to reduce annual real losses by improved pressure management. The **PressCalcs** Standard Software provides more detailed information on this topic.

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WATER BALANCE AND PERFORMANCE INDICATORS PROGRAM 'PIFastCalcs'			Standard	Version 1a	2nd Dec 2005	Canada	Master.0000
OPTIONAL DATA ENTRY SHEET FOR ANNUAL SYSTEM RUNNING COSTS			Data entry		Calculated Values	From another Worksheet	
Utility	Town of Port Colborne	01/01/2005 to	1/1/2006		Number of Days in Period	365	days
System	Whole System	Calculation by	Steve Genser		Date of calculation =	12/4/2006	

Total running costs as calculated below =	0.0	$Cx1000	Transfer this figure to Cell L30 of 'WaterBalance&Pis' Worksheet

Note: The following definitions of annual system running costs should be considered as guidelines only. They are based on the 'Financial Definitions' in pages 19 and 20 of the IWA 'Manual of Best Practice 'Performance Indicators for Water Supply Services', (Alegre H, Hirner W, Baptista J.M. and Parena R, July 2000, ISBN 1 900222 27 2, IWA Publishing; this report should be consulted for further guidance as necessary.

Operational Costs		Sub-total $Cx1000	Group total $Cx1000	INCLUDES
Imported water	Raw water		0.0	BULK SUPPLY IMPORTS: total payments for imported raw water
	Treated water			BULK SUPPLY IMPORTS: total payments for imported treated water
Energy	Raw water		0.0	POWER: all energy costs for water supply electricity and fuel for motive machinery
	Treatment			
	Transmission			
	Distribution			
External services: Outsourcing	Outsourcing		0.0	Outsourcing of technical or administrative services, such as consultants, contractors undertaking operational tasks, meter reading and accounting fees
	Software licences and IT support			Licence fees on computer software and technical support by software companies
	Associated Companies			Costs of associated companies that are not included in other items
	Third party services			Operating costs of providing water services to third parties (other than the regulated water supply function) that are not included in other items
Leasing and Rentals	Premises		0.0	Payments for leasing or renting premises
	Vehicles			Payments for leasing or renting vehicles
	Mobile Plant			Payments for leasing or renting mobile plant
	Fixed Plant			Payments for leasing or renting fixed plant
	Equipment			Payments for leasing or renting equipment
Purchases	Water treatment chemicals		0.0	All water treatment chemicals for water supply that are not in HIRED AND CONTRACTED SERVICES and which are required for operation of sources, treatment plants,transmission and distribution systems
	Other than chemicals and energy			All materials and consumables other than energy and water treatment chemicals for water supply, that are not in HIRED AND CONTRACTED SERVICES and which are required for operation of sources, treatment plants,transmission and distribution systems
Taxes, levies and fees	All kinds		0.0	Any operating licences paid to a Government or municipal authority, abstraction charges, local authority rates
Exceptional earnings and losses	All kinds		0.0	Any exceptional income or expenditure from donations, investment subsidies, compensations or adjustments related to sales/writing off of fixed assets
Other Operating Expenditures	Other direct costs		0.0	Any other operating costs (but excluding interest and taxation, on an aggregated basis)
	General and support expenditures			The aggregate direct cost of GENERAL AND SUPPORT ACTIVITIES (Manpower costs excluded)
	Customer services			Costs directly associated with customer services that are not included in previous items, related to customer accounting, reading of meters, debt revovery, costs of disconnections, customers'enquiries and complaints handling.
	Scientific services			Costs directly associated with scientific and laboratory services and with the monitoring of quality that are not included in previous items
	Other business activities			Costs directly associated with other business activities that are not included in previous items, except for cost depreciation
	Doubtful debts			Charge/credit to the profit and loss account for bad and doubtful debts
Sum of Operational Costs	All the above operational costs		0.0	
Internal manpower costs	Employment costs		0.0	The sum of the total manpower costs of permanent and temorary personnel, including employment-related social costs and benefits paid by the employer
Capitalised cost of self-constructed assets	Negative allocation		0.0	The summation of the amounts in each of the above cost categories that have been incurred in the construction of new or rehabilitated assets
Total Running Costs	Sum of Operational costs and Internal Manpower Costs, minus capitalised cost of self-constructed assets		0.0	

Comments:

Appendix M

PIFastCalc Output
St. Catharines

'LEAKS' Suite of LEAKAGE EVALUATION and ASSESSMENT KNOW-HOW SOFTWARE

WATER BALANCE AND PERFORMANCE INDICATORS PROGRAM 'PIFastCalcs'

Standard | Version 1a | 2nd Dec 2005 | Canada

ANNUAL WATER BALANCE CALCULATION IN IWA STANDARD FORMAT, WITH 95% CONFIDENCE LIMITS | Data entry | Defaults | Calculated Values | From another Worksheet

Note:Calculations should be based on a 12-month period for all aspects of the worksheet to function correctly | Currency = $C | Volume units = Ml | and m³

Utility	City of St. Catharines	Bulk supply (BS) or Distribution System (DS)?	DS		01/01/2004	to	01/01/2005	=	365 days
System	Whole System	Do most customers have storage tanks?	No		Calculation by	Steve Genser		Date	4-Dec-06

Process Reliability Band	WATER BALANCE CALCULATIONS IWA Terminology COMPONENTS OF WATER BALANCE				Volume in period Ml	95% Confidence Limit as +/- %	Variance	FINANCIAL PERFORMANCE INDICATORS FOR NON-REVENUE WATER % of System Input Volume	Calculated Value of NRW as % of System Running Costs in Period Assessed marginal cost of individual components of Non-Revenue Water	Assessed Unit Value of individual components of Non Revenue Water	% of cost of running system
	WOS: Volume from Own Sources (corrected for known systematic errors)						0	0.0%			
A	WI: Water Imported (corrected for known systematic errors)				21823.7	3.0%	111580	100.0%			
	SIV: SYSTEM INPUT VOLUME				21823.7	3.0%	111580	100.0%			
	BACE:Water Exported						0	0.0%			
	WS: WATER SUPPLIED = SIV - BACE				21823.7	3.0%	111580	100.0%			
A	BACM1: Billed Authorised Consumption: Metered	Cycles			17067.9	1.5%	17062	78.2%			
A	BACM2: Billed Authorised Consumption: Metered	Bulk Metering & Industrial			2409.6	1.5%	340	11.0%			
	BACM3: Billed Authorised Consumption: Metered						0	0.0%			
	BACU: Billed Authorised Consumption:Unmetered						0	0.0%	$C/m3	$Cx1000	%
	NRW: NON-REVENUE WATER				2346.2	30.0%	128982	10.8%	0.4626	1085.4	0.0%
A	UACM: Unbilled Authorised Consumption: Metered		0.00%	of WS	0.0		0	0.0%	0.4460	0.0	0.0%
D	UACU: Unbilled Authorised Consumption: Unmetered:	Estimated as	1.250%	of WS	272.8	100.0%	19372	1.3%	0.4460	121.7	0.0%
	WL WATER LOSSES				2073.4	36.4%	148353	9.5%	0.4648	963.7	0.0%
D	UC: Unauthorised Consumption:	Estimated as	0.250%	of WS	54.6	100.0%	775	0.3%	0.4460	24.3	0.0%
B	ALMUR1: Apparent Loss - meter under-registration:	Cycles	0.50%	of BACM1	85.8	7.0%	9	0.4%	0.8000	68.6	0.0%
B	ALMUR2: Apparent Loss - meter under-registration:	Bulk Metering & Industrial	1.00%	of BACM2	24.3	7.0%	1	0.1%	0.8000	19.5	0.0%
	ALMUR3: Apparent Loss - meter under-registration:			of BACM3 and UACM	0.0		0	0.0%	0.8000	0.0	0.0%
D	ALDCD Customer meter data handling errors						0	0.0%	0.8000	0.0	0.0%
	AL: Sum of APPARENT LOSSES				164.7	33.3%	785	0.9%	0.6827	112.4	0.0%
	RL: REAL LOSSES				1908.7	39.7%	149138	8.7%	0.4460	851.3	0.0%
A	% of period system pressurized =	100.0%	365.0	days			Cost of running system in period =				$Cx1000
	CARL: CURRENT ANNUAL REAL LOSSES (when system is pressurized)				5.23	Ml/day					

Process Reliability Band	SYSTEM INFRASTRUCTURE AND PRESSURE DATA		Valid for UARL& ILI calc?	95% CLs as +/- %
A	Lm: Mains Length, km	541.40	Yes	1.0%
A	Nh: Number of Fire Hydrants	3803		1.0%
B	Nb: Number of Separately Billed Properties	41210		2.0%
B	R: Ratio of billed Service Connections (Ns, main to property line) to Billed Props (Nb)	1.000		2.0%
	Ns: No. of billed Service Connections	41210		2.8%
C	Nu: Number of Unbilled Service Connections	0		
	Nt: Total Number of Service Conns (= Ns + Nu), mains to property line	41210	Yes	2.8%
	DC: Density of Connections/ km of mains = Ns/Lm	76.1		3.0%
B	Lp: Average pipe length, property line to meter (m)	7.0		50.0%
	Lp: Total pipe length, property line to meter (km)	288.47		50.1%
C	P: Average pressure when system pressurised (psi)	65.0	Yes	25.0%
	P: Average pressure when system pressurised (m)	46.0		25.0%

ASSESSMENT OF UNAVOIDABLE REAL LOSSES, AND VOLUME AND COST OF POTENTIALLY RECOVERABLE REAL LOSSES

Notes: If Lm and Lp are in km and pressure P is in metres

UBL in litres/hour = (20 x Lm + 1.25 x Nt + 33 x Lp) x $(P/50)^{1.5}$

UARL in litres/day = (18 x Lm + 0.8 x Nt + 25 x Lp) x P

COMPONENT OF REAL LOSSES	Ml per day	Ml in period	$Cx1000 in period	95% CLs as +/- %
UBL: UNAVOIDABLE BACKGROUND LEAKAGE	1.52	555	247.7	38.6%
UARL: UNAVOIDABLE ANNUAL REAL LOSSES	2.29	837	373.5	26.1%
CARL: CURRENT ANNUAL REAL LOSSES	5.23	1909	851.3	39.7%
POTENTIALLY RECOVERABLE REAL LOSSES = CARL - UARL	2.94	1071	477.8	73.5%

IWA BEST PRACTICE PERFORMANCE INDICATOR		UNITS OF PERFORMANCE INDICATOR	Best estimate	95% CLs as +/- %	Lowest Estimate	Highest Estimate
Non Revenue Water Basic (IWA Level 1, Fin36)		% of System Input by Volume	10.8	30.2%	7.5	14.0
Non Revenue Water Basic (IWA Level 1, Fin37)		% of System Input by Value		30.2%		
Apparent Losses (IWA Op23)	Best Op23 PI >	% of Water Supplied (Distribution Systems)	0.8	33.5%	0.5	1.0
		% of System Input Volume (Bulk Supply Systems)	0.8	33.5%	0.5	1.0
Real Losses Basic (IWA Level 1, Op24)	Best Op24 PI >	Litres/service connection/day, when system pressurised	127	39.8%	76	177
		m3/km of mains/day, when system pressurised	9.7	39.7%	5.8	13.5
Real Losses Detailed (IWA Level 3, Op 25)		Infrastructure Leakage Index ILI (non-dimensional)	2.28	47.5%	1.20	3.36

Comments:

Region Billing Equation = (5T1+5T2+5T3+5T4+5T5)-5D1-5D2-5D3-5D4-5D5-5D6-5D7-5D8-5D9

5T1, 5T2, 5T3 - June 30 & November 1, 2005
5T4 - no report
5T5 - June 30, 2005

5D1, 5D2, 5D5, 5D6 - May 20, 2005
5D3 - May 24, 2005
5D7 & 5D8 - August 15 & November 2, 2005
5D9 no report

Process Reliability Bands:

A - actual data
B - calculated based on actual data
C - calculated estimate
D - no data / default

Combinations, for example, B/C may be used to illustrate a calculated estimate based on partial data

Allowance for 3m hydrant lead for each hydrant built in to kilometers of water main.

'LEAKS' Suite of LEAKAGE EVALUATION and ASSESSMENT KNOW-HOW SOFTWARE

WATER BALANCE AND PERFORMANCE INDICATORS PROGRAM 'PIFastCalcs'

DETAILED CALCULATION OF COMPONENTS OF AUTHORISED AND UNAUTHORISED CONSUMPTION

Data entry | Calculated Values | From another Worksheet

Utility: City of St. Catharines

System: Whole System

01/01/2004 to 01/01/2005 = 365 days

Calculation by: Steve Genser

Date: 04/12/2006

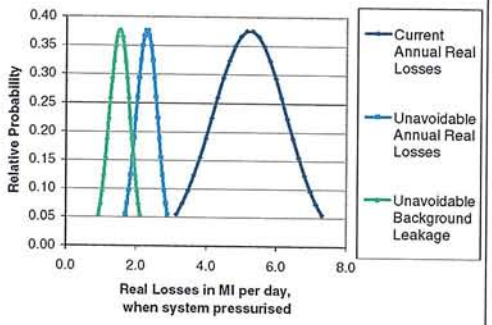
Components of Authorised Consumption	Components in Ml				Total	Additional information on sources of data and basis of estimates E = estimated R = Based on recordings
	Billed Metered	Billed Unmetered	Unbilled Metered	Unbilled Unmetered		
Section A	3153.17				3153.17	
Section B	1449.65				1449.65	
Section C	1783.46				1783.46	
Section D	1548.20				1548.20	
Section E	2590.82				2590.82	
Section F	2002.50				2002.50	
Section G	1506.47				1506.47	
Section H	1612.77				1612.77	
Section I	358.17				358.17	
Section J (Seasonal)	55.77				55.77	
Section K (Bulk Water)	26.33				26.33	
Section L (Large Industrial)	2222.82				2222.82	
Manual Billing Adjustments	205.70				205.70	
					0.00	
Year End Accruals					0.00	
					0.00	
Section D	843.15				843.15	
Section K	2.51				2.51	
Section L	157.95				157.95	
					0.00	
partial section accrual	2637.19				2637.19	
reverse opening accrual	-2203.94				-2203.94	
					0.00	
176 flat rate customers					0.00	
					0.00	
					0.00	
					0.00	
					0.00	
					0.00	
					0.00	
					0.00	
Authorised consumption sub-totals	19952.69	0.00	0.00	0.00	19952.69	Ml

Authorised Unbilled Unmetered Consumption = 0.000% of Water Supplied, transfer this figure to Cell E21 of 'WaterBalance&Pis' Worksheet

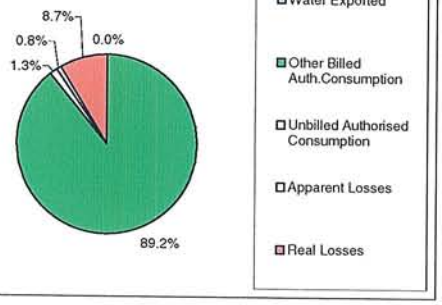
Components of Unauthorised Consumption	Ml	Method of estimation
Unauthorised consumption sub-total	0.00	Ml
Unauthorised consumption =	0.000%	of Water Supplied, transfer this figure to Cell E23 of 'WaterBalance&Pis' Worksheet

WATER BALANCE AND PERFORMANCE INDICATORS PROGRAM 'PIFastCalcs'		Standard	Version 1a	2nd Dec 2005	Canada
Utility	City of St. Catharines	01/01/2004 to 01/01/2005	365	days	
System	Whole System				

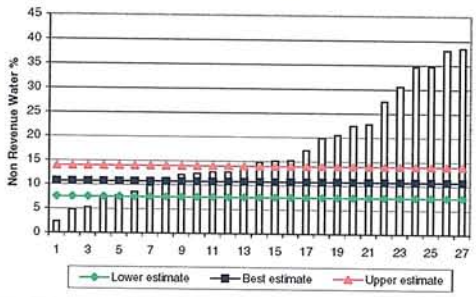
Real Losses and 95% Confidence Limits



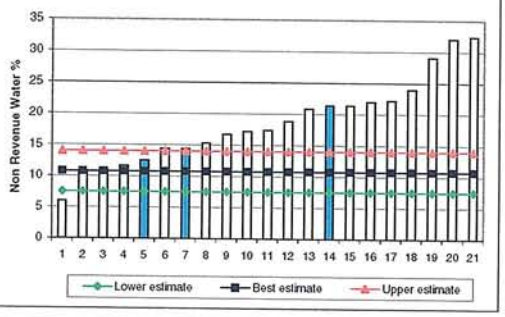
Water Balance Components as % of System Input Volume



NRW % by Volume; Comparison with International Data Set
IWA Level 1 (Basic) Financial PI for Non-Revenue Water (Fin36)
Non-Revenue Water as % of System Input Volume

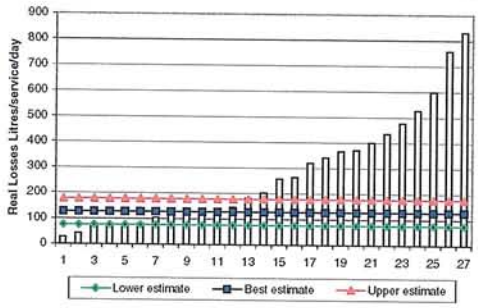


NRW % by Volume; Comparison with North American Data Set
IWA Level 1 (Basic) Financial PI for Non-Revenue Water (Fin36)
NRW as % of System Input Volume: Canadian data in blue



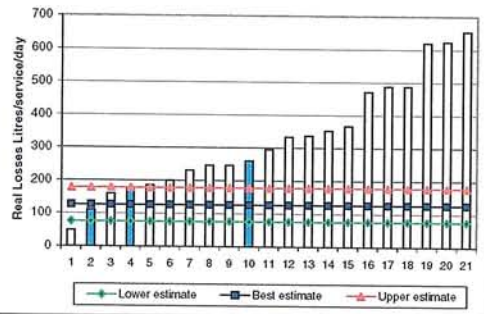
Real Losses in litres/service connection/day
(when system is pressurised)
Compared with International data set
IWA Level 1 (Basic) Operational PI for Real Losses (Op24)

Use Litres/service conn./day if Density of Connections > 20 per km of mains
All international data set have density of connections > 20 per km of mains

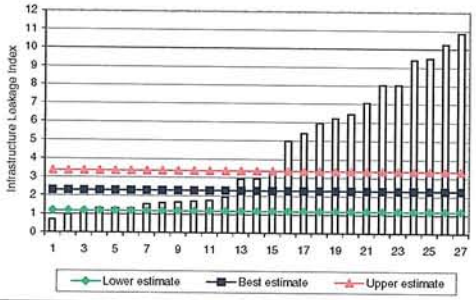


Real Losses in litres/service connection/day
when system is pressurised
Compared with North American data set, Canadian data in blue
IWA Level 1 (Basic) Operational PI for Real Losses (Op24)

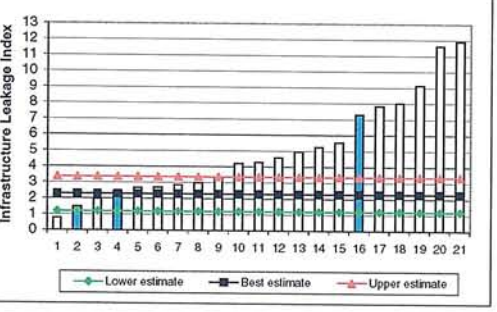
Use Litres/service conn./day if Density of Connections > 20 per km of mains
All European data set have density of connections > 20 per km of mains



Infrastructure Leakage Index ILI for Real Losses
Compared with International data set
IWA Level 3 (Detailed) Operational PI for Real Losses (Op25)



Infrastructure Leakage Index ILI for Real Losses
Compared with North American data set, Canadian data in blue
IWA Level 3 (Detailed) Operational PI for Real Losses (Op25)



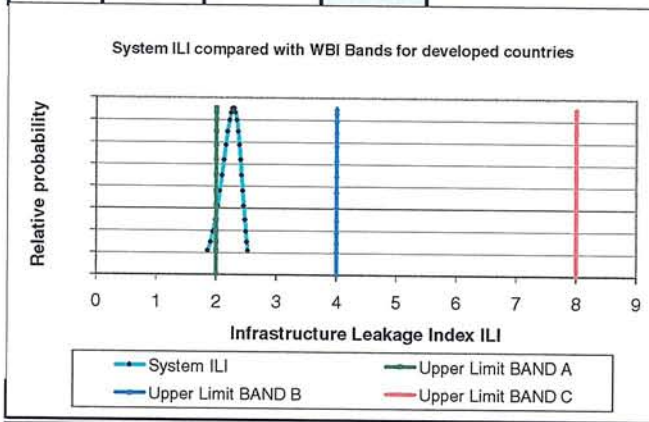
'LEAKS' Suite of LEAKAGE EVALUATION and ASSESSMENT KNOW-HOW SOFTWARE						
WATER BALANCE AND PERFORMANCE INDICATORS PROGRAM 'PIFastCalcs'						
PIFastCalcs	Standard	Version 1a	2nd Dec 2005	Canada	Master.0000	City of St. Catharines

THIS WORKSHEET COMPARES THE CALCULATED SYSTEM ILI WITH WORLD BANK INSTITUTE GUIDELINES

World Bank Institute (WBI) Guidelines

The World Bank Institute has recently introduced, into its NRW Training Modules, a target matrix for Real Losses management performance, based on real losses in volume/service connection/day for a range of average operating pressures, and classified into Bands A to D. The targets assume that customer meters are located at the property boundary, with an average connection density of around 40 per km mains. Bands A to D in the WBI target matrix can also be shown as an equivalent range of ILIs, which can be applied to a wider range of connection densities and customer meter locations, as shown below. Band limits in terms of ILIs, general descriptions of each Band, and appropriate recommended actions are as follows:

Developing Countries ILI range	Developed Countries ILI range	BAND	Calculated ILI for this System	General description of Real Loss Management Performance Categories for Developed and Developing Countries
Less than 4	Less than 2	A		Further loss reduction may be uneconomic unless there are shortages; careful analysis needed to identify cost-effective improvement
4 to < 8	2 to < 4	B	2.3	Potential for marked improvements; consider pressure management, better active leakage control practices, and better network maintenance
8 to < 16	4 to < 8	C		Poor leakage record; tolerable only if water is plentiful and cheap; even then, analyze level and nature of leakage and intensify leakage reduction efforts
16 or more	8 or more	D		Very inefficient use of resources; leakage reduction programs imperative and high priority



WBI Recommendations for BANDS	A	B	C	D
Investigate pressure management options	Yes	Yes	Yes	
Investigate speed and quality of repairs	Yes	Yes	Yes	
Check economic intervention frequency	Yes	Yes		
Introduce/improve active leakage control		Yes	Yes	
Identify options for improved maintenance		Yes	Yes	
Assess Economic Leakage Level	Yes	Yes		
Review break frequencies		Yes	Yes	
Review asset management policy		Yes	Yes	Yes
Deal with deficiencies in manpower, training and communications			Yes	Yes
5-year plan to achieve next lowest band			Yes	Yes
Fundamental peer review of all activities				Yes

GUIDELINE 2: The AWWA Water Loss Committee general guidelines for setting a target ILI (in lieu of having a determination of a system-specific economic level of leakage). Source of information: Table 7 in the AWWA Water Loss Committee Report in the AWWA Journal, August 2003

Note: since this table was published, simplified methods of calculating an economic frequency of intervention for active leakage control by regular survey have been been developed and are included in the ALCCalc software. This has allowed the development of the ELLCalc software to calculate short-term ELL for an active leakage control policy of regular survey. Data from England & Wales (where many Water Companies are recognised as having achieved ELL) suggests that in developed couintries, the ELL (in terms of ILI) is unlikely to exceed 3.0, even where water is plentiful and inexpensive.

Target ILI Range	This System ILI	Water Resources Considerations	Operational Considerations	Financial Considerations
1.0 - 3.0	2.3	Available resources are greatly limited and are very difficult and/or environmentally unsound to develop	Operating with system leakage above this level would require expansion of existing infrastructure and/or additional water resources to meet the demand	Water resources are costly to develop or purchase; ability to increase revenues via water rates is greatly limited because of regulation or low ratepayer affordability
3.0 - 5.0		Water resources are believed to be sufficient to meet long-term needs, but demand management interventions (leakage management,water conservation) are included in the long-term planning	Existing water supply infrastructure capability is sufficient to meet long-term demand as long as reasonable leakage management controls are in place	Water resources can be developed or purchased at reasonable expense; periodic water rate increases can be feasibly imposed and are tolerated by the customer population
5.0 - 8.0		Water resources are plentiful, reliable, and easily abstracted	Superior reliability, capacity and integrity of the water supply infrastructure make it relatively immune to shortages	Cost to purchase or obtain/treat water is low, as are rates charged to customers
Greater than 8.0		Although operational and financial considerations may allow a long-term ILI greater than 8.0, such a level of leakage is not an effective utilization of water as a resource. Setting a target level greater than 8.0 - other than as an incremental goal to a smaller long-term target - is discouraged.		

Note: Simplified methods of calculating an economic frequency of intervention for active leakage control by regular survey have been been developed and are included in the **ALCCalcs** Standard software. This has allowed the development of the **ELLCalcs** standard software to calculate short-term Economic Leakage Level for an active leakage control policy of regular survey.

Important Footnote: the Infrastructure Leakage Index (ILI) provides guidance as to how well real losses are being managed (in terms of repairs, active leakage control and infrastructure management) at the current operating pressure. However, calculation of the ILI does not imply that pressure management in a system is optimal, or economic. If system pressures are excessive, or subject to surges, then pressure management may result in additional benefits for real losses management - in particular, a reduction in new burst frequency and annual repair costs, and a reduction in flow rates of existing leaks. So even if a low ILI is being achieved, there may still be opportunities to reduce annual real losses by improved pressure management. The **PressCalcs** Standard Software provides more detailed information on this topic.

'LEAKS' Suite of LEAKAGE EVALUATION and ASSESSMENT KNOW-HOW SOFTWARE									
WATER BALANCE AND PERFORMANCE INDICATORS PROGRAM 'PIFastCalcs'				Standard	Version 1a	2nd Dec 2005		Canada	Master.0000
OPTIONAL DATA ENTRY SHEET FOR ANNUAL SYSTEM RUNNING COSTS				Data entry		Calculated Values		From another Worksheet	
Utility	City of St. Catharines	01/01/2004	to	1/1/2005		Number of Days in Period	365	days	
System	Whole System	Calculation by		Steve Genser		Date of calculation =	12/4/2006		

Total running costs as calculated below =	0.0	$Cx1000	Transfer this figure to Cell L30 of 'WaterBalance&Pis' Worksheet

Note: The following definitions of annual system running costs should be considered as guidelines only. They are based on the 'Financial Definitions' in pages 19 and 20 of the IWA 'Manual of Best Practice 'Performance Indicators for Water Supply Services', (Alegre H, Hirner W, Baptista J.M. and Parena R, July 2000, ISBN 1 900222 27 2, IWA Publishing; this report should be consulted for further guidance as necessary.

Operational Costs		Sub-total $Cx1000	Group total $Cx1000	INCLUDES
Imported water	Raw water		0.0	BULK SUPPLY IMPORTS: total payments for imported raw water
	Treated water			BULK SUPPLY IMPORTS: total payments for imported treated water
Energy	Raw water		0.0	POWER: all energy costs for water supply electricity and fuel for motive machinery
	Treatment			
	Transmission			
	Distribution			
External services: Outsourcing	Outsourcing		0.0	Outsourcing of technical or administrative services, such as consultants, contractors undertaking operational tasks, meter reading and accounting fees
	Software licences and IT support			Licence fees on computer software and technical support by software companies
	Associated Companies			Costs of associated companies that are not included in other items
	Third party services			Operating costs of providing water services to third parties (other than the regulated water supply function) that are not included in other items
Leasing and Rentals	Premises		0.0	Payments for leasing or renting premises
	Vehicles			Payments for leasing or renting vehicles
	Mobile Plant			Payments for leasing or renting mobile plant
	Fixed Plant			Payments for leasing or renting fixed plant
	Equipment			Payments for leasing or renting equipment
Purchases	Water treatment chemicals		0.0	All water treatment chemicals for water supply that are not in HIRED AND CONTRACTED SERVICES and which are required for operation of sources, treatment plants,transmission and distribution systems
	Other than chemicals and energy			All materials and consumables other than energy and water treatment chemicals for water supply, that are not in HIRED AND CONTRACTED SERVICES and which are required for operation of sources, treatment plants,transmission and distribution systems
Taxes, levies and fees	All kinds		0.0	Any operating licences paid to a Government or municipal authority, abstraction charges, local authority rates
Exceptional earnings and losses	All kinds		0.0	Any exceptional income or expenditure from donations, investment subsidies, compensations or adjustments related to sales/writing off of fixed assets
Other Operating Expenditures	Other direct costs		0.0	Any other operating costs (but excluding interest and taxation, on an aggregated basis)
	General and support expenditures			The aggregate direct cost of GENERAL AND SUPPORT ACTIVITIES (Manpower costs excluded)
	Customer services			Costs directly associated with customer services that are not included in previous items, related to customer accounting, reading of meters, debt revovery, costs of disconnections, customers'enquiries and complaints handling.
	Scientific services			Costs directly associated with scientific and laboratory services and with the monitoring of quality that are not included in previous items
	Other business activities			Costs directly associated with other business activities that are not included in previous items, except for cost depreciation
	Doubtful debts			Charge/credit to the profit and loss account for bad and doubtful debts
Sum of Operational Costs	All the above operational costs		0.0	
Internal manpower costs	Employment costs		0.0	The sum of the total manpower costs of permanent and temorary personnel, including employment-related social costs and benefits paid by the employer
Capitalised cost of self-constructed assets	Negative allocation		0.0	The summation of the amounts in each of the above cost categories that have been incurred in the construction of new or rehabilitated assets
Total Running Costs	Sum of Operational costs and Internal Manpower Costs, minus capitalised cost of self-constructed assets		0.0	

Comments:

Appendix N

PIFastCalc Output Thorold

'LEAKS' Suite of LEAKAGE EVALUATION and ASSESSMENT KNOW-HOW SOFTWARE

WATER BALANCE AND PERFORMANCE INDICATORS PROGRAM 'PIFastCalcs'

Standard | Version 1a | 2nd Dec 2005 | Canada

ANNUAL WATER BALANCE CALCULATION IN IWA STANDARD FORMAT, WITH 95% CONFIDENCE LIMITS

Data entry | Defaults | Calculated Values | From another Worksheet

Note:Calculations should be based on a 12-month period for all aspects of the worksheet to function correctly

Currency = $C | Volume units = Ml | and m³

Utility	City of Thorold	Bulk supply (BS) or Distribution System (DS)?	DS		01/01/2005	to	01/01/2006	=	365 days
System	Whole System	Do most customers have storage tanks?	No		Calculation by	Steve Genser		Date	4-Dec-06

Process Reliability Band	WATER BALANCE CALCULATIONS IWA Terminology COMPONENTS OF WATER BALANCE				Volume in period Ml	95% Confidence Limit as +/- %	Variance	FINANCIAL PERFORMANCE INDICATORS FOR NON-REVENUE WATER % of System Input Volume	Calculated Value of NRW as % of System Running Costs in Period Assessed marginal cost of individual components of Non-Revenue Water	Assessed Unit Value of individual components of Non Revenue Water	% of cost of running system
	WOS: Volume from Own Sources (corrected for known systematic errors)						0	0.0%			
A	WI: Water Imported (corrected for known systematic errors)				3187.3	3.0%	2380	100.0%			
	SIV: SYSTEM INPUT VOLUME				3187.3	3.0%	2380	100.0%			
A	BACE:Water Exported						0	0.0%			
	WS: WATER SUPPLIED = SIV - BACE				3187.3	3.0%	2380	100.0%			
B/C	BACM1: Billed Authorised Consumption: Metered	Residential (~ 70%)			1670.5	1.5%	163	52.4%			
B/C	BACM2: Billed Authorised Consumption: Metered	ICI (~ 30%)			715.9	1.5%	30	22.5%			
	BACM3: Billed Authorised Consumption: Metered						0	0.0%			
	BACU: Billed Authorised Consumption:Unmetered						0	0.0%	$C/m3	$Cx1000	%
	NRW: NON-REVENUE WATER				800.8	12.4%	2573	25.1%	0.4850	388.4	14.7%
A	UACM: Unbilled Authorised Consumption: Metered		0.00%	of WS			0	0.0%	0.4460	0.0	0.0%
D	UACU: Unbilled Authorised Consumption: Unmetered:	Estimated as	1.250%	of WS	39.8	100.0%	413	1.3%	0.4460	17.8	0.7%
	WL WATER LOSSES				761.0	14.1%	2987	23.9%	0.4870	370.6	14.0%
D	UC: Unauthorised Consumption:	Estimated as	0.250%	of WS	8.0	100.0%	17	0.3%	1.7690	14.1	0.5%
B/C	ALMUR1: Apparent Loss - meter under-registration:	Residential (~ 70%)	0.50%	of BACM1	8.4	7.0%	0	0.3%	1.7690	14.8	0.6%
B/C	ALMUR2: Apparent Loss - meter under-registration:	ICI (~ 30%)	1.00%	of BACM2	7.2	7.0%	0	0.2%	1.7690	12.8	0.5%
	ALMUR3: Apparent Loss - meter under-registration:			of BACM3 and UACM	0.0		0	0.0%	1.7690	0.0	0.0%
D	ALDCD Customer meter data handling errors						0	0.0%	1.7690	0.0	0.0%
	AL: Sum of APPARENT LOSSES				23.6	33.9%	17	0.7%	1.7690	41.7	1.6%
	RL: REAL LOSSES				737.4	14.6%	3003	23.1%	0.4460	328.9	12.4%
A	% of period system pressurized =	100.0%	365.0	days			Cost of running system in period =			2648.4	$Cx1000
	CARL: CURRENT ANNUAL REAL LOSSES (when system is pressurized)				2.02	Ml/day					

Process Reliability Band	SYSTEM INFRASTRUCTURE AND PRESSURE DATA		Valid for UARL& ILI calc?	95% CLs as +/- %
A	Lm: Mains Length, km	90.60	Yes	1.0%
A	Nh: Number of Fire Hydrants	600		1.0%
B	Nb: Number of Separately Billed Properties	6269		2.0%
B	R: Ratio of billed Service Connections (Ns, main to property line) to Billed Props (Nb)	1.000		2.0%
	Ns: No. of billed Service Connections	6269		2.0%
B	Nu: Number of Unbilled Service Connections	25		10.0%
	Nt: Total Number of Service Conns (= Ns + Nu), mains to property line	6294	Yes	2.0%
	DC: Density of Connections/ km of mains = Ns/Lm	69.5		3.0%
B	Lp: Average pipe length, property line to meter (m)	10.2		2.4%
	Lp: Total pipe length, property line to meter (km)	63.94		3.7%
A	P: Average pressure when system pressurised (psi)	62.0	Yes	1.0%
	P: Average pressure when system pressurised (m)	43.8		1.0%

ASSESSMENT OF UNAVOIDABLE REAL LOSSES, AND VOLUME AND COST OF POTENTIALLY RECOVERABLE REAL LOSSES

Notes: If Lm and Lp are in km and pressure P is in metres

UBL in litres/hour = (20 x Lm + 1.25 x Nt + 33 x Lp) x $(P/50)^{1.5}$

UARL in litres/day = (18 x Lm + 0.8 x Nt + 25 x Lp) x P

COMPONENT OF REAL LOSSES	Ml per day	Ml in period	$Cx1000 in period	95% CLs as +/- %
UBL: UNAVOIDABLE BACKGROUND LEAKAGE	0.23	85	37.9	2.4%
UARL: UNAVOIDABLE ANNUAL REAL LOSSES	0.36	132	59.0	2.1%
CARL: CURRENT ANNUAL REAL LOSSES	2.02	737	328.9	14.6%
POTENTIALLY RECOVERABLE REAL LOSSES = CARL - UARL	1.66	605	269.9	17.8%

IWA BEST PRACTICE PERFORMANCE INDICATOR		UNITS OF PERFORMANCE INDICATOR	Best estimate	95% CLs as +/- %	Lowest Estimate	Highest Estimate
Non Revenue Water Basic (IWA Level 1, Fin36)		% of System Input by Volume	25.1	12.8%	21.9	28.3
Non Revenue Water Basic (IWA Level 1, Fin37)		% of System Input by Value	14.7	12.9%	12.8	16.5
Apparent Losses (IWA Op23)	Best Op23 PI >	% of Water Supplied (Distribution Systems)	0.7	34.1%	0.5	1.0
		% of System Input Volume (Bulk Supply Systems)	0.7	34.1%	0.5	1.0
Real Losses Basic (IWA Level 1, Op24)	Best Op24 PI >	Litres/service connection/day, when system pressurised	321	14.8%	273	369
		m3/km of mains/day, when system pressurised	22.3	14.6%	19.0	25.6
Real Losses Detailed (IWA Level 3, Op 25)		Infrastructure Leakage Index ILI (non-dimensional)	5.58	14.7%	4.76	6.40

Comments:

Region billing equation = 1D4+5D1-5D2+5D3+5D4; Calibration reports as follows:

5D1 & 5D2 - May 20
5D3 - May 24
5D4 - No report
1D4 - calibration report for May 4 illustrates the meter was significantly under-registering and was repaired.
- calibration report on Oct. 13 illustrates the meter was again under-registering and was repaired.

Process Reliability Bands:

A - actual data
B - calculated based on actual data
C - calculated estimate
D - no data / default

Combinations, for example, B/C may be used to illustrate a calculated estimate based on partial data

Total length of watermain allow for 3 m per hydrant

'LEAKS' Suite of LEAKAGE EVALUATION and ASSESSMENT KNOW-HOW SOFTWARE

WATER BALANCE AND PERFORMANCE INDICATORS PROGRAM 'PIFastCalcs'

DETAILED CALCULATION OF COMPONENTS OF AUTHORISED AND UNAUTHORISED CONSUMPTION

	Data entry	Calculated Values		From another Worksheet	
Utility	City of Thorold	01/01/2005	to	01/01/2006	= 365 days
System	Whole System	Calculation by		Date	

Components of Authorised Consumption	Components in Ml: Billed Metered	Billed Unmetered	Unbilled Metered	Unbilled Unmetered	Total	Additional information on sources of data and basis of estimates (E = estimated; R = Based on recordings)
					0.00	
					0.00	
					0.00	
					0.00	
					0.00	
					0.00	
					0.00	
					0.00	
					0.00	
					0.00	
					0.00	
					0.00	
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					0.00	
					0.00	
					0.00	
					0.00	
					0.00	
					0.00	
					0.00	
					0.00	
					0.00	
					0.00	
					0.00	
					0.00	
Authorised consumption sub-totals	0.00	0.00	0.00	0.00	0.00 Ml	

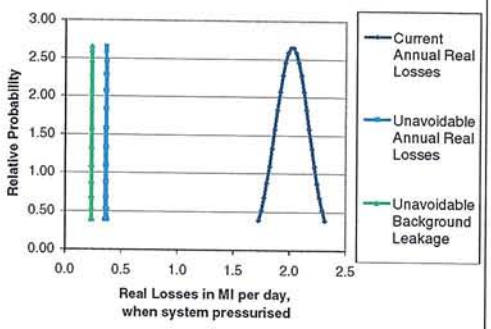
Authorised Unbilled Unmetered Consumption = 0.000% of Water Supplied, transfer this figure to Cell E21 of 'WaterBalance&Pis' Worksheet

Components of Unauthorised Consumption	Ml	Method of estimation
Unauthorised consumption sub-total	0.00 Ml	

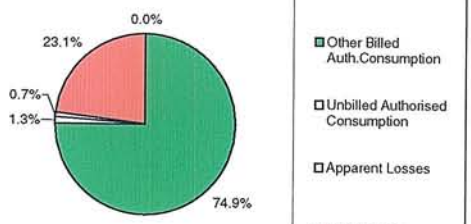
Unauthorised consumption = 0.000% of Water Supplied, transfer this figure to Cell E23 of 'WaterBalance&Pis' Worksheet

WATER BALANCE AND PERFORMANCE INDICATORS PROGRAM 'PIFastCalcs'		Standard	Version 1a	2nd Dec 2005	Canada
Utility	City of Thorold	01/01/2005 to 01/01/2006	365	days	
System	Whole System				

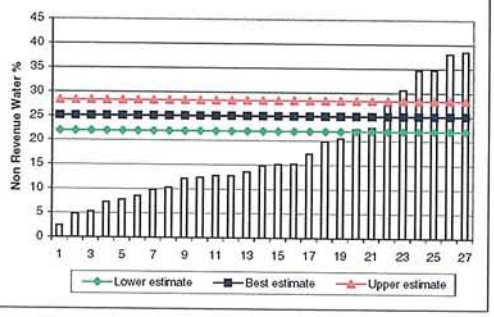
Real Losses and 95% Confidence Limits



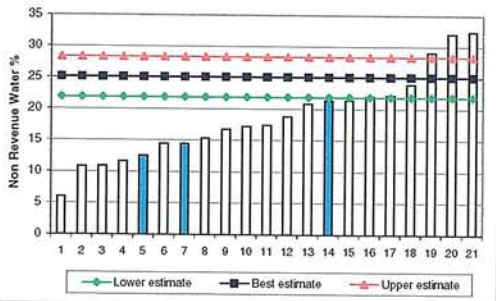
Water Balance Components as % of System Input Volume



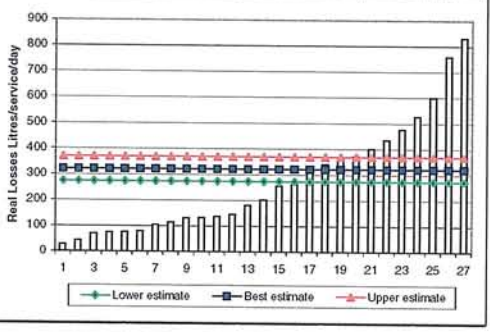
NRW % by Volume; Comparison with International Data Set
IWA Level 1 (Basic) Financial PI for Non-Revenue Water (Fin36)
Non-Revenue Water as % of System Input Volume



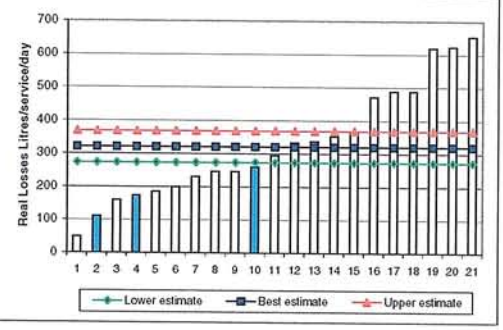
NRW % by Volume; Comparison with North American Data Set
IWA Level 1 (Basic) Financial PI for Non-Revenue Water (Fin36)
NRW as % of System Input Volume: Canadian data in blue



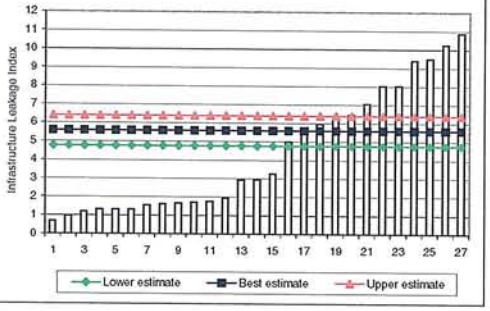
Real Losses in litres/service connection/day
(when system is pressurised)
Compared with International data set
IWA Level 1 (Basic) Operational PI for Real Losses (Op24)
Use Litres/service conn./day if Density of Connections > 20 per km of mains
All international data set have density of connections > 20 per km of mains



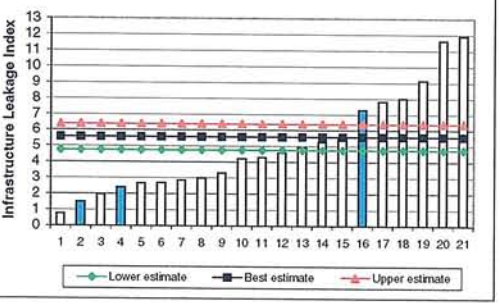
Real Losses in litres/service connection/day
when system is pressurised
Compared with North American data set, Canadian data in blue
IWA Level 1 (Basic) Operational PI for Real Losses (Op24)
Use Litres/service conn./day if Density of Connections > 20 per km of mains
All European data set have density of connections > 20 per km of mains



Infrastructure Leakage Index ILI for Real Losses
Compared with International data set
IWA Level 3 (Detailed) Operational PI for Real Losses (Op25)



Infrastructure Leakage Index ILI for Real Losses
Compared with North American data set, Canadian data in blue
IWA Level 3 (Detailed) Operational PI for Real Losses (Op25)



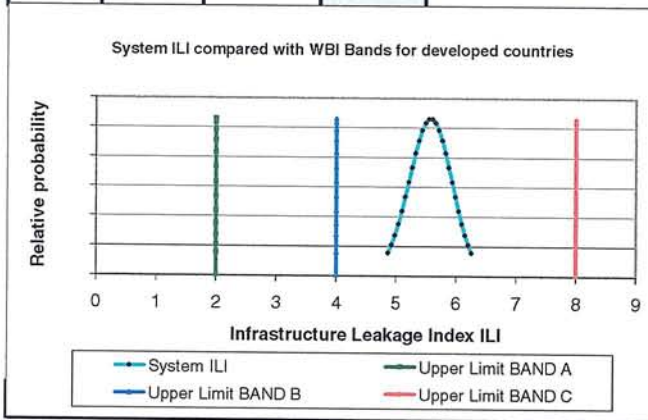
'LEAKS' Suite of LEAKAGE EVALUATION and ASSESSMENT KNOW-HOW SOFTWARE						
WATER BALANCE AND PERFORMANCE INDICATORS PROGRAM 'PIFastCalcs'						
PIFastCalcs	Standard	Version 1a	2nd Dec 2005	Canada	Master.0000	City of Thorold

THIS WORKSHEET COMPARES THE CALCULATED SYSTEM ILI WITH WORLD BANK INSTITUTE GUIDELINES

World Bank Institute (WBI) Guidelines

The World Bank Institute has recently introduced, into its NRW Training Modules, a target matrix for Real Losses management performance, based on real losses in volume/service connection/day for a range of average operating pressures, and classified into Bands A to D. The targets assume that customer meters are located at the property boundary, with an average connection density of around 40 per km mains. Bands A to D in the WBI target matrix can also be shown as an equivalent range of ILIs, which can be applied to a wider range of connection densities and customer meter locations, as shown below. Band limits in terms of ILIs, general descriptions of each Band, and appropriate recommended actions are as follows:

Developing Countries ILI range	Developed Countries ILI range	BAND	Calculated ILI for this System	General description of Real Loss Management Performance Categories for Developed and Developing Countries
Less than 4	Less than 2	A		Further loss reduction may be uneconomic unless there are shortages; careful analysis needed to identify cost-effective improvement
4 to < 8	2 to < 4	B		Potential for marked improvements; consider pressure management, better active leakage control practices, and better network maintenance
8 to < 16	4 to < 8	C	5.6	Poor leakage record; tolerable only if water is plentiful and cheap; even then, analyze level and nature of leakage and intensify leakage reduction efforts
16 or more	8 or more	D		Very inefficient use of resources; leakage reduction programs imperative and high priority



WBI Recommendations for BANDS	A	B	C	D
Investigate pressure management options	Yes	Yes	Yes	
Investigate speed and quality of repairs	Yes	Yes	Yes	
Check economic intervention frequency	Yes	Yes		
Introduce/improve active leakage control		Yes	Yes	
Identify options for improved maintenance		Yes	Yes	
Assess Economic Leakage Level	Yes	Yes		
Review break frequencies		Yes	Yes	
Review asset management policy		Yes	Yes	Yes
Deal with deficiencies in manpower, training and communications			Yes	Yes
5-year plan to achieve next lowest band			Yes	Yes
Fundamental peer review of all activities				Yes

GUIDELINE 2: The AWWA Water Loss Committee general guidelines for setting a target ILI (in lieu of having a determination of a system-specific economic level of leakage). Source of information: Table 7 in the AWWA Water Loss Committee Report in the AWWA Journal, August 2003

Note: since this table was published, simplified methods of calculating an economic frequency of intervention for active leakage control by regular survey have been been developed and are included in the ALCCalc software. This has allowed the development of the ELLCalc software to calculate short-term ELL for an active leakage control policy of regular survey. Data from England & Wales (where many Water Companies are recognised as having achieved ELL) suggests that in developed couintries, the ELL (in terms of ILI) is unlikely to exceed 3.0, even where water is plentiful and inexpensive.

Target ILI Range	This System ILI	Water Resources Considerations	Operational Considerations	Financial Considerations
1.0 - 3.0		Available resources are greatly limited and are very difficult and/or environmentally unsound to develop	Operating with system leakage above this level would require expansion of existing infrastructure and/or additional water resources to meet the demand	Water resources are costly to develop or purchase; ability to increase revenues via water rates is greatly limited because of regulation or low ratepayer affordability
3.0 - 5.0		Water resources are believed to be sufficient to meet long-term needs, but demand management interventions (leakage management,water conservation) are included in the long-term planning	Existing water supply infrastructure capability is sufficient to meet long-term demand as long as reasonable leakage management controls are in place	Water resources can be developed or purchased at reasonable expense; periodic water rate increases can be feasibly imposed and are tolerated by the customer population
5.0 - 8.0	5.6	Water resources are plentiful, reliable, and easily abstracted	Superior reliability, capacity and integrity of the water supply infrastructure make it relatively immune to shortages	Cost to purchase or obtain/treat water is low, as are rates charged to customers
Greater than 8.0		Although operational and financial considerations may allow a long-term ILI greater than 8.0, such a level of leakage is not an effective utilization of water as a resource. Setting a target level greater than 8.0 - other than as an incremental goal to a smaller long-term target - is discouraged.		

Note: Simplified methods of calculating an economic frequency of intervention for active leakage control by regular survey have been been developed and are included in the **ALCCalcs** Standard software. This has allowed the development of the **ELLCalcs** standard software to calculate short-term Economic Leakage Level for an active leakage control policy of regular survey.

Important Footnote: the Infrastructure Leakage Index (ILI) provides guidance as to how well real losses are being managed (in terms of repairs, active leakage control and infrastructure management) at the current operating pressure. However, calculation of the ILI does not imply that pressure management in a system is optimal, or economic. If system pressures are excessive, or subject to surges, then pressure management may result in additional benefits for real losses management - in particular, a reduction in new burst frequency and annual repair costs, and a reduction in flow rates of existing leaks. So even if a low ILI is being achieved, there may still be opportunities to reduce annual real losses by improved pressure management. The **PressCalcs** Standard Software provides more detailed information on this topic.

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WATER BALANCE AND PERFORMANCE INDICATORS PROGRAM 'PIFastCalcs'				Standard	Version 1a	2nd Dec 2005		Canada	Master.0000
OPTIONAL DATA ENTRY SHEET FOR ANNUAL SYSTEM RUNNING COSTS				Data entry		Calculated Values		From another Worksheet	
Utility	City of Thorold	01/01/2005	to	1/1/2006		Number of Days in Period	365	days	
System	Whole System	Calculation by		Steve Genser		Date of calculation =	12/4/2006		

Total running costs as calculated below =	0.0	$Cx1000	Transfer this figure to Cell L30 of 'WaterBalance&Pis' Worksheet

Note: The following definitions of annual system running costs should be considered as guidelines only. They are based on the 'Financial Definitions' in pages 19 and 20 of the IWA 'Manual of Best Practice 'Performance Indicators for Water Supply Services', (Alegre H, Hirner W, Baptista J.M. and Parena R, July 2000, ISBN 1 900222 27 2, IWA Publishing; this report should be consulted for further guidance as necessary.

Operational Costs		Sub-total $Cx1000	Group total $Cx1000	INCLUDES
Imported water	Raw water		0.0	BULK SUPPLY IMPORTS: total payments for imported raw water
	Treated water			BULK SUPPLY IMPORTS: total payments for imported treated water
Energy	Raw water		0.0	POWER: all energy costs for water supply electricity and fuel for motive machinery
	Treatment			
	Transmission			
	Distribution			
External services: Outsourcing	Outsourcing		0.0	Outsourcing of technical or administrative services, such as consultants, contractors undertaking operational tasks, meter reading and accounting fees
	Software licences and IT support			Licence fees on computer software and technical support by software companies
	Associated Companies			Costs of associated companies that are not included in other items
	Third party services			Operating costs of providing water services to third parties (other than the regulated water supply function) that are not included in other items
Leasing and Rentals	Premises		0.0	Payments for leasing or renting premises
	Vehicles			Payments for leasing or renting vehicles
	Mobile Plant			Payments for leasing or renting mobile plant
	Fixed Plant			Payments for leasing or renting fixed plant
	Equipment			Payments for leasing or renting equipment
Purchases	Water treatment chemicals		0.0	All water treatment chemicals for water supply that are not in HIRED AND CONTRACTED SERVICES and which are required for operation of sources, treatment plants,transmission and distribution systems
	Other than chemicals and energy			All materials and consumables other than energy and water treatment chemicals for water supply, that are not in HIRED AND CONTRACTED SERVICES and which are required for operation of sources, treatment plants,transmission and distribution systems
Taxes, levies and fees	All kinds		0.0	Any operating licences paid to a Government or municipal authority, abstraction charges, local authority rates
Exceptional earnings and losses	All kinds		0.0	Any exceptional income or expenditure from donations, investment subsidies, compensations or adjustments related to sales/writing off of fixed assets
Other Operating Expenditures	Other direct costs		0.0	Any other operating costs (but excluding interest and taxation, on an aggregated basis)
	General and support expenditures			The aggregate direct cost of GENERAL AND SUPPORT ACTIVITIES (Manpower costs excluded)
	Customer services			Costs directly associated with customer services that are not included in previous items, related to customer accounting, reading of meters, debt revovery, costs of disconnections, customers'enquiries and complaints handling.
	Scientific services			Costs directly associated with scientific and laboratory services and with the monitoring of quality that are not included in previous items
	Other business activities			Costs directly associated with other business activities that are not included in previous items, except for cost depreciation
	Doubtful debts			Charge/credit to the profit and loss account for bad and doubtful debts
Sum of Operational Costs	All the above operational costs		0.0	
Internal manpower costs	Employment costs		0.0	The sum of the total manpower costs of permanent and temorary personnel, including employment-related social costs and benefits paid by the employer
Capitalised cost of self-constructed assets	Negative allocation		0.0	The summation of the amounts in each of the above cost categories that have been incurred in the construction of new or rehabilitated assets
Total Running Costs	Sum of Operational costs and Internal Manpower Costs, minus capitalised cost of self-constructed assets		0.0	

Comments:

Appendix O

PIFastCalc Output
West Lincoln

'LEAKS' Suite of LEAKAGE EVALUATION and ASSESSMENT KNOW-HOW SOFTWARE

WATER BALANCE AND PERFORMANCE INDICATORS PROGRAM 'PIFastCalcs'

ANNUAL WATER BALANCE CALCULATION IN IWA STANDARD FORMAT, WITH 95% CONFIDENCE LIMITS

Note:Calculations should be based on a 12-month period for all aspects of the worksheet to function correctly

					Standard	Version 1a	2nd Dec 2005		Canada	
					Data entry	Defaults	Calculated Values		From another Worksheet	
					Currency =	$C	Volume units =	Ml	and	m^3
Utility	Township of West Lincoln	Bulk supply (BS) or Distribution System (DS)?	DS		01/01/2005	to	01/01/2006	=	365	days
System	Whole System	Do most customers have storage tanks?	No		Calculation by	Steve Genser		Date	4-Dec-06	

Process Reliability Band	WATER BALANCE CALCULATIONS IWA Terminology COMPONENTS OF WATER BALANCE				Volume in period Ml	95% Confidence Limit as +/- %	Variance	FINANCIAL PERFORMANCE INDICATORS FOR NON-REVENUE WATER % of System Input Volume	Calculated Value of NRW as % of System Running Costs in Period Assessed marginal cost of individual components of Non-Revenue Water	Assessed Unit Value of individual componente of Non Revenue Water	% of cost of running system
	WOS: Volume from Own Sources (corrected for known systematic errors)						0	0.0%			
A	WI: Water Imported (corrected for known systematic errors)				827.4	3.0%	160	100.0%			
	SIV: SYSTEM INPUT VOLUME				827.4	3.0%	160	100.0%			
	BACE:Water Exported						0	0.0%			
	WS: WATER SUPPLIED = SIV - BACE				827.4	3.0%	160	100.0%			
A/B	BACM1: Billed Authorised Consumption: Metered	Residential / ICI			558.8	1.5%	18	67.5%			
A	BACM2: Billed Authorised Consumption: Metered	Bulk metering			162.7	1.5%	2	19.7%			
	BACM3: Billed Authorised Consumption: Metered						0	0.0%			
	BACU: Billed Authorised Consumption:Unmetered						0	0.0%	$C/m3	$Cx1000	%
	NRW: NON-REVENUE WATER				105.9	24.8%	180	12.8%	0.4598	48.7	13.1%
A	UACM: Unbilled Authorised Consumption: Metered		0.00%	of WS			0	0.0%	0.4460	0.0	0.0%
D	UACU: Unbilled Authorised Consumption: Unmetered:	Estimated as	1.250%	of WS	10.3	100.0%	28	1.3%	0.4460	4.6	1.2%
	WL WATER LOSSES				95.6	29.6%	208	11.6%	0.4613	44.1	11.8%
C	UC: Unauthorised Consumption:	Estimated as	0.020%	of WS	0.2	50.0%	0	0.0%		0.0	0.0%
B/C	ALMUR1: Apparent Loss - meter under-registration:	Residential / ICI	0.50%	of BACM1	2.8	7.0%	0	0.3%	0.7919	2.2	0.6%
	ALMUR2: Apparent Loss - meter under-registration:	Bulk metering	1.00%	of BACM2	1.6	7.0%	0	0.2%	0.7919	1.3	0.3%
	ALMUR3: Apparent Loss - meter under-registration:			of BACM3 and UACM	0.0		0	0.0%	0.7919	0.0	0.0%
D	ALDCD Customer meter data handling errors						0	0.0%	0.7919	0.0	0.0%
	AL: Sum of APPARENT LOSSES				4.6	5.2%	0	0.6%	0.7635	3.5	0.9%
	RL: REAL LOSSES				91.0	31.1%	208	11.0%	0.4460	40.6	10.9%
A	% of period system pressurized =	100.0%	365.0	days				Cost of running system in period =		372.9	$Cx1000
	CARL: CURRENT ANNUAL REAL LOSSES (when system is pressurized)				0.25	Ml/day					

Process Reliability Band	SYSTEM INFRASTRUCTURE AND PRESSURE DATA		Valid for UARL& ILI calc?	95% CLs as +/- %
A	Lm: Mains Length, km	28.53	No	1.0%
A	Nh: Number of Fire Hydrants	175		1.0%
B	Nb: Number of Separately Billed Properties	1755		2.0%
B	R: Ratio of billed Service Connections (Ns, main to property line) to Billed Props (Nb)	1.000		2.0%
	Ns: No. of billed Service Connections	1755		2.8%
B	Nu: Number of Unbilled Service Connections	6		16.0%
	Nt: Total Number of Service Conns (= Ns + Nu), mains to property line	1761	No	2.8%
	DC: Density of Connections/ km of mains = Ns/Lm	61.7		3.0%
B	Lp: Average pipe length, property line to meter (m)	9.0		11.0%
	Lp: Total pipe length, property line to meter (km)	15.80		11.4%
B	P: Average pressure when system pressurised (psi)	62.0	Yes	10.0%
	P: Average pressure when system pressurised (m)	43.8		10.0%

ASSESSMENT OF UNAVOIDABLE REAL LOSSES, AND VOLUME AND COST OF POTENTIALLY RECOVERABLE REAL LOSSES

Notes: If Lm and Lp are in km and pressure P is in metres

UBL in litres/hour = (20 x Lm + 1.25 x Nt + 33 x Lp) x $(P/50)^{1.5}$

UARL in litres/day = (18 x Lm + 0.8 x Nt + 25 x Lp) x P

COMPONENT OF REAL LOSSES	Ml per day	Ml in period	$Cx1000 in period	95% CLs as +/- %
UBL: UNAVOIDABLE BACKGROUND LEAKAGE	0.06	24	10.6	15.3%
UARL: UNAVOIDABLE ANNUAL REAL LOSSES	0.10	37	16.5	10.3%
CARL: CURRENT ANNUAL REAL LOSSES	0.25	91	40.6	31.1%
POTENTIALLY RECOVERABLE REAL LOSSES = CARL - UARL	0.15	54	24.0	52.9%

IWA BEST PRACTICE PERFORMANCE INDICATOR		UNITS OF PERFORMANCE INDICATOR	Best estimate	95% CLs as +/- %	Lowest Estimate	Highest Estimate
Non Revenue Water Basic (IWA Level 1, Fin36)		% of System Input by Volume	12.8	25.0%	9.6	16.0
Non Revenue Water Basic (IWA Level 1, Fin37)		% of System Input by Value	13.1	25.0%	9.8	16.3
Apparent Losses (IWA Op23)	Best Op23 PI >	% of Water Supplied (Distribution Systems)	0.6	6.0%	0.5	0.6
		% of System Input Volume (Bulk Supply Systems)	0.6	6.0%	0.5	0.6
Real Losses Basic (IWA Level 1, Op24)	Best Op24 PI >	Litres/service connection/day, when system pressurised	142	31.2%	97	186
		m3/km of mains/day, when system pressurised	8.7	31.1%	6.0	11.5
Real Losses Detailed (IWA Level 3, Op 25)		Infrastructure Leakage Index ILI (non-dimensional)	2.45	32.7%	1.65	3.26

Comments:

Water supplied via Regional Municipality of Niagara's Grimsby Water Treatment Plant via Mudstreet.

Meter (ID 6D2). Meter Calibration Report dated May 24, 2005.

AM Billing Data broken into Quantities Metered each month combines monthly reads and quarterly reads. Second catagory is Bulk Metering with monthly record.

Process Reliability Bands:

A - actual data
B - calculated based on actual data
C - calculated estimate
D - no data / default

Combinations, for example, B/C may be used to illustrate a calculated estimate based on partial data

Total length of watermain allow for 3 m per hydrant

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WATER BALANCE AND PERFORMANCE INDICATORS PROGRAM 'PIFastCalcs'

DETAILED CALCULATION OF COMPONENTS OF AUTHORISED AND UNAUTHORISED CONSUMPTION

Data entry | Calculated Values | From another Worksheet

Utility: Township of West Lincoln

System: Whole System

01/01/2005 to 01/01/2006 = 365 days

Calculation by: Steve Genser

Date: 2nd July 2005

Components of Authorised Consumption	Components in Ml				Total	Additional information on sources of data and basis of estimates E = estimated R = Based on recordings
	Billed Metered	Billed Unmetered	Unbilled Metered	Unbilled Unmetered		
Quantities Metered					0.00	
January	0.113				0.11	R = Based on recordings
February	0.148				0.15	R = Based on recordings
March	139.669				139.67	R = Based on recordings
April	0.175				0.18	R = Based on recordings
May	0.239				0.24	R = Based on recordings
June	137.622				137.62	R = Based on recordings
July	0.202				0.20	R = Based on recordings
August	0.862				0.86	R = Based on recordings
September	172.256				172.26	R = Based on recordings
October	0.209				0.21	R = Based on recordings
November	0.402				0.40	R = Based on recordings
December	106.889				106.89	R = Based on recordings
					0.00	
Bulk Metering					0.00	
January	9.118				9.12	R = Based on recordings
February	11.222				11.22	R = Based on recordings
March	13.706				13.71	R = Based on recordings
April	8.730				8.73	R = Based on recordings
May	21.174				21.17	R = Based on recordings
June	21.061				21.06	R = Based on recordings
July	20.726				20.73	R = Based on recordings
August	13.009				13.01	R = Based on recordings
September	8.567				8.57	R = Based on recordings
October	15.538				15.54	R = Based on recordings
November	7.196				7.20	R = Based on recordings
December	12.613				12.61	R = Based on recordings
					0.00	
					0.00	
					0.00	
					0.00	
Authorised consumption sub-totals	721.45	0.00	0.00	0.00	721.45	Ml

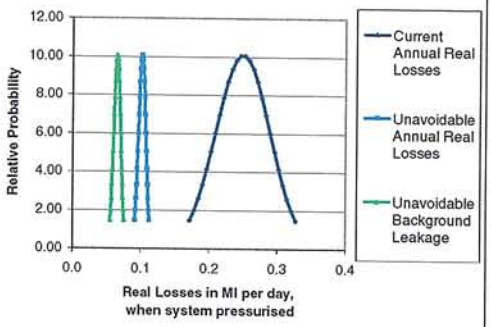
Authorised Unbilled Unmetered Consumption = 0.000% of Water Supplied, transfer this figure to Cell E21 of 'WaterBalance&Pis' Worksheet

Components of Unauthorised Consumption	Ml	Method of estimation
Hydrant (contractors not metered)	0.08	Estimated
By-passes or theft	0.08	Estimated
Unauthorised consumption sub-total	0.17	Ml

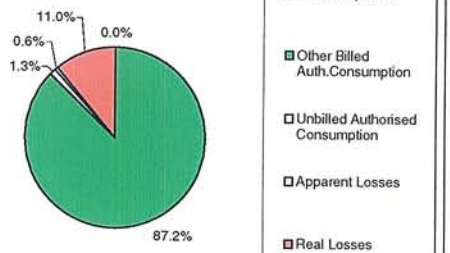
Unauthorised consumption = 0.020% of Water Supplied, transfer this figure to Cell E23 of 'WaterBalance&Pis' Worksheet

WATER BALANCE AND PERFORMANCE INDICATORS PROGRAM 'PIFastCalcs'		Standard	Version 1a	2nd Dec 2005	Canada
Utility	Township of West Lincoln	01/01/2005 to 01/01/2006	365	days	
System	Whole System				

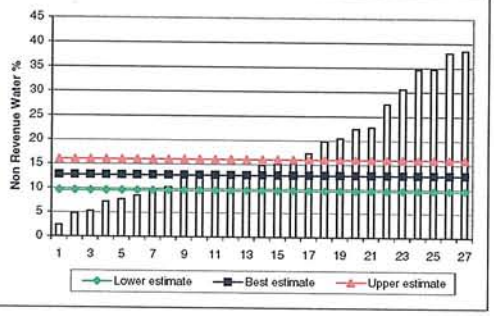
Real Losses and 95% Confidence Limits



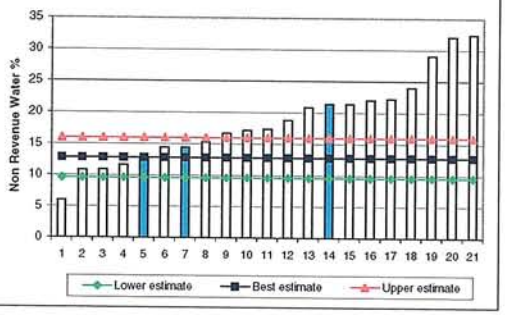
Water Balance Components as % of System Input Volume



NRW % by Volume; Comparison with International Data Set
IWA Level 1 (Basic) Financial PI for Non-Revenue Water (Fin36)
Non-Revenue Water as % of System Input Volume

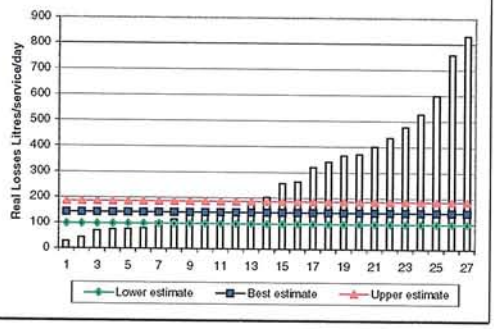


NRW % by Volume; Comparison with North American Data Set
IWA Level 1 (Basic) Financial PI for Non-Revenue Water (Fin36)
NRW as % of System Input Volume: Canadian data in blue



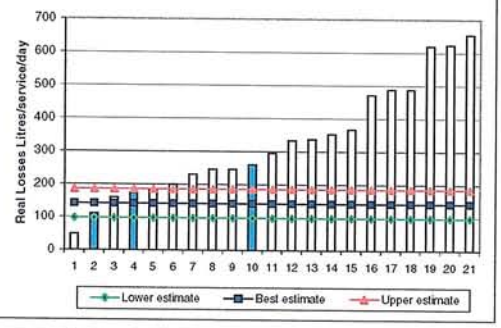
Real Losses in litres/service connection/day
(when system is pressurised)
Compared with International data set
IWA Level 1 (Basic) Operational PI for Real Losses (Op24)

Use Litres/service conn./day if Density of Connections > 20 per km of mains
All international data set have density of connections > 20 per km of mains

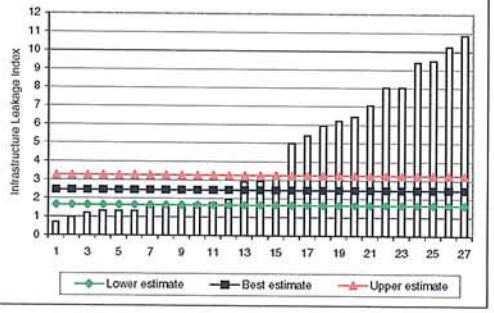


Real Losses in litres/service connection/day
when system is pressurised
Compared with North American data set, Canadian data in blue
IWA Level 1 (Basic) Operational PI for Real Losses (Op24)

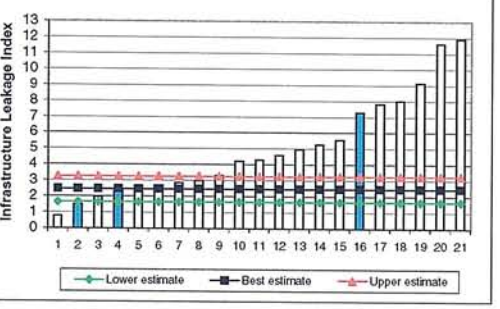
Use Litres/service conn./day if Density of Connections > 20 per km of mains
All European data set have density of connections > 20 per km of mains



Infrastructure Leakage Index ILI for Real Losses
Compared with International data set
IWA Level 3 (Detailed) Operational PI for Real Losses (Op25)



Infrastructure Leakage Index ILI for Real Losses
Compared with North American data set, Canadian data in blue
IWA Level 3 (Detailed) Operational PI for Real Losses (Op25)



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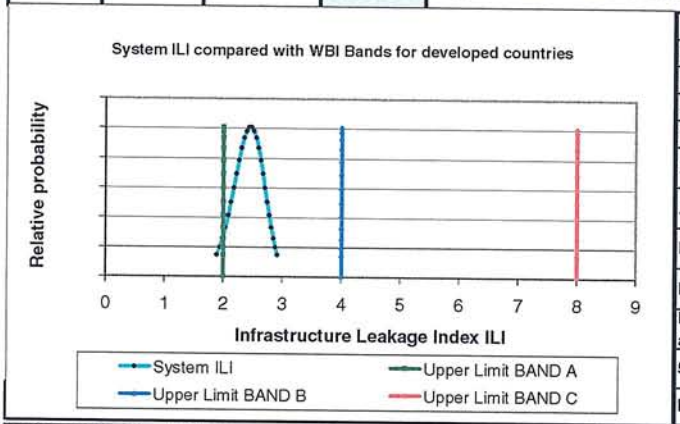
WATER BALANCE AND PERFORMANCE INDICATORS PROGRAM 'PIFastCalcs'						
PIFastCalcs	Standard	Version 1a	2nd Dec 2005	Canada	Master.0000	Township of West Lincoln

THIS WORKSHEET COMPARES THE CALCULATED SYSTEM ILI WITH WORLD BANK INSTITUTE GUIDELINES

World Bank Institute (WBI) Guidelines

The World Bank Institute has recently introduced, into its NRW Training Modules, a target matrix for Real Losses management performance, based on real losses in volume/service connection/day for a range of average operating pressures, and classified into Bands A to D. The targets assume that customer meters are located at the property boundary, with an average connection density of around 40 per km mains. Bands A to D in the WBI target matrix can also be shown as an equivalent range of ILIs, which can be applied to a wider range of connection densities and customer meter locations, as shown below. Band limits in terms of ILIs, general descriptions of each Band, and appropriate recommended actions are as follows:

Developing Countries ILI range	Developed Countries ILI range	BAND	Calculated ILI for this System	General description of Real Loss Management Performance Categories for Developed and Developing Countries
Less than 4	Less than 2	A		Further loss reduction may be uneconomic unless there are shortages; careful analysis needed to identify cost-effective improvement
4 to < 8	2 to < 4	B	2.5	Potential for marked improvements; consider pressure management, better active leakage control practices, and better network maintenance
8 to < 16	4 to < 8	C		Poor leakage record; tolerable only if water is plentiful and cheap; even then, analyze level and nature of leakage and intensify leakage reduction efforts
16 or more	8 or more	D		Very inefficient use of resources; leakage reduction programs imperative and high priority



WBI Recommendations for BANDS	A	B	C	D
Investigate pressure management options	Yes	Yes	Yes	
Investigate speed and quality of repairs	Yes	Yes	Yes	
Check economic intervention frequency	Yes	Yes		
Introduce/improve active leakage control		Yes	Yes	
Identify options for improved maintenance		Yes	Yes	
Assess Economic Leakage Level	Yes	Yes		
Review break frequencies		Yes	Yes	
Review asset management policy		Yes	Yes	Yes
Deal with deficiencies in manpower, training and communications			Yes	Yes
5-year plan to achieve next lowest band			Yes	Yes
Fundamental peer review of all activities				Yes

GUIDELINE 2: The AWWA Water Loss Committee general guidelines for setting a target ILI (in lieu of having a determination of a system-specific economic level of leakage). Source of information: Table 7 in the AWWA Water Loss Committee Report in the AWWA Journal, August 2003

Note: since this table was published, simplified methods of calculating an economic frequency of intervention for active leakage control by regular survey have been been developed and are included in the ALCCalc software. This has allowed the development of the ELLCalc software to calculate short-term ELL for an active leakage control policy of regular survey. Data from England & Wales (where many Water Companies are recognised as having achieved ELL) suggests that in developed couintries, the ELL (in terms of ILI) is unlikely to exceed 3.0, even where water is plentiful and inexpensive.

Target ILI Range	This System ILI	Water Resources Considerations	Operational Considerations	Financial Considerations
1.0 - 3.0	2.5	Available resources are greatly limited and are very difficult and/or environmentally unsound to develop	Operating with system leakage above this level would require expansion of existing infrastructure and/or additional water resources to meet the demand	Water resources are costly to develop or purchase; ability to increase revenues via water rates is greatly limited because of regulation or low ratepayer affordability
3.0 - 5.0		Water resources are believed to be sufficient to meet long-term needs, but demand management interventions (leakage management,water conservation) are included in the long-term planning	Existing water supply infrastructure capability is sufficient to meet long-term demand as long as reasonable leakage management controls are in place	Water resources can be developed or purchased at reasonable expense; periodic water rate increases can be feasibly imposed and are tolerated by the customer population
5.0 - 8.0		Water resources are plentiful, reliable, and easily abstracted	Superior reliability, capacity and integrity of the water supply infrastructure make it relatively immune to shortages	Cost to purchase or obtain/treat water is low, as are rates charged to customers
Greater than 8.0		Although operational and financial considerations may allow a long-term ILI greater than 8.0, such a level of leakage is not an effective utilization of water as a resource. Setting a target level greater than 8.0 - other than as an incremental goal to a smaller long-term target - is discouraged.		

Note: Simplified methods of calculating an economic frequency of intervention for active leakage control by regular survey have been been developed and are included in the **ALCCalcs** Standard software. This has allowed the development of the **ELLCalcs** standard software to calculate short-term Economic Leakage Level for an active leakage control policy of regular survey.

Important Footnote: the Infrastructure Leakage Index (ILI) provides guidance as to how well real losses are being managed (in terms of repairs, active leakage control and infrastructure management) at the current operating pressure. However, calculation of the ILI does not imply that pressure management in a system is optimal, or economic. If system pressures are excessive, or subject to surges, then pressure management may result in additional benefits for real losses management - in particular, a reduction in new burst frequency and annual repair costs, and a reduction in flow rates of existing leaks. So even if a low ILI is being achieved, there may still be opportunities to reduce annual real losses by improved pressure management. The **PressCalcs** Standard Software provides more detailed information on this topic.

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WATER BALANCE AND PERFORMANCE INDICATORS PROGRAM 'PIFastCalcs'			Standard	Version 1a	2nd Dec 2005	Canada	Master.0000
OPTIONAL DATA ENTRY SHEET FOR ANNUAL SYSTEM RUNNING COSTS			Data entry		Calculated Values	From another Worksheet	
Utility	Township of West Lincoln	01/01/2005 to	1/1/2006		Number of Days in Period	365	days
System	Whole System	Calculation by	Steve Genser		Date of calculation =	12/4/2006	

Total running costs as calculated below =	0.0	$Cx1000	Transfer this figure to Cell L30 of 'WaterBalance&Pis' Worksheet

Note: The following definitions of annual system running costs should be considered as guidelines only. They are based on the 'Financial Definitions' in pages 19 and 20 of the IWA 'Manual of Best Practice 'Performance Indicators for Water Supply Services', (Alegre H, Hirner W, Baptista J.M. and Parena R, July 2000, ISBN 1 900222 27 2, IWA Publishing; this report should be consulted for further guidance as necessary.

Operational Costs		Sub-total $Cx1000	Group total $Cx1000	INCLUDES
Imported water	Raw water		0.0	BULK SUPPLY IMPORTS: total payments for imported raw water
	Treated water			BULK SUPPLY IMPORTS: total payments for imported treated water
Energy	Raw water		0.0	POWER: all energy costs for water supply electricity and fuel for motive machinery
	Treatment			
	Transmission			
	Distribution			
External services: Outsourcing	Outsourcing		0.0	Outsourcing of technical or administrative services, such as consultants, contractors undertaking operational tasks, meter reading and accounting fees
	Software licences and IT support			Licence fees on computer software and technical support by software companies
	Associated Companies			Costs of associated companies that are not included in other items
	Third party services			Operating costs of providing water services to third parties (other than the regulated water supply function) that are not included in other items
Leasing and Rentals	Premises		0.0	Payments for leasing or renting premises
	Vehicles			Payments for leasing or renting vehicles
	Mobile Plant			Payments for leasing or renting mobile plant
	Fixed Plant			Payments for leasing or renting fixed plant
	Equipment			Payments for leasing or renting equipment
Purchases	Water treatment chemicals		0.0	All water treatment chemicals for water supply that are not in HIRED AND CONTRACTED SERVICES and which are required for operation of sources, treatment plants,transmission and distribution systems
	Other than chemicals and energy			All materials and consumables other than energy and water treatment chemicals for water supply, that are not in HIRED AND CONTRACTED SERVICES and which are required for operation of sources, treatment plants,transmission and distribution systems
Taxes, levies and fees	All kinds		0.0	Any operating licences paid to a Government or municipal authority, abstraction charges, local authority rates
Exceptional earnings and losses	All kinds		0.0	Any exceptional income or expenditure from donations, investment subsidies, compensations or adjustments related to sales/writing off of fixed assets
Other Operating Expenditures	Other direct costs		0.0	Any other operating costs (but excluding interest and taxation, on an aggregated basis)
	General and support expenditures			The aggregate direct cost of GENERAL AND SUPPORT ACTIVITIES (Manpower costs excluded)
	Customer services			Costs directly associated with customer services that are not included in previous items, related to customer accounting, reading of meters, debt revovery, costs of disconnections, customers'enquiries and complaints handling.
	Scientific services			Costs directly associated with scientific and laboratory services and with the monitoring of quality that are not included in previous items
	Other business activities			Costs directly associated with other business activities that are not included in previous items, except for cost depreciation
	Doubtful debts			Charge/credit to the profit and loss account for bad and doubtful debts
Sum of Operational Costs	All the above operational costs		0.0	
Internal manpower costs	Employment costs		0.0	The sum of the total manpower costs of permanent and temorary personnel, including employment-related social costs and benefits paid by the employer
Capitalised cost of self-constructed assets	Negative allocation		0.0	The summation of the amounts in each of the above cost categories that have been incurred in the construction of new or rehabilitated assets
Total Running Costs	Sum of Operational costs and Internal Manpower Costs, minus capitalised cost of self-constructed assets		0.0	

Comments:

Received April 22, 2022
C-2022-100

MULTI-MUNICIPAL WIND TURBINE WORKING GROUP
TOM ALLWOOD, COUNCILLOR, GREY HIGHLANDS, CHAIR
STEVE ADAMS, COUNCILLOR, BROCKTON, VICE-CHAIR
1925 BRUCE ROAD 10, BOX 70, CHESLEY, ON N0G 1L0
519-363-3039 FAX: 519-363-2203
deputyclerk@arran-elderslie.ca

April 22, 2022

Dear Mayor and Members of Council,

The mandate of the Multi Municipal Working Group (MMWTWG) is to share, discuss and advocate best practices and other means to address mutual concerns regarding proposals to locate and install industrial/commercial wind generation facilities to all the relevant Government Ministries and Agencies.

At the April 14, 2022 meeting of the Multi-Municipal Wind Turbine Working Group passed the following resolution:

Agenda Number: 7.2.4
Resolution No. MMWTWG-2022-17
Title: Setback Recommendation
Date: Thursday, April 14, 2022

Moved by: Bill Palmer - Citizen - Municipality of Arran-Elderslie
Seconded by: Bob Purcell - Mayor - Municipality of Dutton Dunwich

To address concerns related to noise and the public safety of citizens, the Multi Municipal Wind Turbine Working Group recommends that the following setbacks from wind turbines should be adopted in each municipality:

1. 2000 metres from any wind turbine and any noise receptor, including homes, schools, places of worship, and locations where citizens go for relaxation, such as parks and community centres.
2. 1200 metres from any wind turbine and the lot line of any non-participating citizen, or a place where a citizen can access, such as public roadways, or waterways.

Further, that the Recording Secretary is empowered to prepare a letter to all municipalities in Ontario and the responsible Ministries, (Ministry of the Environment Conservation and Parks, and Ministry of Municipal Affairs) to be signed by the chair of the MMWTWG for immediate release.

CARRIED

Through changes made to the Planning Act in 2019, the province returned powers to municipalities to ensure that they have the final say on energy projects in their community. Proponents of new projects need to confirm that their project is permitted by the municipalities' zoning bylaws. Now that there are reports that sites are being sought for new wind turbines, it is timely that municipalities review the provisions in their zoning bylaws and update them as appropriate.

Key elements in zoning bylaws are setbacks between activities. While experience with the existing wind turbine projects in Ontario and changes in other jurisdictions indicate that the current provincial setbacks are inadequate to protect health of nearby residents. Municipalities are free to establish their own setbacks used in local bylaws. It is in this context that the MMWTWG is providing these recommendations to your municipality.

Attached is a summary of information related to setbacks. It includes a review of different setbacks based on a review by the Polish Public Institute of Health as well as information on setbacks used in other jurisdictions. The 2000 m setback from noise receptors is designed to provide protection from audible noise as well as low frequency noise and infrasound which travels greater distances that could occur from multiple turbines permitted by the current setback of 550 metres. Similarly, although 1200 metres may be a larger distance than we have observed significant pieces of blades travel from the towers, it provides a buffer to give protection from fire, or shadow flicker, that can cause problems further than blade pieces fall.

The Multi-Municipal Wind Turbine Working Group invites the participation of all municipalities across Ontario. To obtain details regarding the group's mandates, Terms of Reference and how to be come a Member, please reach out to our Recording Secretary, Julie Hamilton at deputyclerk@arran-elderslie.ca. Size in numbers provides a louder voice to be heard!

Warmest Regards,
On behalf of the Chair, Tom Allwood

Julie Hamilton, Recording Secretary
Deputy Clerk
Municipality of Arran-Elderslie,
1925 Bruce Road 10, PO Box 70
Chesley, ON N0G 1L0
519-363-3039 ext. 105
deputyclerk@arran-elderslie.ca

c. Honourable David Piccini, Minister of Environment, Conservation and Parks, minister.mecp@ontario.ca, Honourable Steve Clark, Minister of Municipal Affairs and Housing, minister.mah@ontario.ca

Encl.

Setback Information

Current Ontario Rules – Regulation 359/09		
Receptors	550 metres	Audible noise only based on 40 dBA
Property Lines	Blade length plus 10 metres	Typically 60 metres

Polish Public Health Institute Review		
Audible Noise	.5 to .7 km	No adjustments for pulsing/tonal quality
Total Noise	1.0 to 3 km	Includes low frequency noise & pulsing/tonal adjustments
Shadow Flicker	1.2 to 2.1 km	Depends on height of turbine
Ice Throw	.5 to .8 km	Fragments of ice thrown from blades
Turbine Failure	.5 to 1.4 km	Potential distance for blade fragments

Examples of Setbacks

Jurisdiction	Set-back	Comments
Dutton-Dunwich, ON	2,000 M	To receptors
Mason County, Kentucky	1,600 M	To property line
Caratunk County, Maine	2,414 M	To property line
Wyoming	1,110 M	5.5 X height to property line
Bavaria, Germany	2,073 M	10 X hub height plus blade length
Sachsen, Germany	1,380 M	10 X hub height
Northern Ireland	1,386 M	10 X rotor diameter
Poland	2,073 M	10 X hub height plus blade length

Received April 20, 2022
C-2022-101

TOWN OF HALTON HILLS
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haltonhills.ca

April 20, 2022

Honourable Steve Clark, Minister of Municipal Affairs and Housing
Via Email

Re: Build it Right the First Time

Please be advised that Council for the Town of Halton Hills at its meeting of Monday, April 11, 2022, adopted the following Resolution:

Resolution No. 2022-0077

WHEREAS The Town of Halton Hills made a commitment through its Climate Change Emergency Resolution adopted in May 2019 to reach net-zero GHG emissions by the year 2030, which is consistent with the current scientific data indicating that this is required by all jurisdictions if we are to avoid catastrophic climate-related events;

AND WHEREAS Residential and commercial buildings account for 33% of the GHG emissions in Halton Hills;

AND WHEREAS The Town of Halton Hills is actively implementing its Low Carbon Transition Strategy and has committed millions of dollars in the current budget to upgrade energy efficiency in its corporate building stock;

AND WHEREAS The Town of Halton Hills has adopted its third upgraded iteration of its Green Development Standards to ensure that all new buildings are built above the current Ontario Building Code mandatory requirements;

AND WHEREAS the Ministry of Municipal Affairs and Housing is consulting on changes for the next edition of the Ontario Building Code (ERO #019-4974) that generally aligns with the draft National Model Building Code except it does not propose adopting energy performance tiers, it does not propose timelines for increasing minimum energy performance standards step-by-step to the highest energy performance tier, and according to Efficiency Canada and The Atmospheric Fund, it proposes adopting minimum energy performance standards that do not materially improve on the requirements in the current Ontario Building Code;

AND WHEREAS The greenhouse gas reduction targets set out in municipal climate Change strategies across the province will not be achievable without a commitment by the Provincial government to use this opportunity with respect to updates to Ontario Building Code to upgrade the energy efficiency of all new builds in line with other Provinces and the National Standards;

AND WHEREAS ensuring that all new buildings in the Province of Ontario are built to the highest energy efficiency means that they will not need expensive retrofits in the future and the cost of heating and cooling these buildings will be reduced from the moment they are first occupied;

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AND WHEREAS the lack of strong energy efficiency standards in the current and proposed OBC have resulted in the costly development of local green development standards as individual municipalities are forced to negotiate energy upgrades as they strive to meet their GHG reduction goals (Halton Hills, Toronto, Whitby, Pickering, City of Waterloo);

THEREFORE BE IT RESOLVED THAT Council request the Province of Ontario to include energy performance tiers and timelines for increasing minimum energy performance standards step-by-step to the highest energy performance tier in the next edition of the Ontario Building Code, consistent with the intent of the draft National Model Building code and the necessity of bold and immediate provincial action on climate change;

AND FURTHER THAT if the OBC is not upgraded to the National Model Building Code that municipalities be given the authority to adopt a higher level of energy efficiency consistent with the National Building Code;

AND FURTHER THAT this resolution be provided to the Minister of Municipal Affairs and Housing, to Halton MPP's to the leaders of all Provincial political parties and to all Ontario Municipalities.

Attached for your information is a copy of Resolution No. 2022-0077.

If you have any questions, please contact Valerie Petryniak, Town Clerk for the Town of Halton Hills at valeriep@haltonhills.ca.

Sincerely,

Melissa Lawr
Deputy Clerk – Legislation

cc. Halton MPP's
leaders of all Provincial political parties
all Ontario municipalities

TOWN OF
HALTON HILLS

THE CORPORATION
OF
THE TOWN OF HALTON HILLS

Resolution No.: 2022-0077

Title: **Build it Right the First Time**

Date: April 11, 2022

Moved by: **Councillor J. Fogal**

Seconded by: **Mayor R. Bonnette**

Item No. 15.3

WHEREAS The Town of Halton Hills made a commitment through its Climate Change Emergency Resolution adopted in May 2019 to reach net-zero GHG emissions by the year 2030, which is consistent with the current scientific data indicating that this is required by all jurisdictions if we are to avoid catastrophic climate-related events;

AND WHEREAS Residential and commercial buildings account for 33% of the GHG emissions in Halton Hills;

AND WHEREAS The Town of Halton Hills is actively implementing its Low Carbon Transition Strategy and has committed millions of dollars in the current budget to upgrade energy efficiency in its corporate building stock;

AND WHEREAS The Town of Halton Hills has adopted its third upgraded iteration of its Green Development Standards to ensure that all new buildings are built above the current Ontario Building Code mandatory requirements;

AND WHEREAS the Ministry of Municipal Affairs and Housing is consulting on changes for the next edition of the Ontario Building Code (ERO #019-4974) that generally aligns with the draft National Model Building Code except it does not propose adopting energy performance tiers, it does not propose timelines for increasing minimum energy performance standards step-by-step to the highest energy performance tier, and according to Efficiency Canada and The Atmospheric Fund, it proposes adopting minimum energy performance standards that do not materially improve on the requirements in the current Ontario Building Code;

AND WHEREAS The greenhouse gas reduction targets set out in municipal climate Change strategies across the province will not be achievable without a commitment by the Provincial government to use this opportunity with respect to updates to Ontario Building Code to upgrade the energy efficiency of all new builds in line with other Provinces and the National Standards;

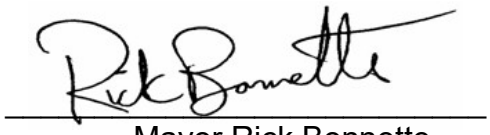
AND WHEREAS ensuring that all new buildings in the Province of Ontario are built to the highest energy efficiency means that they will not need expensive retrofits in the future and the cost of heating and cooling these buildings will be reduced from the moment they are first occupied;

AND WHEREAS the lack of strong energy efficiency standards in the current and proposed OBC have resulted in the costly development of local green development standards as individual municipalities are forced to negotiate energy upgrades as they strive to meet their GHG reduction goals (Halton Hills, Toronto, Whitby, Pickering, City of Waterloo);

THEREFORE BE IT RESOLVED THAT Council request the Province of Ontario to include energy performance tiers and timelines for increasing minimum energy performance standards step-by-step to the highest energy performance tier in the next edition of the Ontario Building Code, consistent with the intent of the draft National Model Building code and the necessity of bold and immediate provincial action on climate change;

AND FURTHER THAT if the OBC is not upgraded to the National Model Building Code that municipalities be given the authority to adopt a higher level of energy efficiency consistent with the National Building Code;

AND FURTHER THAT this resolution be provided to the Minister of Municipal Affairs and Housing, to Halton MPP’s to the leaders of all Provincial political parties and to all Ontario Municipalities.



Mayor Rick Bonnette

Received April 20, 2022
C-2022-102

THE OFFICE OF THE CLERK
Suzanne Huschilt
The Municipality of Hastings Highlands
33011 Hwy 62N
Maynooth, ON K0L 2S0
613 338-2811 ext. 277
shuschilt@hastingshighlands.ca

April 20, 2022

VIA EMAIL ONLY

The Honourable Doug Ford
Premier of Ontario
Legislative Building
Queen's Park
Toronto, ON M7A 1A1
premier@ontario.ca

Attention: Premier Ford

Re: Funding Support for Infrastructure Projects - Bridge and Culvert Replacements in Rural Municipalities

Please be advised that on April 20, 2022, The Council of the Municipality of Hastings Highlands resolved the following:

(139-2022) Consent Agenda Item
That Council for the Municipality of Hastings Highlands accept for information the February 9, 2022 correspondence from Township of Clearview regarding their letter to Premier Ford for funding support for infrastructure projects, bridge and culvert replacements in rural municipalities; and
That Council support the Township of Clearview February 7, 2022 resolution requesting that Federal and Provincial Governments to provide more funding to rural municipalities to support infrastructure projects related to major bridge and culvert replacements; and
That Council direct that this resolution be forwarded to Ontario municipalities, AMO, Premier of Ontario, Provincial Minister of Finance, Federal Finance Minister and ROMA for support.

Please accept this for your consideration and any necessary action.

Regards,

Suzanne Huschilt
Municipal Clerk

cc:
Hon. Peter Bethenfalvy, Ontario Minister of Finance minister.fin@ontario.ca
Hon. Chrystia Freeland, Federal Minister of Finance chrystia.freeland@fin.gc.ca
ROMA roma@roma.on.ca
AMO amo@amo.on.ca
All Ontario Municipalities

THE CORPORATION OF THE TOWN OF COCHRANE Received April 22, 2022
C-2022-103

REGULAR COUNCIL

DATE: April 5, 2022

RESOLUTION NO.: 118 -2022

AGENDA ITEM NO.: 10.1

MOVED BY Belisle

SECONDED BY O'Connor

WHEREAS the Year of the Garden 2022 celebrates the Centennial of Canada's horticulture sector; and

WHEREAS gardens and gardening contribute to the quality of life of our municipality and create safe and healthy places where people can come together; and

WHEREAS the Year of the Garden 2022 will highlight and celebrate the important contribution of gardeners, our local gardening organizations, horticultural professionals and local horticultural businesses which contribute to garden culture and the experience garden of our municipality; and

WHEREAS gardens and gardening have helped us face the challenges of the COVID pandemic; and

WHEREAS Communities in Bloom in collaboration with the Canadian Garden Council, invites all municipalities to celebrate the Year of the Garden;

NOW THEREFORE BE IT RESOLVED THAT I, Mayor Denis Clement, on behalf of the Town of Cochrane do hereby proclaim 2022 as the Year of the Garden in celebration of the contribution of gardens and gardening to the development of our country, our municipality and the lives of our citizens in terms of health, quality of life and environmental challenges; and

THAT the Saturday before Father's Day, June 18, 2022, be recognized as Garden Day in the Town of Cochrane as a legacy of Canada's Year of the Garden 2022; and

THAT the Town of Cochrane is committed to be a Garden Friendly Town supporting the development of its garden culture; and

THAT all the municipalities across Canada be invited to proclaim 2022 to be the Year of the Garden in their respective municipalities, and that a copy of this resolution be provided to all municipalities of Ontario, and for that purpose.

THE CORPORATION OF THE TOWN OF COCHRANE

DECLARED THE MOTION

☑ CARRIED
☐ DEFEATED
☐ DEFERRED
☐ REFERRED TO:_____

☐ RECORDED VOTE - Requested by:_____

Mayor (Acting Mayor)

RECORDED VOTE	FOR	AGAINST	CONFLICT	ABSENT
Daniel Bélisle				
Todd Calaiezzi				✓
Denis Clement				
Rodney Hoogenhoud				✓
Robert Hutchinson				
Desmond O'Connor				
Frank Sisco				

DECLARATION OF CONFLICT OF INTEREST

_____ DISCLOSED HIS/HER INTEREST(S)

_____ VACATED HIS/HER SEAT

ABSTAINED FROM DISCUSSION AND DID NOT VOTE ON THIS QUESTION.