


# WATER ON THE RISE: PROTECTING CANADIAN HOMES FROM THE GROWING THREAT OF FLOODING

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AET Group is an employee-owned multi-disciplinary environmental consulting, auditing and scientific services company that has been serving Canadians since 1998. With over 1,000 projects completed in Ontario and across Canada, AET offers extensive experience, capabilities and a proven track record. AET Group was contracted by the University of Waterloo to provide delivery of the Home Flood Protection Program assessments.

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# EXECUTIVE SUMMARY



Residential basement flooding is on the rise across much of Canada. Intense rainfall events combined with aging infrastructure, increased urbanization, loss of natural infrastructure, and a lack of flood protection measures at the household level have resulted in losses in the billions of dollars for the country's insurance companies, governments, homeowners, landlords and tenants over the past decade. With an average price tag of $43,000 per flooded basement (Insurance Bureau of Canada, 2018), Canadian residents are increasingly seeking site-specific guidance to help them achieve practical, cost-effective means to reduce their household flood risk.

From 2016 to 2018, the Intact Centre on Climate Adaptation (University of Waterloo) developed and tested the **Home Flood Protection Program** (HFPP), which is an initiative designed to provide homeowners with practical information necessary to identify and limit their risk of basement flooding.

A key lesson learned from the program was that there are 10 top actions that can be completed to significantly reduce the risk of basement flooding for most homes (see the top 10 actions listed on page 18). Many of **these actions can be completed by residents themselves in less than 1 day, for under $250.** Unfortunately, many residents are not completing these actions. Program results indicate that direct conversations, between homeowners and those trained in flood risk mitigation, are the most effective means to motivate residents to take action to reduce flood risk at the household level.

## Program Delivery

The Home Flood Protection Program was piloted in Toronto and Burlington, Ontario, as well as in Saskatoon, Saskatchewan (2016-2018). The HFPP delivery in each community included the following key elements:

1. **Free Online Resources:** Home flood protection fact sheets and video links were provided through the program's webpage www.homefloodprotect.ca. Additional local resources were included for participating communities, featuring local flood protection subsidy program information and tips for selecting local flood risk mitigation contractors.
2. **Home Flood Protection Assessment:** A confidential, onsite, 60-90 minute flood risk assessment service was made available to owners of detached homes, semi-detached homes and townhomes. The service featured an easy-to-read summary report and an optional 15-minute follow-up conversation with the assessor. Depending on the resources available within each pilot community, the assessment was available to residents for a fee ranging from $0 to $125.
3. **Customized Outreach Strategy:** A unique outreach strategy was developed for each community based on its flood risk reduction goals, project timelines and the resources available. Program planning and promotions were developed in collaboration with local municipalities, conservation authorities, community groups and insurance providers to complement and enhance ongoing flood risk reduction efforts.

## Program Results

A total of 510 HFPP assessments were completed. Ten flood risk assessors were trained in Ontario, delivering 397 flood risk assessments in 2017 and 2018. Fueled by the success of the Ontario program, an additional two assessors were trained in Saskatoon, Saskatchewan, delivering 113 assessments in 2018.

In Ontario, 72% of program participants participated in a Home Flood Protection follow-up study. Its purpose was to determine the degree to which homeowners took action to limit flood risk based on information they received during their Home Flood Protection Assessment. Ninety-one participants completed a three-month follow-up survey and 24 participants completed a six-month follow-up survey. The flood risk data featured in this report summarizes the results of these assessment reports and follow-up surveys.

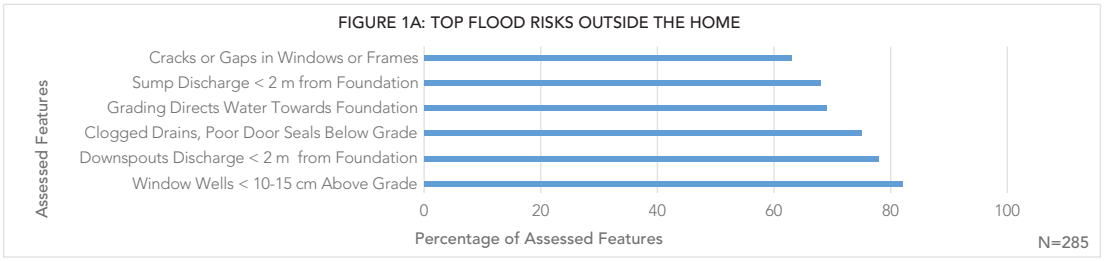
## Flood Risks Outside the Home

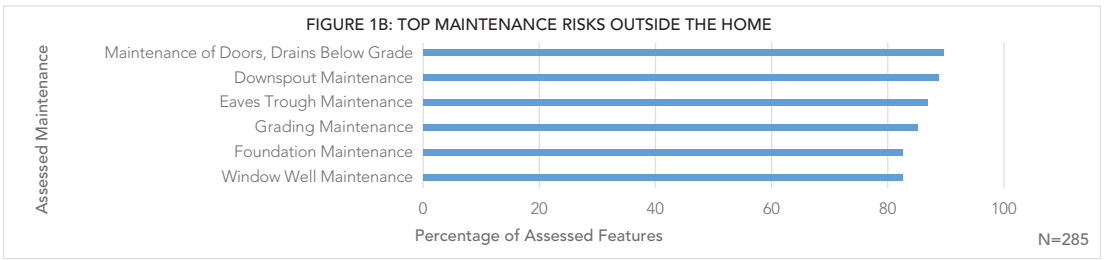
Visual assessment of the lot grading, landscaping and exterior characteristics of participating Ontario homes revealed several key flood protection features that consistently did not meet best practice standards for reducing risk. These deficiencies increased the risk of overland and seepage flooding into the basement. **Eighty-two percent of homes with window wells had wells that were not 10-15cm above the surface of the ground and sealed at the foundation. Seventy-eight percent of homes with downspouts and 68% of homes with sump pump discharge pipes discharged water less than 2m from the home's foundation.** Seventy-five percent of homes with doors below grade had drains and door seals in poor condition. Sixty-nine percent of homes had grading that did not direct water away from the foundation and 63% of homes with basement windows had cracks and gaps in the windows or frames (Figure 1A). When asked to report on maintenance efforts to limit flood risk outside of the home, residents stated that they were acting with commendable effort – however, such reporting stood in contrast to on-the-ground observations (Figure 1B).

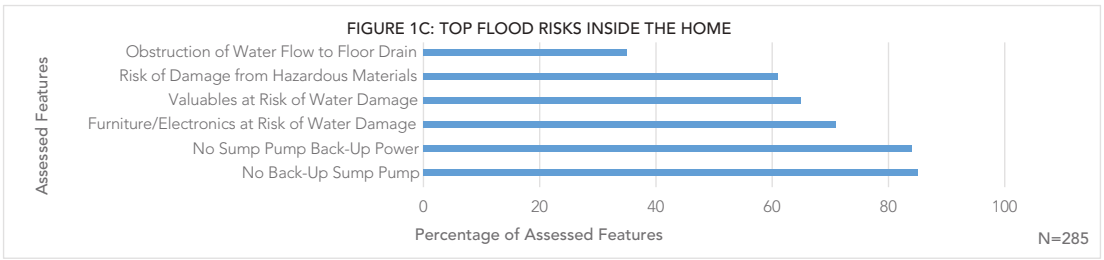
## Flood Risks Inside the Home

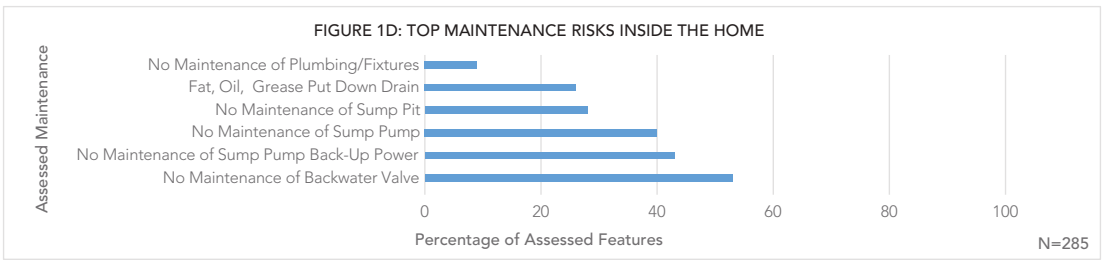
Visual assessment of basements revealed several key flood protection features that did not meet best practice standards for reducing risk. These deficiencies put homes at increased risk of sump pit overflow, sewer backup and damage to the basement's structure and contents. **Eighty-five percent of homes with sump pumps did not have a back-up sump pump and 84% did not have backup power in case of a power outage. Seventy-one percent of homes had furniture and electronics and 65% had stored valuables at risk of water damage during a flood.** Sixty-one percent had improperly stored hazardous materials (e.g. paints, pesticides) that may increase damage during a flood (Figure 1C). Several key maintenance activities that were not completed twice a year put homes at increased risk of sump pit overflow and sewer backup. **Fifty-three percent of homes with backwater valves never maintained them, 43% of homes with backup power for their sump pump never maintained the system, 40% with sump pumps never maintained them,** and 26% of homes put fat, oil or grease down their drains (Figure 1D).

## FIGURE 1: FLOOD RISKS INSIDE AND OUTSIDE THE HOME

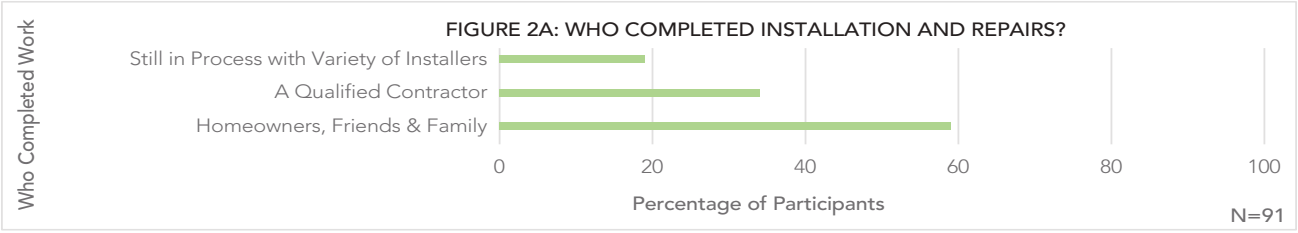


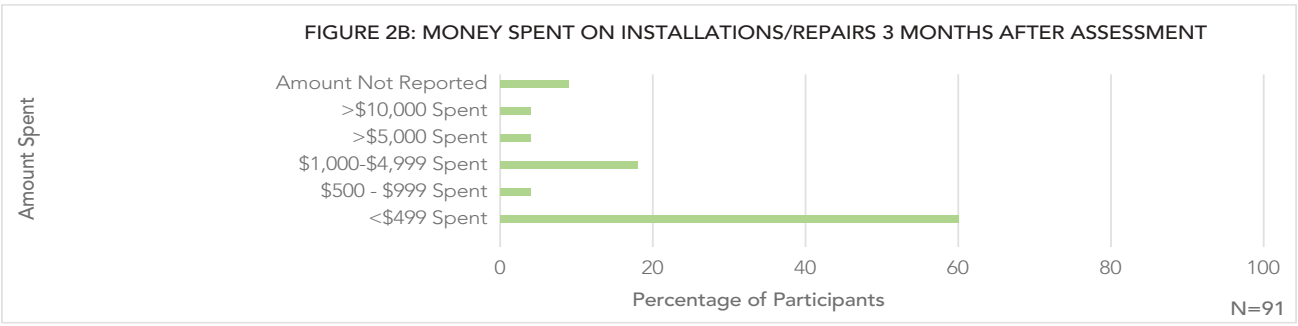



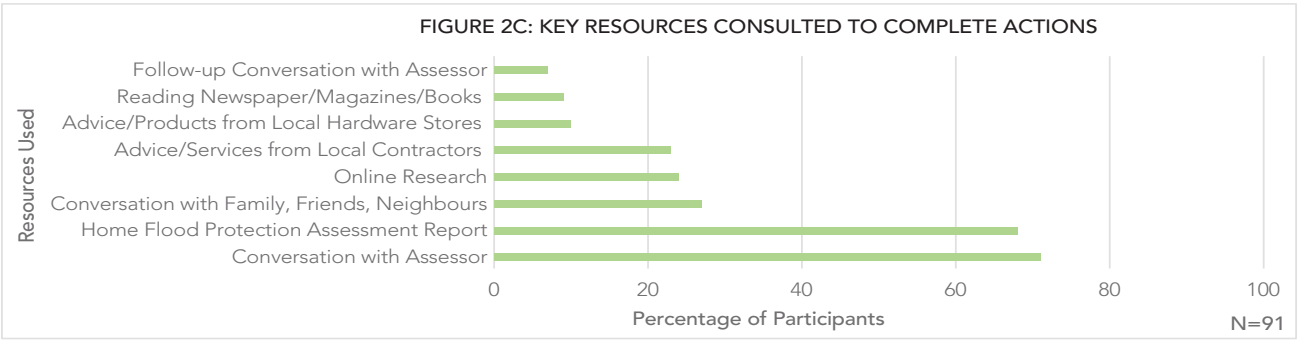



## FIGURE 2: INSTALLATION AND REPAIRS COMPLETED TO REDUCE FLOOD RISK




### Actions Taken to Reduce Flood Risk

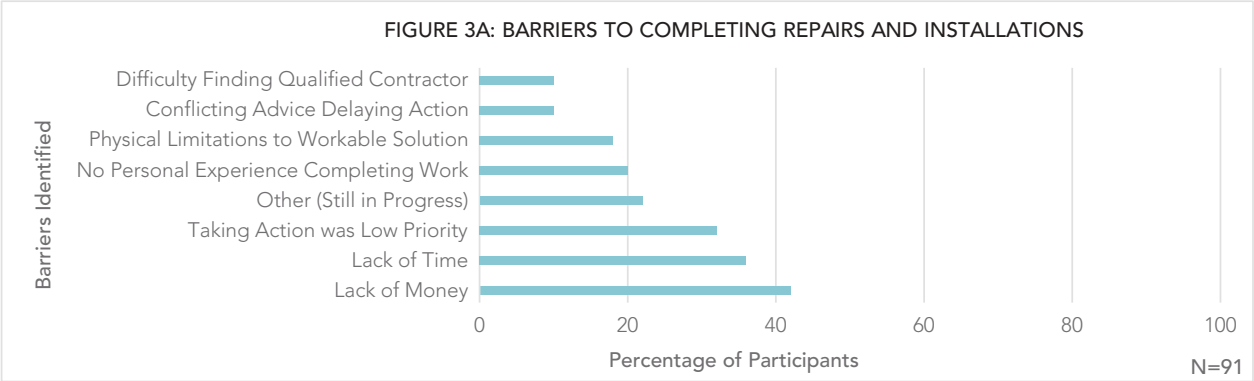
Each home flood risk assessment report featured a summary of the top actions that could be taken "outside" and "inside" the home to reduce risk. These summaries identified physical features and maintenance practices that ranked as "poor/needs further investigation." Study participants were asked to report at 3 months and 6 months to identify which actions they had taken to address any of these top ranked deficiencies. At 3 months, 79% of participants noted completing at least one new action to address flood risk, and at 6 months, 71% of participants noted completing at least one additional action. As part of the 3-month follow-up survey, 59% of participants noted that they had completed the actions themselves or with the help of family and friends, 34% noted that the actions had been completed by a contractor, and 19% stated that actions were still in the process of being completed (Figure 2A).

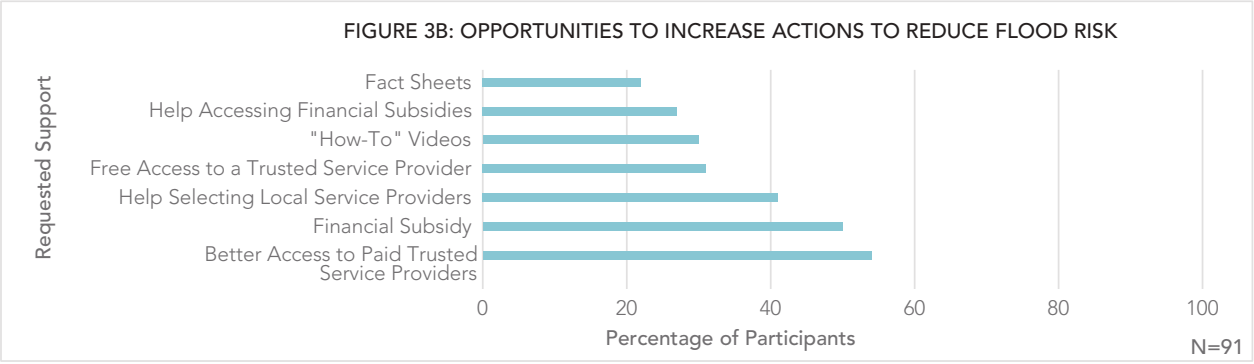
Sixty percent of participants completed actions that cost under $500 and could be completed by a "handy-person" homeowner generally within a day. Examples of these actions include: storing valuables in waterproof containers or removing them from the basement, cleaning out eaves troughs, installing window well covers, and extending downspouts and sump pump discharge pipes to a minimum of 2m away from the foundation. Forty percent of participants completed actions that were more complex, costly and often required the support of qualified contractors. The cost of completing these actions ranged widely from $500 to over $10,000 (Figure 2B). Some of these actions included installing a backwater valve, backup sump pump or backup battery, relining or replacing a sewer lateral, installing a sewer lateral cleanout, replacing basement windows, replacing eaves troughs, replacing a driveway and installing window wells.

### Key Information Resources Cited

Participants used various resources to support their decision-making and to help them complete flood risk reduction actions. The powerful influence of one-on-one conversations with trusted flood risk mitigation experts stands out as significant. Seventy-one percent of participants cited conversations with their Home Flood Protection Assessors and 68% cited their assessment report (which is a written record of the conversation with the assessor) as key resources used. Twenty-seven percent cited the importance of conversations with family, friends and neighbours, 23% cited conversations with local contractors and 10% cited advice from staff at local hardware stores as key decision-making sources of information. Participants also noted referring to educational materials they found online (24%), and in newspapers, books and magazines (9%) (Figure 2C).

## FIGURE 3: BARRIERS AND OPPORTUNITIES TO INCREASE ACTIONS TO PROTECT BASEMENTS FROM FLOODING




## Barriers to Taking Action to Reduce Flood Risk

The main barriers that homeowners identified to taking action can be divided into two main categories: barriers for those who wished to engage a contractor to do the work and barriers for those who wished to complete the work themselves. **For those wishing to engage a contractor, 42% of surveyed participants noted that a lack of money was a barrier to action,** 36% noted that there was a lack of time (many noted they were still waiting for a contractor to complete the work) and 10% noted difficulty finding a qualified contractor. For those wishing to complete the work themselves, a lack of personal expertise (20%), and physical limitations on their properties to finding a workable solution (such as wanting to extend the downspout but realizing it would present a tripping hazard (18%)) were noted barriers. Additional top ranked barriers related to the perceived lack of urgency for completing the work. For example, 32% noted that taking action was a low priority. A total of 12% of participants noted that they received conflicting advice from various sources about how to tackle a problem, and therefore their project stalled (Figure 3A).

## Opportunities to Increase Uptake of Flood Protection Actions by Residents

Participants identified that they would like increased access to financial support, improved access to qualified contractors and increased access to trustworthy, third-party information resources to help improve their ability to protect their homes from flooding.

- Increased Access to Financial Support

**Fifty percent of participants stated they would like a financial subsidy to help them complete flood risk reduction projects,** 31% noted that they would like financial support to get access to qualified contractors for free, and 27% noted that they would like help accessing available subsidies (Figure 3B).

Participants support the provision of municipal flood protection subsidies, including subsidies to complete flood risk assessments. **They also recommend a streamlined process for accessing subsidies such as instant rebates at retail stores for items such as downspout extensions and sump pump backup systems to simplify the process of accessing subsidies and to increase uptake.** Participants are also in favour of receiving insurance discounts for taking action to reduce flood risk.

- Increased Access to Qualified Contractors

**Fifty-four percent of participants noted that they would like increased access to trusted service providers and 41% noted that they would like help selecting qualified contractors** (Figure 3B).

Presently residents are experiencing challenges finding qualified contractors who can do flood protection work for them in a timely manner. Many participants noted long delays waiting for contractors and difficulties getting contractors to respond to requests for smaller jobs that they needed done.

**A business opportunity exists in Ontario for trained home flood risk assessors to help residents identify their key opportunities to reduce risk. Additional opportunities exist for contractors to provide flood protection installation, maintenance and subsidy application services to residents.** Increasing the number of contractors engaged in residential flood protection services will help address the demonstrated public demand for services and will drive local economic growth for contractors and suppliers.

• Trustworthy, Third-Party Information Resources

Residents want greater access to third-party information resources, particularly those residents who wish to complete actions on their own. Participants noted that they want trustworthy information from a source that is not trying to sell any one particular product or service, including those resources produced by government, academic, and non-governmental organizations.

Thirty percent of participants noted that they wanted greater access to third-party how-to videos and 22% noted that they wanted greater access to third-party fact sheets (Figure 3B).

Cost-effective opportunities exist for agencies to share clear and consistent third-party information with their networks. Opportunities also exist for training industry professionals (home inspectors, realtors, insurance brokers, retailers, and mortgage brokers), government and non-governmental organization staff about helping residents to reduce flood risk. Part of the training should include the provision of reputable, third-party resources that they can share with their networks, including how-to-videos, flood protection subsidy information and seasonal maintenance reminders.

## Supporting Residential Flood Risk Reduction Across Canada

Reducing residential basement flood risk at a national scale is a complex challenge that will involve building on the successful work already underway by governments, not-for-profits, academia, retailers, and insurance companies to educate residents and provide financial incentives where possible, to help homeowners take sustained action to reduce flood risk. It will also include bringing additional parties to the table, such as landlord and tenant organizations, to ensure that they are aware of their risks and can take action to reduce those risks. Basement apartments represent some of the most cost-effective housing units in Canada, and it is critical that concerted efforts be made to ensure safe and reliable access to this form of housing.



Homeowner Margaret Banks demonstrates her methods for cleaning out her backwater valve once per season to minimize risk of sewer backup. Burlington, 2017

## The Intact Centre's Support of Nation-Wide Basement Flood Risk Reduction Education Programs

The Home Flood Protection Program's flood risk reduction educational innovations are now driving action to reduce residential flood risk nation-wide.

Two key training programs are in place, one creating a skilled workforce to assess residential flood risk, and the other training industry professionals as well as government and not-for-profit staff to help residents understand their flood risk, and how to take action to reduce that risk. The programs are described below:

### Home Flood Risk Assessor Training

In 2018, the Intact Centre partnered with Seneca and Fleming Colleges to develop a 42-hour Home Flood Risk Assessment Training (HFRAT) course for home flood risk assessors. In September 2018, the first course was offered at Seneca College in Toronto. The course is available nationally in 2019 through the Ontario Colleges' online training portal, OnLearn. Course graduates are granted access to the Home Flood Protection Program's nationally applicable electronic residential flood risk assessment tool, thus enabling them to complete flood risk assessments for residential clients.

Registration is available at: https://fleming-college.ca/continuing-education/courses/home-flood-risk-assessment-training

### Home Flood Risk Educator Training and Materials

In October 2018, a one-hour in-class flood risk education training program was developed and accredited for registered insurance brokers in Ontario. This training program is now being adapted for in-person and online deployment to insurance brokers nationally and to facilitate training of additional groups nation-wide that provide front line flood risk reduction and educational support to homeowners. These groups include realtors, mortgage brokers, emergency service workers, retailers, municipal and conservation authority staff, not-for profits, landlords and tenant associations. The course provides learners with easily shareable and adaptable third-party resources that they can use to drive residential action to reduce basement flood risk.

### Third Party Resources

A variety of free, third-party how-to resources are available to residents and organizations who would like to educate their residential networks. Resources are available through the Home Flood Protection Program website: www.homefloodprotect.ca

# HOME FLOOD PROTECTION PROGRAM

## 1. DEVELOPMENT OF THE HOME FLOOD PROTECTION PROGRAM (HFPP)

The Intact Centre developed the Home Flood Protection Program (HFPP) to help homeowners reduce their risk of basement flooding, and to minimize damage if flooding did occur.

The HFPP included the following key elements:

1. HFPP Assessment Tool and Report
2. HFPP Outreach Strategy
3. HFPP Training Program

### About the Home Flood Protection Assessment

The HFPP offers homeowners a customized flood-risk evaluation known as the "Home Flood Protection Assessment". The assessment takes approximately 1.5 hours to complete. The assessment begins with an assessor conducting a 5 minute interview with the homeowner to discuss their past flood experiences, actions taken to reduce flood risk, and key concerns that they would like the assessment to address. During the assessment, the homeowner accompanies the trained assessor in completing a visual assessment of 45 physical features inside and outside the home using simple tools such as measuring tapes, flashlights and audible moisture meters. The assessment also covers 35 maintenance practices, during which the homeowner is asked about how often they complete each flood risk reduction maintenance activity.

Using the Intact Centre's nationally applicable flood risk assessment tool, all features are assigned a score of "good", "intermediate" or "poor/needs further investigation". Items that score "poor/needs further investigation" are itemized in inside and outside summary pages which also identify practical opportunities to reduce risk. In the Appendices, the report includes a record of all items scored during the assessment and a list of customized resources that residents can use to help them take action.

Residents receive the confidential report in the mail or through a password protected online portal. Upon receipt of the report, residents have the option to have a 15-minute follow-up conversation with the assessor.

### 2019 Home Flood Protection Assessment Delivery

**AET Group will continue to deliver the assessments across Canada in 2019 and beyond.** Registration information is available at www.homefloodprotect.ca

## 1.1 Development of the Assessment Tool and Report

The Home Flood Protection Assessment's best practices and scoring system were developed from January to December 2016. To develop the content, the Intact Centre completed a review of literature on the following topics: residential flood vulnerability, best practices for reducing flood risk, and best practices for engaging residents in one-on-one conversations about flood risk reduction (see Appendix A for a list of assessment tools reviewed).

Once the best practices and the resident engagement script drafts were completed, feedback was sought from subject matter experts. The updated version of the tool and protocols were field-tested in March 2017 and minor updates were made based on feedback from assessors. In 2018, additional upgrades to the best practices in the Home Flood Protection Tool were made to ensure that they met the technical requirements of the Canadian Standards Association Z800-18 Guideline on Basement Flood Protection and Risk Reduction (published Fall 2018).

## 1.2 Development of the HFPP Outreach Strategy

Based on the national and international literature review on motivating homeowner action to reduce flood risk, a comprehensive outreach framework was developed and tested in 2017 in Burlington, Ontario. This resulted in the completion of 86 assessments in Burlington and 18 in nearby communities. In 2018, the original outreach approach was adapted to meet the goals, project timelines and resources available in the participating communities of Toronto and Burlington, Ontario, as well as in Saskatoon, Saskatchewan.

## 1.3 Development of the HFPP Training Program

Development of the HFPP's training program, which included 30 hours of online and 20 hours of in-person training, was completed in 2017 and resulted in the training of 10 flood risk assessors in Ontario. An additional 2 assessors were trained in Saskatoon in 2018 (see Appendix B for a list of stakeholders consulted during the development of the training program).

As part of a complementary project, in collaboration with Seneca and Fleming Colleges, the Intact Centre's assessor training program was adapted into a 42-hour in-class course that featured the use of the home flood risk assessment tool. The first class was offered in September 2018 at Seneca College, Toronto. Students enrolled in the program were primarily from the fields of home inspection, insurance and engineering. An online version of the course is available across Canada in 2019 through the Ontario Colleges OnLearn training portal. Registration is available at https://flemingcollege.ca/continuing-education/courses/home-flood-risk-assessment-training

# 2. PROGRAM IMPLEMENTATION

## 2.1 Overview of Program Approaches and Results

A total of 510 Home Flood Protection Assessments were completed in 2017 and 2018: 120 in Burlington, 168 in Toronto, 109 in areas within 150 km of the Greater Toronto Area (including Kitchener-Waterloo, Brantford, Guelph and Clarington), and 113 in Saskatoon, Saskatchewan.

## 2.2 Pillars of Program Development

The design, promotion and delivery of the HFPP were based on the internationally recognized program pillars for motivating homeowners to take action to reduce their flood risk. Necessity, responsibility, trust, ability, and return on investment were key elements that were highlighted in the development of all communications materials and communications approaches. These pillars are described in greater detail below.

Necessity – Is the risk real and urgent?

- **Past Flood Experience:** Studies note that experience with past floods (especially frequent or intense floods) leads to higher levels of action among homeowners (Owusu, 2015)
- **Risk Mapping:** Studies note that providing homeowners with urban or riverine flood risk maps can help increase uptake of actions but only if this information is delivered by trusted community leaders, family or friends (Owusu, 2015)

Responsibility – Is the resident responsible for taking action?

- **Acknowledging Personal Responsibility:** The realization that reducing flood risk is the homeowner's responsibility and not that of an outside source (e.g. government or insurance company, or in the case of tenants, their landlord) has shown to result in higher levels of action (Maidl and Bruckheimer, 2015)
- **Partners in Protection:** Homeowners need to understand that they have a critical role to play in protecting their homes and that these efforts complement the efforts of governments and insurance companies (Maidl and Bruckheimer, 2015)

Trust – Is the information that is being provided trustworthy and worth one's attention?

- **Trustworthy Information:** The belief that the measures recommended will work (e.g. personal experience or from trusted individuals) is positively correlated with higher levels of action among homeowners (Thistlethwaite et al., 2017)
- **Basic Fact Checking:** Residents look to governments, insurance companies and media personalities to receive high level guidance about what information is accurate and worthy of their attention (Johnson, 2012)
- **Decision-Making Tipping Point:** Residents consider the opinions of trusted individuals to make final decisions about taking action (e.g. help from family, friends, neighbours, contractors, retailers) (Johnson, 2012)

Ability – Does the resident have the information necessary to make informed decisions as well as the skills and the financial supports needed to take action?

- **Self-Evaluated Ability:** A homeowner's self-evaluated ability to address the problem has an important influence on the level of action taken. Positive belief in their personal ability to act is positively correlated with higher levels of action
- **Co-Creation:** Flood Risk Assessments feature a problem-solving conversation between the trained flood risk assessor and the residents. Studies have shown that residents are much more likely to take action if they feel that they have made a well-informed decision themselves as opposed to if they are being told what they must do (Mackenzie-Mohr, 2011; Thistlethwaite et al., 2017)
- **Access to Needed Funds:** Financial subsidies can help to reduce the barriers to action, but if residents must initially self-finance, and subsequently get reimbursed, or if the application paperwork is lengthy/confusing, this reduces the likelihood that they will take advantage of these resources (Kreibich and Schwartze, 2011)

Return on Investment – Is it worth the time and money required to reduce risk?

- **Reasonable Return On Investment:** The perception that the cost of installing measures provides a reasonable return on investment relative to the risk of an event happening, and the associated cost is also an important factor in determining the level of action among homeowners (Kreibich and Schwartze, 2011)

See Appendix C for literature regarding motivating behavioural change to reduce risk.




### 1. Necessity

- Intense storms impact photo

### 2. Responsibility

- Your role

### 3. Return on Investment

- Average flood cost

### 4. Return on Investment

- Discounted price

### 5. Ability

- You can take action with help of confidential report, resources, follow-up support

### 6. Trust

- No product or service sales
- Developed by University of Waterloo, support from City of Burlington

The City of Burlington's promotional flyer which incorporates the pillars of program development, 2017.

## 2.3 Adapting a Communications Strategy for Each Pilot Community

The communications strategy for each pilot community was created using the five pillars for motivating action to reduce risk. However, each tactical plan was adapted based on the goals, timelines and resources available in each community. Broad-based and targeted outreach promotional tactics were employed in each community.

### 2.3.1 Burlington, Ontario – 2017

Roughly 3,500 Burlington residents reported basement flooding during an extreme weather event in August 2014. Following the flood, the Regional Municipality of Halton undertook a comprehensive educational program with residents to raise awareness about reducing flood risks. Educational efforts focused on means to reduce sewer backup risk and highlighting the availability of flood protection financial subsidies. Burlington completed a flood risk reduction study that identified areas at higher risk of overland flooding and priority infrastructure updates to help reduce this risk, demonstrating the need to increase awareness and action to reduce overland flood risk.

In 2017, Burlington engaged the Intact Centre to deliver the Home Flood Protection Program as part of its ongoing efforts to help residents reduce their risk of basement flooding. The City of Burlington, the Province of Ontario, the Intact Centre and participating residents (through program fees) provided funding support to deliver the program. Assessments were available to all residents at a subsidized cost of $125 paid by the homeowner. From July to October 2017, a two-pronged promotions strategy was used which featured broad-based and targeted marketing. The promotions strategy proved to be successful resulting in the completion of 86 assessments. Regional flood subsidy information was shared with residents through the HFPP program. HFPP staff worked collaboratively with the Regional and City governments to help identify areas for targeted outreach and to help promote the program. Burlington identified areas at higher risk of overland flooding. These areas had not been previously targeted by their Regional government's outreach and subsidy programs (which focused on reducing sewer backup flooding). The University of Waterloo led the development of on-the-ground promotional activities by running focus group sessions for residents in target neighbourhoods, tailoring program messaging and outreach to reflect the feedback of participating key influencers in the community (e.g., City councillor, realtor, neighbourhood association presidents, hardware store owner).

### 2.3.2 Burlington, Ontario – 2018

In 2018, an outreach approach, fully funded by the Intact Centre, was deployed to test the impacts of a $0 assessment price tag on Home Flood Protection Program uptake. The simplified promotions approach was tested to promote and deliver up to 100 assessments for free to residents. The only outreach that was completed was by the Mayor and councillors through newsletters and social media. As the program had already built a good reputation, community members were sharing information with their friends and family about the value of the service and the $0 fee. With minimal promotional efforts from April to September, an additional 34 assessments were completed in 2018 for a total of 120 assessments in Burlington.

**Burlington's 2017 broad-based outreach on Home Flood Protection included:**

- Program launch with Mayor, City councillors, Provincial Government, Intact Centre and AET Group representatives appearing at a press conference covered by local media
- Program ads in community newspapers
- Mayor's television, radio and public speaking appearances about the program
- Social media posts featuring success stories of local participants, developed by Intact Centre and shared by the City and councillors

**Burlington's 2017 targeted outreach tactics included:**

- Newsletters from City councillors to their constituents
- Community meetings facilitated by City engineering staff and City councillors
- Intact Centre staff and assessors attending community events, completing community presentations
- Delivery of door hangers to target neighbourhoods by assessors (planned door-to-door program was cancelled due to City's concern about being associated with a fraudulent door-to-door campaign operating in the City at the time)
- Front yard signs available for program participants to post in front of their homes to show program support and encourage

See Appendix D for an additional Burlington promotional flyer, 2017.



Flood Risk Assessor Blake Rodger engages homeowner Jonathan Scott in a flood risk reduction problem-solving conversation. Oakville, 2017

### 2.3.3 Toronto, Ontario – 2018

In 2013, roughly 4,700 Toronto residential basements were flooded due to an extreme rainfall event. Following the flood, Toronto's water management department, Toronto Water, completed outreach activities to raise awareness about how to reduce flood risk and about subsidies available through the City for installing flood protection measures. In 2018, the Intact Centre was engaged by the City of Toronto's Resiliency Office to deliver the Home Flood Protection Program as well as Toronto-focused Emergency Preparedness information as part of their information resource package for residents. The program was rebranded as the Toronto Home Resilience Program to align with the branding of the Toronto Resilience Office. Funding and promotional support was provided by the Insurance Bureau of Canada and the Intact Centre, with additional promotional support provided by the City of Toronto and Intact Financial. The Toronto Home Resilience Program provided information about the flood protection subsidy programs offered by Toronto Water.

From July to September 2018, a simplified, broad-based and targeted marketing approach was applied. Up to 200 assessments were offered to Toronto residents for a fee of $95. Broad-based promotions included a program launch event, paid and unpaid social media campaigns, and program staff appearances on local news stations and the Weather Network. Targeted promotions included emails to the City of Toronto, IBC and Intact Financial employees as well as insurance brokers and sustainability networks through direct email campaigns. A total of 168 assessments were completed. See Appendix E for the program flyer, F for traditional media coverage, and G for a social media sample.

### 2.3.4 Saskatoon, Saskatchewan – 2018

In 2018, the City of Saskatoon engaged the Intact Centre to deliver the Home Flood Protection Program as part of its efforts to support residents who had experienced overland flooding during two extreme rainfall events that flooded hundreds of homes in 2017. Additional funding support was received from Saskatoon Government Insurance (SGI Canada) to help support program promotions. The Intact Centre provided financial and promotional support for the project. The City took the lead on program promotions.

The City offered up to 100 free assessments to residents in areas designated as being at higher risk of overland flooding. They used targeted marketing to engage residents, including flyers to select neighbourhoods, neighbourhood billboards, community meetings and a small door-to-door campaign. Up to 300 assessments were offered to all other areas in Saskatoon for $125. Broad-based tactics were used to engage these residents, primarily featuring utility bill inserts, traditional and social media. The program was promoted from March until September 2018. A total of 58 assessments were completed in areas that were offered free assessments and 55 assessments were completed in areas that required a $125 payment. See Appendix H for Public Service Announcement, I for Neighbourhood Billboard and J for City Councillor Newsletter.

### 2.3.5 Comparing Effectiveness of Outreach Approaches

Broad-based promotional methods that reached out to the entire community (e.g. social media, traditional media, utility bill inserts) resulted in higher numbers of requests for registrations in all cities because of their ability to engage large numbers of people, accounting for between 64% of registration requests in Toronto to as high as 74% of registration requests in Saskatoon. Targeted methods that focused on engaging smaller groups of people accounted for lower numbers of registration requests because they reached fewer residents, generating from 26% of requests in Saskatoon to 36% in Toronto. Of the targeted methods used, those that featured personal conversations accounted for significantly higher rates of registration requests than those using impersonal, group outreach methods such as door hangers. **In Burlington and Saskatoon, personal engagement methods were 9 times as likely to result in registration requests than group methods.** In Toronto the rate was roughly 4 to 1. See Appendix K.

Not everyone completed their registration. When comparing conversions from registration requests to registration confirmations, free assessments showed consistently higher conversion rates ranging from 83% in Burlington in 2017 to 94% in Saskatoon in 2018. The assessments that carried a price tag for the homeowner demonstrated a lower conversion rate ranging from 76% in Burlington in 2017 to 47% in Saskatoon in 2018. Program experience has shown that it is best to have one price that is charged to all residents to minimize confusion and maximize registration completion.

Please see the table below.

| Year | Location | Registrations Requested | Registrations Confirmed | Conversion Rate |
|---|---|---|---|---|
| 2018 | Saskatoon Free | 62 | 58 | 94% |
| 2018 | Burlington Free | 38 | 34 | 89% |
| 2017 | Burlington Free | 12 | 10 | 83% |
| 2017 | Burlington $125 | 100 | 76 | 76% |
| 2018 | Toronto $95 | 237 | 168 | 71% |
| 2018 | Saskatoon $125 | 116 | 55 | 47% |

## 2.4 Best Practices for Raising Awareness and Driving Action

Several broad-based and targeted marketing approaches to promote flood risk protection were tested in various locations throughout 2017 and 2018. Based on a national and international review of best practices for raising awareness and driving action to reduce flood risk, a comprehensive outreach strategy was proposed by the Intact Centre for each participating municipality. This strategy was then adapted by each municipality to help them meet their program goals, timelines and to match the resources available.

Despite the fact that the participating municipalities had different flood histories, some consistent best practices for raising awareness and driving action to reduce flood risk emerged.

### Flood risk reduction educational messages are most likely to be taken seriously by residents when they:

- **Come from a trusted source** (federal, provincial, municipal governments, conservation authorities)
- **Are simple** and easy to understand
- **Are repeated** by a wide variety of trusted sources
- **Provide neighbourhood-specific flood risks** (from rising river levels (riverine), rising lake levels and wave action (coastal) or urban flood risks (water flowing over the ground or backing up through sewer systems)
- **Provide site-specific information** about what can be done to reduce risk at the individual home (third-party assessments)
- **Are vetted by trusted local people** (knowledgeable neighbourhood members, family or friends, local contractors or hardware store staff)
- **Provide opportunities for residents to participate** in discussion and decision-making process (e.g., face-to-face meetings and conversations)
- **Convey messages about actions that residents have control over** (e.g., tenants can only control how valuables in their units are stored and what types of furnishings they select)

### Residents will maximize action to protect their homes from flooding when they have:

- **Free access to third-party educational information** about flood risk reduction best practices (e.g., fact sheets, how-to videos, self-assessment checklists, seasonal maintenance checklists, questions to ask insurance providers, tips for selecting contractors, and tips for accessing local subsidies)
- **Financial support** for key actions that reduce flood risks that are appropriate by municipality (e.g., installing backwater valves and alarms, installing sump pumps, backup sump pumps, backup batteries and alarms, disconnecting downspouts from foundation drains etc.) and consider providing subsidies to support third-party residential flood risk assessments
- **A simple subsidy application process** that requires little time to complete, provides instant rebates and provides application support services for residents
- **Insurance rate adjustments** to homeowners and tenants who have reduced their flood risk

### Provide education and resources for groups that directly engage residents in flood risk reduction education:

- **Provide training for home inspectors** so that they can integrate key flood risk considerations into their home inspection reports
- **Provide training for realtors, insurance and mortgage brokers and not-for-profit staff members** so they can encourage their clients to reduce flood risk
- **Provide training for landlord and tenant organizations** so they can encourage their members to reduce flood risk
- **Engage contractors and local hardware stores** directly in providing flood risk reduction and subsidy information to clients to increase uptake of actions to reduce risk

### Remind residents about the importance of seasonal maintenance activities:

- **Consistent seasonal maintenance messaging** should be made available community-wide by trusted sources (federal, provincial, municipal governments, conservation authorities, retailers, insurance companies and brokers, realtors, not-for-profits, and emergency response agencies)
- **Direct reminders to residents** who have installed flood risk reduction features in their homes (sump pump and backup power systems and alarms as well as backwater valves and alarm systems) should be provided by municipal governments, local contractors, insurance companies, and landlords where applicable
- **Increase access to contracted services** to complete seasonal maintenance activities for residents (e.g., cleaning out eaves troughs, maintenance of sump pump systems, and backwater valves)

# 3. FINDINGS OF THE HOME FLOOD PROTECTION STUDY

## 3.1 Study Characteristics

A total of 363 households agreed to participate in the Home Flood Protection Study. The results presented in this report reflect data from Ontario Study participants only, collected from the following: 285 assessment reports, 91 three-month follow-up surveys and 24 six-month follow-up surveys. Study participation was focused geographically in southern Ontario, primarily in the Cites of Burlington and Toronto. Smaller numbers of study participants were from nearby communities including Oakville, Kitchener, Waterloo, Guelph, Hamilton, Brantford and Clarington. The condition of 45 physical features was verified by a trained assessor using simple tools such as measuring tapes and audible moisture meters. The frequency of the completion of 35 maintenance activities was reported by the resident and was recorded verbatim by the assessor.

### 3.1.2 About the Homes Assessed

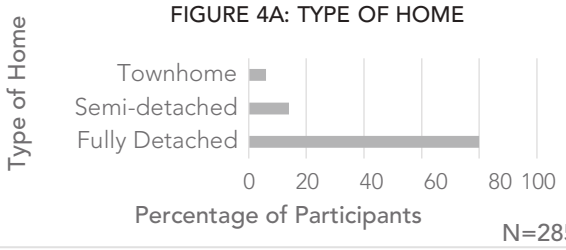
Eighty percent of homes that participated in the study were detached (Figure 4A). All participants were homeowners and almost all participants (99%) were owners of freehold units, while only 1% of participants were owners of condominium units (Figure 4B). Most homes were 2 storey (57%) (Figure 4C) and assessed homes were from a mix of development eras with 21% from between 1971 and 1990, 30% between 1940 and 1970 and 34% from before 1940 (Figure 4D). Forty-one percent of participating homes had fully finished basements, 43% had partly finished basements, and 16% had unfinished basements (Figure 4E).



Homeowner Sharmalene Mendis-Millard works with her assessor to try to investigate the source of high levels on indoor humidity in her basement. Waterloo, 2018.

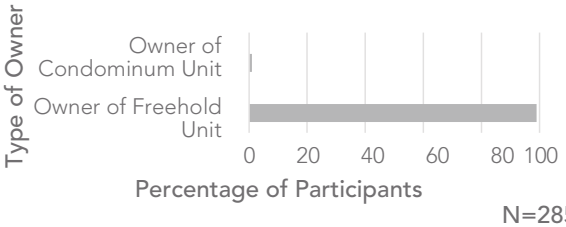
**FIGURE 4: ABOUT THE HOMES ASSESSED**

FIGURE 4A: TYPE OF HOME



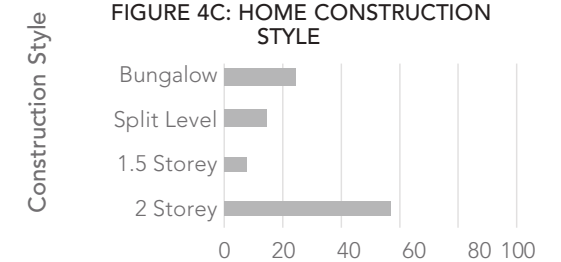

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FIGURE 4B: OWNERSHIP TYPE



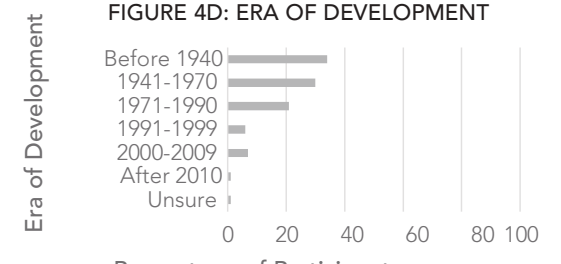

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FIGURE 4C: HOME CONSTRUCTION STYLE



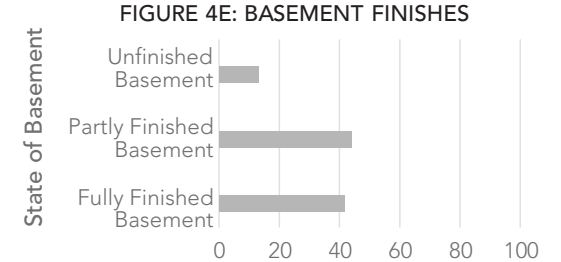

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FIGURE 4D: ERA OF DEVELOPMENT



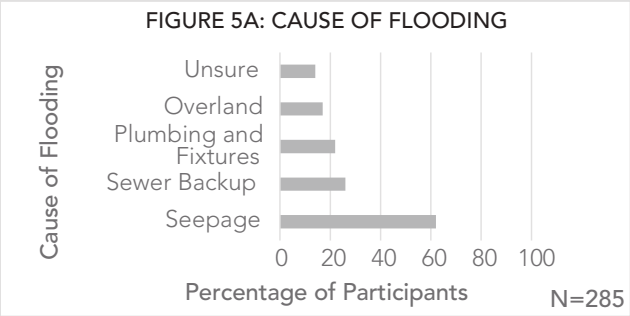

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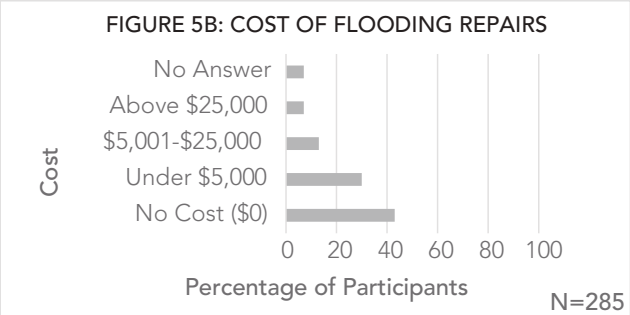
FIGURE 4E: BASEMENT FINISHES



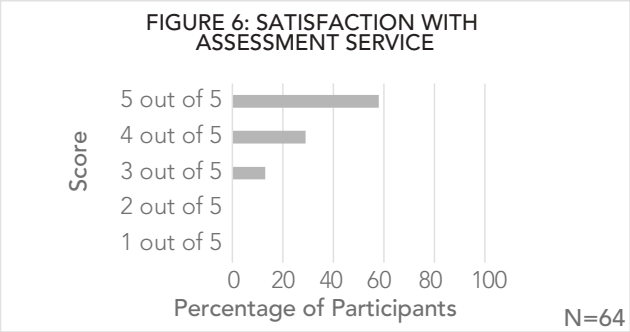

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## FIGURE 5: PARTICIPANTS' PAST FLOOD EXPERIENCE




## FIGURE 6: PARTICIPANTS' SATISFACTION WITH ASSESSMENT SERVICE




### Past Flood Experience

A total of 69% of home flood risk assessment participants noted that they had experienced flooding in the past. This was defined as the sudden and accidental escape of any amount of water into the basement.

The most common causes of flooding that participants experienced were: seepage through the foundation (62% of participants) followed by sewer backup (24% of participants), leaks from plumbing and fixtures (22% of participants), and overland flooding through gaps or cracks in windows, doors and foundation cracks above ground (17% of participants) (Figure 5A).

**The cost of completing flood repairs varied greatly. For example, 43% of participants completed repairs with no cost incurred, 30% of participants spent under $5,000 to complete repairs and the remaining 20% of participants spent over $5,000 to complete repairs** (Figure 5B).

### Satisfaction with the Service

Of the 64 people who responded to the customer service survey, 94% (58 participants) said that they would recommend the service to others. Participant satisfaction with the service was evident, as no participants scored the service 1 or 2 out of 5 (Figure 6).

### Willingness to Pay for Assessments

The full cost of delivering a Home Flood Protection Assessment was $450. The maximum cost participants said they would be willing to pay for this service varied from $50 to $750, with the **average willingness to pay being $150.** Therefore, **a subsidy would be required to support future assessments.** Potential subsidies to support the program could come from municipalities and/or provincial governments. To reduce the cost of delivery, the **key components of the Home Flood Protection Assessment could be integrated into a traditional home inspection.**




Flood Risk Assessor Zina Bahman places a yard sign at the home of a resident before she starts her assessment. Toronto, 2018

### Scoring of Assessed Features and Maintenance Practices Inside and Outside the Home

Physical features were scored based on a visual assessment by the Home Flood Protection Assessor. Maintenance practices were scored based on the self-reported practices of the participant. Using an electronic flood risk assessment questionnaire and scoring system, developed by the Intact Centre, each item assessed received a score of performing "well", "intermediate", or "poor/needs further investigation".
For each item an opportunity to reduce risk was identified, if applicable, and was entered into the Home Flood Protection Report. All items that scored "poor/needs further investigation" inside and outside the home were featured in summary pages that identified top risks and top opportunities to reduce risks. See Appendix L for a Summary or the Residential Flood Risk Reduction Best Practices referred to in the assessment tool, and Appendix M, for a Sample Home Flood Protection Assessment Report.

### Assessed Features

Not all homes had the same number of flood protection features. For example, 98% of homes had basement windows, 62% of homes had window wells, 89% of homes had disconnected downspouts (that deposited water onto the surface of the ground), while 11% of homes had downspouts that were connected underground into foundation drains. Twenty-four percent of homes had sump pits and pumps, and 17% of homes had backwater valves (Figure 7). The risks expressed as percentages in the outside and inside flood risk figures were calculated by taking the number of items that did not meet flood protection best practice divided by the number of those particular items. For example, 144/175 homes with window wells did not meet best practices for flood protection so the number is represented as 82% (Figure 8A).



Waterloo resident Riley Davidson-Evans extends his downspouts to 2 m after his assessment. Waterloo, 2017

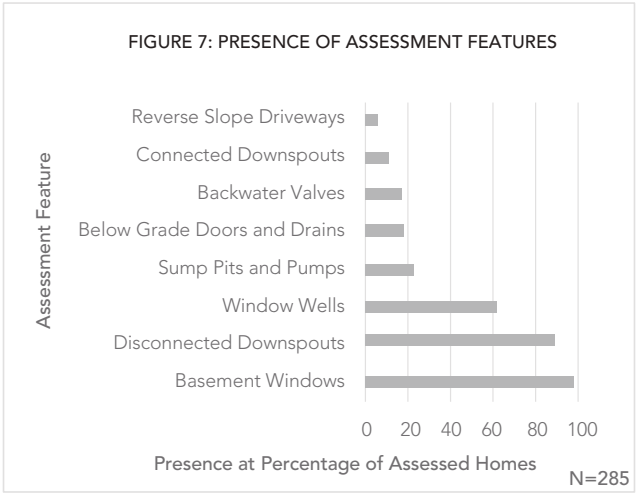
## 3.2 Summary of Top Flood Risks

Program results indicated that the majority of participants were already completing a wide variety of simple and low-cost actions to reduce flood risks at their homes. Participants reported completing the following activities at least twice per year: maintenance of plumbing and fixtures to prevent leaks (91%), cleaning of eaves troughs to prevent overflow at the foundation (85%), removing blockages to water flow in their basement floor drain (83%), and filling of small cracks in the foundation (82%). Actions already taken may be attributed to the considerable ongoing efforts of municipal governments, not-for-profits, conservation authorities, retailers and insurance companies to raise awareness of flood risk and to support practical actions that homeowners can take to reduce risk.

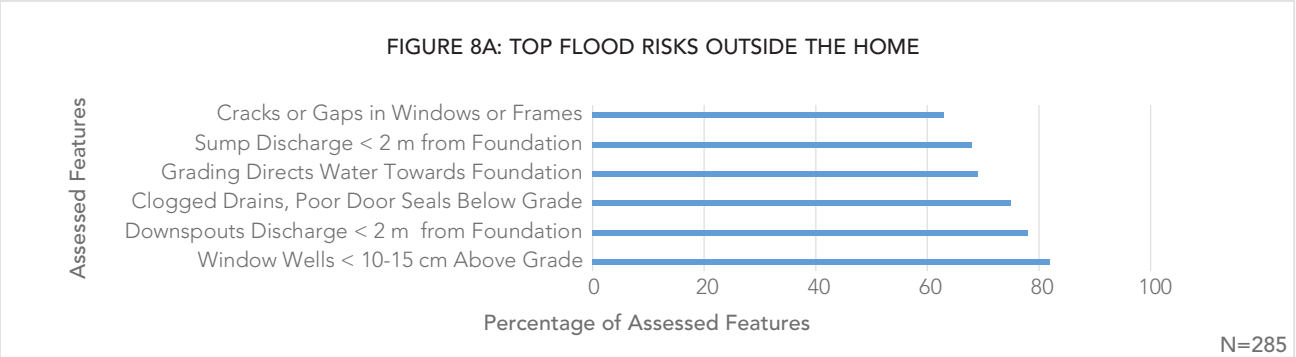
### 3.2.1 Most Common Flood Risks Outside the Home

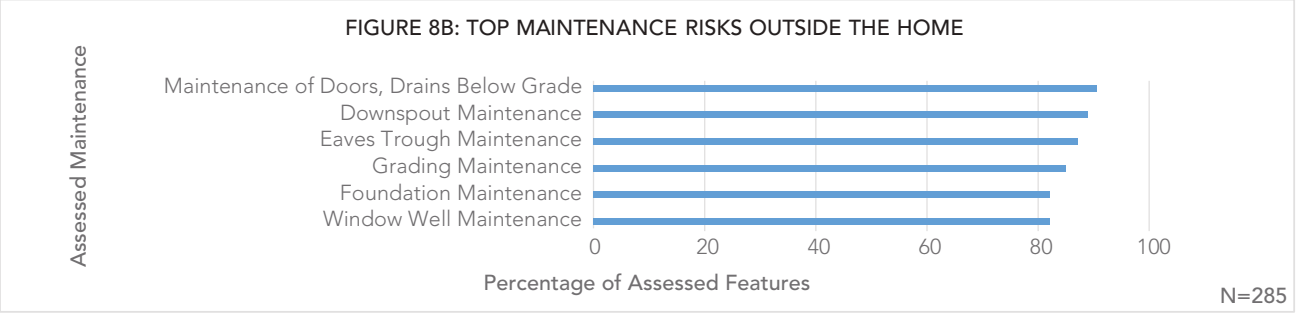
Visual assessment of lot grading, landscaping and exterior characteristics of participating Ontario homes revealed several key flood protection features that consistently did not meet best practice standards for reducing risk. These deficiencies increased the risk of overland and seepage flooding into basements. **Eighty-two percent of homes with window wells had wells that were not 10-15 cm above grade and sealed at the foundation. Seventy-eight percent of homes with downspouts and 68% of homes with sump pump discharge pipes discharged water less than 2m from the home's foundation.** Seventy-five percent of homes with doors below grade had drains and door seals in poor condition. Sixty-nine percent of homes had grading that did not direct water away from the foundation and 63% of homes with basement windows had cracks and gaps in the windows or frames (Figure 8A). When asked to report on maintenance efforts to limit flood risk outside of the home, residents stated that they were acting with commendable effort – however, such reporting stood in contrast to on-the-ground observations (Figure 8B).

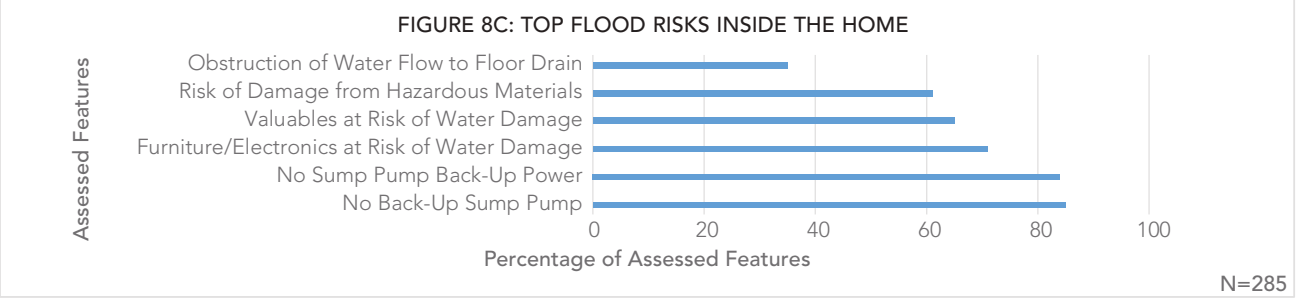
## FIGURE 7: PRESENCE OF ASSESSED FEATURES

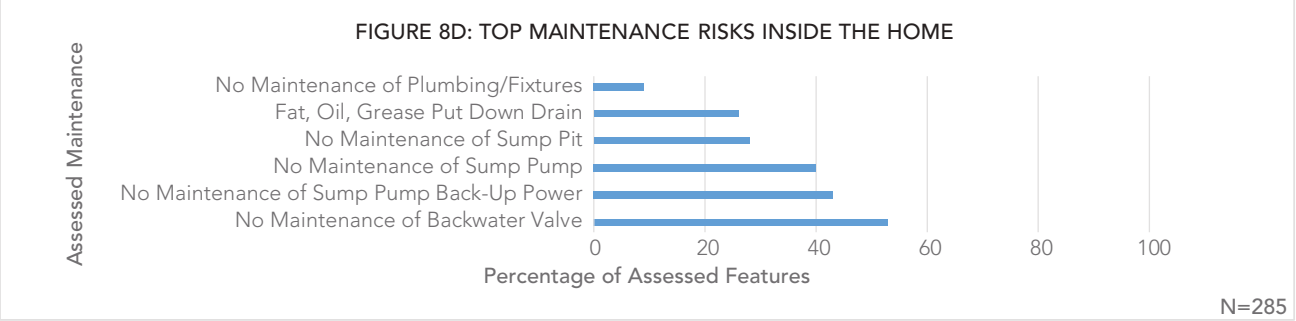


## FIGURE 8: FLOOD RISKS INSIDE AND OUTSIDE THE HOME



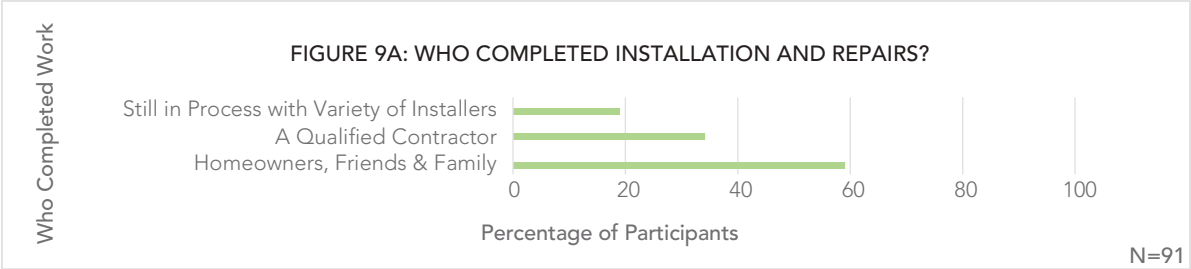



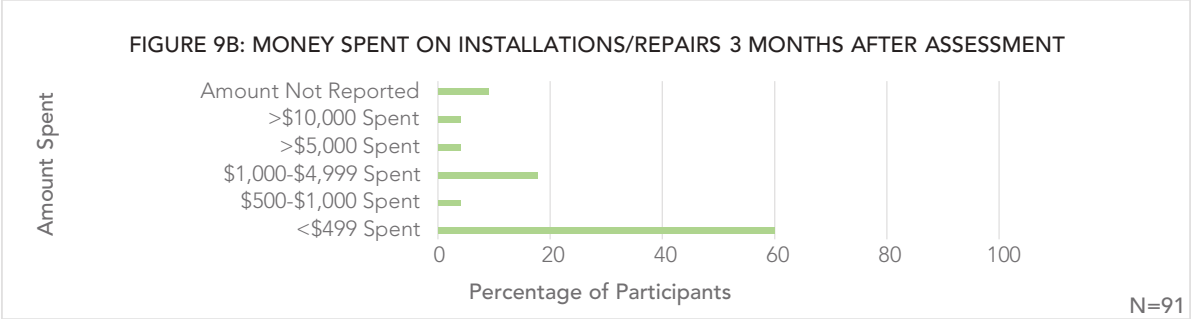



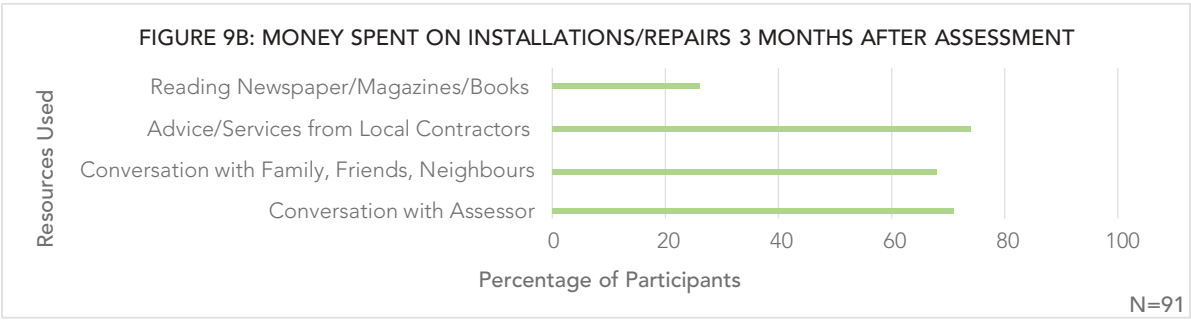

### 3.2.2 Most Common Flood Risks Inside the Home

Visual assessment of basements revealed several flood protection features that did not meet best practice standards to limit risk. These deficiencies put homes at increased risk of sump pit overflow, sewer backup, and damage to structure/contents. **Eighty-five percent of homes with sump pumps did not have a back-up sump pump, and 84% did not have backup power in case of a power outage. Sixty-five percent of homes had furniture and electronics, and 65% had stored valuables, at risk of water damage. Sixty-one percent had improperly stored hazardous materials** (e.g. paints, pesticides) that increased the risk of damage during a flood (Figure 8C). Several key maintenance activities that were not completed twice a year put homes at increased risk of sump pit overflow and sewer backup. **Fifty-three percent of homes with backwater valves never maintained them, 43% of homes with backup power for their sump pump never maintained the system, 40% with sump pumps never maintained them** and 26% of homes put fat, oil or grease down their drains (Figure 8D).

## FIGURE 9: INSTALLATION AND REPAIRS COMPLETED TO REDUCE FLOOD RISK




## 3.3 Actions Taken to Reduce Flood Risk

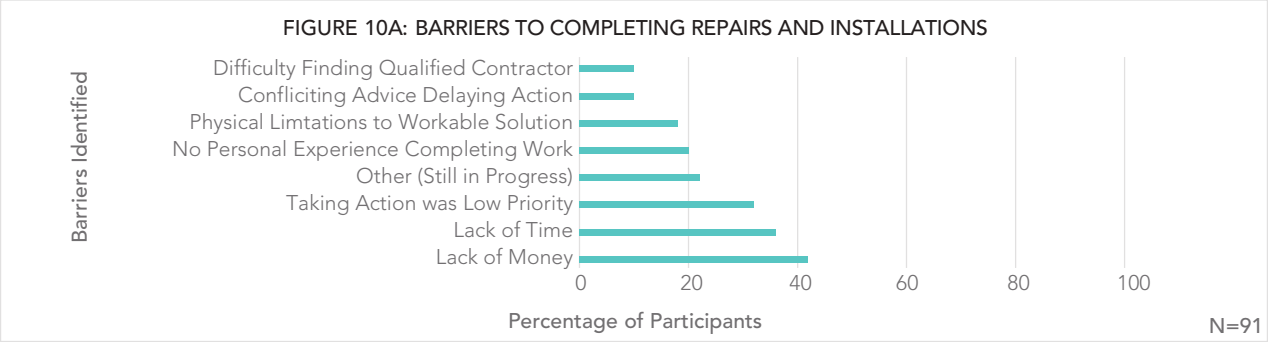
Each assessment report identified physical features and maintenance practices ranked as "poor/needs further investigation" and provided customized opportunities to reduce these risks. Study participants were asked to report at 3 months and at 6 months which actions they had taken to reduce risk. **At 3 months, 79% of participants had completed at least one new action to address flood risk. Three months after that (a total of 6 months after having an assessment), 71% of these same participants indicated that they had taken at least one additional new action to reduce risk.** Many participants (59%) completed the actions themselves (Figure 9A).

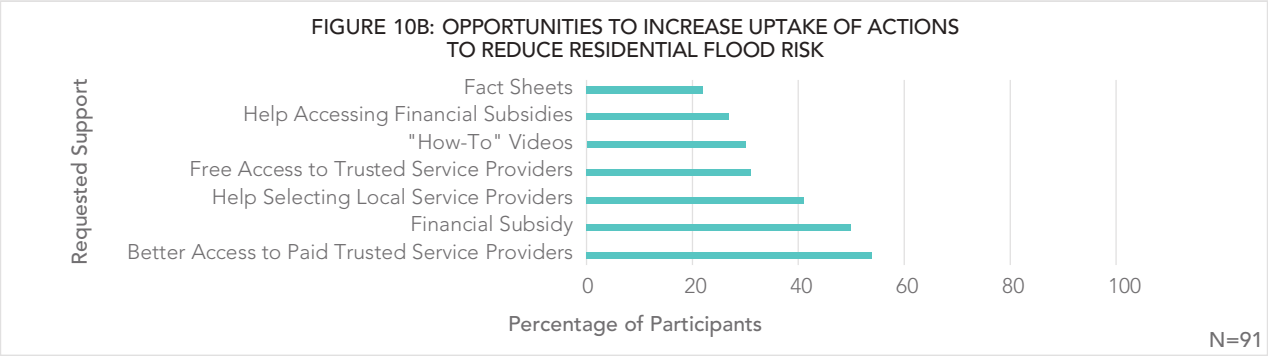
**Sixty percent of participants completed actions which were simple, cost under $500 and could be completed by a homeowner in less than one day**. Examples of these actions include: properly storing or removing valuables and hazardous materials (such as paint and pesticides) from the basement, cleaning out eaves troughs, installing window well covers, and extending downspouts and sump pump discharge pipes to a minimum of 2m away from the foundation. Forty percent of participants completed actions that were more complex, more costly and often required the support of qualified contractors. The cost of completing these actions ranged widely from $500 to over $10,000 (Figure 9B). Some of these more expensive actions included installing a backwater valve, backup sump pump or backup battery, relining or replacing a sewer lateral, installing a sewer lateral cleanout, replacing basement windows, replacing eaves troughs, replacing a driveway, or installing windows wells. See Appendices N and O for all outside risks assessed.

### Key Resources Used to Make Decisions about Taking Flood Protection Action

Participants used various resources to support their decision-making and to help them complete flood risk reduction actions. **The powerful influence of one-on-one conversations with trusted individuals stands out as significant.** Seventy-one percent of participants cited conversations with their Home Flood Protection Assessors and 68% cited their assessment report (which is a written record of the conversation with the assessor) as key resources used, 27% cited the importance of conversations with family, friends and neighbours, and 23% with local contractors. To a lesser degree, participants noted referring to educational materials they found online (24%), and in newspapers, books and magazines (9%) (Figure 9C). See Appendices P and Q for all inside risks assessed.

## FIGURE 10: BARRIERS AND OPPORTUNITIES TO INCREASE ACTIONS




## 3.4 Opportunities to Increase Residential Action to Protect Basements from Flooding

The main barriers that participants identified to taking action to limit flood risk can be divided into two categories: barriers for those who wished to engage a contractor to do the work and barriers for those who wished to complete the work themselves. For those wishing to engage a contractor, **42% of surveyed participants noted that a lack of funds was a barrier to action,** 36% noted that there was a lack of time (many noted they were still waiting for a contractor to get to their job), and 10% noted difficulty finding a qualified contractor to complete the work. For those wishing to complete the work themselves, a lack of personal experience (20%), and physical limitations on their properties to finding a workable solution (such as wanting to extend the downspout but realizing it would present a tripping hazard) (18%), were noted barriers. Additional barriers related to the perceived lack of urgency for completing the work. For example, 32% noted that taking action was a low priority. A total of 12% of participants noted that they got conflicting advice from various sources about how to address a problem, thus their project stalled (Figure 10A).

### Opportunities to Increase Residential Actions to Protect Basements from Flooding

Participants identified that they would like increased access to financial support, improved access to qualified contractors and increased access to trustworthy, third-party information to make it easier for them to take action to reduce their flood risk.

- Increased Access to Financial Support

**Fifty percent of participants noted that they would like to have a financial subsidy to help them pay for flood risk reduction projects,** 31% noted that they would like financial support to get access to qualified contractors for free, and 27% noted that they would like help accessing available subsidies (Figure 10B).

Participants support the provision of municipal flood protection subsidies, including subsidies to complete flood risk assessments. They also recommend a streamlined process for accessing subsidies, such as instant rebates at retail stores for items such as downspout extensions and sump pump backup systems. Participants were also supportive of receiving insurance discounts for taking actions to reduce flood risk.

- Increased Access to Qualified Contractors

**Fifty-four percent of participants noted that they would like increased access to trusted service providers and 41% noted that they would like help selecting qualified contractors** (Figure 10B).

Residents also reported that they experienced challenges finding qualified contractors who could complete work to reduce flood risk in a timely manner. Many noted long delays waiting for contractors and difficulties getting contractors to respond to requests to complete smaller jobs.

Increasing the number of contractors engaged in residential flood protection services will help address the public demand for services and will drive local economic development for contractors and suppliers.

• Trustworthy, Third-Party Information

**Residents identified that they want greater access to third party information resources,** particularly for those residents who wish to complete flood remediation actions on their own. Participants want trustworthy information from a source that is not trying to sell any one particular product or service, including those resources produced by government, not-for-profit, and academic organizations.

Thirty percent of participants noted that they wanted greater access to third party how-to videos and 22% noted that they wanted greater access to third party fact sheets (Figure 10B).

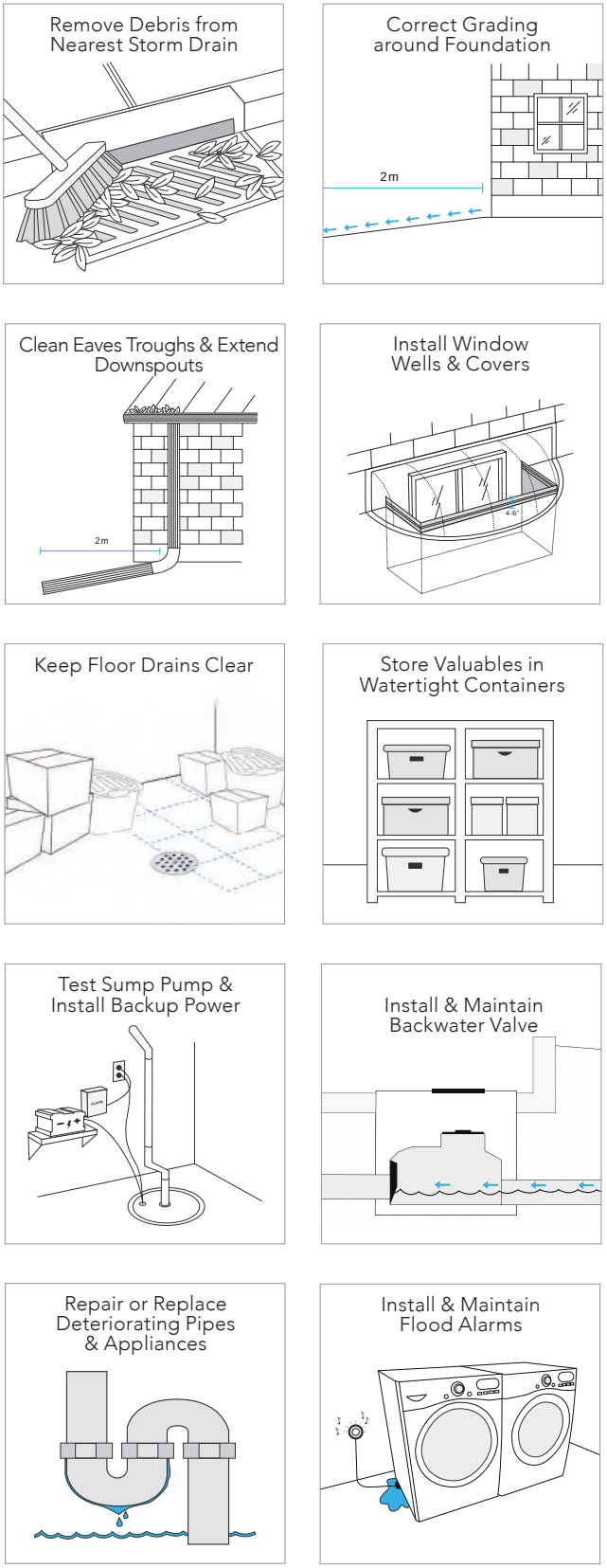
Cost-effective opportunities exist for agencies to share clear and consistent third-party information with their networks. Opportunities also exist for training industry professionals (home inspectors, realtors, insurance brokers, and mortgage brokers), and government and academic organizational staff regarding means to help residents to reduce flood risk. Part of the training should include the provision of reputable, third-party resources that they can share with their networks, including how-to-videos, fact sheets, flood protection subsidy information and seasonal maintenance reminders (Figure 10B).

Please see the "Top Ten Actions to Reduce Basement Flood Risk" in the adjacent column for an example of clear and concise third-party information that can help residents take action to reduce their flood risk.



Flood Risk Assessor Trainer, Ron Bolender, demonstrates to students how to inspect a sump pit and pump. Kitchener, 2017.

## TOP TEN ACTIONS TO REDUCE BASEMENT FLOOD RISK
Intact Centre, 2018



# 4. REDUCING RESIDENTIAL BASEMENT FLOOD RISK ACROSS CANADA

With few, if any, geographic exceptions, reducing residential basement flooding is necessary to maintaining equity of the Canadian residential housing market. In the absence of mitigating risk of basement flooding, the insurability of Canada's housing market will be compromised, and the consequent impacts may be manifested in an increase in mortgage defaults. Fortunately, as highlighted throughout this report, many easily deployable and affordable actions can be taken by homeowners to limit their flood risk exposure. However, many homeowners often do not realize such remedies exist…until it is too late. To increase awareness and drive action to limit otherwise pervasive flood risk, the following actions are recommended:

1. Governments, not-for-profits and insurance companies should use broad-based communications tactics to engage all residents and should use targeted communications tactics to engage residents in high risk flood zones.
2. Where possible, it is important to provide residents with accurate information about their neighbourhood and lot-level flood risks (flood risk mapping) so that they can use this information to make informed decisions about the level of urgency for taking action to reduce risk.
3. Concerted efforts must be made to engage landlords and tenants (who are often overlooked), to ensure that flood protection information and support and is being provided to them. This will help to ensure the availability of safe and reliable basement rental units in Canada.
4. Efforts must be made to increase the number of qualified contractors who are available to complete flood risk reduction assessment, installation and maintenance services.
5. A residential flood risk assessment training program and nationally applicable flood risk assessment tool must be made available to subject matter experts (particularly home inspectors) across Canada. This will ensure that all residents have access to third-party, cost-effective flood risk assessment services that meet national guidelines for flood risk reduction.
6. A flood risk reduction education training program must be made available to organizations that directly engage the public on topics that relate to flood risk reduction. These groups include realtors, mortgage brokers, emergency service workers, municipal and conservation authority staff, retailers, not-for-profits and landlord and tenant associations. The course must provide third-party resources that learners can use to effectively engage their networks.

## 4.1 National Flood Risk Reduction Educational Resources

### Flood Risk Assessment Training

As of March 2019, Home Flood Risk Assessment Training (HFRAT) became nationally available online, to any interested party. Registration is available at https://flemingcollege.ca/continuing-education/courses/home-flood-risk-assessment-training.

Although the course is primarily designed for home inspectors, municipal planners, builders, developers, and others that require in-depth understanding of residential flood protection, it is also of value to insurance and real estate brokers and mortgage lenders.

### Third-Party Flood Protection Resources

For self-directed flood risk mitigation, a variety of free, third-party how-to resources are available through the Home Flood Protection Program website: www.homefloodprotect.ca.

### Participant Testimonial



Toronto Home Resilience Program participant Lindsay Bunce shown in her basement shortly after her basement flood. Toronto, 2018.

The assessor spoke to us about several simple, low-cost measures that we can take to protect our home. "We finally learned how to use our sump pump!" Lindsay explained. "This is our first home and we didn't know what the sump pump was, how it worked, where it drained to, or how to maintain it. Considering sump pump failure is a leading cause of basement flooding we were very happy to receive some professional guidance in this area."

"Overall, the program is so informative and revealed many issues that did not come up during our standard home inspection. It has provided us with a road map to follow as we prioritize upgrades and repairs for our home. We now have peace of mind knowing that we are doing everything we can to protect our home from flooding."

# APPENDICES

## Appendix A: Flood Risk Assessment Tools Reviewed

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Toronto and Region Conservation Authority. (2016). Sustainable Neighbourhoods Action Plans. Retrieved from https://trca.ca/conservation/sustainable-neighbourhoods/

## Appendix B: Stakeholders Engaged in Program and Training Development

Michael Albanese, Business Owner, Avesi Stormwater and Landscape Solutions

Paul Allan, Real Estate Agent and Team Leader, KW Keller Williams Golden Triangle Realty Inc.

Ron Bolender, Home Inspector, Ron the House Doctor

Cary Clark, Manager of Development Engineering and Stormwater, City of Burlington

Larry Freiburger, Director of Operations, AET Engineering Consultants

Hashim Javed, Engineer, Project Manager II,Water &Wastewater System Services PublicWorks, Halton Region

Steve Kee, Director of Media & Digital Communications, Insurance Bureau of Canada

Luke Kuzio, Contract Coordinator, Procurement & Contract Services, University of Waterloo

Gerry Lashley, Director of Personal Property Insurance, Intact (Atlantic andOntario)

Allan Magi, Executive Director, Capital Works Department, City of Burlington

Jamie Shawn Mahoney, Financial Reporting & Insurance Analyst, University of Waterloo

Rod McGilvary, Home Inspector, Baseline Inspections

Frank Mossman, Property and Liability Insurance Inspector, Intact (Atlantic Canada)

Grant Murphy, Director, Infrastructure, County of Peterborough

Chris Rol, Senior Policy Advisor, Insurance Bureau of Canada

Dan Sandink, Director of Research, Institute for Catastrophic Loss Reduction

Richard Simpson, Professional Plumber, Business Owner, Town Councillor, Town of Innisfil

Jitender Singh, Technical Advisor, Canadian Codes Centre, National Research Council,Canada

Kevin Snyder, Senior Field Claims Representative, Intact Insurance

Nickola Voegelin, Legal Counsel & Co-Chair of the Copyright Advisory Committee, University of Waterloo

Sian Williams, (former) Senior Legal Counsel, University of Waterloo

## Appendix C: Best Practices for Motivating Behaviour Change Literature Reviewed

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## Appendix D: Sample Burlington Program Flyer, 2017

# Reduce your flood risk to protect what matters most




**Basement flooding is on the rise, costing homeowners in the GTA on average $40,000 to repair a flooded basement.**
*(Insurance Bureau of Canada 2017)*

**ASSESS YOUR RISKS** **MAKE A PLAN**

**TAKE ACTION TODAY**

**The Home Flood Protection Program helps homeowners reduce their risk of basement flooding and minimize damage if flooding occurs.**

**The Program is developed by the University of Waterloo, delivered locally by AET Group, and receives funding support from the City of Burlington.**

UNIVERSITY OF WATERLOO | aet | Funding Provided By City of Burlington

# TAKE ACTION TODAY!

## Register Your Home to Receive:

**Only $125.00** FOR A LIMITED TIME

- **A 50-point visual assessment of flood risks inside and outside your home with a trained assessor from the award winning consulting firm, AET Group.**
- **An easy to read report identifying top-ranked actions to reduce flood risk.**
- **Follow up support from your assessor and a live customer service agent.**



**The Program operates independently of all funders, and does not promote the sale of any products or services.**

**To access free online resources and to register for a Home Flood Protection Assessment, please call 1-877-876-9235 or visit:**

**www.HomeFloodProtect.ca**

## Appendix E: Toronto Home Resilience Program Flyer Front and Back, 2018




**The Toronto Home Resilience Program provides homeowners with emergency preparedness resources and a 50-point visual Home Flood Protection Assessment that identifies priority actions to reduce basement flood risk.**

**PARTICIPANTS RECEIVE**

- ✓ A 60-90 minute problem-solving conversation with a trained assessor
- ✓ A 50-point visual assessment of flood risks inside and outside the home
- ✓ A confidential report identifying top actions to reduce risk
- ✓ Comprehensive resources including Toronto emergency preparedness handouts, subsidy information, tips for finding contractors, and key questions to ask your insurance representative
- ✓ Follow-up support from your assessor and a live customer service agent



**REGISTER TODAY!**

The Toronto Home Resilience Program is available on a first come first served basis for $95 from July-September 2018.

**www.Toronto.ca/resilientTO**

**1-877-876-9235**

DEVELOPED BY: UNIVERSITY OF WATERLOO; INTACT CENTRE ON CLIMATE ADAPTATION

DELIVERED BY: aet

FUNDED BY: IBC BAC

ADDITIONAL SUPPORT PROVIDED BY: TORONTO; intact; Ontario

This project receives support from the sponsors listed above. Such support does not constitute endorsement of the contents.




## THE TORONTO HOME RESILIENCE PROGRAM

- ✓ Provides emergency preparedness resources
- ✓ Provides a cost-effective action plan to reduce flood risk
- ✓ Protects and enhances property value

## PROVIDING PEACE OF MIND



"After going through two devastating sewer back-up floods in 2014, my family and I wanted to learn what we could do to protect our new home from flooding.

I would recommend having an assessment to anyone who wants to understand what they need to do to protect their home and their personal belongings.

The program has provided us with peace of mind."

*– Carol Solis*

"A few years ago we experienced a flooded basement from sump pit overflow. We also have chronic dampness in parts of our basement. From our assessment we learned we can upgrade our sump pump, install a backup battery and flood alarm and make some inexpensive changes to our downspouts to help us keep water out of our basement even during the biggest storms.

The program is an investment that can save families thousands of dollars in the future."

*– Zainab & Patrick Moghal*



The **Toronto Home Resilience Program** is developed by the University of Waterloo, delivered by AET Group, and funded by the Insurance Bureau of Canada.

**www.Toronto.ca/resilientTO**

**1-877-876-9235**

## Appendix F: Toronto Home Resilience Program, Traditional Media Coverage

Canadian Underwriter, July 2018: How to advise your clients on backwater valves

Canadian Underwriter, July 2018: One tip you can offer clients to help prevent basement flooding

Canadian Underwriter, July 2018: Insurers subsidize Toronto basement flood pilot

Cision, July 2018: IBC a proud supporter of new Toronto Home Resilience Pilot Program

Insurance Business Canada, July 2018: IBC supports Toronto's flood resilience program

Insurance Bureau of Canada, July 2018: IBC a proud supporter of the new Toronto Home Resilience Program

IvesBrain, July 2018: Toronto Partners with IBC and Intact Centre for Flood Resilience Program

Markets Insider, July 2018: IBC a proud supporter of new Toronto Home Resilience Pilot Program

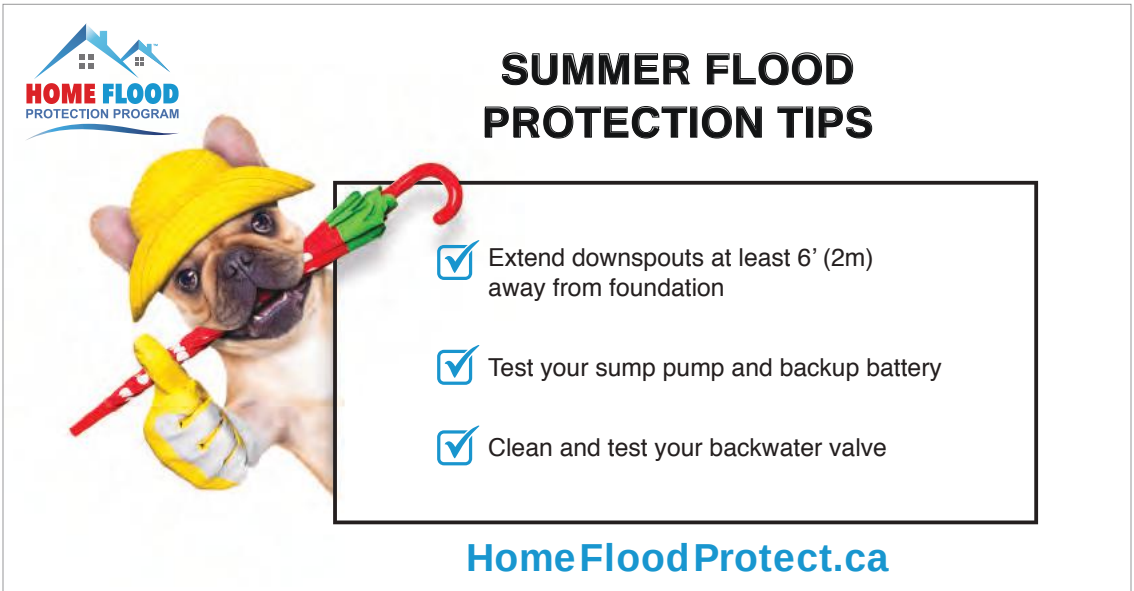
Shop Insurance Canada News, July 2018: Toronto Home Resilience Pilot Program for flood risk launches this week

Water Canada, July 2018: Toronto Partners with IBC and Intact Centre for Flood Resilience Program

## Appendix G: Toronto Home Resilience Program, Social Media Sample, 2018



## Appendix H: Saskatoon Program Public Service Announcement, 2018




Heavy rain in the forecast today. Please take precautions to protect your home from #flooding. Visit www.homefloodprotect.ca or more prevention tips and resources.

## Appendix I: Saskatoon Program, Neighbourhood Billboard, 2018



Appendix J: Saskatoon Program, City Councillor Newsletter Article, 2018

Sarina Gersher Ward 8
building community for all generations

Contact Home

Home › Issues › Home Flood Protection Program

# Home Flood Protection Program



by Sarina Gersher

169sc

on May 08, 2018




Every home has some risk for flooding during spring snow melt and rain storms. The City of Saskatoon and SGI CANADA are sponsoring a national pilot program to help Saskatoon homeowners understand their flood risk and take measures to protect their property from flooding.

Saskatoon homeowners can register now for a free or partially-subsidized professional Home Flood Protection Program home assessment – valued at $450 - to help identify their flood risks. The subsidized Home Flood Protection Program inspections will be available to the first 400 Saskatoon homeowners to register in 2018. Up to 100 homes that meet the criteria for high flood risk areas are eligible for a free home assessment. Other homeowners are eligible for a subsidized rate of $125. (Homes that qualify for free assessments will have already received a notice from the City of Saskatoon indicating their eligibility)

Early action can help homeowners take back control after experiencing loss due to flood damage, and provide some peace of mind for those who are unsure if their home is protected. Register today at HomeFloodProtect.ca or call toll free 1-877-876-9235. View the brochure here.

## Appendix K: Comparing Registration Requests by Outreach Method

| Comparing Registration Requests by Outreach Method | | | | | | |
|---|---|---|---|---|---|---|
| Year | Location | Broad-Based Methods | Targeted Methods | Targeted Methods Breakdown | | Requests Total |
| | | | | Targeted by Group Outreach | Targeted by Personal Conversation | |
| 2017 | Burlington | 81 | 31 | 3 | 28 | 112 |
| | | 72% | 28% | 10% | 90% | |
| 2018 | Burlington | 27 | 11 | 1 | 10 | 38 |
| | | 71% | 29% | 10% | 90% | |
| 2018 | Toronto | 151 | 86 | 23 | 63 | 237 |
| | | 64% | 36% | 27% | 73% | |
| 2018 | Saskatoon | 131 | 47 | 5 | 42 | 179 |
| | | 74% | 26% | 11% | 89% | |

Appendix L: Residential Basement Flood Risk Reduction Best Practices

# RESIDENTIAL BASEMENT FLOOD RISK REDUCTION BEST PRACTICES

## Introduction

This document provides a summary of the residential basement flood risk reduction best practices that were featured in the Home Flood Protection Program that delivered 510 Home Flood Protection Assessments to residences in Ontario and Saskatoon from 2016 to 2018. The best practices were developed by the Intact Centre on Climate Adaptation at the University of Waterloo and meet or exceed the Guideline on Basement Flood Protection and Risk Reduction (Z800-18) published by the Canadian Standards Association in 2018. Meeting all of the best practices reduces risk but does not guarantee basement flood prevention.

## Assessment Methodology

The best practices included in this document include a review of physical features that may be assessed at their surface using simple tools such as using measuring tapes, audible moisture meters and flashlights. This list does not include assessment of physical features that are behind walls, below ground or inside of pipes. The frequency of maintenance activities is recorded based on information provided by the resident.

## Scope of the Assessment

The assessment focuses on risks that are within the control of the resident and are on their private property. It focuses on "urban flood risks" including the risk of water flowing over the surface of the land and into the home through gaps, cracks and openings (overland flooding), seepage through foundation walls or gaps and cracks below ground (infiltration flooding) and backup of water into the home through sump pits or sewer pipes (sewer backup flooding). The assessment does not include an evaluation of risks related to the condition and configuration of municipal sewer infrastructure and overland flow routes. It also does not consider flood risks associated with high river levels (riverine flooding) or high lake levels and coastal wave action (coastal flooding).

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## Water Damage Risk Type Glossary:

**SB** - Sewer Backup;

**OW** - Overland Water;

**GS** - Groundwater Seepage;

**WS** - Water and Sewer Line Rupture;

**PF** - Plumbing Fixtures

## Outside Assessment Best Practices

**A) Overland Drainage of Property**

| Category | Water Damage Risk Type | Assessed Feature Name and Key Questions to Ask | Best Practice |
|---|---|---|---|
| Assessed Feature | OW | **#1. Overland drainage of property**<br>Twenty-four hours after a heavy rain do you see ponding or pooling on your property or in nearby storm drains or drainage ditches? | Twenty-four hours after a heavy rain, water does not pool on the subject property or in nearby storm drains or drainage ditches. If drainage swales are present on the property, they are unblocked and are at least 15cm (6") deep. |
| Assessed Maintenance | OW | **#2. Overland drainage maintenance**<br>How often do you remove debris and obstructions from the water flow paths including swales, nearby storm drains, culverts and drainage ditches? | Once per season or when major storm events are predicted, the participant checks for and removes debris and obstructions from the water flow paths including swales, nearby storm drains, culverts and drainage ditches. |

**B) Landscaping**

| Category | Water Damage Risk Type | Assessed Feature Name and Key Questions to Ask | Best Practice |
|---|---|---|---|
| Assessed Feature | SB, WS, GS | **#3. Condition and location of trees**<br>Would falling limbs due to strong winds or ice accumulation pose any risk of property damage to the home or hydro lines? Does their location pose potential risk to the home's foundation or sewer lateral? | Trees appear to be in good condition. Their limbs do not hang over the home, driveway or hydro lines. Trees are in a position where they likely do not pose a root damage risk to the home's foundation or sewer lateral. |
| Assessed Maintenance | SB, WS, GS | **#4. Tree maintenance**<br>How often do you check the condition of your trees? Do you prune trees as required and water during drought periods? | Once per season the participant checks the condition of trees, prunes as required and waters during drought periods. |

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| Assessed Feature | GS | **#5. Garden beds adjacent to home**<br>Do your garden beds leave a minimum of 20 cm (8") of your foundation exposed? Do foundation plantings provide adequate light exposure and air movement to foundation? | Foundation plantings allow for good light and air circulation between the plantings and the foundation. A minimum 20cm (8") of foundation remains exposed. Trees that will reach a height of 10m (30') or more are minimum of 5m (15') from the foundation and shrubs are minimum of 1.8m (6') from the foundation. Water drains freely away from the foundation. |
| Assessed Maintenance | GS | **#6. Landscaping maintenance**<br>How often do you remove barriers which impede water flowing away from the foundation? | Once per year participant removes barriers which impede water flowing away from foundation. Consider applying mulch to garden beds and aerating the lawn to improve the ability of the soil to soak up water. |

**C) Driveways, Walkways, and Patios**

| Category | Water Damage Risk Type | Assessed Feature Name and Key Questions to Ask | Best Practice |
|---|---|---|---|
| Assessed Feature | SB, OW | **#7. Reverse slope driveway and garage door(s) below grade**<br>Is your below-grade garage door and accompanying drain in adequate condition to reduce flood risk? | The garage door, frame and weather stripping are in good condition.<br>A drain is located on landing and is clear of debris. Water drains in less than 1 hour. The drain does not<br>connect to the sanitary sewer. |
| Assessed Maintenance | SB, OW | **#8. Reverse slope driveway and garage door(s) below grade maintenance**<br>How often do you inspect and repair the garage door, frame, weather stripping and drain? | Each season the participant inspects and repairs the garage door, frame and weather stripping. They also repair and clean out the drain as needed. |
| Assessed Feature | GS | **#9. Impermeable (waterproof surface such as asphalt and interlocking pavers) driveway**<br>Is your driveway free of cracks and does it slope away from your home at a minimum of 1-2%? | The impermeable driveway directs water away from the foundation (1-2% slope) and is free of cracks and gaps. |
| Assessed Maintenance | GS | **#10. Impermeable (waterproof) driveway maintenance**<br>How often do you check for evidence of pooling and ice buildup, repair grading, seal cracks, fill gaps and remove weeds? | Once per season the participant checks for evidence of pooling and ice buildup, repairs grading, seals cracks, fills gaps, and removes weeds. |
| Assessed Feature | GS | **#11. Permeable (water absorbing) driveway**<br>Is your driveway functioning adequately to absorb water and direct it away from your foundation? | The permeable driveway directs water away from the foundation and all water drains within 24 hours. |
| Assessed Maintenance | GS | **#12. Permeable (water absorbing) driveway maintenance**<br>How often do you check for evidence of pooling, ice buildup, and the growth of weeds? | Once per season the participant checks for evidence of pooling, ice buildup, and the growth of weeds. The participant identifies and addresses the reason for clogging. Weeds and debris are removed as needed. |

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| Assessed Feature | OW, GS | **#13. Walkways and patios**<br>Do your walkways and patios slope a minimum of 1-2% away from foundation walls? Are they free of cracks and gaps? | Walkway slopes a minimum 1-2% to direct water away from the foundation and is free of cracks and gaps. |
| Assessed Maintenance | OW, GS | **#14. Walkways and patios maintenance**<br>How often do you check for evidence of pooling and ice buildup? Is grading is repaired, cracks and gaps sealed, and weeds removed? | Once per season the participant checks for evidence of pooling and ice buildup. They repair grading, seal cracks, fill gaps and remove weeds. |

**D) Grading at Foundation Category**

| Category | Water Damage Risk Type | Assessed Feature Name and Key Questions to Ask | Best Practice |
|---|---|---|---|
| Assessed Feature | OW, GS | **#15. Grading at foundation**<br>After a heavy rain, does the grading within 1.8m (6') of your foundation walls direct water away or do you see water pooling? Does the foundation surface easily soak up water? | The grading within 1.8m (6') of the foundation slopes a minimum of 5% to direct water away from the foundation. The foundation surface does not easily soak up water. |
| Assessed Maintenance | OW, GS | **#16. Grading at foundation maintenance**<br>How often do you check for signs of water pooling or ice formation and correct grading to achieve at least a 5% slope away from the foundation? | Each season the participant checks for signs of water pooling or ice formation and corrects grading to achieve at least a 5% slope away from the foundation. |

**E) Eaves Troughs and Downspouts**

| Category | Water Damage Risk Type | Assessed Feature Name and Key Questions to Ask | Best Practice |
|---|---|---|---|
| Assessed Feature | GS | **#17. Eaves troughs**<br>Are eaves troughs adequately sized and in adequate condition to reduce flood risk? | Eaves troughs wrap around the entire building, are in good repair, and have downspouts placed a minimum of every 9-12m (30-40'). Eaves trough of 13cm (5") is present for asphalt shingles or 15cm (6") for metal roof. |
| Assessed Maintenance | GS | **#18. Eaves trough maintenance**<br>How often do you check the eaves troughs for leaks, debris and blockages? Are repairs and debris removal completed as needed? | Each season during heavy rainfalls, the participant checks the eaves troughs for leaks, debris and blockage. Repairs and debris removal are completed as needed. |

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| Assessed Feature | SB | **#19. Connected downspouts**<br>Are downspouts connected to SANITARY OR STORM sewers? | Where approved by government department having jurisdictional authority, downspouts should be disconnected from foundation drains, caps should be installed over underground pipe connections and downspouts should be extended to at least 1.8-3m (6-10') from the foundation or to the nearest drainage swale. Water should not drain onto hard surfaces or onto adjacent properties. Note: Check with the government department having jurisdictional authority to determine eligibility for downspout disconnection and any available subsidy. |
| Assessed Feature | GS | **#20. Disconnected downspouts**<br>Are downspouts (that are not presently connected into underground pipes) directing water at least 1.8m (6') away from your home or the nearest drainage swale? Is water directed onto hard surfaces or adjacent properties? | For downspouts that have been disconnected, caps are securely in place to block the movement of water into underground pipes. Downspouts extend at least 1.8m (6') away from the foundation or to a drainage swale. Water is not directed onto hard surfaces or adjacent properties. |
| Assessed Maintenance | GS | **#21. Downspout maintenance**<br>How often do you check to make sure the downspout extensions are secured, free of leaks, depositing water at least 1.8m (6') from the foundation or to a drainage swale, and that water is not flowing onto adjacent properties? | Once per season the participant checks to make sure that the downspout extensions are secure, free of leaks, depositing water at least 1.8m (6') from the foundation or to a drainage swale, and that water is not flowing onto adjacent properties. |

**F) Rain Barrels**

| Category | Water Damage Risk Type | Assessed Feature Name and Key Questions to Ask | Best Practice |
|---|---|---|---|
| Assessed Feature | GS | **#22. Rain barrels**<br>Are rain barrels installed to prevent overflow? | The rain barrel has a diverter and overflow discharge pipe that delivers water at least 1.8m (6') from the foundation or to a drainage swale.. |
| Assessed Maintenance | GS | **#23. Rain barrel maintenance**<br>How often do you check the rain barrel for leaks, check that the diverter is kept free of debris, and that the overflow pipe extends away from foundation and/or to a drainage swale? | Once per week during the growing season, the rain barrel is checked for leaks, the diverter is kept free of debris, and the overflow pipe is checked to make sure it extends away from foundation and/or to a drainage swale. Before winter, the barrel is drained and the downspout extensions are reinstalled (if applicable).. |

**G) Foundation**

| Category | Water Damage Risk Type | Assessed Feature Name and Key Questions to Ask | Best Practice |
|---|---|---|---|
| Assessed Feature | GS | **#24. Foundation structure**<br>Is your foundation free of cracks and gaps? Are the foundation penetrations well sealed and do they sit above anticipated flood levels? | The foundation appears to be in good condition and is free of cracks and finishing gaps (e.g. no missing parge coat). The foundation penetrations are well sealed and sit above anticipated flood levels. |
| Assessed Maintenance | GS | **#25. Foundation structure maintenance**<br>How often do you check for cracks and gaps in the foundation? | Once per season the participant checks for cracks and gaps, and completes repairs as required. |
| Assessed Maintenance | GS | **#26. Foundation clearance maintenance**<br>How far from the foundation are stored items kept? Is snow cleared from the foundation? Are window openings and vents kept clear? | Stored items are kept at least 15cm (6”) from the foundation. As dictated by snow storm events, the participant clears snow 1m (3’6”) away from the foundation, keeps window openings clear of snow piles and ensures that vents are clear. |
| Assessed Feature | GS | **#27. Foundation efflorescence**<br>Are there signs of efflorescence on the foundation that could indicate moisture problems? Efflorescence (mineral deposits) indicate water moving through masonry, evaporating and leaving minerals behind. The presence of efflorescence can indicate water issues that can lead to spalling or structural damage. | There is no evidence of efflorescence. |
| Assessed Maintenance | GS | **#28. Efflorescence maintenance**<br>How often do you check for evidence of efflorescence, address the sources of water buildup at foundation, and clean and repaint the surface with masonry waterproofing paint as required? | Once per season the participant checks for evidence of efflorescence, addresses the sources of water buildup at the foundation, cleans and repaints the surface with masonry waterproofing paint as required. |
| Assessed Feature | GS | **#29. Foundation moisture content**<br>Is your foundation showing high levels of water retention? | Low levels of moisture at the surface are indicated. |

**H) Windows**

| Category | Water Damage Risk Type | Assessed Feature Name and Key Questions to Ask | Best Practice |
|---|---|---|---|
| Assessed Feature | OW | **#30. Condition of windows**<br>Are windows in adequate condition to help reduce risk of basement flooding? | Frames, glass and seals are all in good condition. |
| Assessed Maintenance | OW | **#31. Window maintenance**<br>How often do you check the condition of the frames, glass and seals, and complete repairs as necessary? | Once per season the participant checks the condition of the frames, glass and seals, and completes repairs as necessary. |

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| Assessed Feature | OW | **#32. Window wells**<br>Are window wells installed in such a way that they reduce flood risk? | For each window that is less than 10-15cm (4-6") above the ground surface, a window well is present, sits at least 10-15cm (4-6") above grade, is sealed at the foundation, and grading adjacent to wells slopes away from the home at a minimum of 5%. Consider installing window wells covers to further reduce risk. |
| Assessed Maintenance | OW | **#33. Window well maintenance**<br>How often do you remove debris, check and repair seals and drains, check and correct grading and ensure the window well covers are in good condition? | Once per season the participant removes debris, checks and repairs seals and drains, checks and corrects grading, and ensures the window well covers are in good condition. The window well should empty within one hour. |

**I) Doors**

| Category | Water Damage Risk Type | Assessed Feature Name and Key Questions to Ask | Best Practice |
|---|---|---|---|
| Assessed Feature | OW | **#34. Doors below grade, stairwells and accompanying drains**<br>Are doors below grade, stairwells and accompanying drains in adequate condition to reduce flood risk? | The frame, door, weather stripping and/or water barrier is in good condition. The door sill is 10-15cm (4-6") above grade, the stairs are free of gaps and cracks and a drain on the landing is present. The drain is not connected to sanitary sewer. Consider a stairwell sill that sits 10-15cm (4-6") above grade to further reduce flood risk. |
| Assessed Maintenance | OW | **#35. Door below grade maintenance**<br>How often do you check the condition of the seals, barriers, sills, stairs and drains and complete repairs as needed? | Once per season the participant checks the condition of the seals, barriers, sills, stairs and drains and completes repairs as needed. The stairwell should drain within 1 hour. |

**J) Exterior Water Sources**

| Category | Water Damage Risk Type | Assessed Feature Name and Key Questions to Ask | Best Practice |
|---|---|---|---|
| Assessed Maintenance | OW, GS | **#36. Hose bib maintenance**<br>How often do you check for leaks and complete repairs as necessary? Is the outdoor water supply shut off, the water line drained, and the hose drained and removed before winter? | Spring, summer and fall the participant checks for leaks, and repairs as necessary. Before winter, the outdoor water supply is shut off and the water line is drained. The hose is drained and removed. |
| Assessed Feature | OW, GS | **#37. Sump pump discharge**<br>Does your sump pump drain pipe deposit water at least 1.8m (6') from foundation or to the nearest drainage swale? Does your discharge pipe exit the home's exterior above anticipated flood levels? | Sump pump drain pipe is present and deposits water at least 1.8m (6') from foundation or to drainage swale and is not directing water onto a hard surface or adjacent property. The discharge pipe's exit point through the home's exterior is above anticipated flood levels. |

7

## Inside Assessment Best Practices

**A) Sewer and Storm Lateral**

| Category | Water Damage Risk Type | Assessed Feature Name and Key Questions to Ask | Best Practice |
|---|---|---|---|
| Assessed Feature | SB, WS | **#38. Sanitary sewer lateral**<br>Is your sanitary sewer lateral in good condition and is it free of blockages? | Inspection of sanitary sewer lateral with a closed circuit television (CCTV) is the best practice if a home is over 25 years old, if the home has experienced sewer backup or if the home experiences chronic drain backup.<br>*Note:* Only a qualified professional can formally identify the condition and the connection status of this item.<br>*Note:* Work with a qualified professional and check with the government department having jurisdictional authority to determine the availability and your eligibility for any subsidies. |
| Assessed Maintenance | SB, WS | **#39. Sanitary sewer lateral maintenance**<br>Is the home over 25 years of age? Is there a history of sewer backup or chronic drainage issues? Have you completed closed circuit television (CCTV) inspection of the sanitary sewer lateral? Have you cleaned out, lined or replaced damaged lateral as needed? Do you prevent fats, oils, flushable wipes and grease from going down the drain? | If the home is over 25 years of age, has experienced sewer backup or has experienced chronic drainage issues, the participant has completed a closed circuit television (CCTV) inspection of the sanitary sewer lateral. Based on the recommendations of a qualified professional, the participant has cleaned out, lined or replaced the damaged lateral as needed. The participant prevents clogging by preventing any of fats, oils, flushable wipes and grease from going down the drain. |
| Assessed Feature | SB | **#40. Storm lateral**<br>Do you have a storm lateral? Is it in good condition and free of blockages?<br>*Note:* Storm laterals are rare before 1990. | Homes may have foundation drains directly connected to storm laterals or sump pump discharge pipes directly connected to storm lateral. The presence or absence of a storm lateral in your location can be formally confirmed by a plumber. If your storm lateral is over 25 years old or if storm water is not draining freely, an inspection by a qualified professional with a closed circuit television (CCTV) will help identify your best course of action.<br>*Note:* Only a qualified professional can formally identify the condition of this item, its connection status and if it is best to disconnect it.<br>*Note:* Work with qualified professional. Check with the government department having jurisdictional authority to determine the availability of a subsidy and your eligibility. |

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| Assessed Maintenance | SB, WS | **#41. Storm lateral maintenance**<br>How often do you complete a storm lateral camera inspection? | The participant completes a storm lateral camera inspection if storm water backup occurs, once the lateral is 25 years old and every 5-10 years after that as a preventative measure. Based on the advice of qualified professional the lateral is repaired, replaced or disconnected. |

**B) Floor Drain**

| Category | Water Damage Risk Type | Assessed Feature Name and Key Questions to Ask | Best Practice |
|---|---|---|---|
| Assessed Feature | SB | **#42. Floor drain**<br>Is your floor drain clear of physical barriers to water flow and in adequate condition to reduce flood risk? Note: Some homes built before 1950 do not have a floor drain. | A floor drain is present and demonstrates a clear flow path of water to the drain. The drain appears to be in good condition, is free of debris and standing water is present in trap. |
| Assessed Maintenance | SB | **#43. Floor drain maintenance**<br>How often do you remove obstacles to water flowing freely to the drain, top up standing water in the trap and remove any debris from the drain? | Each season the participant removes obstacles to water flowing freely to the drain, tops up standing water in the trap and removes any debris from the drain. In case of blockage, strange smell, or lack of water in trap, they contact a licensed plumber. |
| Assessed Feature | SB | **#44. Basement sanitary sewer lateral cleanout** Is a basement sanitary sewer lateral cleanout present and easily accessible? | A basement sanitary sewer lateral cleanout is present and is easily accessible. |

**C) Backwater Valve**

| Category | Water Damage Risk Type | Assessed Feature Name and Key Questions to Ask | Best Practice |
|---|---|---|---|
| Assessed Feature | SB | **#45. Backwater valve**<br>Is a backwater valve appropriate for use in your home or if it is in place, is it in good condition? | Consider working with a qualified professional to determine if a backwater valve is suitable for your home or to evaluate the condition of your backwater valve. If you have a backwater valve or install one, consider installing an alarm to let you know when the valve is closed to prevent flooding from in-home sources. *Note:* Only a qualified professional can formally identify if a backwater valve would be right for your home and the condition of an existing unit. *Note:* Check with the government department having jurisdictional authority to determine the availability of a subsidy for installation and your eligibility. |

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| Assessed Maintenance | SB | **#46. Backwater valve maintenance**<br>How often do you, according to manufacturer's instructions, remove cap, ensure the flapper moves freely, ensure that the gasket is in good condition and remove debris? | Once per season, according to manufacturer's instructions, the participant removes the cap, ensures the flapper moves freely, ensures the gasket is in good condition and removes debris. For repairs, a licensed plumber is contacted. Participant puts NO fats, oil, grease, or flushable wipes down the drain. Consider installing and maintaining a flood alarm to reduce sewer back-up risk from in-home sources. |

**D) Foundation Drain (Weepers)**

| Category | Water Damage Risk Type | Assessed Feature Name and Key Questions to Ask | Best Practice |
|---|---|---|---|
| Assessed Feature | GS, OW, SB | **#47. Foundation drain**<br>Are foundation drain (weepers) present? Is foundation drain functioning properly to drain water away from your foundation? Note: Foundation drains are not common before 1960. Depending on the age of your house it may or may not have a foundation drain or it may have a drain that is old and in poor condition. | Missing or clogged drains increase the risk of basement infiltration flooding. Foundation drains that are connected to sanitary or storm sewers increase the risk of sewer backup related flooding. *Note:* Only a qualified professional can formally identify the condition of this item or recommend if one would be right for your home. *Note:* Check with the government department having jurisdictional authority to determine the availability of a subsidy and your eligibility. |

**E) Sump Pit and Pump**

| Category | Water Damage Risk Type | Assessed Feature Name and Key Questions to Ask | Best Practice |
|---|---|---|---|
| Assessed Feature | SB | **#48. Sump pit**<br>Does your sump pit have a sealed cover and is it in good repair? | The sump pit has a sealed cap, is in good condition (free of cracks and holes) and is free of debris. |
| Assessed Maintenance | SB | **#49. Sump pit maintenance**<br>How often do you check the sump pit, repair cracks or damage, and remove debris? | Each season the participant checks the sump pit, repairs cracks or damage, and removes debris. |
| Assessed Feature | OW, GS | **#50. Sump pump connection**<br>Does your sump pump discharge water to the surface of your property and does it have a backflow valve? | The sump pump discharges water to the lot surface and has a backflow preventer installed. |
| Assessed Feature | SB | **#51. Sump pump**<br>Is your sump pump in good condition and does it run infrequently? | A sump pump is present, the participant reports it is functioning well, and runs a maximum of 5 times per year. Consider installing an alarm to reduce flood risk. |
| Assessed Feature | SB | **#52. Back-up sump pump**<br>Do you have a backup sump pump and is it in good condition? | A back-up sump pump is present and the participant reports it is functioning well. |

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| Assessed Maintenance | SB | **#53. Sump pump(s) maintenance**<br>How often are sump pump(s) and alarms tested, repaired or replaced? | Each season, before vacation, and when an extreme rain or melt event is predicted, the participant tests the sump pump(s). They repair or replace these as required. |
| Assessed Feature | SB | **#54. Back-up power source**<br>Is a back-up battery or generator is present and functioning properly? Is the backup power source elevated above anticipated flood levels? | A back-up battery or generator is present, can generate electricity for a minimum of 72 hours and is reported by participant to be functioning properly. A backup battery or generator is elevated above anticipated flood levels. Consider installing an alarm to further reduce risk. |
| Assessed Maintenance | SB | **#55. Back-up power source maintenance**<br>How often do you test the backup power sources? | Each season, before vacation, and when an extreme rain or melt event is predicted, the participant tests the backup power sources and repairs or replaces the units as required. Consider installing and maintaining<br>an alarm to further reduce risk. |

**F) Exposed Foundation Walls, Floors and Cold Rooms**

| Category | Water Damage Risk Type | Assessed Feature Name and Key Questions to Ask | Best Practice |
|---|---|---|---|
| Assessed Feature | GS | **#56. Unfinished wall cracks**<br>Are your foundation walls free of cracks and stains? | The foundation walls are free of cracks and water stains. |
| Assessed Maintenance | GS | **#57. Unfinished wall crack maintenance**<br>How often do you check for cracks, fill cracks and remove sources of water buildup at the foundation? | Once per season the participant checks for cracks, fills cracks and removes the sources of water buildup at the foundation as needed (corrects drainage, repairs eaves troughs and/or removes snow in winter, and seals foundation from outside in extreme cases). The participant consults with a professional in case of major problems. |
| Assessed Feature | GS | **#58. Unfinished wall efflorescence**<br>Is there evidence of efflorescence on your walls, indicating water movement through the foundation? | The foundation walls are free of efflorescence. |
| Assessed Maintenance | GS | **#59. Unfinished wall efflorescence maintenance**<br>How often do you check for evidence of efflorescence, address sources of water buildup at foundation, and clean and repaint with masonry waterproofing paint? | Once per season the participant checks for evidence of efflorescence, addresses the sources of water buildup at the foundation, cleans and repaints the surface with masonry waterproofing paint as required. |
| Assessed Feature | GS | **#60. Unfinished wall moisture**<br>Are there high levels of moisture on the surface of your walls below windows, near cracks and where walls meet floor? | Low moisture levels are present on all tested areas of wall surface. Monitor for signs of dampness during heavy downpours and spring melts. |
| Assessed Feature | GS | **#61. Unfinished floor cracks**<br>Are there cracks in your floor that provide potential water entry sites to your basement? | Unfinished floors are free of cracks and water stains. |

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|---|---|---|---|
| Assessed Maintenance | GS | **#62. Unfinished floor crack maintenance**<br>How often do you check for cracks, fill cracks, remove source of water buildup at foundation? | The participant checks for cracks once per season, fills cracks and removes source of water buildup at the foundation as needed (corrects drainage, repairs eaves troughs and/or removes snow in winter, seals foundation from outside in extreme cases). The participant consults with a qualified professional regarding major concerns. |
| Assessed Feature | GS | **#63. Unfinished floor efflorescence**<br>Is there evidence of efflorescence on floors, indicating water movement through the foundation? | Floors are free of efflorescence. |
| Assessed Maintenance | GS | **#64. Unfinished floor efflorescence maintenance**<br>How often do you check for evidence of efflorescence, address sources of water buildup at foundation, and clean and repaint with masonry waterproofing paint? | Once per season the participant checks for evidence of efflorescence, addresses sources of water buildup at foundation, cleans and repaints with masonry waterproofing paint<br>as required. |
| Assessed Feature | GS | **#65. Unfinished floor moisture**<br>Are there high levels of moisture, indicating water entry into the basement? | Low moisture levels are present on the floor surface. Monitor for signs of dampness during heavy downpours and spring melts. |
| Assessed Feature | GS | **#66. Earth floors**<br>Are earth floors adequately sealed to reduce risk of flood, moisture buildup and mold growth? | Earth floors are covered with an adequate moisture barrier. At minimum a 6 mil poly moisture barrier covers over the earth with all seams sealed and edges sealed to the walls. |
| Assessed Maintenance | GS | **#67. Earth floor maintenance**<br>How often do you inspect the 6 mil poly moisture barrier for punctures and seam failures and repair or replace materials as needed? | Each year the participant inspects the 6 mil poly moisture barrier for punctures and seam failures. They repair or replace materials as needed. The participant monitors for signs of dampness during heavy downpours and spring melts. |
| Assessed Feature | OW | **#68. Cold Rooms**<br>Are cold rooms properly ventilated, with all surfaces maintaining consistent temperature to reduce mold and mildew risk? | The door, frame and seals are all in good condition and there is no evidence of water entry. Door is adequately insulated. Air circulation level is good with adequate venting and with items off of floor and away from walls by at least 15cm (6”).<br>Space is unheated. |

**G) Finished Walls and Floors**

| Category | Water Damage Risk Type | Assessed Feature Name and Key Questions to Ask | Best Practice |
|---|---|---|---|
| Assessed Feature | GS | **#69. Finished walls**<br>Are water stains or high moisture levels indicating sources of water infiltration? | Walls are free of water stains, no evidence of mold (smell or visual evidence), audible moisture meter indicates no concern. |
| Assessed Maintenance | GS | **#70. Finished wall maintenance**<br>How often do you check for high levels of moisture and water stains? | Each season the participant checks for high levels of moisture and water stains. If high levels of moisture or water damage and/or mold is evident, they consult a professional for remediation. The participant monitors for signs of dampness during heavy downpours and spring melts. |
| Assessed Feature | GS | **#71. Finished floors**<br>Are there high levels of moisture, indicating water entry into the basement? | Low levels of moisture are present on floors, no evidence of mold or mildew are present and no musty smell is present. |
| Assessed Maintenance | GS | **#72. Finished floor maintenance**<br>How often do you the check for water damage and signs of mold growth? | Each season the participant checks for water damage and signs of mold growth. If water damage and/or mold is evident, they consult a professional for remediation. |

**H) Windows**

| Category | Water Damage Risk Type | Assessed Feature Name and Key Questions to Ask | Best Practice |
|---|---|---|---|
| Assessed Feature | OW | **#73. Basement windows**<br>Are windows in adequate condition to reduce risk of overland flooding? | Glass, frames and seals are all in good condition. There is no evidence of water entry. |
| Assessed Maintenance | OW | **#74. Basement window maintenance**<br>How often do you check for cracked glass, broken seals and rotting frames? | The participant checks once per season for cracked glass, broken seals and rotting frames, repairs AND/OR replaces these as required. |

**I ) Plumbing Fixtures**

| Category | Water Damage Risk Type | Assessed Feature Name and Key Questions to Ask | Best Practice |
|---|---|---|---|
| Assessed Maintenance | PF | **#75. Indoor plumbing and fixtures maintenance**<br>How often do you inspect toilets, taps, pipes and water heaters, and have repaired by a plumber as needed? | Each season toilets, taps, pipes and water heaters are inspected by the participant and are repaired by a plumber as needed. Consider installing and maintaining flood alarms. |

**J) Additional Considerations for Limiting Risk of Water Damage, Mold and Mildew Growth**

| Category | Water Damage Risk Type | Assessed Feature Name and Key Questions to Ask | Best Practice |
|---|---|---|---|
| Assessed Feature | N/A | **#76. Furniture and electronics**<br>Are furniture and electronics at risk of damage in the event of a flood? | Furniture items have non-absorbent surfaces up to 30cm (12") and electronics are stored at least 30cm (12") off the floor (or to exceed anticipated flood levels). |
| Assessed Feature | N/A | **#77. Stored valuables**<br>Are your valuables at risk of damage during a flood or at risk of mold and mildew growth? | Valuables are stored in sealed, non-absorbent containers at least 30cm (12") off the floor (or to exceed anticipated flood levels), at least 15cm (6") away from walls that provide good air circulation OR no valuables are stored in the basement. |
| Assessed Feature | N/A | **#78. Relative humidity, air movement and temperature**<br>Are the moisture, humidity and temperature levels in your basement optimum to reduce mold and mildew risk? | A 30-50% relative humidity reading is taken in the basement. Air circulation is good. Minimum regular temperature above 15C (60F) is maintained. |
| Assessed Feature | N/A | **#79. Indoor Sources of Moisture**<br>Are indoor sources of moisture limited to reduce mold and mildew risk? | If a bathroom with a shower is present, a fan is present and when running it is strong enough to hold a piece of tissue. The fan is run for 30-60 minutes after bath or shower use. Furnace humidifiers do not operate in the summer. Wood is not stored, laundry is not hung, and boots are not dried etc. in the basement. |

**K) Hazardous Materials**

| Category | Water Damage Risk Type | Assessed Feature Name and Key Questions to Ask | Best Practice |
|---|---|---|---|
| Assessed Feature | N/A | **#80. Hazardous materials**<br>Are hazardous materials stored in a way that represents a contamination risk during a flood? | No hazardous materials are stored in the basement OR materials are stored in waterproof containers at least 30cm (12") off the floor (or to exceed anticipated flood levels) and/or heating fuel tanks are secured to the floor. |

Appendix M: Sample Home Flood Protection Assessment Report

HOME FLOOD PROTECTION PROGRAM

UNIVERSITY OF WATERLOO

Prepared for
Sally Homeowner
113 Lucky Lane, Kitchener, ON



Date Completed: November 15, 2018
Assessor Name: Sample Assessor
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# INTRODUCTION TO REPORT

## What Does This Report Include?

This report includes an easy to read summary of top ranked items for priority action that have received a "poor/ needs further investigation" score or require specific mention based on questions asked by the homeowner. It also provides a record of all gathered information and provides additional helpful resources to help homeowners take action to reduce flood risk.

## How Are Assessed Features Scored?

Assessors use the standardized assessment tool provided to guide them through a visual assessment of the property and to ask a list of preventative maintenance questions to homeowners. The information gathered is then compared to the tool's scoring definitions, developed by the University in Waterloo in concert with a wide variety of national experts in the area of basement flood risk reduction. Assessed Features are assigned scores of "Good- Best Practice", "Intermediate" or "Poor/ Needs Further Investigation" based on where they fall within these definitions. Any Assessed Features not accessible for observation and any preventative maintenance questions that are not completed by the homeowner are marked "Not Recorded."

## What Does This Report Not Include?

Beyond summarizing the report findings related to assessed items that received a score of "poor/needs further investigation" or require specific mention based on questions asked by the homeowner the report does not formally state a prioritized approach for addressing deficiencies. It is up to Homeowner to decide which actions they will take and in what order.

To ensure program impartiality the report does not recommend specific contractors, suppliers or products. The report also does not provide in-depth drawings or tailored step-by-step instructions to complete projects at the home to address deficiencies.

## How Was Information for this Report Gathered?

The contents of this report have been gathered by examining the physical condition of a variety of features inside and outside the home using simple tools such as a moisture meter, humidity gauge, flashlight and measuring tape. A verbal preventative maintenance questionnaire has also been completed with the homeowner or their designate.

## Reporting Time Frame

This report documents the observed condition of physical features of the home and the preventative maintenance information gathered from the Homeowner on the day of the Assessment only.

## Follow-Up Support Provided

Your assessment fee includes the equivalent of a 15 minute email follow-up conversation with your Assessor. Our customer service team can also answer your basic questions at 1-877-876-9235. For ongoing support, visit homefloodprotect.ca to register for our e-newsletter that includes important preventative maintenance reminders. For do-it-yourself tips and Homeowner Success stories, like us on Facebook@HomeFloodProtect.

## What is Included in the Additional Resources Section?

A list of easy to read, highly practical, online links is provided to help Homeowners take action to reduce flood risk. These include how-to fact sheets and videos, local subsidy information, questions to ask your insurance provider and tips about hiring contractors.

# DEFINITION OF TERMS

### Scoring of Assessment

Each assessed item is assigned a score based on the standardized criteria laid out in the Home Flood Protection Assessment ranking system.

| Score | Description |
|---|---|
| Good – Best practice | Observed or reported in good condition or reported maintenance practice |
| Intermediate | Observed or reported in intermediate condition or reported maintenance practice |
| Poor / Needs Further Investigation | Observed or reported in poor condition or reported maintenance practice or needs further investigation |
| Not Reported | Unobserved or unreported observed condition or reported maintenance practice |
| Out of Scope | Out of scope for this assessment but worthy of further consideration |

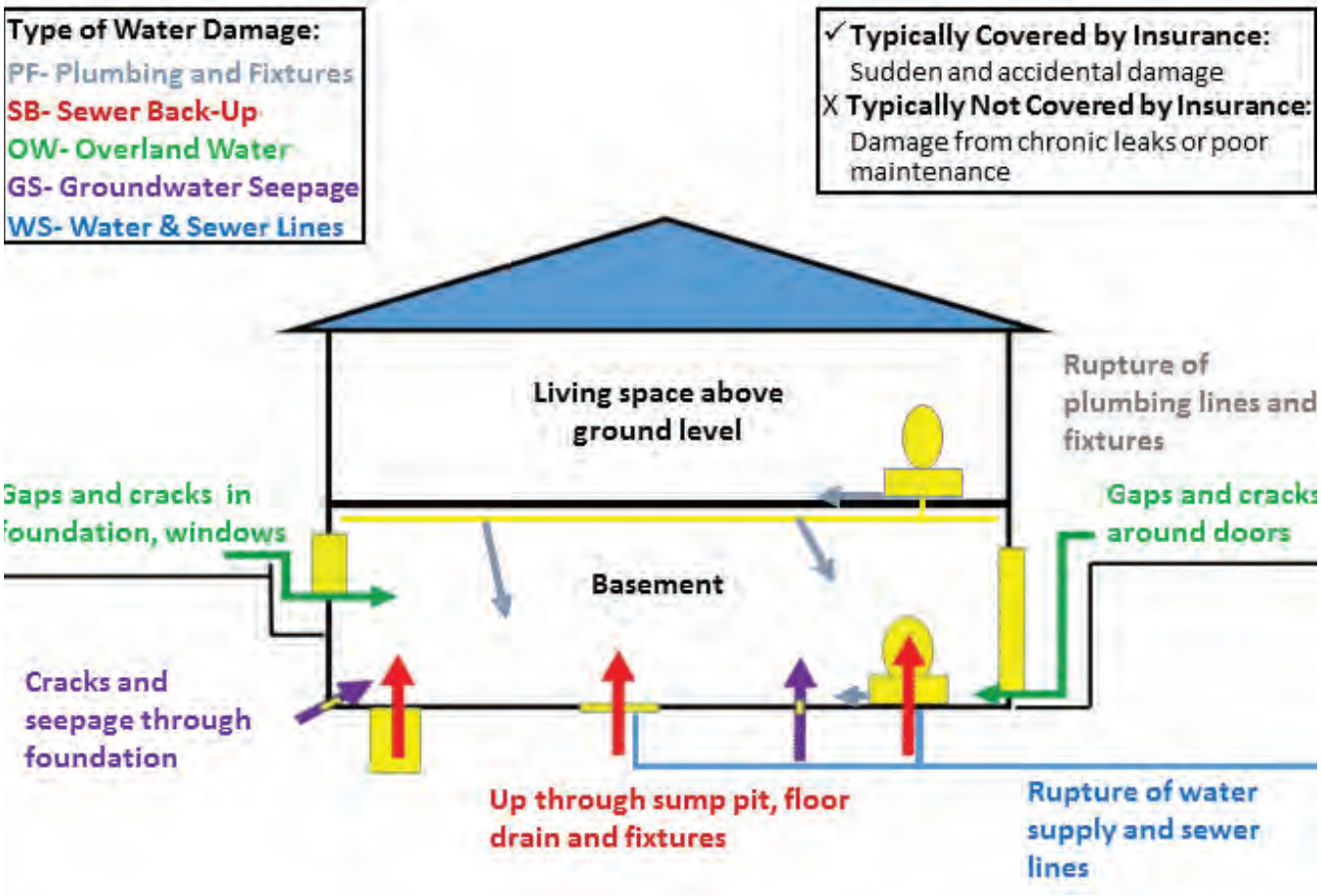
# UNDERSTANDING DIFFERENT TYPES OF WATER DAMAGE RISKS AT YOUR HOME

The diagram and the definitions below are provided to help you understand the types of water damage that may affect any home due to deterioration of physical features, lack of preventative maintenance or water backup from municipal sewer systems during extreme weather events.

These water damage types are referenced in your Home Flood Protection Assessment Report to help you understand the types of water damage risks that have been identified at your home and your opportunities to reduce risk. Please see the customized list of maintenance best practices listed in your report to help you develop your preventative maintenance routine.

### Insurance Coverage Considerations:

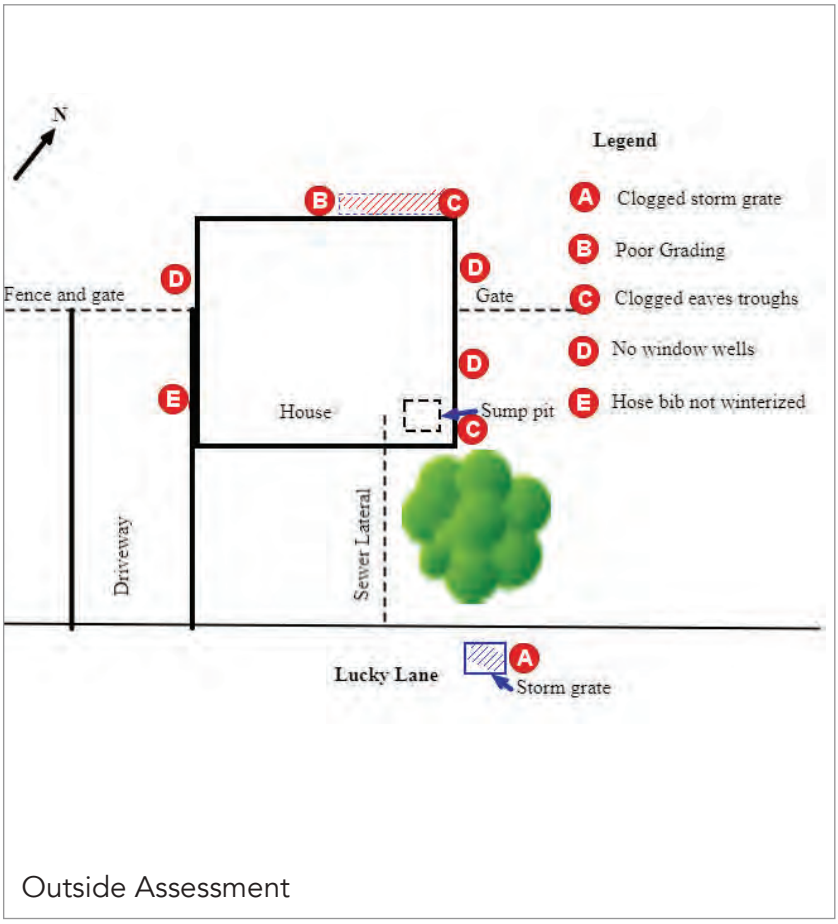
Sudden and accidental water damage is typically covered by insurers, however damage due to slow leaks or lack of preventative maintenance is typically not covered. Since there is no industry-wide, standard language used to define water damage types you may find using the terms and descriptions in this document helpful when working with your insurer to determine which coverage is best for you. Please note that not all insurance companies provide all types of coverages for all homes. See the "Questions for Your Insurance Provider" document in the Additional Resources section of the report for additional information.




| Typical Insurance Policy Coverage for Sudden and Accidental Damage | Code | Type of Water Damage | Simple Definition |
|---|---|---|---|
| Included | PF | Plumbing and Fixtures | Water that enters your home from a tear or rupture of plumbing pipes or fixtures (e.g. toilets, hot water heaters, dish washers) |
| Optional | SB | Sewer Back-Up | Water that flows from the sanitary or storm sewer or your home's foundation drains and backs up into your home through the sump pit, toilets and drains |
| Optional | OW | Overland Water | Water that flows from a lake or river, heavy rain or rapid snow melt and enters through cracks and gaps in your home's exterior from a point at or above ground level |
| Optional | GS | Ground Water | Water that has saturated the ground and enters your home below ground level through gaps, cracks and seepage through your home's foundation |
| Optional | WS | Water and Sewer Lines | Water that enters your home due a tear or rupture of a water supply and/or sewer lines |

# OUTSIDE ASSESSMENT SUMMARY
# TOP-RANKED OPPORTUNITIES TO REDUCE FLOOD RISK

All features and maintenance practices that were assessed as "poor/ needs further investigation", require specific mention based on questions asked by the homeowner or are marked as "out of scope" but deserve further consideration, have been compiled into this summary.




Outside Assessment












# ASSESSED FEATURES

| Fig | Assessed Feature and Best Practice | Type of Water Damage | Assessment | Opportunity to Reduce Risk |
|---|---|---|---|---|
| B | **Grading at foundation- After a heavy rain, does the grading within 1.8m (6') of your foundation walls direct water away or do you see water pooling?**<br><br>The grading within 1.8 m (6') of the foundation walls slopes a minimum of 5% to direct water away from the foundation. The foundation surface does not easily soak up water. | OW, GS | The grading is flat or slopes toward the foundation OR The foundation surface is highly water absorbent OR Needs further investigation. | See B on **Outside Assessment** diagram.<br><br>The grading beside your home directs water toward the foundation. The line in the soil indicates eaves troughs are overflowing and adding additional risk. Correct grading to achieve at least a 5% slope away from the foundation. Consider replacing the surface with non-water absorbent material. See comments related to eaves trough maintenance. |
| D | **Window wells - Are window wells installed in such a way that they reduce flood risk?**<br><br>For each window that is less than 10-15cm (4-6") above the ground surface, a window well is present and sits at least 10-15cm (4-6") above grade. The window well is sealed at the foundation and the grading adjacent to wells slopes away from the home at a minimum of 5%. Consider installing window wells covers to further reduce risk. | OW | For each window that is less than 10-15cm (4-6") above the ground surface, a window well is not present. OR Window wells sit less than 10-15cm (4-6") above grade or are not sealed at foundation or grading at the window wells does not slope away from home at a minimum of 5%. Window well covers are not present OR Requires further investigation. | See D on **Outside Assessment** diagram.<br><br>The windows are only 2.5 cm above grade and there is no formal window well, placing windows at higher risk of water inflow during heavy rains and spring melts. Work with a qualified professional to install a window well with adequate drainage. Correct grading adjacent to the window wells to slope 5% away from home. Consider installing window well covers to further reduce risk. |

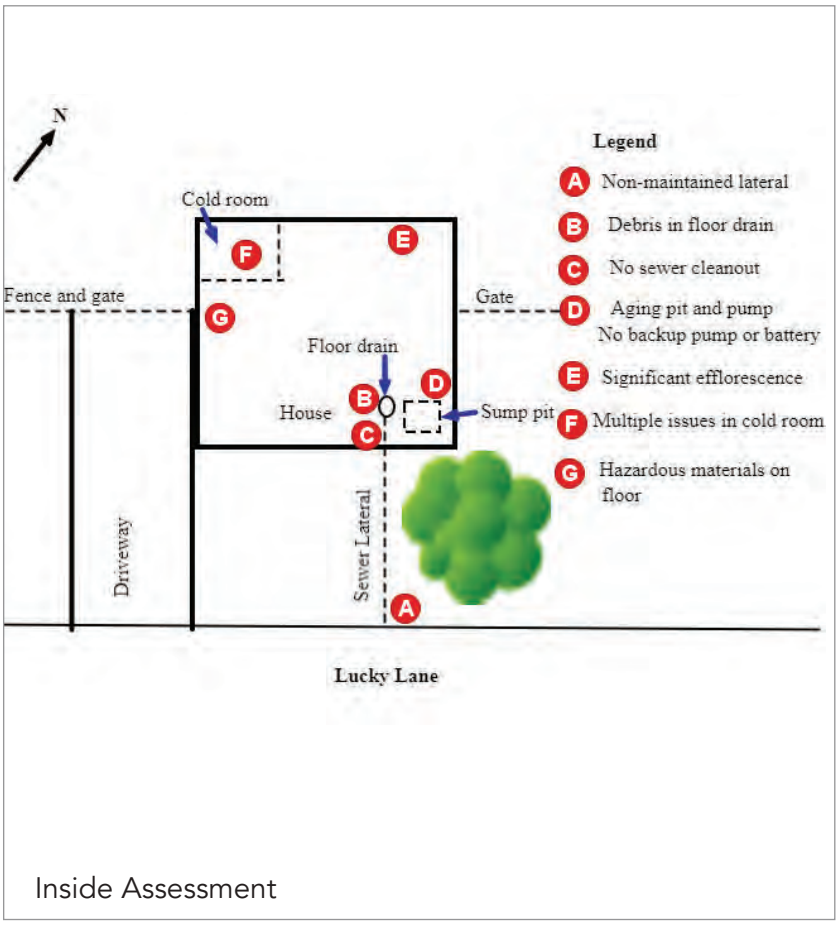
# ASSESSED MAINTENANCE

| Fig | Maintenance Feature and Best Practice | Type of Water Damage | Assessment | Opportunity to Reduce Risk |
|---|---|---|---|---|
| A | **Overland drainage maintenance –**<br><br>Once per season or when major storm events are predicted, the homeowner checks for and removes debris and obstructions from the water flow paths including swales, nearby storm drains, culverts and drainage ditches. | OW | The homeowner never checks for or removes debris and obstructions from the water flow paths including swales, nearby storm drains, culverts and drainage ditches. | See **A** on **Outside Assessment** diagram.<br><br>Once per season or when major storm events are predicted, check for and remove debris and obstructions from the water flow paths including swales and nearby storm drains. If nearby storm drains are free of debris but are still not draining within 24 hours, contact the government department with jurisdictional authority. |
| | **Grading at foundation maintenance –**<br><br>Each season the homeowner checks for signs of water pooling or ice formation and corrects grading to achieve at least 5% slope away from the foundation | OW, GS | The homeowner never checks for signs of water pooling or ice formation nor corrects grading to achieve at least 5% slope away from the foundation. | Each season, check for signs of water pooling or ice formation at foundation. Correct grading to achieve at least 5% slope away from foundation. |

| | | | | |
|---|---|---|---|---|
| C | **Eaves trough maintenance** – Each season during heavy rainfalls, the homeowner checks the eaves troughs for leaks, debris and blockage. Repairs and debris removal are completed as needed. | GS | The homeowner never checks the eaves troughs for leaks, debris and blockage. Repairs and debris removals are not completed as needed. | See **C** on **Outside Assessment** diagram.<br><br>Each season during heavy rainfalls, check for leaks, debris and blockage. Repair, replace and clean out as needed. |
| | **Downspout maintenance** – Once per season the homeowner checks to make sure the downspout extensions are secured, free of leaks, depositing water at least 1.8m (6') from the foundation or to a drainage swale and that water is not flowing onto adjacent properties | GS | The homeowner never checks to make sure the downspout extensions are secure, free of leaks, depositing water at least 1.8m (6') from the foundation or to a drainage swale and that water is not flowing onto adjacent properties. | Once per season check to make sure the downspout extensions are secure, free of leaks, deposit water at least 1.8m (6') from the foundation or to a drainage swale and that water is not flowing onto adjacent properties. |
| | **Window maintenance** – Once per season the homeowner checks the condition of the frames, glass and seals, and completes repairs as necessary. | OW | The homeowner never checks the condition of the frames, glass and seals, or completes repairs as necessary. | Once per season check the condition of the frames, glass and seals. Repair as necessary. |
| | **Hose bib maintenance** – Spring, summer and fall the homeowner checks for leaks and completes repairs as necessary. Before winter, the outdoor water supply is shut off and the water line is drained. The hose is drained and removed. | OW, GS | The homeowner never checks for leaks or completes repairs as necessary. They never shut off the exterior water supply, drains the line or remove the hose. | See **E** on **Outside Assessment** diagram.<br><br>Spring, summer and fall check for leaks and complete repairs as needed. Before winter freeze up shut off the outdoor water supply and drain the water line. Drain and remove the hose. |

# INSIDE ASSESSMENT SUMMARY
# TOP-RANKED OPPORTUNITIES TO REDUCE FLOOD RISK

All features and maintenance practices that were assessed as "poor/ needs further investigation", require specific mention based on questions asked by the homeowner or are marked as "out of scope" but deserve further consideration, have been compiled into this summary.



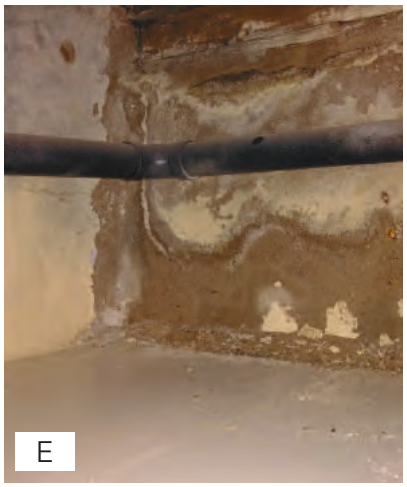

Inside Assessment



B



D



E



F



G

# ASSESSED FEATURES

| Fig | Assessed Feature and Best Practice | Type of Water Damage | Assessment | Opportunity to Reduce Risk |
|---|---|---|---|---|
| | **Sanitary sewer lateral- Is your sanitary sewer lateral in good condition and is it free of blockages?**<br><br>Inspection of sanitary sewer lateral with a closed circuit television (CCTV) is best practice if a home is over 25 years old, if the home has experienced sewer backup or if the home experiences chronic drain backup. Note: Determining the condition of the sewer lateral is outside the scope of this assessment. Consult a qualified professional. | SB, WS | Note: Only a qualified professional can formally identify the condition and the connection status of this item. Note: Work with a qualified professional and check with the government department having jurisdictional authority to determine the availability and your eligibility for any subsidies. | You have noted that you sometimes get drain backups when you do laundry. This indicates restricted flow through your lateral. Consider a closed circuit television (CCTV) inspection by a qualified professional for assessment and repair or replacement to address this issue. |
| | **Basement sanitary sewer lateral cleanout** – A basement sanitary sewer lateral cleanout is present and easily accessible. | SB | A basement sanitary sewer lateral cleanout is not accessible OR not present OR Needs further investigation. | See **C** on **Inside Assessment** diagram.<br><br>Consider working with a plumber to install an easily accessible hatch to improve inspection and maintenance access. This will make it more cost-effective for regular inspection, maintenance and repair. |
| | **Backwater valve- Is a backwater valve appropriate for use in your home or if it is in place, is it in good condition?**<br><br>Consider working with a qualified professional to determine if a backwater valve is suitable for your home or to evaluate the condition of your backwater valve.<br><br>**If you have a backwater valve or install one, consider installing an alarm to let you know when the valve is closed to prevent flooding from in-home sources. Note: This item is outside of scope of this assessment. Consult a qualified professional.** | SB | **Note: Only a qualified professional can formally identify if a backwater valve would be right for your home and the condition of an existing unit. Note: Check with the government department having jurisdictional authority to determine the availability of a subsidy for installation and your eligibility.** | Consider working with a qualified professional to determine if a backwater valve is suitable for your home. If you install a backwater valve remember to complete seasonal maintenance and consider installing a backwater valve alarm to let you know when the valve is closed to prevent flooding from in-home sources. Check with your insurance provider regarding eligibility for premium discounts for installing a backwater valve and/or an alarm. |

| | | | | |
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| | Foundation drain- Is a foundation drain (weepers) present? Is foundation drain functioning properly to drain water away from your foundation?<br><br>Note: Foundation drains are not common before 1960. Depending on the age of your house it may or may not have a foundation drain or it may have a drain that is old and in poor condition. Missing or clogged drains increase the risk of basement infiltration flooding. Foundation drains that are connected to sanitary or storm sewers increase the risk of sewer backup related flooding.<br><br>Note: Determining the condition and the plumbing connection of the foundation drain is outside the scope of this assessment. Consult a qualified professional | GS, OW, SB | Note: Only a qualified professional can formally identify the condition of this item or recommend if one would be right for your home. Note: Check with the check with the government department having jurisdictional authority to determine the availability of a subsidy and your eligibility. | The foundation weepers that enter your sump pit are made of clay. It is likely that these are over 50 years old. Symptoms such as dampness where the basement wall meets the floor are common when these are in poor condition so please monitor these areas regularly. Consider working with a qualified professional to inspect and/or repair your foundation drains to improve the rate of removal of water from your foundation. Check with the government department having jurisdictional authority to determine the availability of subsidy and your eligibility. |
| D | Sump pit- Does your sump pit have a sealed cover and is it in good repair?<br><br>The sump pit has a sealed cap, is in good condition (free of cracks and holes) and is free of debris. | SB | The sump pit is in poor condition (cracks, holes greater than 6mm (1/4”) present), there is no sealed cap, a large amount of debris is evident OR Needs further investigation. | See D on Inside Assessment diagram.<br><br>You have an older sump pit without plastic walls and without a sealed plastic lid. Consider upgrading your sump pit to improve storage capacity and to decrease humidity levels in the basement by installing a unit with a sealable lid. Work with a qualified professional to complete this work. |
| | Sump pump- Is your sump pump in good condition and does it run infrequently?<br><br>A sump pump is present and the homeowner reports it is functioning well and runs a maximum of 5 times per year. Consider installing an alarm to reduce flood risk. | SB | A sump pump is present and the homeowner reports it is not functioning well. AND/ OR The sump pump runs more than 10 times per year OR Needs further investigation. | Your sump pump is over 20 years old and you report that it does not always function well. Consider replacing your sump pump. Consider installing a ground fault interrupter (GFI) outlet to reduce the risk of electric shock. Hire a qualified professional for installation. Consider installing and maintaining alarms to reduce flood risk. Note: Check with the government department with jurisdictional authority regarding availability and eligibility for subsidy. Also check regarding plumbing permits requirements. Check with your insurance provider about discounts for installing alarm systems. |

| | | | | |
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| | **Back-up sump pump- Is there a backup sump pump and is it in good condition?**<br><br>A back-up sump pump is present and the homeowner reports it is functioning well. | SB | A back-up sump pump is NOT present OR Back-up sump pump is present but the homeowner reports it is not functioning well OR Needs further investigation. | Purchase a back-up sump pump. Consider hiring a qualified professional for installation. |
| | **Back-up power source –**<br><br>A back-up battery or generator is present, can generate electricity for a minimum of 72 hours and is reported by the homeowner to be functioning properly. A backup power source is elevated above anticipated flood levels. **Consider installing an alarm to further reduce risk.** | SB | There is no back-up power supply. OR A back-up battery or generator is present and is reported by homeowner to be functioning poorly AND/OR it is not elevated above the anticipated flood level OR Needs further investigation. | Purchase and install a 72 hour back-up power supply and maintain it each season. Raise the power source above the anticipated flood level. Consider installing and maintaining an alarm to reduce flood risk. Check with your insurance professional about discounts for installing sump pump backup batteries and alarm systems. |
| E | **Unfinished wall efflorescence- Is there evidence of efflorescence on your walls, indicating water movement through the foundation?**<br><br>Foundation walls are free of efflorescence. | GS | There is significant evidence of efflorescence (large areas of solid coverage of white flakes) OR Needs further investigation. | See **E on Inside Assessment** diagram.<br><br>Significant evidence of efflorescence was noted at the rear of the house where the grading is poor. Correct drainage, clean out eaves troughs and remove snow in winter. Remove efflorescence and seal the surface with masonry waterproofing paint. |
| F | **Cold Rooms- Are cold rooms properly ventilated, with all surfaces maintaining consistent temperature to reduce mold and mildew risk?**<br><br>The door, frame and seals are all in good condition and there is no evidence of water entry. The door is adequately insulated. The air circulation level is good with adequate venting and all items are off the floor and away from walls by at least 15cm (6”). Space is unheated. | OW | Door, frame and seals are in poor condition, evidence of significant water entry and/or door is not insulated, air circulation is poor with restricted venting and items are stored against the walls or on the floor OR Needs further investigation. | See **F** on **Inside Assessment** diagram.<br><br>Seal cracks in the door, frame and repair/replace seals. Improve insulation of the door or consider replacing them. Improve ventilation and raise items off of floor and away from walls by a minimum 15cm (6”). Consider working with a qualified contractor to remove plywood from the walls, to examine and address sources of water infiltration. |

| | | | | |
|---|---|---|---|---|
| | **Finished walls- Are water stains or high moisture levels indicating source of water infiltration?**<br><br>Walls are free of water stains. There is no evidence of mold (smell or visual evidence). The audible moisture meter indicates no concerns | GS | Walls show major evidence of water entry, clear evidence of mold (smell or visual evidence), moisture meter indicates higher concern OR Needs further investigation. | Major evidence of moisture has been noted on plywood walls inside cold room. Remove the source of water buildup at the foundation as needed (correct drainage, repair eaves troughs and/or remove snow in winter, seal foundation from outside in extreme cases). Remove and replace damaged materials. Consult a professional if you are concerned about mold. If you are considering refinishing your basement, refer to Water-Resistant Building Materials fact sheet. |
| | **Furniture and electronics- Are furniture and electronics at risk of damage in the event of a flood?**<br><br>Furniture items have non-absorbent surfaces up to 30cm (12") and electronics are stored at least 30cm (12") off the floor (or to exceed anticipated flood levels). | N/A | Furniture items have absorbent surfaces in contact with the floor and electronics are stored on the floor OR Needs further investigation. | Carpet on floors, couches with absorbent legs and electronics on the floor are at risk of damage in the event of a flood. Select furniture items that have non-absorbent surfaces up to 30cm (12") and store electronics at least 30cm (12") off the floor (or to exceed anticipated flood levels). |
| | **Relative humidity, air movement and temperature** - Are the moisture, humidity and temperature levels in your basement optimum to reduce mold and mildew risk? A 30-50% relative humidity reading is taken in the basement. Air circulation is good. A minimum regular temperature above 15C (60F) is maintained. | N/A | Over 60% relative humidity reading is taken in basement OR Air movement is highly restricted OR The temperature is kept below 10C (50F) OR Needs further investigation. | The relative humidity reading is 65. This exceeds the recommended maximum of 50%. Reduce sources of moisture and run one or more dehumidifiers to maintain 30-50% relative humidity. Improve air circulation. Maintain minimum temperature of 15C (60F). |
| G | **Hazardous materials- Are hazardous materials stored in a way that represents a contamination risk during a flood?**<br><br>No hazardous materials are stored in the basement and/or materials are stored in waterproof containers at least 30 cm (12") off the floor (or to exceed anticipated flood levels). Heating fuel tanks are secured to the floor. | N/A | Hazardous materials are not sealed in waterproof containers and/or are stored on the floor and/or heating fuel tanks are not secured to the floor OR Needs further investigation. | See **G** on **Inside Assessment** diagram.<br><br>Remove paint, chemicals and other hazardous material from basement or seal hazardous materials in waterproof containers and store at least 30 cm (12") off the floor (or to exceed anticipated flood levels). |

# ASSESSED MAINTENANCE

| Fig | Maintenance Feature and Best Practice | Type of Water Damage | Assessment | Opportunity to Reduce Risk |
|---|---|---|---|---|
| | **Sanitary sewer lateral maintenance** – If the home is over 25 years of age, has experienced sewer backup or has experienced chronic drainage issues, the homeowner has completed closed circuit television (CCTV) inspection of the sanitary sewer lateral. Based on recommendations of a qualified professional, the homeowner has cleaned out, lined or replaced damaged lateral as needed. The homeowner prevents clogging by preventing fats, oils, flushable wipes and grease from going down the drain. | SB, WS | Homeowner has a sanitary sewer lateral that is over 25 years old AND/ OR has experienced sewer lateral backup but has not completed a camera inspection or related repairs and upgrades. OR Needs further investigation. The homeowner regularly puts fats, oils, flushable wipes and grease down the drain. | See **A** on **Inside Assessment** diagram.<br><br>Once a home has reached 25 years of age, a camera inspection of the sanitary sewer lateral is recommended every 5-10 years as a preventative measure. Based on the recommendations of a qualified professional, clean out, line or replace a damaged lateral as needed. Prevent clogging by preventing fats, oils, flushable wipes and grease from going down the drain. |
| B | **Floor drain maintenance** – Each season the homeowner removes obstacles to water flowing freely to the drain, tops up standing water in the trap and removes any debris from the drain. In case of blockage, strange smell, lack of water in trap, the homeowner contacts a licensed plumber. | SB | The homeowner never removes obstacles to water flowing freely to the drain, tops up standing water in trap or removes any debris from the drain. In case of blockage, strange smell, lack of water in trap, they do not contact a licensed plumber. | See **B** on **Inside Assessment** diagram.<br><br>Each season remove obstacles that prevent water from flowing freely to the drain, top up standing water in the trap and remove any debris from the drain. In case of blockage, strange smell and/or lack of water in trap, contact a licensed plumber. |
| | **Sump pit maintenance** – Each season the homeowner checks the sump pit, repairs cracks or damage, and removes debris. | SB | The homeowner never checks the sump pit, repairs cracks or damage or removes debris. | Each season check the sump pit, repair cracks or damage and remove debris. |

| | | | | |
|---|---|---|---|---|
| | **Sump pump(s) maintenance** – Each season, before vacation and when an extreme rain or melt event predicted, sump pump(s) and alarms are tested, repaired or replaced as required. | SB | Sump pump(s) are never tested, repaired or replaced as required. | Each season, before vacation and when an extreme rain or melt event is predicted, test the sump pump(s). Clean, repair or replace these items as required. Consider installing and maintaining an alarm each season to further reduce risk. |
| | **Unfinished wall efflorescence maintenance** –- Once per season the homeowner checks for evidence of efflorescence, addresses sources of water buildup at foundation, and cleans and repaints with masonry waterproofing paint as required. | GS | The homeowner never checks for evidence of efflorescence, addresses the sources of water buildup at the foundation, cleans and repaints the surface with masonry waterproofing paint as required. | Once per season check for evidence of efflorescence. Address sources of water buildup at the foundation. Clean and repaint the surface with masonry waterproofing paint as required. |
| | **Finished wall maintenance** – Each season homeowner checks for high levels of moisture and water stains. If high levels of moisture or water damage and/or mold is evident, consults a professional for remediation. Monitor during heavy downpours and spring melts for signs of dampness. | GS | The homeowner never checks for high levels of moisture and water stains. If high levels of moisture or water damage and/or mold is evident, they do not consult a professional for remediation. The homeowner does not monitor for signs of dampness during heavy downpours and spring melts. | Each season check for high levels of moisture and water stains. If high levels of moisture or water damage and/or mold is evident, consult a professional for remediation. Monitor for signs of dampness during heavy downpours and spring melts. |
| | **Indoor plumbing and fixtures maintenance** – Each season toilets, taps, pipes and water heaters are inspected by the homeowner and are repaired by a plumber as needed. Consider installing and maintaining flood alarms. | PF | Toilets, taps, pipes and water heaters are not inspected by the homeowner or repaired by a plumber as needed. | Each season inspect toilets, taps, pipes and water heaters for leaks and signs of wear. Repair or replace items with the assistance of a plumber as needed. Consider installing and maintaining flood alarms to reduce flood risk. Check with your insurance professional about discounts for installing alarm systems. |

# ADDITIONAL FLOOD PROTECTION RESOURCES

## Regional Resources

Saskatoon Key Flood Protection Resources

Saskatoon Contractor List

Burlington Key Flood Protection Resources

Burlington Contractor List

Toronto Key Flood Protection Resources

Get Emergency Ready Guide- City of Toronto

Toronto Contractor List

Oakville Key Flood Protection Resources

Hamilton Key Flood Protection Resources

Waterloo Region Flood Protection Resources

## National Resources

Self-Help Resources for Outside and Inside the Home

Seasonal Maintenance Checklist

Infographic- Top Tips For Reducing Flood Risk

Infographic- Understanding Flood Insurance Coverage

Questions to Ask Your Insurance Providers

Estimated Cost Ranges for Completing Flood Protection Projects

Water Resistant Building Materials for Your Basement

Temporary Flood Barriers for Your Home

CMHC Guide for Understanding and Fixing Interior Moisture Problems

Emergency Preparedness Resources

# APPENDICES

## Appendix A. Client Information Summary

| | |
|---|---|
| Type of Home | Single Detached |
| Ownership | Owner |
| Type of Ownership | Freehold |
| Consents To Study | No |
| Length of Time in Home | 0-5 years |
| Plan to Stay in Home | Over 10 years |
| Year Home Was Built | 1950 |
| Era of Neighbourhood development | Between 1940 and 1970 |
| Home Layout | 1.5 Storey |
| Home Size | Between 1000 to 2000 sq ft |
| Lot Size | Between 1/4 acre and 1/2 acre |
| Basement Type | Partly finished |
| Foundation Type | Rubble |
| Soil Type | Sand |
| Property within CA Regulated Area | No |
| Water Supply | Municipal |
| Sewage Service | Municipal |
| Weather Conditions | Clear and 5C |

## Appendix B. Reported Past Water Damage Summary

| Past Water Damage to Your Lot and Exterior Structures | |
|---|---|
| Have you experienced any type of water damage to your lot and/or exterior structures (decks, garages, sheds) in the past? | No |
| What was the cause of the water damage? | |
| What category would the water damage fit into (total damage to structures or content) | $0 |
| What actions did you take to reduce your risk of future water damage outside your home? | |
| What is your level of concern about experiencing water damage to your lot or exterior structures in the future? | Low |
| Please list your top 2 water damage-related questions you have about your lot or exterior structures | Is there anything I should do to protect my windows from leaking?<br>How often should I clean out my eaves troughs? |
| **Past Water Damage To Your Home** | |
| Have you experienced water in your basement or any type of water damage inside your home in the past? | Yes |
| What was the cause of the water damage? | Leaking pipes or appliances,<br>Sewer backup through toilet or drains,<br>Sump pump failure,<br>High humidity causing mould or mildew growth. |
| What category would the water damage fit into (Total damage to structures or content) | Under $5,000 |
| What actions did you take to reduce your future risk of indoor water damage? | Completing maintenance activities. |
| What is your level of concern about experiencing water damage to your home is in the future? | Medium |
| Please list top 2 water-damage related questions you have about your home | How do I keep water from backing up through my floor drain?<br>How do I make sure my sump pump will work when I need it in the spring? |

## Appendix C. Outside Assessment Form

| Assessed Feature and Best Practice | Type of Water Damage | Assessment | Opportunity to Reduce Risk |
|---|---|---|---|
| Overland Drainage of Property | | | |
| **Overland drainage of property – Twenty four hours after a heavy rain do you see ponding or pooling on your property or in nearby storm drains or drainage ditches?** Twenty four hours after a heavy rain, water does not pool on the subject property or in nearby storm drains or drainage ditches. If drainage swales are present on the property they are unblocked and are at least 15cm (6") deep. | OW | Twenty four hours after a heavy rain, some water pooling is seen on the subject property or in nearby storm drains or drainage ditches. If drainage swales are present on the property, they are unblocked and are at least 15cm (6") deep. | Homeowner reports water pooling near the storm drain for several hours after a heavy rain. Contact the government department with jurisdictional authority if storm drain is not emptying within 24 hours. Please see preventative maintenance comment below. |
| **Overland drainage maintenance –** Once per season or when major storm events are predicted, the homeowner checks for and removes debris and obstructions from the water flow paths including swales, nearby storm drains, culverts and drainage ditches. | OW | The homeowner never checks for or removes debris and obstructions from the water flow paths including swales, nearby storm drains, culverts and drainage ditches. | See **A** on **Outside Assessment** diagram. Once per season or when major storm events are predicted, check for and remove debris and obstructions from the water flow paths including swales and nearby storm drains. If nearby storm drains are free of debris but are still not draining within 24 hours, contact the government department with jurisdictional authority. |

| Landscaping | | | |
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| **Condition and location of trees – Would falling limbs due to strong winds or ice accumulation pose any risk of property damage to the home or hydro lines? Does their location pose potential risk to the home's foundation or sewer lateral?** Trees appear to be in good condition. Their limbs do not hang over the home, driveway or hydro lines. Trees are in a position where the risk of root damage to the home's foundation or sewer lateral is unlikely. | SB, WS, GS | Trees appear to be in good condition. Their limbs do not hang over the home, driveway or hydro lines. Trees are in a position where they likely do not pose a root damage risk to the home's foundation or sewer lateral. | No action is required. |
| **Tree maintenance –** Once per season, the homeowner checks the condition of trees, prunes as required and waters during drought periods. | SB, WS, GS | Once per season the homeowner checks the condition of trees, prunes as required and waters during drought periods. | Once per season, check the condition of trees and prune as required. Water during drought periods. If concerned about a tree on public property, contact the government department with jurisdictional authority for assistance. If concerned about a tree on your property, contact a certified arborist for help. |
| **Garden beds adjacent to home – Do garden beds leave a minimum of 20 cm (8") of your foundation exposed? Do foundation plantings provide adequate light exposure and air movement to foundation?** Foundation plantings provide good light and air circulation between the plantings and the foundation. A minimum 20 cm (8") of foundation remains exposed. Trees that will reach a height of 10m (30') or more are a minimum of 5m (15') from the foundation and shrubs are a minimum of 1.8m (6') from the foundation. Water drains freely away from the foundation. | GS | Foundation plantings allow for good light and air circulation between the plantings and the foundation. A minimum 20cm (8") of foundation remains exposed. Trees that will reach a height of 10m (30') or more are minimum of 5m (15') from the foundation and shrubs are minimum of 1.8m (6') from the foundation. Water drains freely away from the foundation. | No action required |

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| **Landscaping maintenance –** Once per year the homeowner removes barriers which impede water flowing away from the foundation. **Consider applying mulch to garden beds and aerating the lawn to improve the ability of the soil to soak up water.** | GS | Once per year homeowner removes barriers which impede water flowing away from foundation. | Once per year remove barriers which impede water from flowing away from the foundation. Consider applying mulch to garden beds and aerating lawns to improve the ability of the soil to soak up water. |
| Driveways, Walkways and Patios | | | |
| **Impermeable (waterproof surface such as asphalt and interlocking pavers) driveway – Is your driveway free of cracks and does it slope away from your home at a minimum of 1-2%?** The driveway is sloped away from the foundation walls at a slope of 1-2% and is free of cracks and gaps. | GS | The impermeable driveway directs water away from the foundation (1-2% slope) and is free of cracks and gaps. | No action is required. |
| **Impermeable (waterproof) driveway maintenance –** Once per season the homeowner checks for evidence of pooling and ice buildup, repairs grading, seals cracks, fills gaps and removes weeds. | GS | Once per season the homeowner checks for evidence of pooling and ice buildup, repairs grading, seals cracks, fills gaps, and removes weeds. | Once per season check for evidence of pooling and/or ice buildup. Repair grading, seal cracks, fill gaps and remove weeds. |
| **Walkways and patios – Do your walkways and patios slope a minimum of 1-2% away from foundation walls? Are they free of cracks and gaps?** The walkway slopes a minimum of 1-2% to direct water away from foundation and is free of cracks and gaps. | OW, GS | Walkway slopes a minimum 1-2% to direct water away from the foundation and is free of cracks and gaps. | No action is required. |
| **Walkways and patios maintenance –** Once per season the homeowner checks for evidence of pooling and ice buildup. Grading is repaired, cracks and gaps are sealed, and weeds are removed. | OW, GS | Once per season the homeowner checks for evidence of pooling and ice buildup. They repair grading, seal cracks, fill gaps and remove weeds. | Once per season check for evidence of pooling and/or ice buildup. Repair grading, seal cracks, fill gaps and remove weeds. Replace if the surface is in very poor condition. |

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| Grading at Foundation | | | |
| **Grading at foundation – After a heavy rain, does the grading within 1.8m (6') of your foundation walls direct water away or do you see water pooling?** The grading within 1.8 m (6') of the foundation walls slopes a minimum of 5% to direct water away from the foundation. The foundation surface does not easily soak up water. | OW, GS | The grading is flat or slopes toward the foundation OR The foundation surface is highly water absorbent OR Needs further investigation. | See **B** on **Outside Assessment** diagram. The grading beside your home directs water toward the foundation. The line in the soil indicates eaves troughs are overflowing and adding additional risk. Correct grading to achieve at least a 5% slope away from the foundation. Consider replacing the surface with non-water absorbent material. See comments related to eaves trough maintenance. |
| **Grading at foundation maintenance** – Each season the homeowner checks for signs of water pooling or ice formation and corrects grading to achieve at least 5% slope away from the foundation. | OW, GS | The homeowner never checks for signs of water pooling or ice formation nor corrects grading to achieve at least 5% slope away from the foundation. | Each season, check for signs of water pooling or ice formation at foundation. Correct grading to achieve at least 5% slope away from foundation. |
| Eaves Troughs and Downspouts | | | |
| **Eaves troughs – Are eaves troughs adequately sized and in adequate condition to reduce flood risk?** Eaves troughs wrap around the entire building, are in good repair and have downspouts placed a minimum of 9-12m (30-40'). Eaves trough of 13cm (5") are present for asphalt shingles or 15cm (6") for a metal roof. | GS | Eaves troughs wrap around the entire building, are in good repair, and have downspouts placed a minimum of every 9-12m (30-40'). Eaves trough of 13cm (5") is present for asphalt shingles or 15cm (6") for metal roof. | No action is required. |
| **Eaves trough maintenance** – Each season during heavy rainfalls, the homeowner checks the eaves troughs for leaks, debris and blockage. Repairs and debris removal are completed as needed. | GS | The homeowner never checks the eaves troughs for leaks, debris and blockage. Repairs and debris removals are not completed as needed. | See **C** on **Outside Assessment** diagram. Each season during heavy rainfalls, check for leaks, debris and blockage. Repair, replace and clean out as needed. |

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| **Disconnected downspouts – Are downspouts (that are not presently connected into underground pipes) directing water at least 1.8m (6') away from your home or the nearest drainage swale?** For downspouts that have been disconnected, caps are securely in place to block the movement of water into underground pipes. The downspouts extend at least 1.8m (6') away from the foundation or to a drainage swale. Water is not directed onto hard surfaces or adjacent properties. | GS | For downspouts that have been disconnected, caps are securely in place to block the movement of water into underground pipes. Downspouts extend at least 1.8m (6') away from the foundation or to a drainage swale. Water is not directed onto hard surfaces or adjacent properties. | Consider connecting downspouts to a French drain, rain garden, bioswales or infiltration gallery to soak up water at least 5m (15') away from foundation. Check with government department with jurisdictional authority about drainage by-laws if any significant change to grading or drainage of property is being considered. |
| **Downspout maintenance –** Once per season the homeowner checks to make sure the downspout extensions are secured, free of leaks, depositing water at least 1.8m (6') from the foundation or to a drainage swale and that water is not flowing onto adjacent properties. | GS | The homeowner never checks to make sure the downspout extensions are secure, free of leaks, depositing water at least 1.8m (6') from the foundation or to a drainage swale and that water is not flowing onto adjacent properties. | Once per season check to make sure the downspout extensions are secure, free of leaks, deposit water at least 1.8m (6') from the foundation or to a drainage swale and that water is not flowing onto adjacent properties. |
| Foundation | | | |
| **Foundation structure – Is your foundation free of cracks and gaps?** The foundation appears to be in good condition and is free of cracks and finishing gaps (e.g. missing parging). Foundation penetrations are well sealed and sit above anticipated flood levels. | GS | The foundation appears to be in good condition and is free of cracks and finishing gaps (e.g. no missing parging). The foundation penetrations are well sealed and sit above anticipated flood levels. | No action is required. |
| **Foundation structure maintenance –** Once per season the homeowner checks for cracks and gaps, and completes repairs as required. | GS | Once per season the homeowner checks for cracks and gaps, and completes repairs as required. | Once per season check for cracks and gaps, complete repairs as required. Contact a qualified foundation repair contractor to repair cracks greater than 6mm (1/4"). |

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| **Foundation clearance maintenance** – Stored items are kept at least 15cm (6") from the foundation. As dictated by snow storm events, the homeowner clears snow 1m (3'6") away from the foundation, keeps window openings clear of snow and ensures that vents are clear. | GS | Stored items are kept at least 15cm (6") from the foundation. As dictated by snow storm events, the homeowner clears snow 1m (3'6") away from the foundation, keeps window openings clear of snow piles and ensures that vents are clear. | Store item at least 6" from foundation. At intervals dictated by snow storms, regularly keep snow piles 3' (1m) away from foundation and keep window openings clear of snow piles. Ensure vents are clear. |
| **Foundation efflorescence** – Are there signs of efflorescence on the foundation that could indicate moisture problems? Efflorescence (mineral deposits) indicate water moving through masonry, evaporating and leaving minerals behind. The presence of efflorescence can indicate water issues that can lead to spalling or structural damage. | GS | There is minor evidence of efflorescence. | Reduce the flow of water to the masonry by correcting the grading, maintaining eaves troughs, repairing foundation drains, sealing cracks on driveway, shoveling snow away from the walls in the winter, and minimizing salt use. |
| **Efflorescence maintenance** – Once per season the homeowner checks for evidence of efflorescence, addresses the sources of water buildup at foundation, and cleans and repaints the surface with masonry waterproofing paint as required. | GS | Once per year the homeowner checks for evidence of efflorescence, addresses the sources of water buildup at the foundation, and cleans and repaints the surface with masonry waterproofing paint as required. | Once per season check for evidence of efflorescence. Address the sources of water buildup at the foundation. Clean and repaint the surface with masonry waterproofing paint as required. |
| **Foundation moisture content – Is your foundation showing high levels of water retention?** Low levels of moisture at the surface are indicated. | GS | Moderate levels of moisture at the surface are indicated. | Reduce the flow of water to masonry by correcting the grading, maintaining eaves troughs, repairing foundation drains, sealing cracks on driveway, and shoveling snow away from walls in the winter. Improve drying of the foundation by referring to the landscaping best practices. Contact a qualified foundation repair contractor if the problem persists. |
| Windows | | | |
| **Condition of windows – Are windows in adequate condition to help reduce risk of basement flooding?** Frames, glass and seals are all in good condition. | OW | Frames, glass and seals are all in good condition. | No action is required. |

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| **Window maintenance** – Once per season the homeowner checks the condition of the frames, glass and seals, and completes repairs as necessary. | OW | The homeowner never checks the condition of the frames, glass and seals, or completes repairs as necessary. | Once per season check the condition of the frames, glass and seals. Repair as necessary. |
| **Window wells – Are window wells installed in such a way that they reduce flood risk?** For each window that is less than 10-15cm (4-6") above the ground surface, a window well is present and sits at least 10-15cm (4-6") above grade. The window well is sealed at the foundation and the grading adjacent to wells slopes away from the home at a minimum of 5%. Consider installing window wells covers to further reduce risk. | OW | For each window that is less than 10-15cm (4-6") above the ground surface, a window well is not present. OR Window wells sit less than 10-15cm (4-6") above grade or are not sealed at foundation or grading at the window wells does not slope away from home at a minimum of 5%. Window well covers are not present OR Requires further investigation. | See **D** on **Outside Assessment** diagram. The windows are only 2.5 cm above grade and there is no formal window well, placing windows at higher risk of water inflow during heavy rains and spring melts. Work with a qualified professional to install a window well with adequate drainage. Correct grading adjacent to the window wells to slope 5% away from home. Consider installing window well covers to further reduce risk. |
| Exterior Water Sources | | | |
| **Hose bib maintenance** – Spring, summer and fall the homeowner checks for leaks and completes repairs as necessary. Before winter, the outdoor water supply is shut off and the water line is drained. The hose is drained and removed. | OW, GS | The homeowner never checks for leaks or completes repairs as necessary. They never shut off the exterior water supply, drains the line or remove the hose. | See **E** on **Outside Assessment** diagram. Spring, summer and fall check for leaks and complete repairs as needed. Before winter freeze up shut off the outdoor water supply and drain the water line. Drain and remove the hose. |
| **Sump pump discharge – Does your sump pump drain pipe deposit water at least 1.8m (6') from foundation or to the nearest drainage swale? Does pipe exit the home's exterior above anticipated flood levels?** Sump pump drain pipe is present and deposits water at least 1.8m (6') from foundation or to drainage swale. It does not direct water onto a hard surface or onto adjacent property. The discharge pipe's exit point through the home's exterior is above anticipated flood levels. | OW, GS | Sump pump drain pipe is present and deposits water at least 1.8m (6') from foundation or to drainage swale and is not directing water onto a hard surface or adjacent property. The discharge pipe's exit point through the home's exterior is above anticipated flood levels. | No action is required. |

## Appendix D. Inside Assessment Form

| Assessed Feature and Best Practice | Type of Water Damage | Assessment | Opportunity to Reduce Risk |
|---|---|---|---|
| Sewer and Storm Lateral | | | |
| **Sanitary sewer lateral – Is your sanitary sewer lateral in good condition and is it free of blockages?** Inspection of sanitary sewer lateral with a closed circuit television (CCTV) is best practice if a home is over 25 years old, if the home has experienced sewer backup or if the home experiences chronic drain backup. **Note: Determining the condition of the sewer lateral is outside the scope of this assessment. Consult a qualified professional.** | SB, WS | **Note: Only a qualified professional can formally identify the condition and the connection status of this item. Note: Work with a qualified professional and check with the government department having jurisdictional authority to determine the availability and your eligibility for any subsidies.** | You have noted that you sometimes get drain backups when you do laundry. This indicates restricted flow through your lateral. Consider a closed circuit television (CCTV) inspection by a qualified professional for assessment and repair or replacement to address this issue. |
| **Sanitary sewer lateral maintenance –** If the home is over 25 years of age, has experienced sewer backup or has experienced chronic drainage issues, the homeowner has completed closed circuit television (CCTV) inspection of the sanitary sewer lateral. Based on recommendations of a qualified professional, the homeowner has cleaned out, lined or replaced damaged lateral as needed. The homeowner prevents clogging by preventing fats, oils, flushable wipes and grease from going down the drain. | SB, WS | Homeowner has a sanitary sewer lateral that is over 25 years old AND/OR has experienced sewer lateral backup but has not completed a camera inspection or related repairs and upgrades. OR Needs further investigation. The homeowner regularly puts fats, oils, flushable wipes and grease down the drain. | See **A** on **Inside Assessment** diagram. Once a home has reached 25 years of age, a camera inspection of the sanitary sewer lateral is recommended every 5-10 years as a preventative measure. Based on the recommendations of a qualified professional, clean out, line or replace a damaged lateral as needed. Prevent clogging by preventing fats, oils, flushable wipes and grease from going down the drain. |

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| Floor Drain | | | |
| **Floor drain – Is your floor drain clear of physical barriers to water flow and in adequate condition to reduce flood risk?** Note: Some homes built before 1950 do not have a floor drain. A floor drain is present and demonstrates a clear flow path of water to the drain. The drain is in good condition, free of debris and standing water is present in trap. | SB | A floor drain is present but demonstrates a partly blocked water flow path to the drain. The drain appears to be in moderate condition, minor debris is evident, and standing water is present in the trap. | Some minor debris was seen in the floor drain and an oily film water noted on the surface of the water. Remove stored boxes blocking path of water flow to drain, clean out debris in trap. Repair the drain as needed. |
| **Floor drain maintenance** – Each season the homeowner removes obstacles to water flowing freely to the drain, tops up standing water in the trap and removes any debris from the drain. In case of blockage, strange smell, lack of water in trap, the homeowner contacts a licensed plumber. | SB | The homeowner never removes obstacles to water flowing freely to the drain, tops up standing water in trap or removes any debris from the drain. In case of blockage, strange smell, lack of water in trap, they do not contact a licensed plumber. | See B on **Inside Assessment** diagram. Each season remove obstacles that prevent water from flowing freely to the drain, top up standing water in the trap and remove any debris from the drain. In case of blockage, strange smell and/or lack of water in trap, contact a licensed plumber. |
| **Basement sanitary sewer lateral cleanout** – A basement sanitary sewer lateral cleanout is present and easily accessible. | SB | A basement sanitary sewer lateral cleanout is not accessible OR not present OR Needs further investigation. | See **C** on **Inside Assessment** diagram. Consider working with a plumber to install an easily accessible hatch to improve inspection and maintenance access. This will make it more cost-effective for regular inspection, maintenance and repair. |
| Backwater Valve | | | |
| **Backwater valve – Is a backwater valve appropriate for use in your home or if it is in place, is it in good condition?** Consider working with a qualified professional to determine if a backwater valve is suitable for your home or to evaluate the condition of your backwater valve. **If you have a backwater valve or install one, consider installing an alarm to let you know when the valve is closed to prevent flooding from in-home sources. Note: This item is outside of scope of this assessment. Consult a qualified professional.** | SB | **Note: Only a qualified professional can formally identify if a backwater valve would be right for your home and the condition of an existing unit. Note: Check with the government department having jurisdictional authority to determine the availability of a subsidy for installation and your eligibility.** | Consider working with a qualified professional to determine if a backwater valve is suitable for your home. If you install a backwater valve remember to complete seasonal maintenance and consider installing a backwater valve alarm to let you know when the valve is closed to prevent flooding from in-home sources. Check with your insurance provider regarding eligibility for premium discounts for installing a backwater valve and/or an alarm. |

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| Foundation Drain (Weepers) | | | |
| **Foundation drain – Is a foundation drain (weepers) present? Is foundation drain functioning properly to drain water away from your foundation?** Note: Foundation drains are not common before 1960. Depending on the age of your house it may or may not have a foundation drain or it may have a drain that is old and in poor condition. Missing or clogged drains increase the risk of basement infiltration flooding. Foundation drains that are connected to sanitary or storm sewers increase the risk of sewer backup related flooding. **Note: Determining the condition and the plumbing connection of the foundation drain is outside the scope of this assessment. Consult a qualified professional.** | GS, OW, SB | **Note: Only a qualified professional can formally identify the condition of this item or recommend if one would be right for your home. Note: Check with the check with the government department having jurisdictional authority to determine the availability of a subsidy and your eligibility.** | The foundation weepers that enter your sump pit are made of clay. It is likely that these are over 50 years old. Symptoms such as dampness where the basement wall meets the floor are common when these are in poor condition so please monitor these areas regularly. Consider working with a qualified professional to inspect and/or repair your foundation drains to improve the rate of removal of water from your foundation. Check with the government department having jurisdictional authority to determine the availability of subsidy and your eligibility. |
| Sump Pit and Pump | | | |
| **Sump pit – Does your sump pit have a sealed cover and is it in good repair?** The sump pit has a sealed cap, is in good condition (free of cracks and holes) and is free of debris. | SB | The sump pit is in poor condition (cracks, holes greater than 6mm (1/4") present), there is no sealed cap, a large amount of debris is evident OR Needs further investigation. | See **D** on **Inside Assessment** diagram. You have an older sump pit without plastic walls and without a sealed plastic lid. Consider upgrading your sump pit to improve storage capacity and to decrease humidity levels in the basement by installing a unit with a sealable lid. Work with a qualified professional to complete this work. |
| **Sump pit maintenance –** Each season the homeowner checks the sump pit, repairs cracks or damage, and removes debris. | SB | The homeowner never checks the sump pit, repairs cracks or damage or removes debris. | Each season check the sump pit, repair cracks or damage and remove debris. |
| **Sump pump connection – Does your sump pump discharge water to the surface of your property and does it have a backflow valve?** The sump pump discharges water to the lot surface and has a backflow preventer installed. | OW, GS | The sump pump discharges water to the lot surface and has a backflow preventer installed. | No action required. |

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| **Sump pump – Is your sump pump in good condition and does it run infrequently?** A sump pump is present and the homeowner reports it is functioning well and runs a maximum of 5 times per year. **Consider installing an alarm to reduce flood risk.** | SB | A sump pump is present and the homeowner reports it is not functioning well. AND/ OR The sump pump runs more than 10 times per year OR Needs further investigation. | Your sump pump is over 20 years old and you report that it does not always function well. Consider replacing your sump pump. Consider installing a ground fault interrupter (GFI) outlet to reduce the risk of electric shock. Hire a qualified professional for installation. Consider installing and maintaining alarms to reduce flood risk. Note: Check with the government department with jurisdictional authority regarding availability and eligibility for subsidy. Also check regarding plumbing permits requirements. Check with your insurance provider about discounts for installing alarm systems. |
| **Back-up sump pump – Is there a backup sump pump and is it in good condition?** A back-up sump pump is present and the homeowner reports it is functioning well. | SB | A back-up sump pump is NOT present OR Back-up sump pump is present but the homeowner reports it is not functioning well OR Needs further investigation. | Purchase a back-up sump pump. Consider hiring a qualified professional for installation. |
| **Sump pump(s) maintenance –** Each season, before vacation and when an extreme rain or melt event predicted, sump pump(s) and alarms are tested, repaired or replaced as required. | SB | Sump pump(s) are never tested, repaired or replaced as required. | Each season, before vacation and when an extreme rain or melt event is predicted, test the sump pump(s). Clean, repair or replace these items as required. Consider installing and maintaining an alarm each season to further reduce risk. |
| **Back-up power source –** A back-up battery or generator is present, can generate electricity for a minimum of 72 hours and is reported by the homeowner to be functioning properly. A backup power source is elevated above anticipated flood levels. Consider installing an alarm to further reduce risk. | SB | There is no back-up power supply. OR A back-up battery or generator is present and is reported by homeowner to be functioning poorly AND/OR it is not elevated above the anticipated flood level OR Needs further investigation. | Purchase and install a 72 hour back-up power supply and maintain it each season. Raise the power source above the anticipated flood level. Consider installing and maintaining an alarm to reduce flood risk. Check with your insurance professional about discounts for installing sump pump backup batteries and alarm systems. |
| Exposed Foundation Walls, Floors and Cold Rooms | | | |
| **Unfinished wall cracks – Are your foundation walls free of cracks and stains?** Foundation walls are free of cracks and water stains. | GS | The foundation walls are free of cracks and water stains. | No action is required. |

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| **Unfinished wall crack maintenance** – The homeowner checks for cracks once per season, fills cracks and removes sources of water buildup at the foundation as needed (corrects drainage, repairs eaves troughs and/or removes snow in winter, seals foundation from outside in extreme cases). The homeowner consults with a qualified professional in case of major problems. | GS | Once per year the homeowner checks for cracks, fills cracks and removes the sources of water buildup at the foundation as needed (corrects drainage, repairs eaves troughs and/or removes snow in winter, seals foundation from outside in extreme cases). The homeowner consults with a professional in case of major problems. | Once per season, check for cracks, fill cracks and remove sources of water buildup at the foundation as needed (correct drainage, repair eaves troughs and/or remove snow in winter, seal foundation from outside in extreme cases). Consult with a qualified professional in case of major problems. |
| **Unfinished wall efflorescence – Is there evidence of efflorescence on your walls, indicating water movement through the foundation?** Foundation walls are free of efflorescence. | GS | There is significant evidence of efflorescence (large areas of solid coverage of white flakes) OR Needs further investigation. | See **E** on **Inside Assessment** diagram. Significant evidence of efflorescence was noted at the rear of the house where the grading is poor. Correct drainage, clean out eaves troughs and remove snow in winter. Remove efflorescence and seal the surface with masonry waterproofing paint. |
| **Unfinished wall efflorescence maintenance** – Once per season the homeowner checks for evidence of efflorescence, addresses sources of water buildup at foundation, and cleans and repaints with masonry waterproofing paint as required. | GS | The homeowner never checks for evidence of efflorescence, addresses the sources of water buildup at the foundation, cleans and repaints the surface with masonry waterproofing paint as required. | Once per season check for evidence of efflorescence. Address sources of water buildup at the foundation. Clean and repaint the surface with masonry waterproofing paint as required. |
| **Unfinished wall moisture** – Are there high levels of moisture on the surface of your walls below windows, near cracks and where walls meet floor? Low moisture levels are indicated on all tested areas of the wall surface. Monitor for signs of dampness during heavy downpours and spring melts. | GS | Moderate moisture levels are present on noted areas of the wall surface. | Moderate moisture levels were noted where the wall meets the floor at the rear of the home. Examine sources of moisture from inside and outside the home. Hire a qualified professional as needed to diagnose and repair moisture or mold problems. Monitor for signs of dampness during heavy downpours or spring melts. |
| **Unfinished floor cracks – Are there cracks in your floor that provide potential water entry sites to your basement?** Unfinished floors are free of cracks and water stains. | GS | Unfinished floors are free of cracks and water stains. | No action is required. |

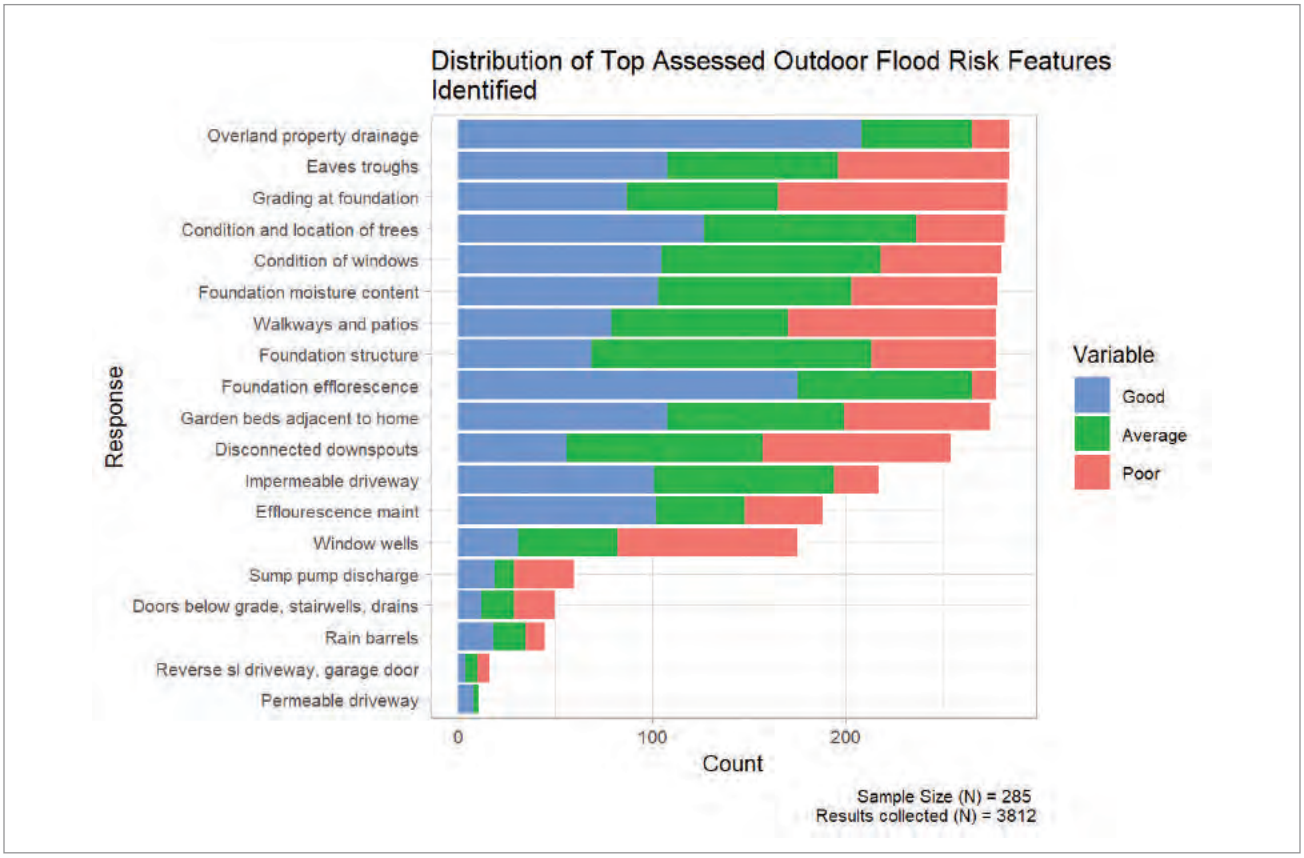
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| **Unfinished floor crack maintenance –** Once per season homeowner checks for cracks, fills cracks, removes source of water buildup at foundation as needed (corrects drainage, repairs eaves troughs and/or removes snow in winter, seals foundation from outside in extreme cases). Homeowner consults with professional regarding major concerns. | GS | The homeowner checks for cracks once per season, fills cracks and removes source of water buildup at the foundation as needed (corrects drainage, repairs eaves troughs and/or removes snow in winter, seals foundation from outside in extreme cases). The homeowner consults with a qualified professional regarding major concerns. | Check for cracks once per season, fill cracks, and remove the source of water buildup at the foundation as needed (correct drainage, repair eaves troughs and/or remove snow in winter, seal foundation from outside in extreme cases). Check with a qualified professional regarding major concerns. |
| **Unfinished floor efflorescence – Is there evidence of efflorescence on floors, indicating water movement through the foundation?** Floors are free of efflorescence. | GS | Floors are free of efflorescence. | No action is required. |
| **Unfinished floor efflorescence maintenance –** Once per season the homeowner checks for evidence of efflorescence, addresses sources of water buildup at foundation, and cleans and repaints with masonry waterproofing paint as required. | GS | Once per year the homeowner checks for evidence of efflorescence, addresses sources of water buildup at foundation, cleans and repaints with masonry waterproofing paint as required. | Once per season check for evidence of efflorescence. Address sources of water buildup at the foundation. Clean and repaint with masonry waterproofing paint as required. |
| **Unfinished floor moisture – Are there high levels of moisture, indicating water entry into the basement?** Low moisture levels are present on the floor surface. Monitor for signs of dampness during heavy downpours and spring melts. | GS | Low moisture levels are present on the floor surface. | Monitor for signs of dampness during heavy downpours and spring melts. |
| **Cold Rooms – Are cold rooms properly ventilated, with all surfaces maintaining consistent temperature to reduce mold and mildew risk?** The door, frame and seals are all in good condition and there is no evidence of water entry. The door is adequately insulated. The air circulation level is good with adequate venting and all items are off the floor and away from walls by at least 15cm (6”). Space is unheated. | OW | Door, frame and seals are in poor condition, evidence of significant water entry and/or door is not insulated, air circulation is poor with restricted venting and items are stored against the walls or on the floor OR Needs further investigation. | See **F** on **Inside Assessment** diagram. Seal cracks in the door, frame and repair/replace seals. Improve insulation of the door or consider replacing them. Improve ventilation and raise items off of floor and away from walls by a minimum 15cm (6”). Consider working with a qualified contractor to remove plywood from the walls, to examine and address sources of water infiltration. |

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|---|---|---|---|
| Finished Walls and Floors | | | |
| **Finished walls – Are water stains or high moisture levels indicating source of water infiltration?** Walls are free of water stains. There is no evidence of mold (smell or visual evidence). The audible moisture meter indicates no concerns. | GS | Walls show major evidence of water entry, clear evidence of mold (smell or visual evidence), moisture meter indicates higher concern OR Needs further investigation. | Major evidence of moisture has been noted on plywood walls inside cold room. Remove the source of water buildup at the foundation as needed (correct drainage, repair eaves troughs and/or remove snow in winter, seal foundation from outside in extreme cases). Remove and replace damaged materials. Consult a professional if you are concerned about mold. If you are considering refinishing your basement, refer to Water-Resistant Building Materials fact sheet. |
| **Finished wall maintenance – Each season homeowner checks for high levels of moisture and water stains.** If high levels of moisture or water damage and/or mold is evident, consults a professional for remediation. Monitor during heavy downpours and spring melts for signs of dampness. | GS | The homeowner never checks for high levels of moisture and water stains. If high levels of moisture or water damage and/or mold is evident, they do not consult a professional for remediation. The homeowner does not monitor for signs of dampness during heavy downpours and spring melts. | Each season check for high levels of moisture and water stains. If high levels of moisture or water damage and/or mold is evident, consult a professional for remediation. Monitor for signs of dampness during heavy downpours and spring melts. |
| **Finished floors – Are there high levels of moisture, indicating water entry into basement?** Low levels of moisture are present, there is no evidence of mold or mildew and no musty smell is present. | GS | Low levels of moisture are present on floors, no evidence of mold or mildew I present and no musty smell is present. | No action is required. If you are considering refinishing your basement, refer to Water-Resistant Building Materials fact sheet. |
| **Finished floor maintenance –** Each season homeowner the checks for water damage and signs of mold growth. If water damage and/or mold is evident, the homeowner consults with a professional for remediation. | GS | Each season the homeowner checks for water damage and signs of mold growth. If water damage and/or mold is evident, they consult a professional for remediation. | Each season check for water damage and signs of mold growth. If water damage and/or mold are evident, consult a professional for remediation. |
| Windows | | | |
| **Basement windows – Are windows in adequate condition to reduce risk of overland flooding?** Glass, frames and seals are all in good condition and there is no evidence of water entry. | OW | Glass, frames and seals are all in good condition. There is no evidence of water entry. | No action is required. |

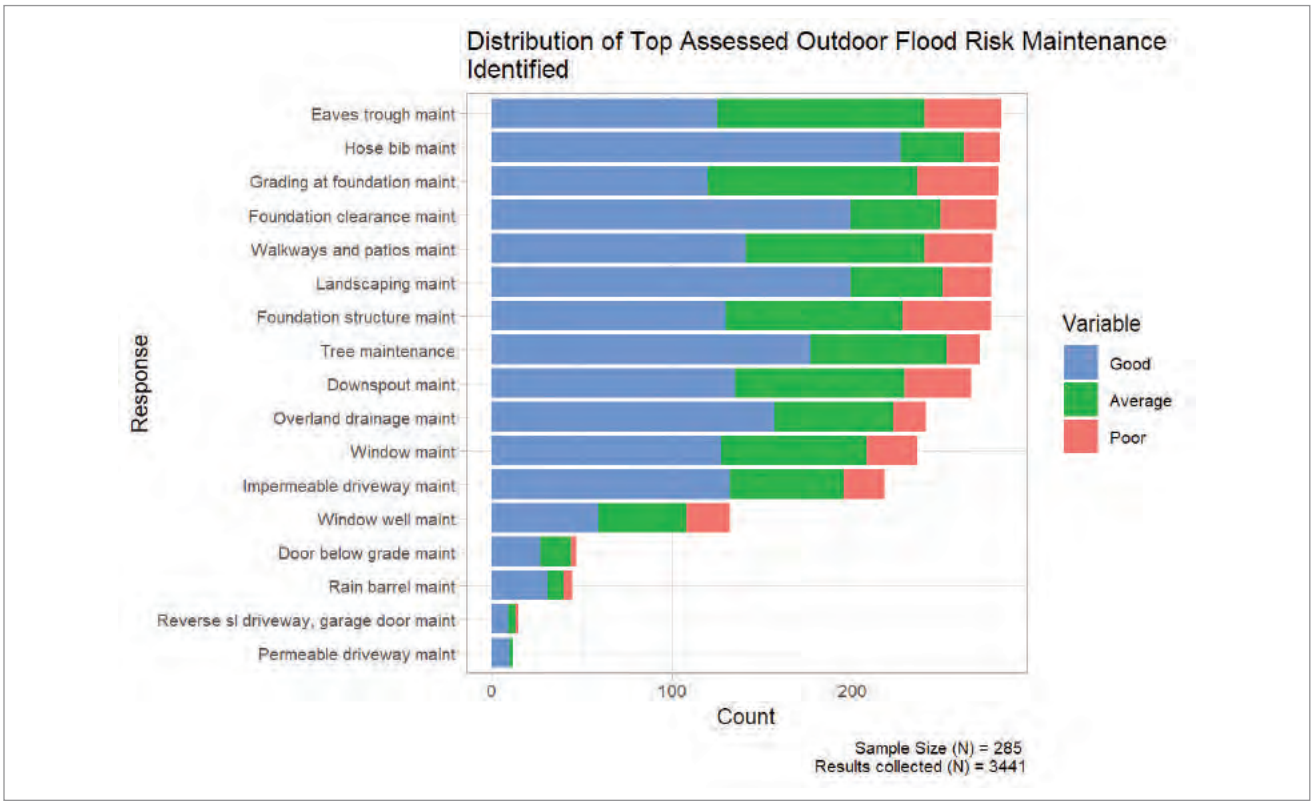
| | | | |
|---|---|---|---|
| **Basement window maintenance** – The homeowner checks once per season for cracked glass, broken seals and rotting frames. They repairs and/or replaces these as required. | OW | The homeowner checks once per year for cracked glass, broken seals and rotting frames, repairs AND/OR replaces these as required. | Once per season check for cracked glass, broken seals and rotting frames. Repair AND/OR replace these as required. |
| Plumbing Fixtures | | | |
| **Indoor plumbing and fixtures maintenance** – Each season toilets, taps, pipes and water heaters are inspected by the homeowner and are repaired by a plumber as needed. **Consider installing and maintaining flood alarms.** | PF | Toilets, taps, pipes and water heaters are not inspected by the homeowner or repaired by a plumber as needed. | Each season inspect toilets, taps, pipes and water heaters for leaks and signs of wear. Repair or replace items with the assistance of a plumber as needed. Consider installing and maintaining flood alarms to reduce flood risk. Check with your insurance professional about discounts for installing alarm systems. |
| Additional Considerations for Limiting Risk of Water Damage, Mold and Mildew Growth | | | |
| **Furniture and electronics – Are furniture and electronics at risk of damage in the event of a flood?** Furniture items have non-absorbent surfaces up to 30cm (12") and electronics are stored at least 30cm (12") off the floor (or to exceed anticipated flood levels). | N/A | Furniture items have absorbent surfaces in contact with the floor and electronics are stored on the floor OR Needs further investigation. | Carpet on floors, couches with absorbent legs and electronics on the floor are at risk of damage in the event of a flood. Select furniture items that have non-absorbent surfaces up to 30cm (12") and store electronics at least 30cm (12") off the floor (or to exceed anticipated flood levels). |
| **Stored valuables – Are your valuables at risk of damage during a flood or at risk of mold and mildew growth?** Valuables are stored in sealed, non-absorbent containers at least 30cm (12") off the floor (or to exceed anticipated flood levels), at least 15cm (6") away from walls to provide good air circulation OR no valuables are stored in the basement. | N/A | Valuables are stored in sealed, non-absorbent containers at least 15cm (6") off the floor, at least 10cm (3") away from walls that provide moderate air circulation. | Store items in sealed, non-absorbent containers at least 30 cm (12") off the floor (or to exceed anticipated flood levels) and 15 cm (6") away from walls. Consider moving most valuable items above the basement. |
| **Relative humidity, air movement and temperature – Are the moisture, humidity and temperature levels in your basement optimum to reduce mold and mildew risk?** A 30-50% relative humidity reading is taken in the basement. Air circulation is good. A minimum regular temperature above 15C (60F) is maintained. | N/A | Over 60% relative humidity reading is taken in basement OR Air movement is highly restricted OR The temperature is kept below 10C (50F) OR Needs further investigation. | The relative humidity reading is 65. This exceeds the recommended maximum of 50%. Reduce sources of moisture and run one or more dehumidifiers to maintain 30-50% relative humidity. Improve air circulation. Maintain minimum temperature of 15C (60F). |

| | | | |
|---|---|---|---|
| **Indoor Sources of Moisture–Are indoor sources of moisture limited to reduce mold and mildew risk?** If a bathroom with a shower is present, a fan is present and when it is running it is strong enough to hold a piece of tissue. Fan is run for 30-60 minutes after a bath or shower. Furnace humidifiers do not operate in the summer. Wood is not stored, laundry is not hung, boots are not dried etc. in the basement. | N/A | If a bathroom with a shower is present, a fan is present and when running it is strong enough to hold a piece of tissue. The fan is run for 30-60 minutes after bath or shower use. Furnace humidifiers do not operate in the summer. Wood is not stored, laundry is not hung, boots are not dried etc. in the basement. | No action required. |
| Hazardous Materials | | | |
| **Hazardous materials – Are hazardous materials stored in a way that represents a contamination risk during a flood?** No hazardous materials are stored in the basement and/or materials are stored in waterproof containers at least 30 cm (12") off the floor (or to exceed anticipated flood levels). Heating fuel tanks are secured to the floor. | N/A | Hazardous materials are not sealed in waterproof containers and/ or are stored on the floor and/or heating fuel tanks are not secured to the floor OR Needs further investigation. | See **G** on **Inside Assessment** diagram. Remove paint, chemicals and other hazardous material from basement or seal hazardous materials in waterproof containers and store at least 30 cm (12") off the floor (or to exceed anticipated flood levels). |

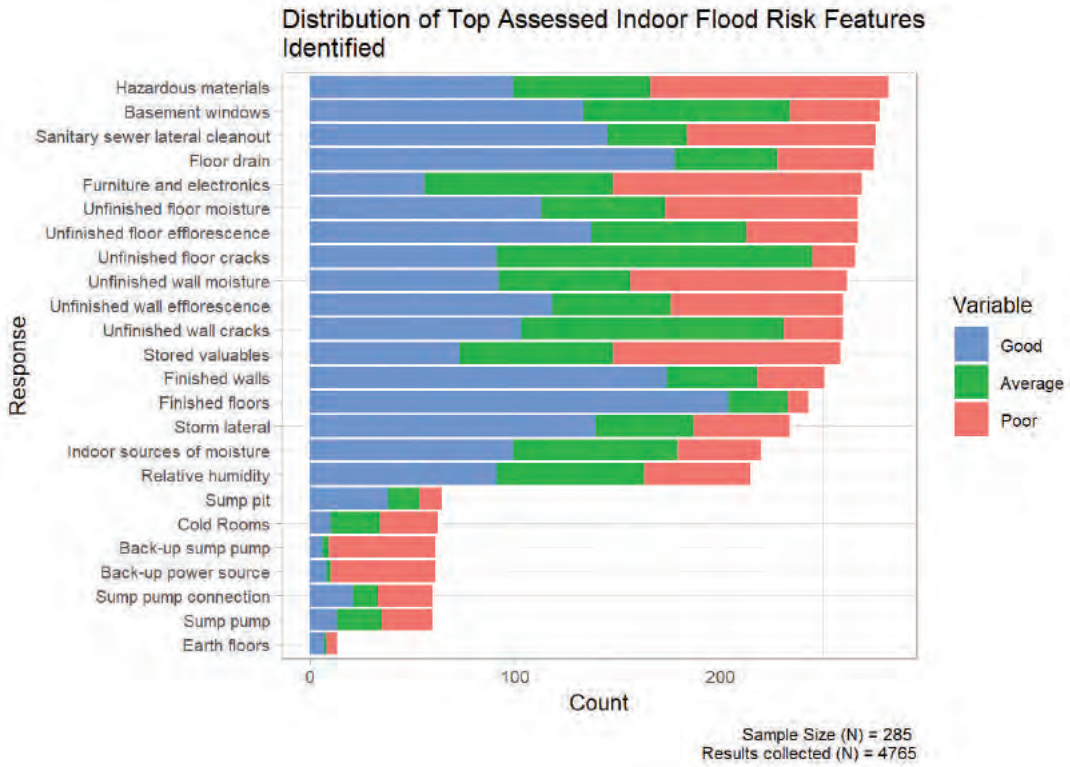
## Appendix N: Ontario- Assessment of All Flood Risk Features Outside the Home



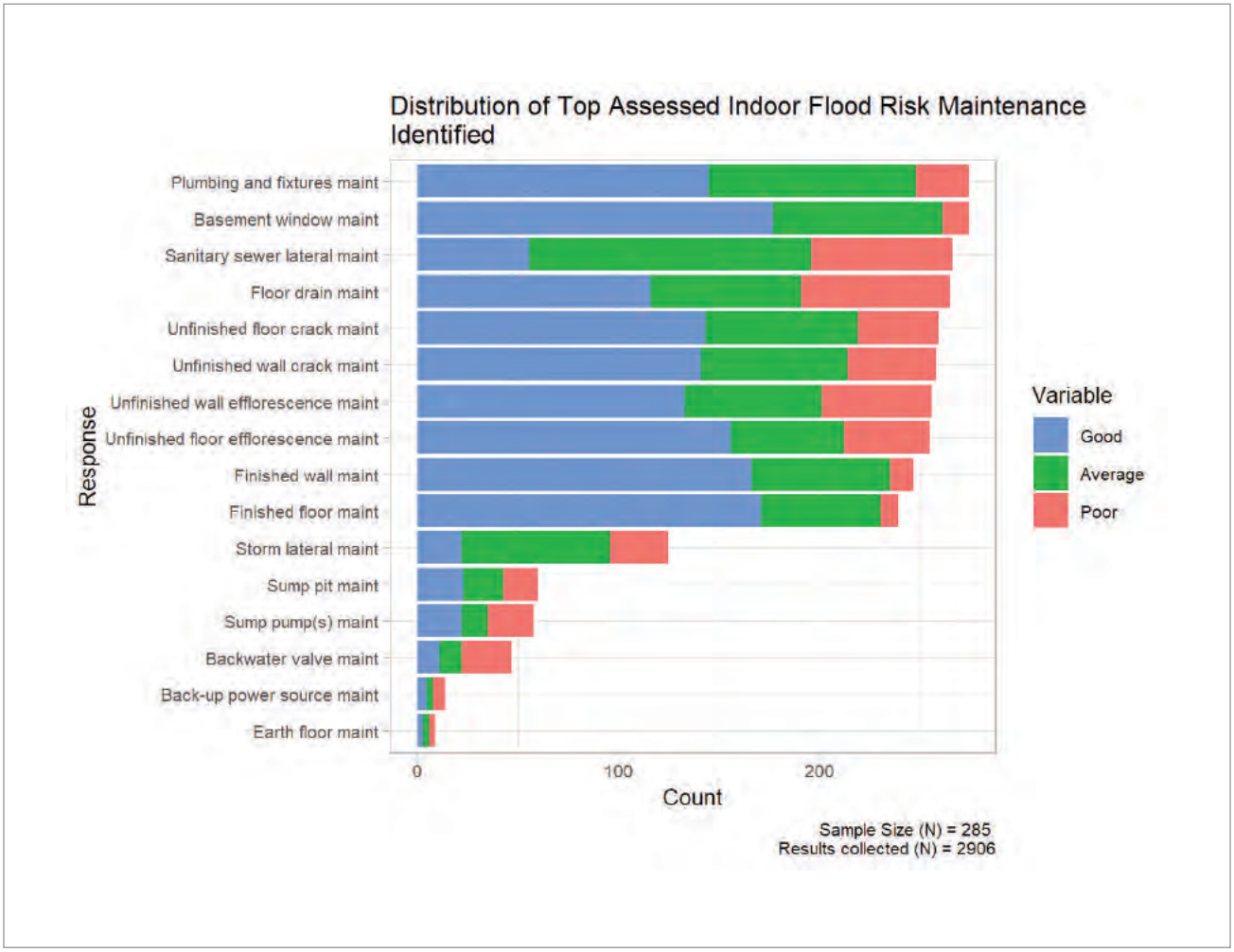

## Appendix O: Ontario- Assessment of All Flood Risk Maintenance Activities Outside the Home



## Appendix P: Ontario- Assessment of All Flood Risks Features Inside the Home



## Appendix Q: Ontario- Assessment of All Flood Risk Maintenance Activities Inside the Home



## Appendix R: Participant Testimonials




"After going through two devastating sewer back- up floods in 2014, my family and I wanted to learn what we could do to protect our new home from flooding. I would recommend having an assessment to anyone who wants to understand what they need to do to protect their home and their personal belongings. The assessment is $125, a small price to pay to have peace of mind."

*– Carol Solis (Burlington, Ontario)*




"A few years ago we experienced a flooded basement from sump pit overflow. We also have chronic dampness in parts of our basement. From our assessment we learned we can upgrade our sump pump, install a backup battery and flood alarm and make some inexpensive changes to our downspouts to help us keep water out of our basement even during the biggest storms. The $125 assessment fee is an investment that could save any family thousands of dollars in the future."

*– Zainab & Patrick Moghal (Waterloo, Ontario)*




**FOR FURTHER INFORMATION ABOUT THE REPORT, PLEASE CONTACT:**

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