Come Hell or High Water: A Comparative Analysis of the 2013 High River Flood Response

by

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COMMITTEE APPROVAL

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## List of Acronyms

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<tr>
<th>Acronym</th>
<th>Description</th>
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<tbody>
<tr>
<td>AEMA</td>
<td>Alberta Emergency Management Agency</td>
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<tr>
<td>AEP</td>
<td>Alberta Environment and Parks</td>
</tr>
<tr>
<td>AERP</td>
<td>Alberta Emergency Response Plan</td>
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<td>CARRI</td>
<td>Community and Regional Resilience Initiative</td>
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<tr>
<td>CFO</td>
<td>Chief Financial Officer</td>
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<tr>
<td>CSA</td>
<td>Canadian Standards Association</td>
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<tr>
<td>DMTF</td>
<td>Debris Management Task Force</td>
</tr>
<tr>
<td>EMC</td>
<td>Emergency Management Coordinator</td>
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<tr>
<td>EMAP</td>
<td>Emergency Management Accreditation Program</td>
</tr>
<tr>
<td>EMFO</td>
<td>Emergency Management Field Officer</td>
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<tr>
<td>EOC</td>
<td>Emergency Operations Center</td>
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<tr>
<td>EPA</td>
<td>United States Environmental Protection Agency</td>
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<tr>
<td>FRSC</td>
<td>Foothills Regional Services Commission</td>
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<td>GoA</td>
<td>Government of Alberta</td>
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<td>HHW</td>
<td>Household hazardous waste</td>
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<tr>
<td>ICS</td>
<td>Incident Command System</td>
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<tr>
<td>IPCC</td>
<td>Intergovernmental Panel on Climate Change</td>
</tr>
<tr>
<td>LRRC</td>
<td>Foothills Regional Landfill &amp; Resource Recovery Centre</td>
</tr>
<tr>
<td>NGO</td>
<td>Non-government organization</td>
</tr>
<tr>
<td>PCGCC</td>
<td>Pew Center on Global Climate Change</td>
</tr>
<tr>
<td>PPE</td>
<td>Personal protective equipment</td>
</tr>
<tr>
<td>RWRS</td>
<td>Regional Waste Reduction Specialist</td>
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<tr>
<td>SP</td>
<td>Samaritan’s Purse</td>
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<tr>
<td>SOP</td>
<td>Standard operating procedure</td>
</tr>
<tr>
<td>SPM</td>
<td>Senior Project Manager</td>
</tr>
<tr>
<td>SWANA</td>
<td>Solid Waste Association of North America</td>
</tr>
<tr>
<td>ToHR</td>
<td>Town of High River</td>
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<tr>
<td>UNODRR</td>
<td>The United Nations Office for Disaster Risk Reduction</td>
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<tr>
<td>Glossary of Terms</td>
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<td>-----------------------------------</td>
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<tr>
<td>Disaster communication</td>
<td>Print, radio, online, and other methods of communicating disaster response, disaster recovery, and evacuation information to residents, responding staff, and volunteers</td>
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<td>Disaster debris management</td>
<td>The collection, removal, hauling, and disposal of debris generated by a natural disaster</td>
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<td>Disaster recovery</td>
<td>The period of time associated with rebuilding a community after a disaster response</td>
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<td>Disaster response</td>
<td>The period of time immediately after a natural disaster occurs when first responders, such as police and fire crews, act to save lives, property, and the environment</td>
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<tr>
<td>Incident Command System</td>
<td>A training system for disaster response and incident management professionals, as well as municipal staff</td>
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<tr>
<td>Non-government organization</td>
<td>Usually, a non-profit organization and independent of government</td>
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<tr>
<td>One in 100-year event</td>
<td>An event that has a 1% chance, or one in 100% chance of occurring any year. This term is often used to refer to flooding, or precipitation levels</td>
</tr>
<tr>
<td>Volunteer Communication</td>
<td>Training materials and information for volunteer efforts to clean a community after a disaster event</td>
</tr>
<tr>
<td>Re-entry, or accessibility plan</td>
<td>A plan to systematically re-enter a community after an evacuation has occurred</td>
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Abstract

Southern Alberta and the Town of High River were impacted by the most devastating floods in Alberta history in 2013 (MNP, 2015, p. 1). This research was designed to analyze how well prepared the Government of Alberta and the Town of High River were for the 2013 flooding, whether the disaster debris cleanup followed industry best-practices, and what improvements could be made for future disaster responses in the province. This research utilized a comparative analysis approach, utilizing qualitative data gathered from semi-structured interviews with key stakeholders involved in the 2013 flood debris cleanup. The results of this study indicate the Town of High River and the Government of Alberta were unprepared for the flooding in 2013, however, they quickly mobilized a response that allowed the community to recover remarkably. There were many ways the disaster response and recovery did not follow industry best-practices and major gaps exist in Alberta’s disaster management planning and disaster debris handling practices. This study can help the Government of Alberta and municipalities address these gaps before future natural disasters occur.

Keywords: natural disasters, flooding, debris management
Come Hell or High Water: A Comparative Analysis of the 2013 High River Flood Response

Introduction to disaster debris management

Environmental and economic studies expert Curtis (2009), claimed that extreme weather events will occur more frequently in the future at a global level. The author wrote that this will occur because of climate change and that these events will continue to cause major damage to important infrastructure (p. 429). The United Nations Office for Disaster Risk Reduction (UNODRR) Report (2015) claimed that losses from natural disasters have been increasing steadily since 1980 (p. 49) and that the global expected average annual loss in the built environment associated with tropical cyclones, earthquakes, tsunamis, and floods is now estimated at US$314 billion. The authors concluded that this risk presents a real challenge to the global agenda of sustainable development (p. 54).

According to Reinhart et al. (1999), natural disasters generate huge amounts of waste debris, often five to 15 times the typical annual waste generation rates of a community. Hurricane Andrew, for example, generated 43 million yd³ of debris and these wastes can lead to clean-up delays, cost escalation, and adverse environmental impact (p. 3).

Following a disaster, the Community & Regional Resilience Initiative (CARRI) (2008), which worked out of the Oak Ridge National Laboratory (p. v), said the standard response actions include: emergency responders searching for, rescuing, and caring for casualties, evacuees, and the sheltered. This emergency response period overlaps with a restoration period, when the repairable essentials of urban life are restored, which in turn overlaps with a reconstruction period of infrastructure (p. 3-4).
The province of Alberta, Canada has recently been impacted by extreme weather events, including: the wild fires in Slave Lake (2011), the Town of High River (ToHR) and Southern Alberta flooding (2013), and the wild fires in Fort McMurray (2016). According to the MNP Report (2015), 2013 saw record rainfall in Southern Alberta. The Bow River recorded an estimated peak flow of 2,670 m$^3$/s in 2013, dwarfing the previous high of 1,740 m$^3$/s in 2005 (p. 26). According to the Alberta Emergency Management Agency (AEMA), peak flows on the Highwood River, seen below in Figure 1 with the Highwood River highlighted, also exceeded 2000 m$^3$/s (Alberta Emergency Management Agency, n.d., p. 20).

Figure 1. The Town of High River Picture Map, 2017.

The cost of the ToHR and Calgary flood cleanup, to the Federal and Provincial Governments, was approaching six billion at the end of 2013 (Wood, 2013, para 1). Given the expected increases in extreme weather events (Curtis, 2009, p. 429) and Alberta’s recent disaster experiences, the Government of Alberta (GoA) and the ToHR could be studied to learn from their experiences and help minimize the impact of future extreme weather events.

The purpose of this research, is to explore three questions, each pertaining to a specific period of the 2013 flooding in the ToHR:
1. Were the GoA and the ToHR prepared, in advance, to properly haul and dispose of the debris generated from the 2013 flooding?

2. Did the debris management strategies utilized in the ToHR, during the 2013 flood response and recovery, follow industry best-practices?

3. What lessons learned can be implemented after the flooding in 2013, to improve the response capabilities of the GoA and municipalities for future natural disasters?

I experienced the flooding in the ToHR, through my professional capacity as the Assistant Manager of the Foothills Regional Landfill & Resource Recovery Centre (LRRC). The LRRC received most of the flood debris from the ToHR and the devastation, destruction of property, and amount of waste debris generated from the flood was shocking to me. After seeing the devastation first-hand, I became motivated to learn more about disaster preparation and disaster debris management. To better understand the field of disaster debris management, I began reading expert sources about extreme weather events and disaster planning.

**Literature review on disaster debris management**

Disaster debris is generally the result of natural disasters, such as earth quakes and extreme weather events. Greenough et al. (2001) referred to extreme weather events as a break from the normal, including precipitation extremes and severe tropical storms (p.191). The Intergovernmental Panel on Climate Change (IPCC) (2014) claimed that heavy precipitation events have increased in frequency, intensity, and that risks of flooding from these events have increased, particularly in urban areas (p. 8-15). The authors also wrote that changes in extreme weather and climate events have been observed since 1950, with many changes being linked to human influences (p. 7). The authors claimed that human emissions of greenhouse gases are the highest in history (p. 2) and that current atmospheric concentrations of carbon dioxide, methane,
and nitrous oxide are unprecedented in at least the last 800,000 years (p. 4). The authors also claimed that it is extremely likely that more than half of the observed increase in global average surface temperature, from 1951 to 2010, was caused by anthropogenic forces (p. 5).

The Pew Center on Global Climate Change (PCGCC) Report (2006) warned that future impacts of climate change and increasing natural disasters will include: detrimental consequences for human health, food and fiber production, water supplies (p. 1), ecosystems, and biodiversity (p. 6-7). The UNODRR Report (2015) claimed that disaster risk is normally a function of the severity and frequency of the hazard, the numbers of people and assets exposed to the hazard, and of their vulnerability or susceptibility to damage” (p. 26). O’Brien et al. (2006) wrote that extreme weather events disproportionately affect the poorest people in affected areas (p. 64), which the UNODRR (2015) demonstrated by comparing the 2004 Indian Ocean tsunami to Hurricane Katrina in New Orleans. All those exposed to the tsunamis were at risk, irrespective of their income, ethnicity or social class. In contrast, New Orleans represented a predictable ending to a historically configured risk, where low income residents settled the high-risk areas of the community and were impacted most severely by the event (p. 25).

The UNODRR (2015) authors wrote that the most intensive risk layers of natural disasters are characterized by low-frequency, high-severity losses normally seen in extreme hazard events, such as the Indian Ocean tsunamis of 2004. Extensive risk layers are characterized by high-frequency, low-severity losses and are associated with localized recurrent hazard events, such as flash floods (p. 26). The UNODRR (2015) authors wrote that in most contexts, disaster risk reduction has been approached through a set of practices to protect development against exogenous threats, rather than to prevent, or avoid the generation and accumulation of risks within development (p. 26). According to Henstra and McBean (2005), there appeared to be a
growing consensus among experts that a paradigm shift was required to move from reactive, response-based disaster management, to a more proactive effort of disaster mitigation and risk reduction (p. 304).

The IPCC (2014) authors wrote that adaptation and mitigation are complementary strategies for reducing and managing the risks of disasters caused by climate change (p. 17). The PCGCC (2006) authors claimed that mitigation efforts could stabilize atmospheric greenhouse gas concentrations, but future concentrations will likely still be well above current levels and will lead to further rises in temperatures, sea level, changes in precipitation, and more extreme weather. The next stage of the international efforts to cope with climate change, must deal squarely with adaptation and coping with those impacts that cannot be avoided (p. 1). The authors also wrote that adaptation to climate is not a new phenomenon, as societies throughout history have successfully adapted to natural climate variability, however, human-induced climate change lends a complex new dimension to this challenge (p. 3).

The UNODRR (2015) authors wrote that as early as 1979, the Office of the United Nations Disaster Relief Coordinator concluded that greater emphasis would need to be given to pre-disaster planning and the United Nations General Assembly designated the 1990s as the International Decade for Natural Disaster Reduction. By 2015, 168 UN Member States adopted a new international framework for disaster reduction (p. 27), however, global disaster risk has not been reduced significantly. While improvements in disaster management have led to dramatic reductions in mortality in some countries, economic losses are now reaching an average of US$250 billion to US$300 billion each year (p. 44).

According to Henstra and McBean (2005), Canadian responsibility for disaster management is shared among Canada's three levels of government, with most disasters falling
under provincial jurisdiction. The authors wrote that despite Canada being represented at and endorsing numerous major global initiatives on disaster reduction and mitigation, Canada had yet to fully integrate mitigation into disaster management, but was operating under a system focused on disaster response and recovery (p. 304-307).

One of the most common extreme weather events to impact human settlements are flooding events (Werrity, 2006, p. 16). White¹ (1937) claimed that floods are natural phenomena, but flood damages are products of human action and are the cost of man's development upon natural flood plains. Humans typically justify these risks because of “access to navigable waterway facilities, water supply and waste-disposal facilities, fertile alluvial soils, relatively flat building sites, and access to land transportation facilities located in valley bottoms” (p. 57).

The causes of flooding are a combination of natural and human processes. White (1936) wrote that all streams experience natural seasonal and annual fluctuations in flow. Humans have the choice of occupying the land at the hazard of occasional flooding, occupying it with partial or complete protection, or staying out of the flood plain entirely (p. 133). White (1937) also noted that the human construction of infrastructure constrict channel cross sections, reduce the water-carrying capacity of stream channels, and increase the risk of flood impacts on humans (p. 57).

White (1937) wrote that the basic problem in human adjustment to floods is one of land-use planning. This planning process involves choices among flood protection, flood-plain readjustment, and maintenance of existing land use (p. 61). Burby & French (1989) wrote that structural protections, such as channel improvements, dikes and levees, have been the historical approach to flood protection of human settlements (p. 297). These projects can be costly and

¹ White’s work has had a profound impact on disaster and hazard management (Wescoat, Jr., 1993, p. 587)
often lack uniformity of methods for estimating the limit of justification for flood protection (White, 1936, p. 148).

Werrity (2006) wrote that despite the high costs, many engineered flood protection projects fail and that a recent motivational shift of policy makers, for environmental enhancement and sustainability, has triggered a critique of the former centralized technocratic paradigm, with its heavy reliance on structural defenses (p. 18-21). Burby & French (1989) explained that public policy had shifted toward non-structural hazard management measures, such as improved warning systems, flood insurance, and land use management (p. 289).

Burby & French (1989) wrote that regulations are the most commonly used means for influencing development in flood hazard areas, including: “floodproofing requirements and floodway regulations aimed at reducing potential property damage, elevation requirements for structures, subdivision regulations governing the creation of new lots and layout of streets and utilities, and zoning regulations covering permitted land uses and the intensity of development” (p. 291). They also claimed that land use management measures will be most effective when they are in place before pressures for flood plain development build within a community (p. 295). White (1937) also noted the efficacy of reducing flood stages through enhanced vegetal cover and minimization of soil erosion in alluvial systems (p. 58).

Burby & French (1989) claimed that many communities do not become concerned with flood plain land use management, until it is too late and after they have created a problem by allowing flood plain development (p. 295). Due to this tendency in municipal planning, they recommended that flood hazard mitigation programs be focused on at-risk communities with currently undeveloped flood plains (p. 295).
Sorensen & White (1980) wrote that most humans living within a threat of natural disasters, do little to minimize the risks and simply bear the losses imparted by natural events. This mindset is common on a global scale, with people often calling disasters an act of God and unavoidable (p. 279). Henstra and McBean (2005) wrote that this perspective has been widely rejected by disaster researchers (p. 304) and White (1937) advised that the time to make the analysis of mitigation strategies is in advance of, rather than after a major flood (p. 61).

One significant component of cleanup costs associated with extreme weather events, is dealing with the debris generated by the disaster event. The United States Environmental Protection Agency (EPA) (2008) refers to this as disaster debris management. Disaster debris will often include: building debris, vegetative debris, sediments, personal property, and other materials. These materials can be costly to cleanup, overwhelm local waste management facilities, and devastate ecosystems (p. 1-3).

There are numerous resources developed to help all levels of governments effectively manage disaster debris. Coppola (2006) wrote that the key components of disaster management include: mitigation, preparedness, response, and recovery (p. 8). This section is a summary of key findings and recommendations from disaster response, climate, and waste management experts. This review included academic literature, government reports, consultant reports, and disaster planning tools. The themes of these documents focused on how to prepare before a disaster occurs, important components that should comprise a disaster response plan, strategies that can help minimize waste, and how to ensure the safety of people re-entering a disaster impacted area. These themes and sources will be used to establish a set of best-practices in the field of disaster planning and disaster debris management.
Preparation recommended before a disaster occurs

Preparation was a key recommendation from almost every expert source reviewed on disaster debris management. Pearce (2003) claimed that disaster management planning has often not been properly prioritized by many communities. Pearce also wrote that the effectiveness of a community’s emergency management department depends on the credibility given it by local government officials. Emergency management will be ineffective without proper research, resources, and competent people assigned to plan for natural disasters (p. 211-212). There are standard recommended components that experts believe should be considered by municipalities when developing an effective disaster response plan.

Recommended components of a disaster response plan

This section contains key components that experts recommend be included in a disaster response plan. Several expert sources were used to develop these overall recommendations, which are framed under these eight themes:

1) Having qualified people develop and utilize a disaster response plan

The EPA (2008) claimed that a proper team should include: emergency management, planning, environmental, and first responder officials. This team should finalize a disaster response plan and update the plan regularly (p. 5).

2) Outlining goals and assigning responsibilities of responding organizations

Reinhart et al. (1999) wrote that an effective plan should contain mission statements and a hierarchy of priorities to guide operational decisions during a disaster response and recovery. Planners should also name which organizations will be responsible for debris cleanup and identify capabilities of each organization involved (p. 30). According to the EPA (2008), recycling and waste minimization should be prioritized in all disaster response plans (p. 3).
3) Assessing regional capacities to manage and track disaster debris

The EPA (2008) noted the importance of assessing whether existing waste management facilities would be overwhelmed by a surge in disaster debris. A list of other geographically close facilities should be made, along with closed sites that could be reopened in an emergency (p. 9). Tracking information and tonnage during a disaster response was also recommended. Proper tracking will ensure accurate reporting, help with planning for future disasters, and ensure contractors are paid correctly (p. 10). Reinhart et al. (1999) wrote that temporary transfer and storage sites, for debris and supplies, should also be planned before a disaster occurs. Additionally, locations of hazardous waste processors and waste to energy facilities should be noted and maps of these facilities should be ready for potential responding staff (p. 30).

4) Safety training and procedure development

Solis et al. (1996) wrote that having health and safety standards in place before a disaster occurs, regarding disaster debris management, can help ensure response actions are handled responsibly and that training be readily available when needed (p. 9-10). The EPA (2008) also recommended municipalities cross-train their staff, to ensure they have sufficient manpower during a disaster response (p. 15). The authors further recommended preparing asbestos handling procedures for a disaster response. Buildings containing asbestos are often damaged during disasters, require demolition (p. 20), and asbestos risk increases with demolition and renovation of homes containing building materials from before 1980 (Worksafe BC, 2011, p. 2).

5) Contracting of disaster debris management activities

The EPA (2008) recommended that disaster debris cleanup contracts be pre-negotiated and templates for additional contracts be created before a disaster occurs. Pre-negotiated
contracts ensure fair pricing for services and allow legal issues to be reviewed before a disaster occurs. An approved contractors list can also help improve response time and safety (p. 15).

6) Developing procedures to estimate volumes of disaster debris

Hirayama et al. (2010) developed a procedure for estimating quantities of debris generation from different types of natural disasters in Japanese history. Per unit generation of disaster debris was derived by using hazard zone maps and historical tonnage generated from recent earthquakes and floods in Japan (p. 175). Procedures of this kind, can be utilized to scale responses appropriately and the EPA (2008) wrote that identifying the most likely disasters to impact an area, can also help planners estimate debris volumes and types (p. 3).

7) Communication with the public

The EPA (2008) wrote that disaster response communication with the public, in advance of a disaster, will help cleanup operations run with better cooperation from impacted residents. Locations and hours of operation, for transfer stations and storage facilities, should be communicated to the public before a disaster occurs in case communication lines are disturbed by the disaster (p. 13). Final copies of a disaster debris management plan should be posted on the internet and welcome public engagement and feedback (p. 17).

8) Collaboration between all levels of government

The EPA (2008) recommended that neighboring communities share resources in the event of a disaster and establish mutual aid agreements. These agreements can be binding, or simply intentions to support each other (p. 32-33). The EPA also advocated the importance of learning from other disaster impacted communities and provided templates and completed disaster response plans to help disaster planners (p. 44-47).
The theme of preparation was echoed throughout the literature on disaster debris management, as the uncertainty involved in disaster management calls for general plans and guidelines to be ready in advance of an event, rather than acting reactively. Once a disaster has occurred, there are additional strategies experts recommend responding crews utilize. These strategies can help ensure the safety of people responding and that disaster debris is managed responsibly.

**Recommended debris management strategies for a disaster response and recovery**

Experts have recommended that during an actual disaster response, responding crews should focus their efforts around restoring accessibility to disaster impacted areas, recycling disaster debris, and minimizing waste. An accessibility, or re-entry plan should be a key component of any disaster response. Özdamar et al. (2014) undertook a technical approach to flood debris cleanup, by studying ways to “maximize cumulative network accessibility during the cleanup operation” and improve accessibility for cleanup crews (p. 249). The EPA (2008) also wrote that debris removal, road clearing, and providing access for emergency responders should be the initial steps after a disaster (p. 20).

The EPA (2008) outlined strategies for handling general types of disaster debris and recyclable materials. Recyclable material strategies included: scrap metal, white goods, bricks, concrete, asphalt, and electronics (p. 22-23). The authors also outlined strategies to utilize waste biomass as an energy source, where facilities are available (p. 28). Grinding, open burning, and the use of air curtain incinerators can also be utilized to reduce the volume of disaster debris and reduce hauling costs (p. 29-30).

After I established an understanding of industry best-practices for disaster preparation and debris handling, I could compare the best-practices from the industry, to those found and
utilized in Alberta before, during, and after the 2013 flooding in the ToHR. These comparisons could indicate what best-practices were in place and utilized and where the GoA could improve for future disaster planning.

**Methodology**

After studying industry best-practices in the field of disaster debris management, the next step was to compare them against the 2013 disaster planning and response in the ToHR, however, data and information about the debris management was limited. To better understand the needs and gaps in information related to the 2013 disaster response, staff from the ToHR recommended speaking with people directly involved in the debris cleanup. I was referred to organizations including the Alberta Emergency Management Agency (AEMA), Tervita, and hauling companies involved in the ToHR cleanup.

In preliminary discussions with these organizations, the only publicly available quantitative data about disaster debris management, were annual landfill reports summarizing the volumes of materials landfilled, or recycled from the ToHR. Further, the ToHR allowed me to read the existing disaster response plan from before 2013, along with some engineering reports related to diking, but the disaster response plan had very limited information regarding disaster debris management. There were also no reports available that summarized the disaster debris planning and strategies utilized during the flooding, so, qualitative approaches were examined.

Williams (2007) described qualitative research as a holistic approach that works towards discovery and involves data collected from the senses, which are then used to explain phenomena relevant to social behaviors (p. 67-68). Williams also wrote that comparative analysis is based on the experiences of people involved in an event and that data can be drawn from interviews (p. 68-69). Interviews with the small group of experts involved, seemed the
most likely approach to gain insight to the disaster debris management planning and strategies utilized during the ToHR 2013 flood response and recovery.

Rihoux et al. (2008) wrote that qualitative comparative analysis allows for a systematic comparison of cases (p. 6) and is appropriate for unique cases (p. 4), such as a natural disaster. Having established industry best-practices through reviewing expert literature, I determined that a qualitative comparative analysis could help illuminate how well the GoA and the ToHR planned and responded, relative to industry best-practices in disaster debris management.

Rihoux et al. (2008) wrote that the process of configurational comparative analysis relies on comparison between cases and theories and requires that the variables be derived from theory, but can also allow for data to inform theory (p. 6). I determined that the interview questions could be drawn from the literature review and compared to the actual strategies utilized. Responses from people directly involved in the preparation and response in the ToHR, could be compared with industry best-practices for comparative analysis. This comparative analysis approach, would highlight any best-practice components of disaster preparation that were well prepared, or missing before the flooding. This information would help answer the first research question: were the GoA and the ToHR prepared, in advance, to properly haul and dispose of the debris generated from the 2013 flooding?

Participants would also be asked whether industry best-practices were utilized during the disaster response and recovery stages in the ToHR. These responses would answer the second research question: did the debris management strategies utilized in the ToHR, during the 2013 flood response and recovery, follow industry best-practices?

Finally, participants would help answer the third research question: what lessons learned can be implemented after the flooding in 2013, to improve the response capabilities of the GoA
and municipalities for future natural disasters? This research would help the GoA, the ToHR, and all municipalities learn from the experience and improve disaster responsiveness.

In preliminary discussions with participants, it became clear that most participants did not have knowledge of every issue addressed in the literature review above. Fylan (2005) referred to semi-structured interviews as an interview that has a set of questions designed for the participant, but is free to deviate from the script and adapt to the participant’s experience (p. 65-66). Semi-structured interviews were determined to be the best approach, following a question guide (Appendix A), but adjusting to each participant’s knowledge and experience.

**Semi-structured interviews**

A question guide (Appendix A) was developed for obtaining information to answer each of the three research questions. Each question related directly to recommendations found in the literature review above, which outlined key elements in the field of disaster debris management. Interview sections were designed to reveal information about those key elements and how they were addressed in the ToHR. These elements included: 1) preparation before the flooding disaster; 2) disaster response strategies utilized during the disaster response and recovery and; 3) improvements made after the disaster and lessons learned for future disasters.

Expert sampling involves inviting a group of persons with known experience and expertise in some area, to elicit relevant information (Nonprobability Sampling. n.d.). In addition to the experts involved, some residents of the ToHR were interviewed because many of the best-practices outlined in the literature review above, are related to communication and safety for residents. Most interviews, however, were with experts and employees directly involved in the flood debris management. Due to the limited number of people involved in the ToHR disaster
planning and response, random participants would not have known the information relevant to this study.

According to Berg (2004), the snowball sampling method is effective when a researcher can contact people known to have been involved in a case and use those contacts to refer other people involved (p. 6). Through the snowball and expert sampling methods, contact was made with many people involved in the flood response and I was able to find a well-rounded pool of willing and knowledgeable interview participants.

Initial contact with participants was made through email, or by telephone. Each participant was sent an invitation letter (Appendix B) that outlined the project, potential conflicts of interest, and examples of questions that would be asked. All interviews occurred between June and August of 2017, lasted between 30-80 minutes, and were conducted privately in person, or by telephone. Each participant signed a consent form (Appendix C) before the interview and was given options for anonymity, or to have their responses credited to their name, or job title. They were also given a demographic survey (Appendix D) and the right to withdraw at any time.

Interviews were recorded and transcribed into Microsoft Word. Data from the transcripts was then formatted in Microsoft Word, for auto-coding in Nvivo data analysis software (Nvivo, n.d.). Responses from the transcripts were organized, based on the most relevant topic from the question guide, and Nvivo was utilized to summarize all the relevant responses for each question and subject matter in the question guide. Nvivo was also utilized for word frequency analysis, with no significant findings to include in the results.

All data was stored on one external hard-drive and locked in a fire-proof safe. Both the data and hard-drive required a user ID and were password protected. Results of interviews were
stored as recordings and transcripts, with the final analysis and recommendations being disseminated to participants by inclusion in a final thesis.

**Ethical considerations for the researcher and interviews**

While working on this research, the ethical standards outlined in the Royal Roads University Research Ethics Policy (Royal Roads Academic Council, 2011) were followed. Ethical clearance for research involving humans was received from the Royal Roads Ethics Board on May 19, 2017 (Appendix E). Clearance from the researcher’s sponsor, the Foothills Regional Services Commission (FRSC), was received on May 1, 2017 (Appendix F).

Bias and sampling were noted ethical issues for consideration in this research. I experienced the flooding personally and managed a site that benefited from the waste disposal fees, so, considerations were necessary to ensure my biases did not affect the recommendations from the study. Any issues that could directly benefit my job and the LRRC were avoided. It was also important to not influence participants with questions and reactions during an interview (Interviews, n.d., para. 31). For these reasons, the interview questions were drawn directly from the literature review and comments from other participants, rather than from my experience. I also personally knew people involved in the cleanup, so, interviews were not conducted with anyone I currently work with, or with anyone potentially influenced by an existing power relationship with me.

**Background of participants**

Some participants in this study worked for the ToHR during, or after the 2013 flooding. One participant was an employee of the ToHR and was also a flood-impacted resident (P1). Shawn Zorn was also a flood-impacted resident and personally went through the evacuation, re-entry, cleaning, and remediation of his home (P12). Another participant was the Emergency
Management Coordinator (EMC) for the ToHR (P4) and the Chief Financial Officer (CFO) for the ToHR, at the time of the flooding, also participated in this research (P13).

Many participants worked in, or closely with the GoA Emergency Operations Center (EOC). Two participants worked for Tervita during the 2013 flood response. One was a Senior Project Manager (SPM) (P2), while Cameron McLean was the President of Environmental Services for Tervita during the 2013 flooding. Darwin Durnie worked as the head of the Debris Management Task Force (DMTF) in the EOC and was seconded from Stantec to the GoA (P5) and the Managing Director of the AEMA also participated in this study (P11).

Some participants worked for organizations involved in the response and recovery, but not directly in the EOC. Brent Davis was the Response Director for Samaritan’s Purse (SP) and managed the SP volunteer response effort in southern Alberta. Brent was also the Chair of the Alberta Non-Government Organization (NGO) Council, a consortium of NGOs that specialize in disaster response in Alberta (P3). The Regional Waste Reduction Specialist (RWRS) for Alberta Environment and Parks (AEP), who became the EOC’s liaison with AEP, also participated (P6).

Two participants dealt with debris hauling after the 2013 flooding. Dean Leask was the President of Contain-Away Services, one of the primary haulers involved in the initial waste removal from the disaster zone (P7). The second, was a Supervisor for a larger hauling company that also responded to help haul waste from the ToHR (P10).

The last two participants dealt mostly with landfill operations during the ToHR flood cleanup. John Deagle managed the LRRC, which received most of the waste and flood debris from the ToHR (P9). Jim Lapp responded to the ToHR from Edmonton in 2013, spending most of his time helping at the LRRC. At that time, Jim was a member of the Solid Waste Association of North America (SWANA) International Board and Crisis Committee (P8).
All participants were male, except one, and were directly involved in the disaster debris management following the 2013 flooding. The ethnicity of all participants was white, except for one First Nations participant. Participants are summarized below, based on their selections for anonymity. Each code was used to refer to the participant in the results section below.

Table 1

Interview Participant data coding and background information

<table>
<thead>
<tr>
<th>Code</th>
<th>Name</th>
<th>Title</th>
<th>Organization</th>
</tr>
</thead>
<tbody>
<tr>
<td>P1</td>
<td>Anonymous</td>
<td>Resident</td>
<td>The Town of High River</td>
</tr>
<tr>
<td>P2</td>
<td>Anonymous</td>
<td>Senior Project Manager</td>
<td>Tervita</td>
</tr>
<tr>
<td>P3</td>
<td>Brent Davis</td>
<td>Emergency Response Manager</td>
<td>Samaritan’s Purse</td>
</tr>
<tr>
<td>P4</td>
<td>Anonymous</td>
<td>EMC</td>
<td>The Town of High River</td>
</tr>
<tr>
<td>P5</td>
<td>Darwin Durnie</td>
<td>Emergency Response Advisor</td>
<td>Stantec</td>
</tr>
<tr>
<td>P6</td>
<td>Anonymous</td>
<td>RWRS</td>
<td>AEP</td>
</tr>
<tr>
<td>P7</td>
<td>Dean Leask</td>
<td>President</td>
<td>Contain-Away Services</td>
</tr>
<tr>
<td>P8</td>
<td>Jim Lapp</td>
<td>Board Member</td>
<td>SWANA</td>
</tr>
<tr>
<td>P9</td>
<td>John Deagle</td>
<td>Landfill Manager</td>
<td>Foothills Regional LRRC</td>
</tr>
<tr>
<td>P10</td>
<td>Anonymous</td>
<td>Supervisor</td>
<td>Hauling Company</td>
</tr>
<tr>
<td>P11</td>
<td>Anonymous</td>
<td>Managing Director</td>
<td>AEMA</td>
</tr>
<tr>
<td>P12</td>
<td>Shawn Zorn</td>
<td>Resident</td>
<td>The Town of High River</td>
</tr>
<tr>
<td>P13</td>
<td>Anonymous</td>
<td>Chief Financial Officer</td>
<td>The Town of High River</td>
</tr>
<tr>
<td>P14</td>
<td>Cameron McLean</td>
<td>President of Environmental Services</td>
<td>Tervita</td>
</tr>
</tbody>
</table>

The first research and interview portions, focused on research question one: were the GoA and the ToHR prepared, in advance, to properly haul and dispose of the debris generated from the 2013 flooding?

Results and Analysis

Results of disaster debris preparation before 2013

Each interview reviewed several issues, periods of time, and themes. The following section outlines the results and analysis of participant responses to questions regarding each of the three research questions. Each research question is addressed separately below, with a unique results and analysis section. Some disaster debris management themes were only relevant to one
research question, while others elicited information relevant to multiple research questions. The key themes and related research questions are summarized below in Table two.

Table 2

<table>
<thead>
<tr>
<th>Disaster Response Best-Practice Theme</th>
<th>Relevant Research Questions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Existing disaster response plan</td>
<td>1</td>
</tr>
<tr>
<td> Lessons learned from previous disasters</td>
<td>1</td>
</tr>
<tr>
<td> Disaster response directories</td>
<td>1, 2, and 3</td>
</tr>
<tr>
<td> Combined plans with other government organizations</td>
<td>1, 2, and 3</td>
</tr>
<tr>
<td> Accessibility and re-entry plan</td>
<td>1, 2, and 3</td>
</tr>
<tr>
<td>Qualifications of disaster debris management team</td>
<td>1, 2, and 3</td>
</tr>
<tr>
<td>Safety training and procedures</td>
<td>1, 2, and 3</td>
</tr>
<tr>
<td>Disaster response communication</td>
<td>1, 2, and 3</td>
</tr>
<tr>
<td>Transfer stations</td>
<td>1, 2, and 3</td>
</tr>
<tr>
<td>Landfill operations</td>
<td>1, 2, and 3</td>
</tr>
<tr>
<td>Contracting of disaster debris management</td>
<td>1, 2, and 3</td>
</tr>
<tr>
<td>Recycling disaster debris and waste minimization</td>
<td>1, 2, and 3</td>
</tr>
<tr>
<td>Volunteer organization and safety</td>
<td>1, 2, and 3</td>
</tr>
<tr>
<td>Guiding documents of disaster response and recovery</td>
<td>1, 2, and 3</td>
</tr>
<tr>
<td>Material progression and handling strategies</td>
<td>1, 2, and 3</td>
</tr>
<tr>
<td>Hazardous waste disposal and asbestos exposure</td>
<td>1, 2, and 3</td>
</tr>
<tr>
<td>Updates made since the ToHR 2013 flooding</td>
<td>3</td>
</tr>
<tr>
<td>Lessons learned from the ToHR 2013 flooding</td>
<td>3</td>
</tr>
</tbody>
</table>

**Disaster preparedness of the Government of Alberta before 2013.** This section outlines the key disaster response documents and research in Alberta before the flooding events of 2013, along with participant responses related to disaster preparation. The GoA addressed the need for strong disaster response planning through the Alberta Emergency Response Plan (AERP), which was published in 2008. The AERP (2008) assigned the AEMA as the coordinating agency in case of disaster within Alberta (p. 3), outlined the process of declaring a state of emergency, explained the provincial system for sharing disaster recovery costs, and outlined the roles assigned to each branch of government in a state of emergency (p. 12-31).
Another document about disaster preparation in Alberta, was the Provincial Flood Mitigation Report: *Consultation and Recommendations* (Groeneveld, 2006). This study was authored in 2005, after flooding resulted in the loss of lives and $165 million dollars in disaster service payments. A ministerial task force consisting of representatives from Alberta Infrastructure and Transportation, Alberta Environment, and Alberta Municipal Affairs was created to form recommendations for improving flood protection in Alberta. This committee recommended improving awareness of flood risks for municipalities, regulations and programs to limit future developments in flood prone areas, and continuing to provide technical expertise to municipalities for river and lake related flooding (Executive Summary). Many years after the report was authored, Groeneveld and others felt the recommendations from the committee went largely ignored and the report was only made public in 2012 (Paperny, 2013, para 1-12).

Most participants in this study felt the AEMA was generally unprepared for the 2013 flooding. Jim Lapp said, “there wasn’t any emergency response planning to say, if we have a large-scale disaster and all this debris, what steps are we going to take” [Participant (P)8]. Once the AEMA got involved, a plan for rebuilding the community started to form, “but it’s probably another week down the road and these people are going to kill us if we don’t let them in now” (P10). Brent Davis said most of the plans were developed quickly and reactively. “Phased re-entry, rodeo grounds as a reception center for people coming back and learning about the state of their home, the tours ahead of time, those were all built on the fly” (P3).

Despite the general lack of preparation from the AEMA, participants felt that the involvement of the AEMA and large specialized companies, like Tervita, helped increase the level of training involved in the disaster response. According to a Tervita SPM, “my crews were very well informed, we knew what was going on, we were all trained on how to deal with the
people.” (P2). Another participant said, “once the AEMA got there, there was a lot more structure and more checks and balances with safety” (P10).

**Disaster preparedness of the Town of High River before 2013.** This section presents the key disaster response documents and research in the ToHR before the flooding events of 2013, along with participant responses related to preparation. The ToHR had an existing emergency response plan before the flooding in 2013, but most participants thought the plan was inadequate for the flooding experienced in 2013, or wasn’t used. Dean Leask stated that “the magnitude of that particular flood, was something we could never imagine” (P7). Brent Davis felt the plan “wasn’t as apparent as it should be” (P3) and John Deagle said he “didn’t see any part of what they had in place” (P9).

The existing disaster response plan was titled *Foothills Regional EOC Guidelines* (The Town of High River, 2005). This plan was, essentially, a procedural manual for the basic purposes and scope of an EOC, including 33 positions in an EOC and 70 pages of templates and forms for EOC use. Notably absent from all sections, was anything related to debris and waste management. One participant said the plan in place before the 2013 flooding, “was done off the side of somebody’s desk, was never approved by council, and was updated last in 1997” (P4).

When asked whether the ToHR had a disaster response plan in place before 2013, some participants spoke of the Groeneveld Report (2006) and other engineering reports. These reports were not actually part of the disaster response plan, but were available in the town office. One participant said flood mitigation was the primary reference of the town’s disaster plans and noted that the Groeneveld Report had recommended infrastructure upgrades (P5). A Tervita SPM said that the ToHR “understood that if they had a flood disaster, those dikes were not going to keep
protecting the town. They knew that, and they were actually in the process of improving, but it was slow and bureaucracy driven” (P2).

The consensus from participants of this study, was that the ToHR was inadequately prepared for the flooding of 2013 and the magnitude of the flooding made things worse. The Director of the AEMA said, “I guess clearly the town was not prepared, again nobody could have foreseen an event of that magnitude” (P11).

When asked what the ToHR could have done differently to prepare for a disaster, one participant said, “they could have started the process sooner. One of the biggest problems for the ToHR, was its poor land use management. Allowing development in places, where development should never have been allowed” (P4). Another participant said the key things missing were dikes large enough to handle the rising water (P5). According to the Director of the AEMA, “they had done a great job in modelling floods up to the one in 100-year event, it’s when you get the extraordinary greater than one in 100-year event. What happens when the worst-case scenario happens and then how do you go about alerting and evacuating people” (P11).

**Recommended components of a disaster response plan in place before 2013.** This section summarizes which expert recommended components of a disaster management plan, based on the literature review above, were in place before 2013 and which components were lacking for both the GoA and the ToHR. There were no disaster debris management standard operating procedures (SOP) ready for responding staff and contractors before 2013. “None of the SOPs had anything to do with debris” (P4), however, the AEMA’s Director stated that “at the municipal level, they relied heavily on the experience of guys like the Operations Chief and P5, who had worked on the Slave Lake wildfire response and recovery” (P11). Another participant said, “the only mutual aid agreements were related to firefighting” (P4).
Participants claimed that the ToHR had completed some disaster response training for some staff before 2013. According to their EMC, “they had Incident Command System (ICS) training and older staff were trained on Emergency Site Management” (P4). Despite this training, most participants felt disaster response training was not prioritized by the ToHR before 2013. The ToHR CFO said, “I was with the ToHR for 12 months prior to the flood and received no disaster training” (P13) and a SPM for Tervita said, “the biggest thing I noticed, even with the ToHR folks, the skill level for dealing with the disaster wasn’t there” (P2).

According to most participants, there was very little disaster response information available to residents before 2013. The ToHR CFO said, “the only communication would have been related to flood and rainfall warnings, nothing regarding evacuation plans” (P13). The EMC said, “it was pretty limited, so, they printed off brochures, I don’t think they were online (P4).

According to all participants knowledgeable of the situation, the ToHR had no pre-negotiated contracts in place for disaster debris management. Dean Leask said, “they never do, they just end up calling us and saying you’re our local guy” (P7). The AEMA, however, had a standing agreement with Stantec, “to provide Municipal Engineering and support advice” (P11).

Some participants had responded to the Slave Lake fires in 2011 and they brought up lessons learned from the fires, but none of those lessons were implemented in the ToHR before 2013. The only lessons learned from Slave Lake that were applied, were applied at the AEMA and were utilized during the response and recovery stages in the ToHR. Those lessons learned will be discussed in the disaster response and recovery section for research question two below.

Every participant agreed that the ToHR was a high-risk area for flooding, which is confirmed by Alberta Environment and Parks interactive flood hazard mapping application (Alberta Environment and Parks, n.d.). The Director of the AEMA said, “the ToHR floods on an
annual basis and about every decade, they have a catastrophic flood event” (P11). The Director of the AEMA said their “approach to engage communities to prepare before 2013, was to allow municipal autonomy. You know your responsibilities, you know your threats, risks, and you guys are expected to be responsible and deal with them. I would say that because of the 2013 flood, we saw that there were potentially some weaknesses in this approach” (P11).

Results from document analysis and interviews, regarding the preparation of the GoA and the ToHR, were compared to the recommended best-practices outlined in the literature review above. The results of this comparison are summarized in Table three below.

Table 3

<table>
<thead>
<tr>
<th>Recommended component of disaster response plans</th>
<th>The ToHR</th>
<th>The GoA or AEMA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disaster response plan for the ToHR ready before 2013</td>
<td>minimal</td>
<td>no</td>
</tr>
<tr>
<td>Roles and responsibilities clearly assigned</td>
<td>no</td>
<td>yes</td>
</tr>
<tr>
<td>Mutual aid agreements in place before the 2013 flood</td>
<td>only on fire</td>
<td>no</td>
</tr>
<tr>
<td>Flood modelling completed before the 2013 flood</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>Disaster debris SOPs ready before the 2013 flood</td>
<td>no</td>
<td>no</td>
</tr>
<tr>
<td>Disaster response training for staff before the 2013 flood</td>
<td>some</td>
<td>yes</td>
</tr>
<tr>
<td>Disaster response communication before the 2013 flood</td>
<td>minimal</td>
<td>minimal</td>
</tr>
<tr>
<td>Pre-negotiated disaster debris management contracts</td>
<td>no</td>
<td>only with Stantec</td>
</tr>
<tr>
<td>Lessons learned from historical disasters implemented</td>
<td>no</td>
<td>minimal</td>
</tr>
<tr>
<td>High-risk communities prioritized</td>
<td>no</td>
<td>no</td>
</tr>
</tbody>
</table>

Analysis of disaster debris preparation before 2013

This analysis is aimed at answering research question one: were the GoA and the ToHR prepared, in advance, to properly haul and dispose of the debris generated from the 2013 flooding? When compared with industry best-practices in disaster debris planning, the ToHR was largely unprepared for the debris generated from the flooding in 2013. They had a limited disaster response plan, which did not deal with debris management at all, but was simply an ICS guideline. They had no SOPs ready for responding staff, no pre-negotiated contracts, and mutual-
aid agreements limited to Emergency Services. They also had very limited pre-planned disaster communication materials and provided limited disaster response training to staff before 2013.

The AEMA brought in experienced people to help with the ToHR flood response and recovery, but was also largely unprepared to deal with the debris and developed most flood response communication materials for the public reactively and under pressure. The AEMA lacked pre-made communications regarding safe handling practices of disaster debris, pre-negotiated contracts to deal with the disaster debris, and an effective plan for distributing information to residents and volunteers. The result of this lack in planning, was confusion for residents and debris management staff. This confusion was worst during the initial evacuation and re-entry, but improved as the AEMA brought in more experienced staff and produced communication material. Another consequence of poor pre-planning by the AEMA, was a rushed negotiating process for contracts.

The AERP had very little focus on disaster debris management and had not been updated since 2008. Further, during the process of this research, the AERP link was pulled from the AEMA website and cannot be publicly accessed, though the AERP may be in the process of an update. Most troubling, is that participants thought these problems of lacking disaster response preparation likely exist throughout the province of Alberta. The ToHR EMC said, “I think this is an industry wide problem” (P4) and Jim Lapp explained, “I think where the preparedness ends, is after the saving life and property, when it comes to the debris cleanup. I think that’s the case in most municipalities, they don’t plan for debris” (P8).

Many participants felt that a flooding disaster of the 2013 scale could never happen in the ToHR. One ToHR staff said, “we learned everything after the flood, we had nothing in place before the flood and we had no reason to” (P1). Every participant considered the ToHR high-risk
for flooding, the ToHR had multiple major floods in recent decades, had reports warning them of the inadequacies of their dikes, yet did little to update their plans. One participant stated, “it’s a little frustrating to hear again and again, this was unprecedented. Come on guys! Look at global trends and start planning for some of these unprecedented things” (P4). The ToHR should have had more pressure from the AEMA and Federal Government, to improve their disaster preparedness, especially given the high-risk nature of the community to flooding.

One participant explained that the mentality of thinking major disasters won’t happen here, is pervasive throughout Alberta. This participant thought this mentality exists because most of Alberta’s growth has occurred since the 1990s and the GoA did not have experience with large natural disasters. He also explained that in North America, we design things to a 1% chance of happening, which everyone describes as a one in 100-year event. “Many people think these events will only happen every 100 years, but they actually have a one percent chance of happening in any year. Planners build subdivisions, diking, and plans to this one in 100-level and we’ve become so good at it, we can predict the water level to a millimeter. Except, what if it rains more? That’s what happened in the ToHR” (P5).

Another reason for the lack of disaster debris planning, is that disaster response systems in Alberta are built around the Incident Command System (ICS). The ICS is disconnected from waste and debris management because they do not even have waste and debris management positions in an EOC. The Director of the AEMA explained that “under ICS, there isn’t a permanent debris management position created. If you need to do debris management, it’s usually a task force that’s created under the Operations Chief. It’s funny, it’s one of those things that I think on most exercises, is overlooked because you just don’t have to deal with it. In reality, there are mountains of garbage that you’re going to have to deal with” (P11). Disaster
debris management should be a key component of the ICS system and should be integrated into ICS training. A summary of key points from this analysis section is found in Table four below.

Table 4

Summary of key points from analysis for research question one

<table>
<thead>
<tr>
<th>Key points of analysis regarding preparation before 2013</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) The ToHR and GoA were missing most expert recommended components of a disaster response plan before the 2013 flooding</td>
</tr>
<tr>
<td>2) Residents of the ToHR were complacent about the risks of flooding</td>
</tr>
<tr>
<td>3) The GoA did not engage the ToHR to ensure readiness, despite it being a high-risk community</td>
</tr>
<tr>
<td>4) The Incident Command System is disconnected from debris and waste management</td>
</tr>
<tr>
<td>5) Disaster planning throughout Alberta may also be disconnected from debris and waste management</td>
</tr>
</tbody>
</table>

The second section of research and interviews, focused on research question two: did the debris management strategies utilized in the ToHR, during the 2013 flood response and recovery, follow industry best-practices? The next sections summarize the results and analysis of research and participant responses related to the disaster response and recovery periods in the ToHR.

Results of debris management best-practices utilized in the Town of High River

This section outlines the key disaster response documents and strategies used during the flood response and recovery periods following the ToHR 2013 flooding, along with participant responses related to those periods. There were many lessons learned from the 2011 Slave Lake wild fires that helped AEMA responders manage the ToHR flood debris. According to the Director of the AEMA, the “coordinated white goods plan and the dropping of dumpsters all over the place” (P12) came directly from Slave Lake. In addition, John Deagle “was dealing with the previous Landfill Manager from Slave Lake, he was phoning daily with advice” (P9). While most of the advice from Slave Lake was helpful, Deagle also noted that using Bagsters to collect disaster debris worked well in Slave Lake, but not in the ToHR (P9).
Re-entry plan and guiding documentation for the response and recovery. The ToHR was evacuated following the 2013 flooding and the EOC had to develop a re-entry plan for the community. This section outlines the results of questions related to re-entry and any documents that helped guide the re-entry, response, and recovery stages.

There was no pre-planned re-entry plan for the ToHR, however, the Director of the AEMA said the re-entry plan was developed by “the plan staff at the EOC” (P11), “in the week prior to the re-entry” (P13). Some key issues considered in the re-entry plan included: “were the streets drivable, did they have enough capability in the lift stations, had the homes all been assessed. So, it was just making sure all of that was done and it was done sector by sector, based on damage” (P4). Multiple participants mentioned that during re-entry, “safety was a major concern” (P6).

According to the Director of the AEMA, “the priority for re-entry was to secure critical infrastructure and to make sure that responders were safe” (P11). Once residents returned, Brent Davis explained that “each day, they would move the barricades back a little bit further, based on when public works could get roads cleared and cars moved” (P3). Knowledgeable participants involved in the re-entry process mostly agreed that the AEMA “sequenced it right” (P2), however, some participants were critical of how aspects of the re-entry plan were managed. A SPM for Tervita said, “were the people that were doing it appropriately staffed? I don’t think so, you know, the RCMP, there’s a lot of issues around that whole 3-5 days after period” (P2). This participant also claimed that Tervita was being asked to do work that was not within their realm of expertise. “I think the best one was the back alleys, we don’t do that type of work. We’re not a civil construction firm, so, why are we doing it? Because we want to make a buck off a disaster? That’s just a bad approach, so, I tried to put an end to that” (P2).
Regarding communication of the re-entry plan to the public, one town resident said, “nobody really knew, it wasn’t really communicated well. The town office was compromised too, where their phone numbers and contact information were. There was nobody that had that, so, they really couldn’t contact anyone coming back in” (P12). Dean Leask also felt the GoA was not entirely truthful with residents about the state of the town. “I can remember the Minister of Infrastructure telling people that the town was under water and I was driving around getting bins in town, I didn’t see any water anywhere” (P7).

All participants agreed there were no guidance documents for the debris management, once the disaster response and recovery phases began. The town’s EMC said, “I’m not sure you would find a whole lot of written documentation, a lot more of the guidance was just hiring people with that expertise” (P4). Rather than utilizing pre-prepared documentation, actions were guided by “incident action plans that came out daily” (P11).

The MNP Report (2015) mentioned the Recovery Operations Manual as a key guidance document for actions during the disaster response and recovery in the ToHR. According to the Director of the AEMA, this document “is mostly to guide the provincial effort in supporting municipalities with things like funding, or grant programs and it focusses on the provincial level” (P11). Once the town was evacuated and a state of emergency declared, the AEMA became responsible for managing the flood debris cleanup.

**Qualifications of the disaster debris management task force.** This section outlines the background and experience of the staff in multiple organizations assigned to manage the 2013 disaster debris cleanup in the ToHR. According to Dean Leask, “when you get into these situations, it becomes fairly militaristic” (P7). Cameron McLean said, “P11 was an ex-Lieutenant
Colonel from the Princess Patricia, i’m a Leftenant Colonel in the Engineer Reserves, and most of my staff were either active reserves, or former military” (P14).

Tervita’s “senior operational guy had 15-20 years’ experience in the remediation industry, mostly in Alberta. The site supervisors, this is what they do for a living, supervise crews and they’ve been in the remediation industry most of their entire lives. For hazmat, we brought some of our specialized crews from British Columbia” (P14).

To manage the disaster debris cleanup for the AEMA, a Debris Management Task Force (DMTF) was organized in the EOC. According to the Director of the AEMA, the Director of the DMTF “had been the Director of Public Works for Drumheller, had experience in the Slave Lake fires, and he called a bunch of guys that were the heads of Public Works at other municipalities” (P11). According to John Deagle, the DMTF Director “was an Engineering Technician from Stantech and the former president of the Alberta Public Works Association” (P9).

There was some disagreement over the qualifications of the DMTF Director, who was the key person managing the disaster debris cleanup in the ToHR. One participant said the Director “was able to get quite a way before he was told, you don’t understand what you’re doing and you’re causing headaches. Probably, very good intentions and probably wanted to do it from the heart, but didn’t understand the logistics that had to be followed to make the response and recovery work” (P2). Jim Lapp said, “I thought he was very good at keeping things within the EOC moving straight ahead” (P8) and another participant said, “I think he did a great job” (P10).

Another part of the AEMA’s disaster debris management team, were the Emergency Management Field Officers (EMFO). The Director of the AEMA explained, “we have a total of 12 Field Officers and they provide advice on municipal emergency management plans and they
act as liaison officers for the agency in a municipality’s EOC” (P11). Only two participants knew who the EMFOs were, as their involvement was limited in the ToHR.

**Communication during the disaster response and recovery.** This section explains participant responses related to online, radio, print, and other forms of communication throughout the disaster response and recovery stages. These communications were used to educate people in the ToHR about evacuation, re-entry, disaster response, disaster recovery, safety, daily operations, and other subjects. Once the disaster response began in the ToHR, the GoA and Tervita knew communication about re-entry would be crucial for the public. Cameron McLean said, “one of our first tasks was to establish a 24-hour manned call center that anyone could call to get updates and ask questions. Through that, through cable TV, streaming news lines, a website, the GoA and the ToHR did their utmost to ensure communication” (P14).

One problem that arose in being able to communicate disaster response information to the public, was that “the flood took out many lines of communication, so, that was very chaotic” (P4). Communication was ineffective because “the cell networks went down, power went out, and it was only door-to-door notifications that were effective” (P4).

The Director of the AEMA said, “when the residents were allowed to re-enter their homes, they had to go through the Welcome Center. At the Welcome Center, they were given a package from Alberta Health Services and Building Codes. This package had information about how you could remediate mold, what to do with flood debris, how to remediate a home, and how to properly dispose of white goods and contaminated food” (P11).

Volunteer organizations mobilizing people to help clean up the ToHR, often had to develop their own educational communication about health risks and safety. Brent Davis said, “we built some information sheets that we were able to distribute to volunteers. We developed a
bit of an orientation for them, we would stage all our volunteers, train them there in the morning, and then bring them in. We were able to help some of the other organizations that were managing real general volunteers, at least do some sort of orientation with them. I think we were too little, too late” (P3). Brent also said that the communication to volunteers was handled “poorly.

Eventually, bringing organizations that are operating in theater together on a regular basis, as part of the EOC, was very effective. It was late in happening, like we were several weeks in before we realized who was actually operating in the community. We were fairly disconnected from the local EOC.” (P3).

John Deagle said that throughout the disaster response, EOC communication with the landfill was lacking. “It was fine in the meeting, but if they decided to do something after that, they never let us know. If they started cleaning up an area that wasn’t discussed in the meeting, suddenly we got slammed with 1000 vehicles coming here that we didn’t know about” (P9).

Many participants brought up their frustration with the way politicians communicated with the public during the ToHR disaster response and recovery. Cameron McLean said, “it was unfortunate to watch the provincial parties, perhaps not work together as much as I wish they would have. To watch people publicly criticize the cleanup efforts for political gain, just doesn’t seem right” (P14). Another participant thought that unrealistic promises were made to the public by politicians. “That’s politics, it’s easy to say I’ll fix your house, until you see the bill. When a politician says I’ll fix your house, that means you, or I are fixing somebody’s house” (P2).

One disaster debris management issue that became political, was “waiving fees at the landfill. That was a political decision and they kept it in place for a very long time” (P4). The selection of Tervita to manage the disaster debris cleanup also became a political issue, with one participant saying, “that came out of nowhere, as far as I was concerned. The appointment of
Tervita with that large contract to take over things” (P6). Cameron McLean claimed that “the selection of houses for remediation priority was never impacted by politics, but people may have perceived that. In reality, it was the priority for only technical reasons, I assure you” (P14).

One participant felt that politicians were not involved enough. “They weren’t evident in our meetings, except I believe the Mayor was in the center of town. I never saw Minister Fossett either and I don’t know where he was, or what, specifically, he was involved with. Minister McQueen did come down at one point, she certainly made a good effort to get an understanding of what was going on” (P6).

**Flood debris material progression and tracking.** This section outlines responses related to how flood debris progressed and was tracked throughout the disaster response and recovery in the ToHR. Most participants did not feel there was a planned progression of flood debris communicated, rather, the cleanup was reactive to debris materials as they came. The AEMA’s Director claimed the AEMA “had an idea that first we’d have to deal with all the debris and flotsam left from the flood itself, then the potentially contaminated soil, then white goods as people came back in, then building material, and then probably dangerous goods, or hazardous material like asbestos” (P11). Despite this awareness of debris progression from the AEMA, the ToHR CFO described the cleanup as “very uncoordinated and just random based on where there were materials” (P13).

John Deagle said that the landfill was not updated effectively about an expected progression of debris materials coming out of the ToHR (P9). This lack of communication between the AEMA and the landfill, led to disagreements about proper handling and disposal. One participant recalled the landfill staff arguing with the EOC about accepting liquid waste at
the landfill, which is usually not accepted at that landfill, but the landfill staff were instructed to build a pit for the liquid waste (P5).

One disaster debris management best-practice that did not prove effective in the ToHR disaster response and recovery, was the use of tonnage projection models. According to John Deagle, “what surprised them was the amount of material, or waste coming out of the homes. We had charts, we had all kinds of graphs, everything that you calculate potential tonnage with those graphs, but they were meaningless. No one listened to them, although the model says a certain tonnage, it is what’s on the street” (P9).

As the disaster debris cleanup began in the ToHR, tracking of different waste streams was emphasized by the EOC. According to Jim Lapp, material tracking “was the prime focus at the EOC, having good scale records because of the funding process and audit trail” (P8). However, one participant said that things were not tracked early in the disaster response. “There were a lot of people taking advantage of it. There was no way of tracking what they did, how much garbage they hauled, or where they hauled from. At the beginning, it was a free-for-all” (P10). Once the EOC became more organized, “they got a stricter process in place, where I had to show them everything that my guys were doing” (P10).

**Flood debris handling and recycling strategies.** This section reviews the handling and recycling strategies used for many of the common disaster debris waste streams in the ToHR response and recovery. Silt was hauled to the landfill, tested, and used as cover material in the landfill (P9). A second stockpile of silt was created by Tervita. “As far as I’m concerned, you can blend that with recycled material and make a good soil out of it, but I don’t think that’s been done” (P2). Concrete “would have gone to a recycler, like Burnco” (P14) and any concrete that reached the landfill, was “separated out, ground up, and used as road base” (P9). Vegetative
debris went into the landfill with the rest of the flood impacted waste, as “it was all piled in one” (P12). Even the trees and vegetative debris that were segregated, were “put in a special area, ground into wood chip, and just used as cover material in the landfill” (P9).

According to both flood impacted ToHR resident participants, most scrap metal went “into the pile” (P12) and was landfilled. Brent Davis saw people “sifting piles of debris for metal, it was pretty amazing. They had their panel pan and away they went” (P3). Vehicles were “picked up, taken to a large holding area at the rodeo grounds, and then dealt with by the insurance companies” (P6). According to John Deagle, white goods were taped closed, loaded onto lowboy trailers, and hauled to the landfill. At the landfill, they were lined up in a field where “Freon was removed and they were picked up by a hoe with a wrist on it and shaken. The food waste was shaken into a ten-yard roll-off bin and approximately 7,400 white goods were then recycled” (P9).

Asbestos containing materials were handled by Tervita. According to one participant, “when we started doing demolitions of homes, asbestos was a big concern for a couple of the neighborhoods in town, so, they had to do abatement” (P4). Once Tervita began remediating homes, asbestos was handled “as per rules and regulations. Double bagged, taped up, and put into an approved landfill” (P14). Regarding asbestos in the general “flood debris, I think nobody knew, or tracked” (P4). Residents and volunteers were likely at risk of asbestos exposure, which will be further discussed in the safety section below.

Segregated household hazardous waste (HHW) was “picked up by Tervita in a half-ton, brought out to the landfill, and put through our HHW program with Clean Harbors” (P9). According to one participant, segregation of hazardous materials was very loose because of the speed of the cleanup (P5). Jim Lapp said, “at least in the residential side, I only saw one place
where somebody had set out paint cans and solvents at a residence separately. All the rest of the stuff seemed to be tossed into the pile of debris at the curb, there was no separation of anything” (P8) and Brent Davis said, “hazmat got lost in the overall waste management” (P3). According to a Tervita SPM, “industrial and commercial hazardous waste was mostly dealt with through insurance” (P2).

Most participants agreed that recycling was not a priority for the EOC. The ToHR EMC said, “I think the idea was to just get rid of all of it. People wanted it out of their homes, so, they didn’t take a whole lot of time to sort it” (P4). Jim Lapp mentioned that “any recycling planning that was done, was done at the landfill” (P8), though Tervita did some recycling with some of the bigger infrastructure jobs. “Steel was a big one, the bridge, that all went for recycling” (P2).

**Transfer station and landfill operations.** This section summarizes participant responses related to landfill operations and the decision to not utilize a transfer station during the 2013 ToHR response and recovery. According to participants, transfer stations were not utilized “and that was actually a point of contention between some of the people that were haulers” (P6). While transfer stations were not used for the general waste, the Director of AEMA said, “we had central collection points for things like hazardous materials” (P11).

Instead of setting up a transfer station for small haulers to utilize, large garbage bins were dropped throughout the town and “you had a combination of people throwing debris in the bins, stuff being piled up on the street, and the bins being transported to the landfill” (P13). Most participants thought it was a mistake for the EOC to not utilize a transfer station. John Deagle said, “everyone was so concerned about it being legal or not” (P9), but “AEP was very open to that kind of thing. Obviously, it’s a very temporary basis and things like large parking lots and that kind of thing could have worked very well (P6).
The direct haul to landfill approach taken by the EOC, led to long landfill lineups and minimized the opportunities to salvage and sort waste materials. According to a Supervisor from a hauling company, “the landfill lineup down the highway was until you couldn’t see any further” (P10). The RWRS said, “I believe there was an effort made to remove things that shouldn’t go into the landfill. That’s one of the challenges of a direct haul and dump system, you’re not going to see things until they reach the landfill and by that time, it’s too late” (P6).

The increase in traffic to the landfill forced the LRRC to hire new staff and extend their hours. Most participants agreed that twelve-hour work days at the landfill (7 AM - 7 PM) worked well and allowed most people to haul when needed. Jim Lapp recalled that “generally, people were only working during the day hours, eight o’clock to five” (P8) and Tervita “never found landfill hours to be a problem” (P2).

The EOC wanted 24-hour operations at the landfill as soon as the disaster recovery started because hours of operation would be an impediment removed from the resident’s mind (P5). John Deagle recalled that “the mayor of the ToHR came right into the meeting, pointed his finger at me, and said you’re open 24 hours” (P9). Landfill management, however, was unwilling to further extend the hours because of the risk of site abuse and “we didn’t have the staff to do it” (P9). The Director of the AEMA also noted that “often, the pre-determining step is actually having a qualified operator. So, it’s not just as easy as saying we’ll leave the gates open and have people drop stuff off” (P11). To address the lack of qualified staff at the landfill, the AEMA “can source staff from across the province and borrow them on a short-term basis from municipalities, or private sector” (P11). In the case of the ToHR, Jim Lapp brought in one landfill compactor operator for one day and two office staff for a few weeks. These volunteers helped with landfill operations and were found through Jim’s SWANA network (P8).
Most participants claimed they would not have utilized 24-hour landfill operations, even if hours had been extended. Dean Leask said, “we worked as long as we wanted. I think once you get into those situations, that’s when accidents happen” (P7). One participant, however, was confident that haulers would have responded to extended hours, with another wave of operators to utilize the 24-hour operations (P5). The RWRS said another concern “was that the flood could overwhelm the landfill site. I started to contact some of the other landfills in the area that could take material” (P6). As a result, the EOC opened another landfill to reduce lineups (P5) and “BFI Calgary was reopened to take disaster debris” (P9).

Volunteer organization and training. This section summarizes participant responses related to the organization of volunteer efforts, and training for volunteers entering the ToHR to help clean flood impacted homes. All participants were amazed by the volunteer turnout in the ToHR. Brent Davis said, “even months after the disaster, you’d have people showing up at our trailers saying, I just want to volunteer” (P3). One resident said, “the volunteers I got, phenomenal people, I cannot say enough about them. They put their own lives on hold to help me, it still touches my heart” (P1).

Plans to organize volunteer efforts in the ToHR were not developed before the flood, but were built quickly after the flooding occurred (P3). The AEMA “leveraged an organization called Mission Possible out of Calgary, they organized all the volunteers out of Calgary, and they came down to the ToHR” (P11). Brent Davis also claimed that “the NGO council, interestingly enough, was written into the ToHR re-entry plan, unbeknownst to us, a couple days prior to the first stage of re-entry” (P3). Once volunteers started entering the ToHR, they would “go from block to block, they would clean out an area, they would help the residents, and they would fill the garbage bins” (P10). Ongoing EOC engagement with volunteer organizations, occurred
through “our Program Manager for our operation in High River, he was a direct liaison back to the EOC “(P3).

Due to safety risks, some limits were placed on volunteer access to the ToHR. Cameron McLean said, “large groups of volunteers working in a hazardous material environment, that just isn’t how it works, it’s unsafe” (P14). Despite these limits, Brent Davis said, “there’s a reality that you’re not going to keep somebody from volunteering, if they want to volunteer and I think we saw that” (P3). Once the EOC realized volunteers were coming, safety training was prioritized. Volunteers would “go to the Volunteer Center, they would get a safety brief, they would pick up safety equipment, and then be matched up with a job and a supervisor” (P11). One participant described the training provided to volunteers as rudimentary (P5) and Brent Davis said there was “huge variance between volunteer agencies and how they kept people safe” (P3).

Because of the rudimentary training and difficulties controlling large numbers of volunteers, most participants witnessed volunteers working in unsafe manners. Brent Davis mentioned that “there were serious concerns about volunteers showing up in emergency rooms with injuries that were related to the work they were doing because you can’t clean out a flooded house with flip flops” (P3). Jim Lapp also knew people that “came down here, worked down here, got back to Edmonton, and then they were sick for two weeks. That’s a health and safety issue, when you have volunteers coming in, doing things like that, and not understanding the risks, they have to be protected” (P8). Despite these incidents, one participant said that there were no deaths, or serious injuries during the recovery (P5).

Some volunteers caused property damage to the homes they were cleaning. “One of the big challenges with property, is that if you don’t know what you’re doing, you can give the home owner a false sense of security. I saw people driving into town with pickup trucks full of sheet
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rock in week one of the disaster recovery and I know these houses are still saturated with water” (P3). Brent Davis also said, “we walked into some houses where bearing walls and teleposts were removed because they were contaminated. That doesn’t make any sense, now you’ve effectively condemned the house” (P3). Brent Davis explained that “if I’m using an army of volunteers and I’m directing their efforts, I’m responsible for them being compliant with OH&S. And a lot of volunteer organizations don’t get that” (P3).

**Contracting of disaster response and recovery work.** This section summarizes the findings and participant responses related to disaster debris management contracting practices utilized by the GoA, during the 2013 flood response and recovery in the ToHR. According to Alberta media, many stakeholders perceived unfairness in the GoA contracting practices used in the ToHR, but especially the $45 million Tervita contract for flood recovery operations (“Sole-sourced Tervita”, 2014, para 1-4). According to the Director of the AEMA, “during the state of provincial emergency, we used a lot of sole-sourced contracts to whoever was nearby” (P11). Cameron McLean said, “Tervita was recognized and notified because of our work at the Calgary Stampede, where we were onsite within hours. I believe the province saw the speed, the size of our company, the assets, the manpower, and they believed that we were the only company that could immediately get it ready in time” (P14).

After the 2013 flooding occurred in the ToHR, contracting responsibility was transferred to the AEMA and “handled through the EOC” (P4). “We gave the EOC our numbers on the spot, I didn’t jack my rates up, I used really broad-based flat-numbers and they agreed to it” (P7). The AEMA also “got lots of offers of help from municipalities. We’d take a Sanitation Engineer in from St. Albert and have them work down in the ToHR for a week” (P11). These agreements were not pre-negotiated, but were set up “on a phone call and we’ll sort it out once you get here”
According to Jim Lapp, “some of the people driving the trucks, they didn’t know what a diff-lock was. I think that’s one of the consequences of doing things last minute, struggling to find drivers and available trucks” (P8).

According to a Tervita SPM, the Tervita contract was vague and difficult to utilize. This participant called it “pretty loosey goosey and then it kept getting dialed down and we’re going well, we do need to make a profit, we can’t do everything for free” (P2). This participant also said, “eventually, you should just throw the contract away and say, let’s tender everything going forward, that came too late in the game” (P2). The Tervita contract also created problems for the ToHR staff. “So, although the town eventually was back in control, they weren’t really because they didn’t have the money. The GoA was paying the bill, so, the GoA was still in control. It got very confusing because you had to get permission from Tervita, they’d send you an email back that had the GoA yes or no and usually the GoA ended up changing something in the request. So, now Tervita’s like, we can do it, but we’re going to do it this way and you’re like, that’s not what I want. It didn’t work, in doing debriefs with the staff, it was very patronizing. The sense that you’re not responsible enough to dictate what happens in your community, was just a horrible message” (P4).

A Tervita SPM said that contracting control “has to be handed back eventually. That group that administrated it, became a real headache for us. There were things asked for that were not on paper, we would do them because we we’re there, and long after the fact, it became a battle of who said what and things weren’t signed. That’s why you have a procurement person in your EOC, somebody needs to sign off that I did allow that. Where we ran into problems, is that as people removed from the province, they conveniently forgot what they said” (P2).
Participants mentioned that fraud and confusion over rates, were problems for the GoA during the 2013 ToHR flood response and recovery. A Supervisor of a hauling company said the GoA “were catching a lot of people that were defrauding the province” (P10). The ToHR CFO also recalled that “there were discrepancies on how much people were getting paid and then they had a lot of add-ons for different materials. You had people coming in, acting, and then discussing terms, conditions, and rates afterwards” (P13). A couple of participants thought that some companies were trying to take advantage of the GoA. One participant said, “Waste Management brought so many bins in, almost more than were needed. And after a couple weeks, they were all sitting in a field, they were out of control” (P10).

Opinions were mixed on whether local contractors were properly utilized during the ToHR cleanup. Dean Leask said, “no, we were only in the zone for about three weeks and Tervita took over and we never got another lick of work. And we lost 30-40 accounts because they were shut down due to the flood” (P7). Cameron McLean said that for Tervita, utilizing local contractors “was one of our main goals. They had to be safe, they had to be vetted, but that was absolutely one of our goals” (P14). The Director of the AEMA explained that “unfortunately, at that point, a lot of the local contractors were affected by the flood itself. So, they didn’t have their equipment, or they were already busy” (P11). Another reason local contractors were not more utilized, “was the Tervita contract had such a high threshold for insurance. They’re used to working with big companies that have extra layers of insurance that a lot of local contractors couldn’t meet, so, they were ineligible to work” (P4).

**Safety training & asbestos exposure.** This section reviews the findings and responses related to safety training and asbestos exposure throughout the disaster response and recovery stages in the ToHR. All participants agreed that safety was a priority in the response and
recovery, however, there were times safety did not seem to be prioritized. The EOC ensured that anybody that was a contractor, were doing their daily briefings, following their certificates of recognition, properly deploying PPE, and travel speed in the town was also ruthlessly enforced (P5). John Deagle “sampled air quality before we started bringing in flood impacted materials, we were concerned about mold and asbestos” (P9). According to a SPM, “safety’s first with Tervita, there were very few incidents” (P2) and Cameron McLean said, “that’s why the structural engineer was so critical. Even though we want everyone in their house as fast as possible, we don’t want them in a house that’s not structurally sound” (P14).

“Every imaginable piece of personal protective equipment (PPE) was available for free at the Welcome Center. You could stop by and pick up steel-toed boots, Tyvek suits, buckets of chemicals, it was all there” (P4). While PPE was readily available, safety training materials were not provided by the AEMA to contractors hauling debris (P10), or landfill staff (P9).

The EOC decided to not heavily enforce safety once home owners re-entered their homes because “residents were kept out of their homes for weeks, their doors were breached, their homes were inspected, and the EOC felt further intrusion on their property was out of scope for their responsibilities” (P5). According to the ToHR CFO, residents were given “very little safety training, I would say more information handouts, just for them to be aware” (P13). One handout given to residents was The Access Acknowledgement Form, which was provided to each home owner by the ToHR. This form was required to be signed by residents before they could re-enter their homes and informed residents of the numerous risks involved with re-entry, including:

- Water, sewer, electricity, natural gas, telephone, fire, police, ambulance, emergency services, and public roads had been lost, or impacted
- The potential for sink holes, flooding, high water, unstable soils, and related impacts
- The presence of contaminated water, sewage, agricultural runoff, water-borne bacteria, viruses, moulds, mildews, fungi, and other moisture-caused conditions

Residents re-entering their flood impacted homes, were also given information booklets from Fortis Alberta, Atco Gas, and Alberta Health Services. These handouts were not available online at the time of this research, but a copy was available in the ToHR office which outlined additional risks and recommendations, including:

- Electrical, natural gas, and home phone service restoration
- Garbage collection, HHW, PPE, and safe handling procedures for flood-impacted debris
- Proper use of gas and electrical powered pumps, for pumping water out of basements
- Mental health and wellness concerns for flood-impacted residents
- Contact information for Emergency Services and organizations involved in the recovery
- Potential health and safety risks of asbestos and moulds

The ToHR EMC said that safety was prioritized for “the contractors moving debris, but not for the home owners and volunteers taking debris out of houses” (P4). Another participant mentioned that “there were a lot of dumb things done for sure. The insurance companies, especially, are in the game for the insurance company and you did notice a real big difference from what the province wanted done and what an insurance company wanted done. Like, the standards there, people were put in harm’s way” (P2).

Asbestos exposure and awareness was one component of safety that most participants agreed was overlooked and many participants “didn’t even think about it, no. Until you just mentioned it, that thought didn’t even come into my head” (P10). One resident, whose home was built in a period of asbestos use in building materials, did not seem to understand that their home likely contained asbestos. This participant said there was no asbestos assessment done on their
home and that they received no educational material about asbestos before re-entry (P1). Brent Davis said, “if a homeowner didn’t know that they had asbestos in their home and they started clearing it out, I don’t think there was any messaging around asbestos risk. I’m sure there were homes that were torn up that folks were at risk of asbestos exposure” (P3). Notably absent from the PPE provided to the ToHR residents, were asbestos approved respirators (P4).

According to participants, asbestos was mostly overlooked during the early stages of the disaster response in the ToHR. The Director of the AEMA recalled, “we weren’t really concerned with asbestos the first two weeks. After that, when they started on some of the rebuilds, then we realized how much asbestos we were going to have to deal with. And because we had Tervita, we were fairly certain that they were going to handle the asbestos properly” (P11). Regarding the likely exposure of residents and volunteers to asbestos, the Director of the AEMA said, “it’s one of those things, where in retrospect, I would have liked to have had better supervision over that army of volunteers that came in, but it is what it is” (P11).

**Overall disaster response and recovery organization.** This section reviews participant responses related to the overall organization of the 2013 disaster debris cleanup in the ToHR. Participants were generally amazed by the result of the cleanup and agreed that the home re-entry process Tervita developed for residents, worked well. “Each homeowner would get a package and a personal interview with our staff. We had fulltime people walking with each homeowner, here’s what your house looks like, here’s what we’re going to do, do you consent that this work proceed” (P14)?

Despite the general positive remarks about the result of the disaster response and recovery, there were many aspects that did not function well. Participants said that the disaster response and recovery in the ToHR were “initially, very reactive and I would say almost panic
driven” (P8). A Tervita SPM thought that “the GoA wasn’t very effective in their management of the disaster response. If you look at the binders of information that we put up front, it’s very apparent that we’re asking questions and they’re not being answered. We were also bound to a standard that others weren’t. On a house remediation, we had a very rigorous program that we had to follow, whereas, somebody else could come in and just do the work. So, that created this thought that Tervita’s in it for the money” (P2).

There was disagreement about staff turnover within the EOC and how much continuity there should have been between the initial disaster response and the transition to recovery in the EOC. The ToHR EMC said the response and recovery “were very rushed, reactive, and very disjointed because of the turnover of people. The town staff were there, they brought in Incident Management Teams, and they were there for three to four days and they left, so, it was very disjointed” (P4). On the other side of the issue, a Tervita SPM said, “the first mistake is that generally, the people that come in to do the initial response, like the Fire Department and Police Department, they’re replaced by another group of people that will do the recovery and that didn’t really happen in the ToHR” (P2). This participant also felt that for the local people involved in the ToHR disaster response and recovery, it was difficult to look at things objectively. “You need to have them removed, in BC, the command and control are with somebody that’s very strong and saying, I know people are standing outside and looking for somewhere to live, what do we need to do? So, it’s a more logistical approach” (P2).

Many ToHR staff were not willing to take time off during the 2013 disaster response and recovery. One participant said, “they were burned out by the end of the first week and most of their homes and families were affected. When the province took over, they said town staff, we
don’t want to see you for another two weeks. A lot of them kept working, especially the public works guys were like, this is our water treatment plant, we know how to run it” (P4).

Most participants agreed that the bin system employed by the EOC for collecting flood debris, was not effective. John Deagle said, “they put out the wrong sized, six-yard front-end containers. If someone throws in a couch, that’s full (P9). The hauling companies were dumping bins that had been scattered around the neighborhoods and when trucks would try to relocate bins, residents would threaten them (P10). Dean Leask explained that “generally, a bin will take as long as a week to fill up, well these guys are filling it up in ten minutes. So, with this much volume, you get lineups at the landfill. We were an hour and a half turnaround time and you have 30 bins. Takes an hour and a half to dump them and ten minutes to fill them, the math is just really not on your side” (P7). Another participant also mentioned that “we didn’t have a good sense of where the bins were, which meant they didn’t get emptied enough. A lot of people complained that the bin on their street was full, it was like responding to residents calling about full bins, as opposed to systematically driving through streets” (P4).

Eventually, the EOC discontinued the bin system for collecting debris, as it was not working effectively (P5). The strategy then moved to piling flood-impacted debris in front yards. “They started doing something called a wagon train. They would go down a neighborhood with a loader and tandem trucks, or these trailer units with end-dump trailers. Loaders would load the debris and the trailers would go down the street and clean up the street” (P8). Participants thought the wagon train system was much more efficient than the initial bin system utilized.

The sections above, summarized the document analysis and participant responses regarding how best-practices in disaster debris management were utilized by the GoA and the
ToHR during the 2013 response and recovery. The results from these sections, are summarized in Table five below.

Table 5

**Summary of recommended disaster response and recovery strategies used in the ToHR**

| **Asbestos exposure** | Overlooked for residents and volunteers  
| Managed properly by Tervita |
| **Hazardous waste management** | Most HHW went into the landfill |
| **Transfer station use** | Not used, led to major problems at landfill |
| **Landfill hours and operations** | 7 AM – 7 PM worked for most participants  
| EOC wanted 24-hour operation  
| Second landfill eased traffic to local landfill |
| **Volunteer organization and training** | Incredible volunteer turnout and utilization  
| Training developed in weeks before re-entry  
| Safety training was rudimentary  
| Volunteers were at risk & damaged homes |
| **Contracting for debris management** | Sole-sourced contracts seen as unfair  
| Loose contracting, fraud, and confusion  
| Many local contractors were not used |
| **Safety training during the response and recovery** | Tervita brought a strong safety culture  
| PPE was readily available  
| Safety was a priority for contractors  
| Minimal training for residents & volunteers |
| **Overall response and recovery organization** | EOC lack of continuity created problems  
| Bin system failed, wagon train worked well |

**Analysis of debris management best-practices utilized in the Town of High River**

This section analyzes the documentation and participant responses found in the previous results section. This analysis is aimed at answering research question two: did the disaster debris management strategies utilized in the ToHR, during the 2013 flood response and recovery, follow industry best-practices?
One formal assessment of the GoA response and recovery to the 2013 ToHR flooding has already been completed. The MNP Report: *Review and Analysis of the Government of Alberta’s Response to and Recovery from 2013 Floods* (2015) was commissioned by the GoA. Overall, the MNP Report (2015) called the GoA response a success and concluded that the province should be proud of the efforts of those involved (p. 7). Some stakeholders felt that many of the GoA structures and trainings were developed sporadically (p. 54) and the authors advised the GoA to focus on training and documented procedure development before another disaster (p. 62). While the MNP Report (2015) had many valuable insights for high level administration and legislation, the report barely mentioned disaster debris management. This further supports that there is a disconnect between the GoA and disaster debris management.

When compared with industry best-practices in disaster debris planning, the GoA response and recovery in the ToHR did not follow most industry best-practices, however, most participants were impressed with the overall outcome. “ Incredible effort, incredible speed, incredibly lucky that nobody got hurt” (P5). Another participant said, “ I think they did an incredible job. There’s a lot of anger, but they did pull it off. Residents are living there and the town is improving” (P2).

Due to the hard work of an experienced team from the AEMA, the GoA was able to quickly develop an effective re-entry plan and prioritized key infrastructure to allow residents to return safely. Tervita was a capable contractor to manage the initial disaster response in the ToHR, added expertise and training in disaster debris management, and managed asbestos correctly. Regarding Tervita’s efforts in the ToHR, Cameron McLean said, “ it’s one of the proudest working moments I have in my career. To mobilize under an emergency response, with
no pre-existing contracts. To mobilize that size of professional staff, to achieve the desired end-
scope, to achieve the mission that we were given, and be on time, i’m so proud of it” (P14).

The GoA educated most residents on flood related safety risks and the cleanup resulted in 
very few incidents and no fatalities throughout the recovery period. Further, the inflow of 
volunteers was inspiring to most participants and PPE was readily available for residents and 
volunteers, though asbestos respirators and PPE were missing. The EOC also held regular safety 
meetings, ensured contractors worked safely, and Tervita formalized effective procedures for 
home inspections and asbestos abatement.

Opening an additional landfill eased traffic to the LRRC and the hours at the LRRC 
proved to be effective. The EOC staff were frustrated with the hours, but the LRRC was 
unwilling to over-extend their staff, risk breakdowns of their equipment, and risk abuse of the 
landfill site. The LRRC could also not find qualified staff and volunteers to allow them to run 
24-hour operations. A transfer station in the ToHR could have run 24-hour operations, with less 
risk to the landfill site and less qualified staff required. If 24-hour landfill operations are required 
during a disaster response and recovery, the EOC should assist in hiring and training landfill 
staff, as landfill management will likely have limited time to interview and train new staff.

The following table summarizes strategies utilized in the ToHR that followed best-
management practices for disaster debris management in 2013.
Table 6

*Summary of best-practices followed in the Town of High River response and recovery*

| Debris management best-practices utilized successfully by the ToHR, the GoA, and AEMA |
|Re-entry priorities were managed effectively |
|Tervita was qualified to manage disaster debris, asbestos, and improved overall safety |
|Contractor safety was prioritized by the EOC |
|Volunteer turnout was high and helped speed the cleanup process |
|PPE was readily available for residents and volunteers |
|Landfill hours were effective for residents, volunteers, and haulers |
|The wagon train system for debris cleanup worked efficiently |
|Opening a second landfill helped ease traffic to the closest municipal landfill |
|Disaster debris materials were eventually tracked accurately |

While many parts of the disaster response and recovery worked well, relative to industry best-practices, there were also many aspects that did not. Landfill staff were not involved in creating disaster management plans for the ToHR, despite managing the landfill that would deal with the waste. Re-entry plans for the ToHR should have been pre-planned and re-entry communication materials for the public were limited. Guidance documentation was also limited to high-level administration for the AEMA. A more fundamental problem seems to be a general disconnect between disaster management professionals and debris management in Alberta. Jim Lapp said, “I don’t think the province’s emergency response really focuses on the debris cleanup, they focus on life and property” (P8). This statement was supported by the Director of the AEMA’s comment that a disaster debris management specialist is not part of a standard EOC.

The Director of the DMTF had experience with landfills, as a Public Works Director for the Town of Drumheller, but his priority was to restore key infrastructure in the ToHR. He was also trying to make the best of a situation with little pre-planning and intense pressure for residents to return quickly. Jim Lapp said, “he had some background with waste, I don’t know if I’d call him a waste Manager though” (P8). Jim also felt that “any recycling planning that was done, was done at the landfill” (P8).
Due to this disconnect between the EOC and debris management strategies, recycling was not prioritized in the response and many resources were wasted. Concrete, white goods, cars, and easily separated metal were properly managed and recycled. Some trees and vegetative debris were separated, though the end use as daily cover put them in the landfill anyways. The silt could have been reused in soil, scrap metal could have been better segregated, and HHW was mostly landfilled. Most recyclable materials were thrown out, with little effort placed on segregation. The ToHR CFO thought the response was “very 1920’s, we just took the material, put it in a bin, took it to the landfill, and buried it” (P13).

Communication about debris management strategies was lacking throughout the disaster response and recovery, but especially at the beginning. Many stakeholders, such as the landfill and SP, were not well informed of an expected progression of materials and landfill staff were often caught unprepared. The result, as with fridges full of rotten food, was weeks of failed strategies by landfill staff, before finding an effective procedure to clean and recycle white goods. Tonnage projection models were also not utilized effectively during the cleanup.

The AEMA relied too heavily on personal experience in disaster debris management and did not put lessons learned from other disasters, into easily transmittable formats. This problem was again seen with recycling the fridges, as the Director of the AEMA said, “when it comes to the disposal of white goods, you know we’ve now done it three times on a fairly large scale, so, we’re aware of a lot of the challenges that presents” (P11). Despite this claim, landfill staff struggled to recycle white goods and went through multiple failed strategies before discovering an effective recycling procedure on their own (P9). Personal lessons in disaster debris management should be organized and readily available for stakeholders that will have to manage future disasters. The AEMA should pre-plan information about disaster debris material
progression, SOPs for safe handling of debris for responding staff, and educate politicians on appropriate communication with the public during a disaster.

A transfer station should have been utilized during the ToHR cleanup. Putting debris material in front yards and having crews pick up the debris worked for most residents, but many residents disliked the material on their lawns and the wait time for the piles to be removed. Many residents had their own trucks and trailers and did not wait for cleanup crews to remove the flood debris but hauled their own debris to the landfill. “You need to give them a place to take that stuff, otherwise, they’re going to show up and line up on the roads at the landfill. And that high traffic at the landfill, well it’s a nightmare” (P8). A transfer station could have kept the small, non-professional drivers, out of landfill lineups and reduced frustration. Dean Leask said, “if they had opened other places for us, rather, than everybody just making one trip to the landfill, it probably would have alleviated a lot of congestion” (P7). A transfer station could have also allowed for 24-hour dumping operations in the ToHR. It could have been manned by less qualified staff and allowed to run through the night. AEP was supportive of a transfer station, while LRRC management was not supportive of 24-hour landfill operations.

The generosity of volunteers in the ToHR was amazing. Volunteer organizations became integrated with the EOC over time, but were initially disconnected. SP had to develop their own safety communication material, felt left out of the EOC meetings, and discovered they were involved in the disaster response, by reading it online. There was not an effective mobilization plan to coordinate volunteer organizations and most of the volunteer organization was reactive. The AEMA should work closely with the NGO Council, to build disaster response plans and better integrate volunteer efforts into recovery operations. Safety handouts should be pre-planned and distributed to volunteer organizations, so, messaging and training is consistent and readily
available. Many volunteer organizations are well trained, offer their services for free, and are a significant asset to the GoA disaster response capabilities. Jim Lapp and SWANA were utilized, but mostly helped at the landfill. The AEMA should also work closely with SWANA, to help with disaster debris management and bring in additional waste management expertise to an EOC.

Disaster debris management Contracts were not pre-negotiated, were rushed, managed sporadically (P2), and “could have been a couple of weeks before all the bugs were worked out” (P13). There were also no pre-approved contractor lists for the EOC and the resulting contracting chaos led to fraud and overcharging. Having pre-approved contractors and pre-negotiated contracts, would have helped reduce unqualified contractors and improve fairness.

The sole-sourced Tervita contract limited the ability of local contractors to work through the disaster response and recovery, at the very time they were losing business. The Tervita contract was appropriate for the initial disaster response, however, it became cumbersome and difficult to utilize once the ToHR began reassuming control. Hiring an independent Project Manager, rather than including contract management in a sole-sourced contract, would have improved opportunities for local contractor utilization. The GoA should have also began tendering more disaster recovery projects, as operational organization returned to normal.

Asbestos exposure was not prioritized in the early disaster response, was not communicated effectively in the safety handouts for residents, and many residents and volunteers were likely exposed. The limited asbestos exposure information that was included with safety handouts for home owners, was not effectively distributed to volunteers, hauling companies, or landfill staff that were encountering the same risks. Asbestos exposure information should be pre-prepared and readily available immediately after a disaster because residents and volunteers will remove flood impacted asbestos containing materials.
The following table, summarizes best-management practices in disaster debris management that were not properly utilized in the 2013 ToHR disaster response and recovery.

Table 7

**Summary of best-practices not followed in the Town of High River response and recovery**

<table>
<thead>
<tr>
<th>Debris management best-practices not utilized successfully by the ToHR, GoA, or the AEMA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Guidance documentation was not available for most staff</td>
</tr>
<tr>
<td>The DMTF in the EOC, was not managed by a waste management professional</td>
</tr>
<tr>
<td>Recycling and waste minimization were not prioritized by the EOC</td>
</tr>
<tr>
<td>Disaster debris communication was not pre-planned and was poor throughout</td>
</tr>
<tr>
<td>Debris material progression was not communicated effectively and led to confusion</td>
</tr>
<tr>
<td>Tonnage projection models were not utilized effectively</td>
</tr>
<tr>
<td>Lessons learned from previous disasters, were not transmitted effectively</td>
</tr>
<tr>
<td>A general disconnect exists between the AEMA and disaster debris management</td>
</tr>
<tr>
<td>A transfer station was not utilized, which created problems for haulers and the LRRC</td>
</tr>
<tr>
<td>The bin system failed, caused numerous problems, and HHW was mostly landfilled</td>
</tr>
<tr>
<td>Volunteer organizations were not well integrated and were inconsistent with safety standards</td>
</tr>
<tr>
<td>Poor contracting practices led to numerous problems</td>
</tr>
<tr>
<td>Safety training was rudimentary for residents and volunteers</td>
</tr>
<tr>
<td>Asbestos exposure was overlooked for residents and volunteers</td>
</tr>
</tbody>
</table>

**Results of improvements made, and lessons learned since 2013**

The ToHR flooding occurred in 2013 and the AEMA and the ToHR have since implemented many improvements. The final section research and interview portions, focused on research question three: what lessons learned can be implemented after the flooding in 2013, to improve the response capabilities of the GoA and municipalities for future natural disasters? The next sections summarize the results and analysis of participant responses related to this period.

**Improvements made by the Town of High River since the 2013 flood.** Most participants agreed that the ToHR is better prepared for a disaster today than in 2013. According to the ToHR EMC, “our current plan is based on the Canadian Standards Association (CSA), a standard called Emergency Management Accreditation Program (EMAP), and then we had a list of 116 lessons learned from the flood. One of things that we did, was make it easier to get bigger,
so, our plan is now geared to disasters that exceed our capacity. We have an evacuation plan, a notification and warning plan, and we’re just getting a mutual aid agreement that will cover all emergency management” (P4).

The ToHR published the *After-Action Report: June 2013 Flood*. This report summarized the sequence of events leading up to the flooding and how the town responded. The report listed 13 recommendations and the improvements made since the 2013 flooding, with almost no mention of disaster debris management (The Town of High River, 2014, p. 16-18).

The ToHR has also worked to improve their “utilization of volunteers, so, recognizing how important they were to the speed of the recovery and how can we make that process a little safer and smoother next time. We have recently come out with an app to help with that, which was funded by the Federal Government. It’s meant to connect volunteers with specific skill sets, to specific opportunities. So, it’s almost like a dating profile, but for volunteers” (P4).

According to the ToHR EMC, the “biggest change has been training. The ToHR has adopted a policy where everybody is required to participate in the Emergency Management Program” (P4). Another town staff member said, “we’re a lot more prepared, we’ve got that siren now and we’ve got the berms in place” (P1). A summary of improvements made by the ToHR since the 2013 flooding, is found below in Table eight.

Table 8

<table>
<thead>
<tr>
<th><strong>Summary of improvements made by the Town of High River since 2013</strong></th>
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</thead>
<tbody>
<tr>
<td><strong>Disaster response improvements</strong></td>
</tr>
<tr>
<td>Disaster response plan has been updated to CSA and EMAP standards</td>
</tr>
<tr>
<td>Staff worked through the <em>After Action Report</em>, of lessons learned from the 2013 flooding</td>
</tr>
<tr>
<td>Expanding mutual aid agreements</td>
</tr>
<tr>
<td>Improved volunteer utilization planning</td>
</tr>
<tr>
<td>Improved disaster response training for all staff</td>
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</tbody>
</table>
Improvements made by the Government of Alberta since the 2013 flood. The GoA and the AEMA have made numerous improvements since 2013, this section summarizes some of those improvements. “What we’ve tried to do, is have a list of contractors who are qualified, ready to go, and have special capacities for disaster response” (P11). The AEMA also now has “the Community Emergency Management Program that municipalities can use to build their own Municipal Emergency Plan, build hazard and risk assessments, and build hazard specific plans if they’re at high risk for wildfires, flood, or dangerous good releases” (P11).

The AEMA also tries to be more proactive, by engaging high-risk communities to think about “mutual aid agreements and investing in disaster response supplies. In the wake of the 2013 flood, we ran a big multi-year flood preparedness grant program. We granted out millions of dollars to high risk communities, so, they could be better prepared. We also established a flood response stockpile down in the Municipal District of Foothills” (P11), which is close to the ToHR. The AEMA has also started training politicians to improve public communication during a disaster (P11). Jim Lapp and SWANA have started working on new training related to disaster debris management. “The local chapter is working on developing a disaster debris course for waste managers and we’re hoping that will be used as a Canadian course” (P8). The GoA and SWANA improvements since the 2013 flooding are summarized below in Table nine.

Table 9

<table>
<thead>
<tr>
<th>Summary of improvements made by the Government of Alberta since 2013</th>
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</thead>
<tbody>
<tr>
<td><strong>Disaster response improvements</strong></td>
</tr>
<tr>
<td>Created a list of standing offers from qualified contractors</td>
</tr>
<tr>
<td>Implemented the Community Emergency Management Program</td>
</tr>
<tr>
<td>Are more proactive about engaging high-risk communities for disaster preparation</td>
</tr>
<tr>
<td>Established a flood response materials stockpile in Southern Alberta</td>
</tr>
<tr>
<td>Started training politicians about appropriate disaster response communication</td>
</tr>
</tbody>
</table>
In this research, many participants shared additional lessons learned that could help with future disasters and have not already been summarized. These are summarized in the following sections.

**Additional disaster management pre-planning needed.** Jim Lapp said, “number one lesson is pre-planning, I think that needs to be one of the highest priorities. Municipalities are already required to have an emergency response plan, and this is not changing that plan, it’s only adding to it” (P8). Another thing municipalities can plan for, is “staging heavy equipment. There’s only three or four places in the ToHR we can do it, so, there’s no reason why we can’t pre-identify those places as staging area Alpha etc.” (P4). Another lesson learned was “notwithstanding what the disaster was anticipated to be, anticipate it to be way bigger. Plan for being out of control, recognize that chaos works. Do not underestimate the resiliency, creativity, and ability of the public to get things done, despite your best plans” (P5).

**Disaster response and recovery organization.** Darwin Durnie recommend “to be ready to get relieved in an EOC sooner than you think by half, so, that your relief team can be active, and you can come back fresh. Because in the timeline, everybody thinks they must deal with everything up front, but you really need the fresh horses at the end” (P5). Jim Lapp said that “with a flood event, you have to have somebody monitoring the streets. So, if you go down the street and clean up this debris, then you forget about that street and move on to another neighborhood. Next thing you know, that street’s all piled up with debris again, so, you must have people out monitoring that” (P8).

**Landfill management and transfer stations.** John Deagle outlined many lessons learned for landfill operations following the 2013 ToHR flooding. The LRRC utilized 2 working faces, to separate the large commercial trucks, from small residential haulers. After having huge
lineups for days, the scale house started handing out numbered cards to drivers on the inbound scale, rather than entering the load with a license plate, personal name, or business name. The number was entered into the scale house software for each load and was handed back by the driver on the outbound scale. This improved efficiency for the scale checkers to find the vehicle in their scale house software and process the load. The ToHR also paid for all flood waste loads, so, there was no time spent processing debit and credit cards. The result, was a decrease from an average of 90 seconds to process each load, to 15 seconds per load. The landfill also hired temporary laborers for traffic control (P9).

Jim Lapp recommended that during a disaster cleanup, debris haulers should not use “dump trucks with pup-trailers, avoid them if possible. The problem with the pup-trailers, was when they back up, they would jackknife the trailers. So, they’d use double the space and the problem was even worse in the ToHR, because a lot of these drivers didn’t know how to drive” (P8). Dean Leask had a similar recommendation, “I mean, some of these trucks that were running down the road, I don’t think they’d been used in 15 years. I think we have to stick with professionals in these situations” (P7). Dean also recommended that “you pick a designated landfill and these five professional haulers are the only ones hauling into the landfill and that’s it for the next few weeks. The rest of you have to haul somewhere else, you could set up a transfer station on the edge of town, that would make beautiful sense” (P7).

**Recycling of disaster debris.** Brent Davis spoke about improvements that could be made with sorting of recyclable debris materials. “What municipalities will do, is they’ll require some level of sorting at the curb, and then they’ll do their haulage based on that sort. By sorting your white goods, your appliances, versus your general type of debris is at least a good start. That way, you know you can actually pick up appliances and they’re not sitting underneath a heap of
sheet rock, carpet, and that kind of thing” (P3). The RWRS for AEP thought that “having seen
the kinds of things that were disposed of and knowing that some of the very important things
could have been restored. I mean, pictures, personal documents, that kind of thing” (P6). One
resident spoke about the impact of losing personal family pictures. “We lost all the pictures of the
kids growing up playing ball and that’s something we’ll never get back. I know we’ve got the
memory of it, but when you look at a picture, that memory comes back so much clearer” (P1).

**Organization of volunteer efforts.** Brent Davis learned that volunteer groups becoming
integrated with the EOC “became incredibly valuable” (P3). The RWRS also said, “your team
coordinating volunteers, has to be equal to the task of handling the large numbers that come in”
(P6). One participant recommended that the GoA implement a volunteer program like BC. “In
BC government offices, is an emergency response kit. When somebody says we need you, you
have the right to say no, but if you volunteer in their program, the expectation is that you will
respond. And I would hazard to say that 80% of the people will respond and it’s as a volunteer,
you’re working 18 hours, I think they only allow you for 2 weeks now” (P2).

Brent Davis also said the “Red Cross was able to secure a lot of safety equipment at no
cost and it wound up being warehoused at the rodeo grounds. We decided it wasn’t doing a
whole lot of good there, where people were just bypassing the rodeo grounds and going into the
town. So, we pre-positioned pallets of safety supplies in neighborhoods and residents could
access them. Whether it was just masks, gloves, Tyvek, just take it. I have to think it was better
there, then sitting in a warehouse not being used and it got used, so, I assume people were
wearing it” (P3). In a disaster response, an EOC should also plan for locations volunteer
organizations could utilize for training and storage space. SP set up in Aldersyde because “it just
kind of got us out of the fray and we needed a large footprint for our equipment” (P3).
Disaster response communication with the public. One resident spoke of the importance of clear communication about evacuation. “Time, you know if we would have had even 12 hours more time to get ready, things would have turned out much different for me. They said there was a possibility of it being 1750 m³ a second, but as a resident, you really can’t fathom what that means” (P1). For Cameron McLean, “the biggest lesson learned, is managing expectations. When your town floods and you think you’re going get your house paid for, and you’re going to be in your house in a month, you have an unrealistic expectation” (P14).

Contracting of disaster debris management. The contracting process in the ToHR was a point of concern for many participants. A Tervita SPM said, “I think the contracting was really poorly done. So, that needs to be looked at, how they contract third-party. What you really need to do, is hire a good independent Project Manager. That would have worked better, they put that task on Tervita and Tervita was also putting equipment in the field. So, you do lose a bit of control because our interest becomes what we can do to make money for our company” (P2).

Cameron McLean mentioned that “one thing to consider, is that no company can just have 300 employees waiting, it doesn’t work that way. Sometimes these tenders, people will say we need a four-hour response with 300 people and 200 trucks. Well, no, you’re not going to get that, or you’re going to spend so much money, you’re going to bankrupt the province. So, the balance between what industry can offer, verses what people actually want, verses what they can realistically expect, is the lesson learned that I would caution anybody who is a future planner for these things. To be constantly manned to a one in 100-year event, well you can’t afford that, it’s not going to happen. To be constantly manned to a one in five-year event, that’s where the debate gets interesting. The evaluation of potential risk that decides what we need to do for future
tenders, future standing groups, and then having at least a template in place for the ability of the province to hire contractors and to help manage the event” (P14).

Darwin Durnie recommended landfills can rent-to-own equipment during a disaster, as landfills are often concerned about the cost of buying extra equipment during a disaster recovery (P5). The Director of the AEMA also recalled that the Darwin “knew we were going to get ripped off, so, that is just a very real lesson in emergency management. You need somebody who knows this stuff, we had guys trying to rip us off and Darwin poked big holes in their offer. Maybe you want to talk about the financial considerations of having a debris management program in place, as opposed to being over a barrel when you do have to have it” (P11). The EOC also engaged local industry that was familiar with the area and tried to keep outside contractors away, as some companies have teams and manuals about how optimize revenue in a disaster event (P5).

The ToHR CFO spoke of the importance of “that tracking piece, whether its weights, but also the financial piece. Particularly in this case, when we are dealing with $17 million, that’s a lot of invoices and that’s a lot of dollars coming out of the tax payer’s pocket. So, better coordination and tracking of invoices, recognizing all the different aspects of the emergency response must be tracked separately. It might look like something is similar, say cleaning up streets and removal of dirt should be separate from hauling of waste. So, making sure that they’re not going into the same bucket because at some point, they have to be separated” (P13).

One participant asked, “why hasn’t a lessons learned been done? And maybe they just didn’t want to talk to Tervita. I don’t know, but disasters are going to happen today, tomorrow, and we’re going to re-learn it and its going to cost a lot. Why don’t they do a post-disaster get together and go ok, five items that we need to improve? Because you’re talking to me now, about
three years after the fact, and I’m trying to remember. I’d have to look at photos, I’d have to look at what happened. I would champion seeing some of my tax dollars put to use creating a committee that would go ok, we’ve had three big disasters that have fallen, like one is in recovery while the other is happening and we’re not pinning them together” (P2).

This section summarized lessons learned from participants in this study that were not already discussed as industry best-practices. These lessons are summarized in Table ten below.

Table 10

**Summary of additional lessons learned from the 2013 Town of High River flooding**

<table>
<thead>
<tr>
<th>Additional lessons learned</th>
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<tbody>
<tr>
<td>Ensure pickup of sorted debris materials matches required sorting for residents</td>
</tr>
<tr>
<td>Prepare communication about options for salvaging family pictures and other items</td>
</tr>
<tr>
<td>Integrate volunteer organizations immediately with an EOC</td>
</tr>
<tr>
<td>Alberta could consider setting up a volunteer program modelled after BC</td>
</tr>
<tr>
<td>Pre-position pallets of safety equipment throughout the community</td>
</tr>
<tr>
<td>Utilize SWANA and other waste management organizations for debris management</td>
</tr>
<tr>
<td>Prepare clear communication of safety risks and reasonable expectations for home remediation, and distribute communication material to the public and politicians</td>
</tr>
<tr>
<td>Hire an independent Contracting Manager for a disaster response EOC</td>
</tr>
<tr>
<td>Ensure pre-negotiated contracts and tenders have realistic expectations</td>
</tr>
<tr>
<td>Landfills and municipalities can rent-to-own equipment during a disaster response</td>
</tr>
<tr>
<td>Understand that many companies will try and maximize profit from a disaster</td>
</tr>
<tr>
<td>Create a committee to ensure lessons learned from past disasters are being implemented</td>
</tr>
</tbody>
</table>

**Analysis of improvements made, and lessons learned since 2013**

This section analyzes the documentation and responses of participants found in the previous results section. This analysis is aimed at answering research question three: what lessons learned can be implemented after the flooding in 2013, to improve the response capabilities of the GoA and municipalities for future natural disasters?

The ToHR has improved their training across all levels of staff. They have improved their disaster response plan, volunteer utilization planning, and are broadening their mutual aid agreements. The Emergency Management link on the town’s website has good information about
emergency alerts, evacuation notices, and other disaster information. Disaster response should be more prominent on the town’s website and disaster debris management is not currently mentioned (“High River is ready”, n.d.). Among the updates given by participants, there was little mention of changes to disaster debris management. The ToHR should prioritize building a disaster debris management section in the ToHR disaster response plan.

The GoA has made many improvements since the 2013 flooding, which were evident to some participants involved in the 2016 Fort McMurray wild-fire response. Brent Davis said, “in Fort McMurray, we were very much integrated into the EOC” (P3). The town’s EMC agreed, “I had the opportunity to go to Fort McMurray in 2016 and they did much better there” (P4). One participant disagreed, however, saying, “rather than lessons learned and using the expertise that they grew and gained from the ToHR, Fort McMurray chose to manage their disaster on their own. They got the province involved, but they didn’t say, let’s follow the sequencing the ToHR did, they re-created it” (P2). The GoA has also taken steps to improve their contracting practices, are more proactive in working with high-risk communities, have introduced new training for politicians, established safety material stockpiles to improve disaster responsiveness, and have implemented new grant programs to help municipalities develop disaster response plans.

While the GoA has made many improvements since the 2013 ToHR flooding, there are many indications that the GoA has not had urgency to learn from the experiences. According to a Tervita SPM, “have they asked Tervita to participate? No and that’s probably a big mistake, we could probably give some good input and we’d do it for free” (P2). The ToHR CFO also said, “as far as I’m aware, nothing has been published highlighting, say the costs, or the amount of material that came out of that. There’s probably been some estimates and some numbers thrown
around, but never a final summary to highlight how much material and the costs involved” (P13). This type of analysis would help the GoA improve efficiency and responsiveness.

When it came to learning from his experiences with disaster debris management, John Deagle said officials from “Saskatchewan and BC were more interested than the GoA” (P9). Jim Lapp also recalled “a conversation I had with a person from the AEMA, this person wasn’t there at the time of the ToHR flooding, or Slave Lake, but was involved in Fort McMurray. The comment was that they don’t focus on debris disposal” (P8). According to participants, data from the ToHR has not also been utilized to project future disaster tonnage, though the Director of the AEMA said, “that’s probably a good suggestion” (P11).

The AEMA should complete more focused follow-up assessments of their disaster debris management practices after any disasters and implement the recommendations and lessons learned. Many participants were surprised this hadn’t already been done for the ToHR cleanup. There needs to be more urgency to improve the overall responses to disasters and specific attention should be given to debris management, as it has clearly been overlooked by the GoA historically. Tonnage projection models could also be started by the GoA and provided to municipalities, to help with planning and scaling disaster responses appropriately.

Conclusions and recommendations

This study sought to answer three questions about the three stages of the 2013 ToHR flood response. General findings of this study were that the ToHR and the GoA were largely unprepared for the 2013 flooding, when compared to industry best-practices. While the disaster response and recovery stages managed by the AEMA followed many best-practices, there were also many overlooked best-practices that led to operational problems in the cleanup. Many improvements have been made by the GoA and the ToHR since 2013, but disaster debris
management still seems to be largely ignored. There are also many lessons learned from the
ToHR disaster response that have still not been implemented.

The findings from this comparative analysis study are consistent with Reinhart et al.
(1999), who found that at-risk communities were often ill prepared for disasters, despite living in
disaster prone regions (p. 28). Results are also consistent with Solis et al. (1996), who studied
disaster debris management practices across Canada and wrote that debris management is often
overlooked by municipalities and waste management facilities (p. 2).

Reinhart et al. (1999) wrote that effective debris management requires planning ahead of
time and that without effective disaster planning documentation, disaster responses will result in
confusion, inefficiency, and wasted resources (p. 30). These authors also claimed that recycling
of disaster debris is often not prioritized due to: safety concerns, political pressure to remove
debris quickly, contamination levels of debris, and difficulty sorting impacted debris. The authors
recommend requirements for recycling be included in disaster response plans and contracts, to
ensure recycling is prioritized in recovery efforts (p. 31). The findings of this study support these
claims and illuminate why disaster responses often overlook these components of a disaster
response and recovery.

Results of this study support the findings of Solis et al. (1996) that collaboration and
planning with local media outlets, can help improve communication during a disaster response.
These authors also noted the importance of having health and safety standards in place before a
disaster, to ensure response actions are safe and that training be readily available (p. 9-10).
Results from this study also support their claim that special concern should be given to landfill
space, as some landfills are often close to final capacity and can be overwhelmed with disaster
debris (p. 11).
The MNP (2015) authors wrote that many lessons were learned during the 2013 flood response, but they also noted “a lesson has not been truly learned, until improvement actions have been fully implemented” (p. 33). The authors also found that many stakeholders felt some of the disaster response structures and training were rushed (p. 54) and cautioned that any improvements to procedures and structures will be of little use, if they are not understood by staff that would be responding to future disasters. They also wrote that training after a disaster is difficult, as people will default to their most recent training under pressure. The authors thought the GA should focus on training and documented procedure development before the next disaster occurs and noted that established Standard Operating Procedures (SOPs) can help improve communication in the critical first 36 hours of a response (p. 62). These findings are all consistent with the results of this study.

This study introduces a new comparative analysis approach that could be used to analyze disaster response preparation, ongoing debris management strategies, and improvements made following a disaster. The importance of integrating ICS training and debris management professionals, is another new finding of this study and illuminates a potential gap in the expert literature on disaster debris management. The disconnect between ICS and debris management, also demonstrates a new fundamental missing component of disaster planning that should be addressed in all jurisdictions.

The next sections provide a set of clear conclusions and recommendations that could help the GoA, the ToHR, and other municipalities improve disaster debris planning and management. **The Town of High River should develop a disaster debris management plan**

In addition to the best-practices outlined in the literature review above, this plan should contain evacuation points with backup contact information for residents and a secondary location
for backup communications, in case the municipal office is affected by a disaster. The ToHR should also ensure essential remote sites have multiple phone lines and the ability to add phone lines in case of emergency. It is also important for the ToHR to have clear messaging when warning residents, or ordering evacuation. Flood modelling could help create clear messaging about the potential depth of water that would be expected with different river flow rates.

**Disaster debris management should be prioritized in disaster planning**

The GoA and the AEMA should prioritize disaster debris management and can do so through the following actions:

1) Create a permanent disaster debris management specialist position, as part of standard ICS training and a standard EOC.

   This issue was not discussed in the expert literature reviewed in this study, but there is a clear lack of collaboration, or silo effect, between disaster planning professionals and debris management practices in Alberta. Hotoran (2009) referred to the silo effect as a lack of communication and common goals between departments in an organization because of isolation (p. 216-217). To ensure disaster debris is managed appropriately throughout Alberta, connections need to be made between disaster planning and waste management professionals.

   2) Conduct in-depth reviews of disaster debris management after any disaster and ensure lessons learned are implemented.

   The EPA (2008) wrote about the importance of learning from other disaster impacted communities (p. 44) and disaster debris management experience has not been effectively converted into meaningful tools and procedures in Alberta.

   3) Develop tonnage projection models based on recent and similar disasters.
Many tools have already been developed for this process, but they should be customized to Alberta and distributed to at-risk municipalities.

4) Develop a debris hauling procedure that can be replicated in future disasters

For future flooding disasters, the AEMA should utilize a combination of the wagon train system utilized in the ToHR and providing a 24-hour transfer station for self-hauling residents and small commercial trucks. A limited number of large professional haulers could then haul to a waste management facility. This procedure should be formalized and distributed to communities, so, it can be utilized immediately following a disaster event.

5) High risk communities should be prioritized for disaster debris planning.

High-risk communities should be prioritized for the recommendations made in this section, though most of the recommendations are applicable to any municipality. The EMFO program could be a tool for the AEMA to work closely with high-risk communities. White (1937) found that when a community subject to flood has found it impracticable to prevent future flooding, there has been little effort to reduce the damages which may result from future floods. Individuals adopt a grin and bear it attitude and hope that the next flood will not occur during their lifetime. (p. 60). This was the perspective of most respondents in this study and it needs to be addressed in other high-risk communities. The UNODRR (2015) authors wrote that disasters like New Orleans cannot be blamed on bad stars, but rather on the lack of a political and economic imperative to reduce risks (p. 26). This was also the case in the ToHR.

Extreme weather and disaster events can be referred to as Black Swan events. Taleb (2010) referred to a Black Swan event as an “outlier, as it lies outside the realm of regular expectations, because nothing in the past can convincingly point to its possibility. Second, it carries an extreme impact (unlike the bird). Third, in spite of its outlier status, human nature
makes us concoct explanations for its occurrence after the fact, making it explainable and predictable (p. xxii). Taleb (2010) asked “why we focus on the minutiae, not the possible significant larger events, in spite of the obvious evidence of their huge influence”? (p. xxiii). Disaster planners shouldn’t wait until an unimaginable disaster event occurs and then try and react, rather, they need to start realizing that the unthinkable is becoming more likely, because of climate change.

6) Prioritize recycling and waste minimization during responses.

7) Continue promoting disaster response training throughout the province.

Municipalities and companies that deal with disaster debris management should conduct regular training on how to manage disaster debris generated from the disasters most likely to impact their region. Naess et al. (2005) interviewed local officials and stakeholders involved in a Norwegian flood response and found that the highly centralized nature of Norwegian politics, led to little incentive and flexibility to change at the municipal levels (p. 129). The GoA needs to ensure Alberta does not fall into these same traps and that communities are actively involved in disaster preparation.

8) Make clear mission statements regarding the management of disaster debris.

Reinhart et al. (1999) wrote that an effective disaster plan should contain mission statements and a hierarchy of priorities to guide operational decisions during a disaster response (p. 30). The AEMA and municipalities need to clearly prioritize where recycling fits into their hierarchy of disaster decision making and better communicate those goals.

9) Ensure that disaster debris management sections are added to existing municipal disaster response plans throughout Alberta.
Every municipality should develop a disaster debris management section and add the section to their existing disaster response plans and websites. Planners could single out high-priority areas in the town, such as transfer stations, or evacuation centers, and update any changes required during a disaster. Pre-planned re-entry priorities could also help responding staff, as not every disaster will bring in provincial experts. If there is a smaller scale disaster, pre-planned re-entry priorities can help the less experienced staff manage their efforts. The AEMA could require that debris management sections be added as part of a Municipal Emergency Response Plan and AEP could also make it an environmental approval requirement, for landfills to work with their local municipalities and build disaster debris management plans.

White (1937) wrote that enthusiasm for constructive public action, with respect to floods, rise sharply at the time of a flood and then dissipate rapidly. Public support for significant changes in flood-plain conditions often disappear before corrective action can be finalized (p. 61). Therefore, Alberta should use the recent natural disasters in the province to help motivate action and ensure readiness for future disasters before public enthusiasm for change is lost.

**Continue improving disaster response communication**

Disaster response communication material should be improved and prepared by the AEMA, in advance of any future disasters. This can be done through the following steps:

1) Summarize lessons learned in recent disasters and best-practices in disaster debris management.

Disaster response information should be available online for residents before a disaster occurs and should be consistent across the province. This communication material should also prioritize eliminating asbestos exposure risks for residents and volunteers entering older homes. PPE provided during a disaster response, should be expanded to include asbestos respirators.
Clear communication regarding the source of disaster response funding and reasonable expectations about returning to impacted homes, may also help reduce anger and confusion among residents and contractors involved in a disaster response and recovery.


This document, or section, should include best practices, communication materials, safety training, and other operational SOPs that are prepared in advance of a disaster. Material progression and safe handling best-practices should also be included for residents, volunteers, and responding staff.

3) Continue improving connections with volunteer organizations.

Safe-handling practices should be shared and agreements pre-negotiated with volunteer organizations to ensure safety, consistency, and outline GoA expectations for responding volunteer groups. The AEMA should also continue improving working relations and utilization of well-organized charitable organizations, such as SP. SWANA and regional waste management groups should also be better utilized to assist with disaster debris management in an EOC.

**Improve disaster response and recovery contracting processes**

Major improvements should be made in the GoA contracting processes, including:

1) Limit the use of sole-sourced contracts.

The GoA should not continue using massive sole-sourced contracts long after the initial state of emergency. Contracts should be created with the ability to cancel the contract and tender projects once the initial chaos of a disaster response has subsided.

2) Hire independent Contracting Managers, removed from any sole-sourced contract.

3) Prioritize using qualified contractors and minimize fraud.
The combination of contracting fewer qualified haulers, while utilizing a transfer station, could help alleviate some of the problems with bad hauling companies and long landfill lineups. Each municipality should have pre-qualified contractors and pre-negotiated contracts for debris management, with a focus on the ability to scale up resources for large disasters.

4) Prioritize the use of local contractors during a disaster response and recovery.

Below is a summary of the key recommendations from this study and the organizations that would be responsible for their implementation.

Table 11

<table>
<thead>
<tr>
<th>Summary of recommendations</th>
<th>Responsibility</th>
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<tbody>
<tr>
<td>1) Develop a disaster debris management plan</td>
<td>AEMA and municipalities</td>
</tr>
<tr>
<td>2) Create a debris management specialist position in ICS training</td>
<td>AEMA</td>
</tr>
<tr>
<td>3) Conduct in-depth reviews of debris management</td>
<td>AEMA</td>
</tr>
<tr>
<td>4) Develop tonnage projection models for Alberta</td>
<td>AEMA</td>
</tr>
<tr>
<td>5) Develop a debris hauling procedure that can be replicated</td>
<td>AEMA</td>
</tr>
<tr>
<td>6) High-risk communities should be prioritized</td>
<td>AEMA and municipalities</td>
</tr>
<tr>
<td>7) Prioritize recycling and waste minimization during responses</td>
<td>AEMA and municipalities</td>
</tr>
<tr>
<td>8) Continue promoting disaster response training in Alberta</td>
<td>AEMA and municipalities</td>
</tr>
<tr>
<td>9) Create clear mission statements regarding disaster debris</td>
<td>AEMA and municipalities</td>
</tr>
<tr>
<td>10) Summarize lessons learned &amp; best-practices</td>
<td>AEMA</td>
</tr>
<tr>
<td>11) Continue improving connections with volunteer organizations</td>
<td>AEMA</td>
</tr>
<tr>
<td>12) Limit the use of sole-sourced contracts</td>
<td>AEMA</td>
</tr>
<tr>
<td>13) Hire independent Contracting Managers</td>
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</tr>
<tr>
<td>14) Prioritize qualified contractors and minimize fraud</td>
<td>AEMA and municipalities</td>
</tr>
<tr>
<td>15) Prioritize the use of local contractors</td>
<td>AEMA and municipalities</td>
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This study focussed on one community’s flooding disaster and the results are unique to the setting in which these events occurred. The comparative analysis approach utilized, however, brought to light important improvements the GoA and the ToHR can make and could be a useful approach to analyzing any disaster response. Many participants mentioned that the AEMA had improved disaster response strategies since the flooding in the ToHR and this comparative analysis approach could be utilized to analyze the AEMA disaster response and recovery after
the Fort McMurray fires of 2016. Results from that analysis, could be compared against the findings of this study, to gauge whether the GoA has made significant improvements and what has been neglected. The disaster debris best-practices outlined in this study, could also be expanded to include wildfires and other types of disasters.

Another area that requires more study, is Alberta’s land use strategies and whether they are effective in incentivizing flood mitigation, or whether they promote risk-laden development of flood plains. The PCGCC (2006) authors wrote that a proactive approach to flood mitigation aims to reduce exposure to future risks, for instance by avoiding development on flood-prone lands. A reactive approach aims only to alleviate impacts once they have occurred (p. 10). Alberta’s policies could be studied at the municipal level, to determine if proactive actions are being taken in high-risk communities.

The United Nations Office for Disaster Risk Reduction (2015) authors wrote that if a country ignores disaster risk and allows risk to accumulate, it is in effect undermining its own future potential for social and economic development (p. 55). Alberta should take immediate and meaningful action to ensure improved disaster debris management practices are implemented throughout the province.
References


High River is ready. (n.d.). Retrieved from https://hrready.ca/


Appendix A - Interview Questions Guide

Q.1. Background

Preparation

Q.2. Existing Disaster Response Plan

Did High River and Alberta have a disaster response plan in place for the High River area?
(Reinhart et al. 1999, p. 28), (Coppola 2006, p. 9).

Were there disaster response directories prepared in advance of the flooding (EPA, 2008, p.1)

Were the people involved in the creation of the disaster response plan involved in the cleanup?
(EPA, 2008, p. 5)

Were there any disaster response plans made in conjunction with Okotoks? (Solis et al.1996, p. 6-7) (EPA, 2008, p. 32-33).

Was there any planning done between High River and Alberta?

Did Alberta or High River utilize disaster response plan tools available online before the flooding? (EPA, 2008, p. ii).

Q.3. Existing SOPs

What types of SOPs were available for responding staff regarding disaster debris management?

Q.4. Previous Training

What type of disaster response training was given before the flooding happened? (EPA, 2008, p. 15) (MNP Report, 2015, pg. 11)

Did High River cross-train staff to deal with disaster debris? (EPA, 2008, p. 15)

Q.5. Disaster Response Communication
Did the Province or High River communicate disaster debris management plans to the public before the flooding hit? (EPA, 2008, p. 13)

Was information about debris management available online? (EPA, 2008, p. 17)

How did they communicate this information to the public after the flooding hit?

Would you consider the communication effective? (Solis et al. 1996, p. 9-10)

Were politicians educated on proper communication during a disaster?

Q.6. Transfer Stations

Were transfer stations utilized to reduce haul and wait times for residents? (Reinhart et al. 1999, p. 30) (Solis et al. 1996, p.15-19)

Why or why not?

Q.7. Landfill Hours of Operation

What were the hours of operations for residents to haul flood impacted material?

Were the hours effective?

Why or why not?

Q.8. Pre-negotiated Contracts

Did the province or High River have any pre-negotiated contracts in place to deal with debris management in the event of a disaster? (Reinhart et al. 1999, p. 30) (EPA, 2008, p. 15)

Q.9. Recycling

Was recycling prioritized in any part of debris management plans? (Reinhart et al. 1999, p. 31) (EPA, 2008, p. 22-23)

Q.10. Lessons Learned from Slave Lake

What lessons were learned from the Slave Lake fires of 2011 and how were they implemented before the flooding in 2013? (EPA, 2008, p.44-47). (MNP Report, 2015, pg. 11)
Q.11. Volunteer Organization

Did the province or High River have any plan in place to organize volunteer work effectively? (Brent Davis)

Q.12. Volunteer Safety Training

Did they have any training planned to ensure volunteers worked safely? (Brent Davis)

Q.13. High Risk for Flooding

Would you have considered High River to be a high-risk area for flooding before 2013? (Solis et al. 1996, p. 2).

Q.14. Preparation

Do you think High River and Alberta were prepared for the flooding in 2013? (Hirayama et al. 2010, p. 168).

What was missing?

What could they have planned better?

Do you think disaster debris management was overlooked by the town and province? (Solis et al. 1996, p. 2).

Response

Q.15. Guiding Documents for Response

What documents guided the actions of those responsible for disaster debris management? (EPA, 2008, p.20)

What is the Recovery Operations Manual and how was it used? (MNP Report, 2015, pg.38)

Q.16. Accessibility Plan

Was there a plan in place to restore accessibility to High River after the flooding in 2013? (Özdamar et al. 2014, p. 260).
Who had the plan?

Who was responsible for carrying out this plan?

Who was responsible for clearing debris to restore accessibility to the town? (EPA, 2008, p.20)

What areas were prioritized for access?

Q.17. First Priorities

What were the first priorities of those running the disaster debris management response?

Was anything overlooked?

What things surprised them?

Was the overall management proactive or reactive and why?

Q.18. Material Progression

Was there an expected progression of materials that were planned for, or was the cleanup reactive to materials as they came? (EPA, 2008, p.20), (Reinhart et al. 1999, p. 10-11,30).

Q.19. Qualifications of Debris Management Team

What was the specialty and background of the people running the debris cleanup and management?

Did the people running the cleanup have waste management and debris management experience?

Did they have previous experience with flood debris management?

Were they familiar with EPA documents about best management practices for disaster cleanup?

Q.20. Impact of Politicians

What was your experience with politicians input to the debris cleanup in High River? (Otto Naes et al. 2005, p.128)

Q.21. Organization of Response
Do you think decisions were planned well, or were they rushed or reactive in any way? (Reinhart et al. 1999, p. 30).

Can you give an example?

Why do you think this decision was rushed or reactive?

Q.22. Hazardous Materials

How were hazardous materials dealt with in High River? (Solis et al. 1996, p. 10-14)

Were there any particular businesses or areas that were considered high risk?

Q.23. Landfill Capacity

What considerations were made for capacity of waste management facilities in the region? (Reinhart et al. 1999, p.11)

Were any closed waste management sites reopened to help take material?

Q.24. Material Tracking

Was all material from the flood tracked? (EPA, 2008, p. 10)

How?

Q.25. Material Handling Strategies

How were the following materials handled? (Reinhart et al. 1999, p.9-11) (EPA, 2008, p. 24-27)

Trees and vegetative debris, Hazardous waste, Asbestos containing waste, White goods, Freon-based appliances, Scrap metal, Recyclable materials, Concrete, Automobiles, Boats

Q.26. Emergency Management Field Officer Program

What is the Emergency Management Field Officer program and how was it utilized in this response? (MNP Report, 2015, pg. 10)

Q.27. Overall Response Assessment
Would you consider the overall cleanup response to have been effective or not? (MNP Report, 2015, pg. 6)

Tervita

Q.28. Contracting Process
Are you familiar with how the province awarded contracts during the cleanup?

Q.29. Utilization of Local Contractors
Do you think local contractors were properly utilized during the cleanup process? (“Sole-sourced Tervita”, 2014, para 1-4)

Safety

Q.30. Safety
Do you think safety was a high priority for the debris management crew?

What steps were taken to ensure safe work?

What training was provided to debris management staff?

Q.31. Safety Policies and Standards
What standards and policies were used to ensure cleanup was safe for volunteers?

Q.32. Safety Training
What training was provided to volunteers before they entered flood impacted homes?

Q.33. Asbestos Exposure and Training
Was asbestos exposure a concern for volunteers and home owners? (EPA, 2008, p.20)

If so, what steps were taken to educate home owners?

What steps were taken to ensure demolition contractors were properly trained in handling asbestos waste?

Improvements
Q.34. Disaster Response Plan Updates

Has a disaster response plan been developed since the 2013 flooding to reflect the lessons learned? (Reinhart et al. 1999, p. 29) (EPA, 2008, p. 5)

Did Alberta or High River utilize disaster response plan tools available online after the flooding? (EPA, 2008, p. 16)

Q.35. Post-flood Training

What type of training has been provided to staff since the 2013 flooding? (MNP Report, 2015, pg. 8)

Q.36. Alberta Emergency Response Plan

Are there plans to update the Alberta Emergency Response Plan?

Q.37. Future Tonnage Projections

Has data been used to generate any future tonnage projections for flooding events? (Hirayama et al. 2010, p.175)

Q.38. Lessons Learned

What were lessons learned during the cleanup efforts? (EPA, 2008, p.44-47).

How have these been implemented since the cleanup?

What types of SOPs have been developed since the flooding?

Survey Questions
Appendix B - Email Invitation Letter

To whom it may concern,

I invite you to contribute to a research project that I am conducting. This project is part of the requirement for a Master’s Degree in Environment and Management at Royal Roads University. My credentials with Royal Roads can be established by contacting, Dr. Chris Ling. The objective of my research project is to look at three questions:

1. How prepared were The Alberta Government and Town of High River for the debris generated from the 2013 flooding?
2. Was the disaster debris management response in High River effective?
3. What lessons can be learned for future disasters in Alberta and High River?

These findings may hold considerations and implications to inform planners and waste management professionals, to help improve readiness and response capabilities for future natural disasters in Alberta. I will be submitting my findings as a thesis to Royal Roads University. There is potential that these findings may be used in the future for teaching and professional development purposes.

My research will consist of interviews with experts and staff involved in the 2013 flood debris cleanup in High River. Questions will focus on areas including: preparation before the flooding, strategies utilized during cleanup, health & safety, and improvements implemented since the flooding. Each interview will take on average 30 minutes. Interviews will occur from May-July of 2017, with the final thesis expected to be completed by September 2017.

Your contribution to this research will be helpful and will be kept strictly confidential if necessary. Discussions will be recorded in audio format and transcribed into Word format. Where appropriate, data will be themed and summarized in the body of the final report. At no time will any specific comments be attributed to any individual, unless given consent by the respondent. Participants may be assigned pseudonyms in order to maintain anonymity. If you do choose to participate, you are free to withdraw at any time without prejudice right up until the submission of the final paper by emailing or telephoning me or my supervisor.

If you are available to commit to an interview, and would like to participate in this research, please email me with your intent to participate. You can also contact me if you have any questions about this research at all:

Name: Joe Angevine

Sincerely,
Joe Angevine
Master of Arts, Environment and Management, graduate student,
Royal Roads University
Appendix C - Informed Consent Form

Title of Project: Come Hell or High Water: A Comparative Analysis of the 2013 High River Flood Response

Name of Researcher: Joe Angevine, Master’s student in Environment and Management
Researcher Affiliation: Royal Roads University
Project Advisor: Gillian Kerr, Royal Roads University Associate Professor

1. I have read and understood the attached information sheet giving details of the project.
2. I have had the opportunity to ask the researcher any questions that I had about the project and my involvement in it, and understand my role in the project before proceeding.
3. I understand that I am invited and free to participate and that I have the right to withdraw at any time without prejudice and without giving a reason.
4. I understand that data gathered in this project may form the basis of a report or other forms of publication and presentation.
5. I understand that my name will not appear on any final documentation without my consent.
6. I would like my responses (check as many as apply):
   - [ ] To all remain anonymous and my identity withheld from publication
   - [ ] To be credited to my name
   - [ ] To be verified, in the case of direct quotes
   - [ ] To be attributed to my job title
   - [ ] To be attributed to a pseudonym

Printed name of participant: ________________________________  Participant signature: ________________________________

Date: __________________________

Researcher’s signature: ________________________________

Date: __________________________
Attachment to the Consent Form (Information sheet)

Title of Project: Come Hell or High Water: A Comparative Analysis of the 2013 High River Flood Response

Identification of the researcher and the university affiliation:
University affiliation: Royal Roads University, Master’s student in Environment and Management
Researcher: Joe Angevine
Project Advisor: Gillian Kerr, Royal Roads University Associate Professor

Statement of research purpose: The purpose of this research is to better understand three issues related to the High River flooding of 2013:
1. Were the Town of High River and the Alberta Government prepared to deal with the debris generated from the flooding?
2. Was the resulting disaster debris management effective?
3. What improvements could be made for responding to disaster debris management in future disasters?
It is my hope that this work will be used to inform and help these governments learn from past disasters and develop strong disaster response plans for the future.

Contact person who can verify the authenticity of the research project:
Name: Christopher Ling Ph.D

Participants: Interview candidates will be drawn from key people involved in the 2013 High River flood response and preparation. Interviewees will include staff from the following organizations: Foothills Regional Landfill, Alberta Environment and Parks (AEP), Alberta Emergency Management Agency (AEMA), hauling companies involved in debris hauling during the 2013 flood, Tervita, consultants hired by Alberta to oversee the 2013 flood cleanup, volunteers that helped clean out basements of impacted homes, and The Town of High River. Additional candidates may be added as a result of recommendations from interviewees.

Involvement in this research project will require the following commitment:
Participate in an interview and reflect on the experiences and lessons learned through the 2013 High River flooding disaster response. There is no cost for the respondents.

Duration of participant involvement in the research project:
Generally, one half-hour interview session, with some respondents needing more time.

The following describes the nature of questions that participants will be asked:
- Did High River and Alberta have a disaster response plan in place for the High River area before the flooding of 2013?
- What types of Standard Operating Procedures were available for responding staff regarding disaster debris management?
- What documents guided the actions of those responsible for disaster debris management?
- What were the first priorities of those running the disaster debris management response?
- Do you think safety was a high priority for the disaster debris management crew?
- What standards and policies were used to ensure cleanup was safe for volunteers?
- What were lessons learned during the cleanup efforts?

Conflicts of interest:
The researcher works in the waste management field, in the case study area. He was the Assistant Manager at the Foothills Regional Landfill during the 2013 flood cleanup, which dealt with most of the waste removed from High River. He has since been promoted to Landfill Manager of the Foothills Regional Landfill. He has opinions about the province’s preparation and response, saw some of the response first-hand, and was personally concerned with the cleanup process. The researcher is also personally concerned with improving the province’s disaster management capabilities for the future.

Participants will have the opportunity to discuss any perceived or potential conflicts of interests with the researcher, so they can make an informed decision about whether or not to participate. Participants are asked to retain a copy of this consent form for their reference.

Project Findings: Interview conversations will be recorded, transcribed and analyzed. Results will be stored as recordings and transcripts and disseminated by including the findings in a final thesis. Participants will be informed of the results of the research by being provided with copies of the final thesis. The final thesis will be published in RRU’s Digital Archive, Pro-Quest and Library and Archives Canada.

Participant Anonymity and Records Confidentiality: All data will be stored on one encrypted external hard-drive, to be locked in a fire proof safe. Both the data and hard-drive will require a user ID, and will be password protected. The only data to be shared, will be the final research paper, using pseudonyms or other options for anonymity based on respondents preferences. Only the researcher for this project and his academic supervisor will have access to raw data with identifying information.

Audio, Video, or Photographic Recording of Participants
The researcher will secure the permission of the participants through the informed consent materials for the use of audio recordings from the interviews.

Right to decline: When a participant indicates that they will not be participating in this research, then effectively they will not be included in this study. Participants have the right to decline at any time.
Appendix D - Demographic Survey

What is your age?
- □ 18-24 years old
- □ 25-34 years old
- □ 35-44 years old
- □ 45-54 years old
- □ 55-64 years old
- □ 65-74 years or older

Ethnicity origin or race: please specify your ethnicity
- □ White
- □ Hispanic or Latino
- □ Black or African American
- □ Other ________________________

What is the highest degree or level of school you have completed?
- □ No schooling completed
- □ High school, diploma or equivalent GED
- □ Some college credit, no degree
- □ Trade/technical/vocational training
- □ Associate degree
- □ Bachelor's degree
- □ Master's degree
- □ Professional degree
- □ Doctorate degree

Where do you currently live?
__________________________________________________

Where did you live during the 2013 flooding in High River?
__________________________________________________

Who was your employer during the 2013 High River flooding?
__________________________________________________

What was your job title during the 2013 High River flooding?
__________________________________________________

How many years of experience did you have in the position you held during the 2013 High River flooding?
__________________________________________________

How many years of experience do you have in the waste management industry?
__________________________________________________
September 20, 2017

Ethical Review – Joe Angevine

To Whom It May Concern:

This letter confirms that the Royal Roads University Research Ethics Board (RRU REB) has approved research for the project: **Come Hell or High Water: A Case Study of the 2013 High River Flood Response**, in accordance with TCPS 2 (2014) *Tri-Council Policy Statement: Ethical Conduct for Research Involving Humans* and [RRU Research Ethics Policy](http://www.royalroads.ca).

Approval was granted on **May 19, 2017**, pending any additional approvals required by the sponsoring organization or any other organization.

Should you require any additional information, please feel free to contact us.

Sincerely,

Gina Armellino
Research Ethics Coordinator
Appendix F – Foothills Regional Services Commission Approval letter
MAY 1, 2017

Royal Roads University

To whom it may concern,

This letter is written to confirm that The Foothills Regional Services Commission (FRSC) is sponsoring the thesis research undertaken by Joe Angevine, for the Master of Environment and Management program at Royal Roads University (RRU). This research will analyze the preparation and response of Alberta and The Town of High River, to the 2013 High River flooding, and will make recommendations on what improvements could be made for future disaster responses in the province. The FRSC understands that this research may have implications and recommendations for the FRSC and does not require a review in addition to the RRU ethical review. The FRSC also does not require a research privacy agreement that is different from the RRU ethics review for this project.

Yours truly

W. (Bill) Robinson, BAccs, CPA, CGA

CAO – FOOTHILLS REGIONAL SERVICES COMMISSION