The Multiple Barrier Approach to Safe Drinking Water for First Nations Communities: A Case Study

by

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I hereby declare that I am the sole author of this thesis. This is a true copy of the thesis, including any required final revisions, as accepted by my examiners.

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Abstract

The drinking water contamination tragedy in Walkerton, Ontario during the spring of 2000 led to many changes in water management for the province. Among these changes has been the increased use of the multiple barrier approach (MBA) to safe drinking water as the basis of water management for communities throughout Ontario. The MBA is also used in the management of water for First Nations communities throughout Ontario and Canada. Literature on water quality management for First Nations suggests that despite these changes, many communities continue to face challenges for ensuring the safety and quality of their drinking water supplies. Fort William First Nation, Gull Bay First Nation, and Mattagami First Nation, were selected for this study in order to investigate the use of the MBA in these communities. Data was collected using key informant interviews with representatives of institutions that affect water management for the case study communities, direct observations during visits to two of the communities and attendance at a First Nations water policy forum, and through a review of recent reports and publications on safe drinking water for First Nations. The research has provided insight into the challenges that the case study communities face for ensuring safe drinking water under the MBA, as well as opportunities that exist to address those challenges. The findings suggest that the MBA currently does not meet the unique needs of some First Nations communities. They also suggest that specific adaptations of existing water management strategies to the MBA framework may lead to a more effective approach to ensure safe drinking water for First Nations communities. This thesis focuses on several key ways to make these changes: Strengthen public involvement and awareness; Introduce effective legislative and policy frameworks; Encourage research, science and technology for First Nations' water management; Allocate sufficient financial resources to First Nations to recruit, train and retain qualified water managers and maintain drinking water infrastructure, and; Increase efforts to ensure that water management goals are supported by local and indigenous traditional knowledge, beliefs and perspectives.

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Stu

Dedicated to the memory of my grandmother, Sarah, who was a model of selflessness and who found endless joy in the details of life.

"Tell me, are you going back to school?"

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AGGEP: Anishinabek of the Gitchi Gami Environmental Programs

AAWTT: Advanced Aboriginal Water Treatment Team

ATK: Aboriginal Traditional Knowledge

CELA: Canadian Environmental Law Association

CGDWQ: Canadian Guidelines for Drinking Water Quality

CRTP: Circuit Rider Training Program

COO: Chiefs of Ontario

CWA: Clean Water Act, 2006

ENGO: Environmental non-government organization

FNWMS: First Nations Water Management Strategy

FNWPF: First Nations Water Policy Forum

FWFN: Fort William First Nation

GBFN: Gull Bay First Nation

INAC: Indian and Northern Affairs Canada

LRCA: Lakehead Region Conservation Authority

MRSPC: Mattagami Region Source Protection Committee

MBA: Multiple (or Multi-) Barrier Approach

MOE: Ontario Ministry of the Environment

NAN: Nishnawbe-Aski Nation

NGO: Non-government Organization

OFNTSC: Ontario First Nations Technical Services Corporation

PTO: Political-Territorial Organization

SDWF: Safe Drinking Water Foundation

SWP: Source Water Protection

THM: Trihalomethanes

UOI: Union of Ontario Indians

WCWC: Walkerton Clean Water Centre

WHO: World Health Organization

1. INTRODUCTION

1.1. Problem Context

> *"When it comes to the safety of drinking water, residents of First Nations communities do not benefit from a level of protection comparable to that of people who live off reserves."*
> Commissioner of the Environment and Sustainable Development [CESD] (2005, 1)

This statement, taken from the Auditor General of Canada's review of drinking water in First Nations communities, identifies the unbalanced nature of safe drinking water provision in Canada. A number of changes to drinking water policy in Ontario and Canada have been introduced over the course of the past decade in order to ensure safe drinking water for all Ontarians (see Subsection 2.2.2). The changes were largely the result of Justice Dennis O'Connor's (2002 a,b) report on the public inquiry into the contamination of Walkerton, Ontario's municipal drinking water supply in 2000 that led to seven deaths and more than 2000 illnesses. Many of Walkerton's residents, according to Rizak and Hrudey (2008), have lifelong health complications from those illnesses. In Part II of the report, O'Connor (2002b, 486) identifies First Nations communities as having, "some of the poorest quality water in the province."

Prior to the Walkerton incident and inquiry, water issues for First Nations were simply not on political agendas (Mascarenhas 2005, 16). The current public awareness of daily challenges that First Nations face in drinking water management is a recent phenomenon, largely triggered by the Walkerton tragedy. This was the case despite the fact that numerous First Nations had experienced water contamination comparable to Walkerton's many times in the preceding ten years. The fact that the present awareness emerged from an incident in a non-First Nation community is perhaps a reflection of the disparity between First Nations and non-First Nation communities. One such community that has dealt with serious water quality challenges is Grassy Narrows First Nation. The community's Wabigoon River was contaminated with mercury in the 1960s, which led to the accumulation of the heavy metals in staple foods. As a result of this, many of the people living in the community are still experiencing the effects of that incident (Canadian Broadcasting Corporation [CBC] n.d.; Quinn 1991). More recent

examples of water contamination include the water quality advisories in communities like Pikangikum First Nation and Neskantaga First Nation that, as of 2008, had been in effect for more than a decade according to the Polaris Institute (Harden and Levalliant 2008). The experiences of communities like these two First Nations are now being discussed more often in public discourse.

Since the Walkerton incident, more attention has been paid to water quality issues for First Nations. This attention is manifested in the various government-commissioned reports and panels as well as publications from Non-Government Organizations (NGOs), that explore these and related issues (Chapter 2 for more information). One incident in particular, the contamination and subsequent evacuation of Kashechewan First Nation in 2005, has helped to bring First Nations' water issues into political and public discourse in Canada. Despite this attention, in early 2009, more than 40 First Nations communities in Ontario (and more than 100 across Canada) continued to experience boil water advisories (Poulin 2009). Thus, while the growing attention to water quality challenges for First Nations may have a positive effect in the long term, many communities continue to struggle daily with unsafe drinking water at present.

1.2. Research Objectives

This research has two primary objectives: The first is to gain an understanding of some of the main challenges that First Nations face in ensuring safe drinking water through examining the use of the Multiple Barrier Approach (MBA) to safe drinking water in three communities. Krewski et al. (2002) characterize the MBA as a fundamental risk-based approach to water quality management. The second main objective of the study is to identify opportunities for addressing the common drinking water challenges in these communities and to provide policy recommendations based on these findings. A secondary objective of the study is to develop policy recommendations for improving the provision of safe drinking water for First Nations, based on the research findings.

1.3. Methodology Overview

This research involved the exploration of drinking water challenges and opportunities in three case study communities located in northern Ontario. The three communities of Gull Bay First Nation, Fort William First Nation and Mattagami First Nation were selected for use in the case study. I focused on the institutional environment to shed light on the influence that policymaking and program implementation had on the ability to ensure safe drinking in First Nations' communities.

Interviews were conducted with representatives from each of the sample communities and with key informants from the institutional environment related to water resources for the three case study communities. Participants from the institutional environment included individuals from: federal and provincial ministries; a public health unit; source water protection committee members; an organization providing technical services to First Nations; a community-based environmental non-government organization (NGO); and a First Nations Political-Territorial Organization (PTO). Representatives from the cultural institutions included Elders and community leaders.

In addition to interviews, data were gathered from peer-reviewed literature and from other documentary sources including government and non-government reports, policy briefs, press releases, and websites. Direct observation, undertaken during two months of field research, was also included as data, to supplement the interviews and review of literature. Observations were recorded during visits to two of the three study communities, and through attendance at the Chiefs of Ontario First Nations Water Policy Forum (herein referred to as the FNWPF), where I listened to discussions among representatives of First Nations and other institutions, and where I was able to identify potential interviewees through networking. The different types of sources gathered through direct observations provided me with a variety of data sets that were used to compare and contrast information.

1.4. Thesis Overview

This thesis examines the MBA as it is applied to First Nations communities. The research findings allow for new insights into how drinking water is currently managed in First Nations communities, and how it may be improved in the future. The following chapters describe in detail how these findings were developed.

Chapter 2 of this paper constitutes the literature review, which explores the core concepts of the study: risk management, the MBA, and Aboriginal people and water. This describes the conceptual framework used in the research, which is informed by these core concepts and it discusses the main theories and research that were used to support the study design. Chapter 3 describes the methodological approach to the research, as well as the specific methods used in data collection and analysis. Chapter 4 consists of the case study characterization, providing details about the study communities and the various study participants and data sources. The results, discussion and conclusions in Chapters 5 and 6 describe the findings, which support my assumption that the multiple barrier approach must be adapted to the contexts of First Nations communities. Specifically, drinking water management needs to include: improved and culturally appropriate public involvement and awareness; enforceable regulations and guidelines for drinking water services; the incorporation of Indigenous traditional knowledge and beliefs in treatment technologies; the availability of qualified and committed community water managers; and the improvement of funding arrangements.

2. LITERATURE REVIEW

This study investigated policies and practices of drinking water quality management for First Nations communities, with a specific focus on the MBA for safe drinking water. The conceptualization, design, and analysis processes were informed by literature from several disciplines including physical and social geographies, biology, anthropology, political science, and law. A substantial amount of information on First Nations' drinking water was drawn from non-academic literature, such as reports on adverse water quality in communities, commentary on water policy by environmental non-government organizations (ENGOs) and Aboriginal organizations, government reports on special commissions and inquiries, and journalistic material. For this reason, the literature review delves into literature that is not always peer-reviewed. The inclusion of these sources was justified because issues relating to water quality for First Nations in Ontario are in debate both within and to a large degree outside of academic discourse.

The increased focus in the media and in government reports on drinking water issues in Ontario was largely influenced by the contamination of Walkerton Ontario's water supply in 2000. This event is also a reference point for an increase in national attention on First Nations' water issues. The incident in Walkerton and the subsequent public inquiry brought water quality concerns into the public sphere, shaking the confidence of Ontario's residents in their water supplies and catalyzing the movement towards better approaches to determining standards for drinking water management in the province (Mascarenhas 2005). In the report of the Walkerton Inquiry, Justice Dennis O'Connor identified First Nations in Ontario as having, "some of the poorest quality water in the province" (O'Connor 2002b, 486). Section 2.2 therefore provides a discussion of the details and main causes that lead to this situation in Northern communities.

The literature review is structured in the following manner. First, a brief justification of the study is provided, followed by an overview of the recent history of drinking water management for First Nations. The next section (2.2) is subdivided into several subsections; it includes a

brief discussion of writings on traditional Indigenous beliefs and perspectives on water (Subsection 2.2.1), and it reviews drinking water policy for First Nations, including issues of jurisdiction over water and the standards and guidelines that currently exist for water quality and infrastructure, for First Nations communities (Subsection 2.2.2 and 2.2.3). Subsection 2.2.4 describes and discusses a variety of government and non-government reports, the publication of which have been prompted by recent incidents of drinking water contamination in Canada during the past decade. The final subsection (2.2.5) explores the future directions for First Nations' water policy that are described in the literature.

Sections 2.3 and 2.4 of the literature review look specifically at literature on risk management for drinking water quality, as well as the multiple barrier approach to safe drinking water respectively. The MBA is a practical framework for risk management for drinking water quality (Hrudey & Hrudey 2003) and the principles of this approach have become entrenched in drinking water management for water systems in Ontario, including for First Nations' water systems. The MBA framework is used in the thesis in order to provide context and structure to the study's methodology; this is elaborated on in Section 2.5.

2.1. Justification of Research

The original motivation for undertaking this research arose from the high number of First Nations communities throughout Canada that are experiencing adverse water quality. Throughout 2008 and early 2009, Health Canada (2009) consistently reported that more than 100 First Nations communities either had to boil their water, or could not consume it due to poor water quality. This number alone indicates that the current approach to ensuring drinking water safety on reserves is failing many communities. Coupled with this circumstance is absence of studies investigating the suitability of the MBA for First Nations in the literature on safe drinking water for First Nations. One exception to this is an article by Arquette et al. (2002), which provides a critique of conventional approaches to risk management (a concept that forms the basis of the MBA, as will be discussed in Section 2.3) and its suitability for First Nations. In their article, Arquette et al. suggest that risk management is often practiced in such a way that it does not benefit First Nations, in part because it fails to incorporate traditional

Indigenous perspectives, knowledge, or values. The MBA also fails to benefit First Nation communities in some ways because the institutional arrangements that have popularized the MBA in Ontario have not included a First Nations perspective, nor have these arrangements considered the Nation to Nation implications and relationships that affect this type of risk management. This thesis intends to fill the research gap, by investigating the effectiveness of the MBA for First Nations' drinking water and by recommending ways in which the MBA can be adapted to better improve drinking water management for those communities.

2.2. Drinking Water Management for First Nations

The history, present circumstances and future of drinking water management for First Nations communities are multilayered and complex phenomena from several perspectives. In a sense, drinking water management for reserves is a topic that touches on many contentious issues for Indigenous people in Canada. These issues include (but are not limited to) public health, sovereignty of Indigenous peoples, and environmental protection. The many different roles that water itself plays for different people adds complexity – it is both a life sustaining substance and an economic good; for some water holds spiritual significance, yet for many people it is also a convenient vector for waste disposal. This heterogeneous nature of water provides some challenges to drinking water management.

Wilson (2004, 70) indicates that the conventional approach to water management in Canada often leads to, "end-of-pipe solutions [that] do not address the deeper, more widespread abuse of water resources." Furthermore, water management in Canada typically does not incorporate traditional Indigenous perspectives on water, such as those concerning the interconnectedness of water with all ecosystem elements and the notion of water as an "all pervasive life force" (Notzke 1994, 7). Since the case study communities are all located in or in close proximity to Ontario's Great Lakes Basin, the geographical emphasis of this discussion is on Ontario; however, First Nations across the country are affected by many of the same conditions. These conditions are as a result of Federally-based water quality guidelines and Federal agencies that have responsibility for many aspects of First Nations' drinking water. In his dissertation on water management for First Nations in southern Ontario, Mascarenhas (2005) asserts that

water management has undergone a form of commercialization in the province, particularly during the neoliberal political environment of the 1990s under the leadership of Premier Mike Harris' Conservative party. Examples of this trend included the privatization of water quality testing laboratories throughout the province and broad amendments to environmental regulations, which have undermined the ability of government agencies to protect water quality (*ibid.*). This market-oriented approach to the business of managing water tends to consider water more in terms of its physical, chemical, and biological properties than in terms of the essential services that it provides to people and to the environment. The following subsections expand on these notions and provide an overview of water management for First Nations in Ontario.

2.2.1. Indigenous Traditional Knowledge and Water

It is important to consider traditional perspectives and beliefs about water in order to provide a deeper understanding of the role that the substance plays in the case communities. Traditional perspectives can also provide insight as to why conventional water management approaches do not always address the needs of so many First Nations in Canada. There is a large body of literature on Indigenous traditional knowledge (ITK)[1] (Chiefs of Ontario [COO] 2001); the intent of this section is to provide an overview of that literature, to discuss the role of ITK in this research, and to provide a brief glimpse into traditional perspectives on water.

Traditional knowledge is described by Hobson (1992) as the accumulated knowledge that humans acquire regarding their physical and spiritual relationships to their place in the world. Sources on traditional knowledge make little mention of specific lengths of time that are required to nurture these relationships, as the length of time necessary to do so likely varies among different people and cultural groups. Indigenous people have inhabited the land that is now known as Canada for many generations and as such traditional Aboriginal cultures, spiritual beliefs, languages, and worldviews are embedded with intimate knowledge of the environment, based on generations of first-hand experience. It is important to note that there

[1] In this paper the term "ITK" is used as an equivalent to Aboriginal Traditional Knowledge (ATK). I have occasionally written "ATK" in references to publications that specifically use this term, since their synonymity is somewhat debated in the literature.

are many different and diverse Aboriginal cultures within Canada, although some general similarities do exist among certain Nations. It is also worth noting that in part due to the loss of many Indigenous languages and cultures through influences such as the residential school system, traditional knowledge is not held by all people of Aboriginal descent. However, the Chiefs of Ontario (COO 2006, 5) mention that, "the vast majority [of the First Nations population] continues to possess certain aspects of it." The presence of diverse Indigenous cultures throughout the country means that the perspectives presented in this paper should not be assumed to represent all Indigenous cultures or people in Canada. The Chiefs of Ontario (2006, 5) identify water as something that, "offers 'life-giving' forces, accompanied by certain duties and responsibilities, none of which can be adequately expressed in a convenient package for the consumption of non-Native society." My intention is to present perspectives that are as accurate and relevant to Anishinabek culture (i.e., the cultures of the case study communities) as possible.

In a publication released by the Chiefs of Ontario on Aboriginal traditional knowledge and source water protection (COO 2001), the authors stress that despite the large body of literature that addresses Indigenous ways of knowing, there are many aspects to traditional knowledge systems that cannot be fully described in writing, such as knowledge holders' spiritual belief systems and experiential knowledge. The Chiefs of Ontario also note the difficulty faced in communicating traditional knowledge to people who hold Western perspectives, because it differs in its fundamental philosophies and it is imbued with Aboriginal traditions, laws, languages, and worldviews (Arquette et al. 2002; COO 2001; COO 2007; McGregor 2004).

Interest in Indigenous ways of knowing amongst researchers has been growing since the 1980s (Agrawal 1995; Berkes et al. 2000; Van Gerwen-Toyne 2001). This trend has been motivated in part by the failure of what Agrawal (1995, 419) describes as the "grand theories of development," to bring about the positive change they were intended to, in the developing world. Attention to traditional knowledge has also been fuelled by the search of environmental movements for more holistic worldviews than the conventional, Western notions of progress through economic and technological advancement. Several scholars highlight that over the course of nearly three decades, research and discourse on the topic of Indigenous knowledge

have frequently suffered from generalizations, conceptual weaknesses and attribution of the "noble-savage" stereotypes (Berkes 2008; Proctor 2000; Stevenson 2001). There is also general agreement in the literature on Indigenous knowledge that there are many different types, levels, and layers to traditional knowledge systems (Usher 2000; White 2006). One characterization of traditional knowledge, described by Berkes (2008, 4), conjures the notion of traditional knowledge as "a way of life," and, "ways of knowing", as opposed to the Western notions of knowledge as information.

According to Notzke (1994), the basic premise of natural resources management is founded upon Western ideologies of human superiority over nature and is therefore in some ways philosophically incompatible with traditional Indigenous culture and traditional perspectives on the environment, which tend to consider that, "all aspects of life are interrelated." Notzke points out that Western water managers often see water as a product that must be managed with technology, to ensure humans can consume it safely. Alternatively, traditional Indigenous cultures tend to hold broader conceptualizations of water as the Earth's lifeblood, having a role not only in the sustenance and livelihoods of people but also in culture, spirituality, and the natural world (Environment Canada 2008). Walkem (2007) underscores the nature of conventional resource management as being human-centred, with little acknowledgement that the human species is only one of many forms of life. While there have been some attempts to incorporate ITK into conventional water management in Canada, many efforts made to date have not been sufficient. Several provinces and territories in Canada require that traditional knowledge be included in resource management policy and legislation, yet this often occurs without adequate consultation with Indigenous knowledge holders themselves (White 2006).

Despite the historically deep divide between philosophies of conventional Western approaches to water management and Indigenous traditional approaches and relationships to the environment, there has been some discussion in the literature regarding potential confluences between Western and traditional Indigenous ways of knowing. In part, this discourse has emerged out of the drive to integrate traditional knowledge with Western science in resource management (Van Gerwen-Toyne 2001). Some, such as Stevenson (2001) and Proctor (2000), argue that the very notion of "traditional indigenous knowledge" is a Western concept itself,

and its characterization as a distinct body of knowledge often does nothing to benefit those Indigenous people from whom it is obtained. Furthermore, Stevenson (2001) touches on the notion that Western conceptualizations of traditional knowledge strip it of its deeper, spiritual and personal meaning to Aboriginal people.

Other scholars, such as Agrawal (1995) and Berkes (2008), insist that both significant similarities and differences exist between the two paradigms of Western science and ITK. Agrawal (1995) admits that both Western and Indigenous knowledge systems are highly heterogeneous and cannot be generalized into simple definitions or characterizations, but he insists that along with the differences between the knowledge systems, many overlaps and complementarities can be found. Berkes (2008) identifies some of the major differences that are thought to exist between the two paradigms: ITK is generally considered to be embedded in culture, location, time, and spirituality, whereas Western science is disembodied, universal, and value-free. Berkes also mentions it is likely that Western science and ITK have been mutually influenced by each other over time and therefore exhibit some similarities. Opinions among traditional knowledge holders, academics and policy makers differ, and the debate as to what connections may be made between Western science and traditional knowledge persists.

There has been a recent trend in resource management, to incorporate some aspects of traditional indigenous values into conventional Western scientific management practices. One example is provided by Berkes et al. (2000), who draw parallels between ITK and adaptive management (see Gunderson et al. 1995; Holling 1978). In order to support this example, Berkes et al. (2000) provide a review of literature on ITK in resource management, and give examples of social learning that lead to adaptive systems of environmental management, and therefore practices that align with adaptive management approaches. They label adaptive management as, "rediscovery of traditional systems of knowledge and management." There is also a broader literature on the integration of scientific knowledge with local knowledge systems; in a recently published literature review of stakeholder participation in environmental managements, Reed (2008) argues that combining local and scientific knowledge systems can enhance knowledge of complex environmental systems and provide benefits to environmental decision-making.

Traditional Indigenous perspectives on the environment tend to consider all of the elements of the natural world as natural and interconnected, having life and innate value, apart from nature's utility for humans as the source of 'natural resources' (Arquette et al. 2002; COO 2001; Walkem 2007). Furthermore, whereas some Western policy makers view threats to the environment as posing risks to human health and well being, traditional Indigenous perspectives go further, viewing health in terms of culture, spirituality, and the environment, as distinct from humans (COO 2006; Walkem 2007). In illustration of this point, Walkem (n.d., 6) explains that: "Indigenous Peoples [*sic*] relationship with water demands far more than a simple recognition of a right to use or drink water, and must include respect for our responsibility to make decisions for the preservation of water and its ability to sustain life."

Walkem (2007) outlines four general perspectives of Indigenous peoples' attitudes towards water:

- The concept known as the "Seventh Generation Principle", where multiple generations including youth and Elders are responsible for considering the impacts of decisions made today on generations far into the future.

- Recognition of the interconnectedness of all things, living and non-living; a perspective considers all aspects of the environment as "kin" to humans.

- The need for humans to recognize the inherent value of water, as opposed to water's value in terms of the services that it can provide.

- The role of Indigenous people to "say no" to developments or management approaches that do not align with Indigenous Peoples' principles.

Despite the important role ITK plays to managing water, policymaking and practice for safe drinking water for First Nations has largely occurred in absence of traditional Indigenous laws (Walkem 2007, 309), practices and beliefs (Agrawal 1995; Simpson 1999). In order for

drinking water provision to be improved, ITK must inform these processes in a way that respects philosophical differences and involves First Nations people.

2.2.2. Law and Water for First Nations

According to Ardith Walkem (2007), First Nations people in Canada have consistently been denied the right to safe and clean water. She outlines a legal perspective of this ongoing challenge. An understanding of the legal barriers and tools facing First Nations is important because increasingly, Indigenous people are turning to the judicial system in order to address the water quality disparity in Canada (Walkem 2007).

Officially, the federal government holds the authority to make laws applying to "Indians and lands reserved for the Indians" as per Section 91(24) of the Constitution Act, 1867. There are a number of federal laws that impact water for First Nations both directly and indirectly. These laws include the Canada Water Act, Canadian Environmental Protection Act, Department of Health Act, Department of Indian Affairs and Northern Development Act, Fisheries Act, Indian Act, First Nations Land Management Act, and the First Nations Commercial and Industrial Development Act. Table 1 lists and describes each of these pieces of legislation. The number of acts that impact water management for First Nations indicates the fragmented nature of the legislative environment for drinking water in Canada; there is no uniform piece of legislation that dictates jurisdiction over and responsibility for water, where First Nations are concerned. Instead, water is governed in a way that further complicates an already complex resource to manage, particularly among communities that do not often have the resources or capacity to engage in these multiple pieces of legislation and regulation.

Table 1: Federal Legislation Affecting Water Management for First Nations

Legislation	Description
Canada Water Act (1985)	Establishes roles for the Federal Minister of the Environment in water management for water quality management areas that are of shared-interest with the governments, institutions and individuals. The Act provides the minister with some authority to designate what constitutes waste, and to identify appropriate management and enforcement steps. It plays a minor role in source water protection. The scope of this legislation is limited for First Nations water.
Canadian Environmental Protection Act (1999)	Designed to regulate and control the release of toxic substances such as persistent organic pesticides (e.g. DDT) and dioxins. Part 9 of the Act allows for regulations for pollution prevention and control, specifically for Aboriginal land. Lead Agency: Environment Canada.
Department of Health Act (1996)	Assigns responsibility to Health Canada for areas that are, "not by law assigned to any other department, board or agency of the Government of Canada." (Health Act, supra note 4 at s 4(1)). Whether another agency of the federal government is responsible for First Nations water is not clear in the legislation. Also, regulations that are formed under this act apply to fairly simple water systems, and penalties for non-compliance are weak.
Department of Indian Affairs and Northern Development Act (1985)	Delineates powers to Minister of Indian Affairs to issues that are not assigned to any other agency or body and over which INAC has jurisdiction. Within the Act, there is no list of specific issues that can be regulated; however authority does exist for the Minister to introduce a new law governing First Nations water.
The Fisheries Act (1985)	Regulates the management of waters in order to protect fish. It affects fish harvesting practices, fish habitats, the release of toxic substances, and the safe use of fish. Due to its focus specifically on fish, it has limited utility for the management of drinking water sources. Lead agency: Department of Fisheries and Oceans Canada.
Indian Act (1985)	Permits the Federal Cabinet to make regulations in order to prevent the spread of disease and maintain sanitary conditions on reserves. To date, the Act has not been interpreted or applied to drinking water management. According to Swain et al. (2005b), the nature of the legislation precludes that it would not be sufficient for the complexity and size of First Nations' water systems and the complexity of issues facing communities. The extent to which the Act can regulate water management is very limited, and enforcement for the regulations would be not be culturally appropriate. Additionally, while the Act allows for the creation of by-laws for some aspects of water management by first nation band councils, the enforcement options are severity limited in terms of severity and scope. Lead agencies: INAC, Health Canada.
First Nations Commercial and Industrial Development Act (2005)	Designed for the regulation of large-scale commercial and industrial development on reserves, the Act could be used to regulate water facilities. However, in order to use this legislation, First Nation bands are required to agree to the incorporation by reference, and enforcement, of provincial regulations. The use of provincial legislation is a major sticking point for many First Nations. Lead agency INAC.
First Nations Land Management Act (1999)	Provides the powers, rights and privileges of land ownership to First Nations, and overrides any aspects of the Indian Act related to land management. To make and enforce regulations under the act, First Nations must be a signatory to the Framework Agreement on First Nations Land Management (February 12, 1996), and must have developed a land code designating procedures for land transfers, accountability, resource revenues, conflicts and so on, related to land management. Under the Act, First Nations can make regulations relating to the protection of land, including environmental assessment, monitoring, and protection. 17 First Nations had enacted land codes in 2005, and at that time, none had included water regulations under the Act (Swain et al. 2005) While the Act has potential as a tool for water system regulation, it requires more resources and capacity to implement than many First Nations have to commit. Lead agency INAC.

Adapted from: Swain et al. (2005b)

Some provincial laws can also apply by general application[2] to reserve lands as long as: they do not infringe upon the nature of being "Indian" as defined in the Indian Act, 1985; they do not conflict with jurisdiction assigned to band councils; or they do not detract from fiduciary responsibilities of the federal government, for reserves (COO 2001; O'Connor 2002b; Swain et al. 2006b). There is some debate as to whether provincial water quality laws should apply by means of general application on reserves. The Expert Panel on Safe Drinking Water for First Nations (herein referred to as the Expert Panel) however, had the following summary of the issue: "Applying provincial drinking water and wastewater law as a law of general application is fraught with such uncertainty that it is neither a viable nor effective option" (Swain et al. 2006b, 2). An example of where provincial legislation for water protection would pose a problem if applied to reserves is the Clean Water Act, 2006, for source water protection. The Act often leads to changes in land management in order to protect water sources; requiring reserves to do so under the legislation would infringe upon federal jurisdiction and the constitutional rights of First Nations (Swain et al. 2006b). In the report on the Walkerton inquiry, O'Connor (2002b) discusses this controversy and ultimately avoids making conclusions as to which laws should apply to First Nations' water. Instead, he suggests that the province has a lot to offer in terms of expertise and resources that could be beneficial in cooperative relationships between governments, instead of imposing such assistance.

At the provincial level in Ontario, there are a number of acts that indirectly affect drinking water management. Several of these statutes deal with environmental protection and the prevention of pollution and contamination. While these acts do not apply to reserve lands, the regulations made under them inevitably impact the quality of water that First Nations receive, because of the natural movement of water across borders. Examples of such provincial legislation are the Environmental Protection Act (1990), the Ontario Water Resources Act (1990), and the Nutrient Management Act (2002). These acts are interesting to consider, but since they are not directly applicable to First Nations, I have not provided a comprehensive list

[2] Section 88 of the Indian Act (1985) indicates that some provincial laws may apply by reference to First Nations, except where such laws conflict with the Act or with other laws or rules that have been created by Bands under the Act.

of the acts or their impacts. For a thorough discussion on this matter, see Chapter 2 from Part II of Report on the Walkerton Inquiry (O'Connor 2002b).

Certain features of Canadian law have also been used to assert First Nations' rights to natural resources. The sources include reserve rights, Aboriginal title, Aboriginal rights and treaty rights (Walkem 2007; Bartlett 1988). Each of these sources of rights was reinforced in Section 35 of the Constitution Act, 1982, where it declares: "The existing Aboriginal and treaty rights of the Aboriginal peoples of Canada are hereby recognized and affirmed." According to the Chiefs of Ontario (2001), this section of the Act limits the capability of the Crown to infringe upon those rights. Despite legal recognition of Aboriginal and treaty rights however, the impacts those rights have on drinking water management remains largely unexplored in the courts. Some, such as Bartlett (1988), view water rights as inherently part of Aboriginal and treaty rights; however the literature implies that this is not universally recognized – at least not yet. Future court rulings may create the conditions under which these rights are recognized, although this would be an expensive and time-consuming process.

Some consider the Indian Act, 1876 (revised in 1985), as yet another legal obstacle to ensuring safe drinking water for First Nations. This piece of federal legislation is now more than a century old and according to Bartlett (1990), serves only to exacerbate the obstacles that First Nations face. Bartlett (*ibid.)* points in particular to the few provisions that allow for self-government by First Nations communities and therefore independent decision-making power over the land and water. According to Notzke (1994, 3), "Indian treaty rights have a tradition of restrictive interpretation." This statement implies that the interpretation of treaty rights has been historically limited to issues that are explicitly addressed in legal documents, and that broader interpretation of those rights has usually not been practiced. Such limitations have acted as barriers to some First Nations to the protection of water resources, since water rights are generally not specifically addressed in treaties.

The 1980s and 1990s brought some important changes to the legal system as it affects natural resources for First Nations people in Canada. Arguably the most significant change was the inclusion of entrenched Aboriginal and treaty rights for First Nations in Section 35 of the

Constitution Act, 1982. Following this, a 1990 Supreme Court decision on Sparrow (R. v. Sparrow [1990]) also had a major effect on Aboriginal peoples' rights. In short, the decision was the first time that the extent of Section 35 of the Constitution Act was explored in the Supreme Court (Notzke 1994). The Sparrow case addressed the fiduciary responsibility of the federal government to respect and give priority to Aboriginal rights, and it reinforced that any infringement upon or denial of them by the Crown must be clearly justified and demonstrated. In the outcome of the case, the Supreme Court laid out a process by which Aboriginal peoples can address disputes regarding their Aboriginal and treaty rights in the courts. Since that decision, a number of other cases have further clarified that process, including Delgamuukw v. British Columbia [1997], which addressed land title for the first time, acknowledging the right of First Nations to own land and resources, in order that they can be used for purposes that are not traditional or historical, such as for economic development. This decision may have important future implications regarding "non-traditional" water use by First Nations, particularly with the ongoing and rapid growth of Aboriginal populations.

Despite court decisions such as Sparrow*,* 1990, which serve to underscore Aboriginal people's rights to access resources, Notzke (1994) indicates that there have been few court decisions on the subject of water rights for First Nations. Bartlett (1988) and Walkem (2007) maintain that implicit in the establishment of reserves is enough water to prosper; this concept has legal recognition in the United States through a court decision now referred to as the Winters Doctrine (Winters vs. United States 1908). Notzke (1994), however, claims that these rights are not completely effective in the U.S. and that the existence of these rights is often more symbolic than truly beneficial for First Peoples there. This example provides a lesson for Canada, that any legislation that is introduced to uphold First Nations' rights to safe drinking water must reinforce accountability and be enforceable to ensure that those rights can be realized at the community level.

Even with the existence of constitutional protections of Aboriginal and treaty rights, and the possibility that future court decisions will lead to better water management, First Nations still face many obstacles to ensure safe drinking water. In particular, the processes by which Indigenous people can assert their rights through the courts can be a very expensive and

lengthy undertaking, in an institution (i.e., the Canadian court system) that many Indigenous people see to be a colonial one. Thus even the option of using the legal system is riddled with obstacles and barriers for many people. Furthermore Notzke (1994) emphasizes that the struggle by First Nations within and outside of the courts is not simply about the right to use and access resources, or to gain control over resources. At its core, this struggle is also about the meaningful involvement of Indigenous people in decision-making that affects their health and the desire for this decision-making right to become an integral part of all policy making affecting Aboriginal peoples.

2.2.3. Jurisdiction and the Institutional Environment

In order to understand the various players who are involved in water management for First Nations communities, it is important to review Canadian water jurisdiction. Legislated responsibility for water management in Canada is divided between the federal and provincial governments through the Canada Water Act (1985), which assigns the primary responsibility for provision of safe drinking water to the provinces (Hill et al. 2007). The federal government has reserved direct responsibility over what is referred to as the Federal House, which includes military bases, federal prisons, national parks and First Nations reserves (Hill et al. 2007; Mascarenhas 2005). A major challenge for water management on reserves is that legally enforceable national guidelines do not exist. Since water resources do not adhere to political boundaries, this dichotomy in legislated control is particularly complicated (de Loë et al. 2002; Hill et al. 2007; O'Connor 2002a).

Specific responsibilities for water management are shared between Health Canada, Indian and Northern Affairs Canada (INAC), as well as by First Nation band councils (Mascarenhas 2005; O'Connor 2002a). At the community level, First Nation band councils are responsible for the design, construction, and maintenance of water treatment and distribution facilities on reserves and for providing 20% of the necessary funds for construction; the balance of funds and oversight of these projects are provided by INAC (Indian and Northern Affairs Canada [INAC] 2009b; Swain et al. 2006b). Health Canada is responsible for water quality monitoring and the issuance of adverse water quality advisories. While this delineation of responsibility appears to be straightforward, Ardith Walkem (2007) believes that in practice it is highly ineffective.

Among a variety of problems is the limited ability of many band councils to provide the required 20% of funding for water management projects as well as the lack of legally enforceable standards for the design of water treatment and distribution systems and for the water quality that those systems provide (Commissioner of Environment and Sustainable Development [CESD] 2005; Harden & Levalliant 2008; O'Connor 2002b,).

Other federal departments that are involved with First Nations' water and wastewater include Public Works and Government Services Canada, which assists with procurement and engineering advice and approvals, and Environment Canada, which is involved with source water protection, through its responsibilities over the discharge of wastewater into federal waters (Swain et al. 2006a), and through the provision of tools and information about source water protection (SWP) to First Nations (INAC 2006). There are many other ministries at the federal and provincial levels that impact water management for jurisdictions outside of First Nations, but have indirect effects on First Nations by way of the water that flows into reserves. An example at the federal level is the Department of Fisheries and Oceans and Environment Canada, which develops and implements programs and policies for the protection of oceans and fresh water bodies throughout the country (Fisheries and Oceans Canada 2009). Provincial agencies are typically responsible for the regulation of drinking water, although several federal ministries play indirect roles in water management through agriculture, fisheries, and financial allocations (O'Connor 2002b).

A number of provincial ministries and agencies in Ontario are also involved in water management. These include the Ministry of Agriculture, Food, and Rural Affairs, the Ministry of Natural Resources, and the Ministry of Health and Long Term Care. Even though provincial ministries do not play direct roles in water management for First Nations, the services of some ministries benefit many reserves. For example, the Ministry of Environment plays a role in reviewing and certifying water treatment facilities upon request and it works with some First Nations (those that are located within the boundaries of source protection areas) to include these communities in the provincial source water protection initiative. The Ontario Clean Water Agency also works with First Nations on operator certification on a cost-recovery basis. Conservation Authorities (CAs) in Ontario are watershed management

agencies that are established under the authority of the Ontario Ministry of Natural Resources and are funded and administered locally. These organizations play indirect yet important roles in water management and protection. While the jurisdiction of CAs does not extend to reserves, their roles in flood protection, source water protection, and watershed and land management in conservation areas can have impacts on the state of First Nations' water.

Other agencies involved in water management include technical service advisory groups, regional councils (for example, tribal councils), and environmental health organizations that deal with public health matters (*ibid.*). The report of the Expert Panel (Swain et al. 2006b, 1) explains that, "these arrangements are neither comprehensive nor easily deciphered; most critically, there are numerous gaps and a lack of uniform standards, as well as enforcement and accountability mechanisms."

Considering that jurisdiction over drinking water for First Nations is such a complex matter, it is not surprising that the institutional environment affecting drinking water for First Nations is equally complicated. A variety of institutions, including government and non-government organizations at both the provincial and federal levels impact water management for First Nations in Ontario. Table 2 provides a list and short descriptions of roles that each institution plays in water management for First Nations. A compounding factor to the complexity that arises out of so many different players is that the roles that each of these institutions and agencies play vary from region to region. With the lack of clarity regarding water rights, jurisdiction and responsibility, as well as the many institutions that play roles in First Nations' water management, it is not surprising that water-related tragedies occur in some First Nations communities.

Table 2: Roles and Responsibilities of Institutions for First Nations' Water

Institution	Description of Role
First Nations Band Councils	Responsible for the planning, design, and construction of facilities, as well as ongoing operations and maintenance. Contribute 20% of capital funds to project.
Indian and Northern Affairs Canada	Coordinate and manage funding for First Nations water facilities. Regularly inspect facilities. Play a role in certification of facilities through provincial bodies.
Health Canada	Assists with monitoring and surveillance for public health. Also develops federal water quality guidelines and reviews infrastructure plans and designs for health and safety considerations.
Public Works and Government Services Canada	Play an assistance role for implementation and reviews of capital and operations and maintenance plans, including technical assistance for physical infrastructure development.
Environment Canada	Plays a role in providing information and developing tools for regulatory requirements and source water protection, for First Nations. Reviews the environmental aspects of infrastructure.
Technical Service Advisory Groups	Advise and provide direct assistance to First Nations on technical matters for infrastructure (including water and wastewater).
Provinces	Play a role in making standards, certifying water operators, and making watershed plans. Done on a cost-recovery or partnership basis.
Municipalities	Enter into agreements with some First Nations for sharing water supplies and systems. Can play a role in watershed planning.
Other Institutions that Affect Water Management for First Nations	Organizations such as PTOs, Citizens groups and NGOs, and traditional authorities (such as Elders) can impact public perception and political desires of First Nations communities.

Adapted from: INAC (2006, Figure1)

2.2.4. Recent Attention to First Nation Water Issues

> "…many First Nation communities within Canada today have, for many years, lived with and suffered from, unsafe drinking water in their daily lives. The situation in many First Nations has more in common with the Global South than the rest of the country."
>
> Harden and Levalliant (2008, 6)

The above quotation is from a recent report of the Polaris Institute. The statement echoes a sentiment that is found in numerous reports that have been published during the past decade on the challenges that are faced by First Nations communities to ensure safe drinking water.

A number of recent changes to water management across the province of Ontario are directly attributable to tragedies such as the Walkerton incident. The Safe Drinking Water Act (2002) legislates water quality standards for the province as well as sets requirements for operator certification and facility construction, while the Clean Water Act (2006) legislates the source water protection process for many (although not all) areas of the province. Even though First Nations are not affected directly by either of these developments (because reserves are federal entities), some communities do benefit indirectly from the provincial legislation. For example, First Nations can receive letters of conformity from the provincial government, certifying that their treatment facilities meet provincial standards. Also, communities that are located within the boundaries of source water protection areas that were established under the Clean Water Act have the option to participate on source protection committees and to include their water sources in the source protection process.

Government Initiatives and Reports

Several important publications have arisen from government-sponsored initiatives to assess and make recommendations for improving drinking water for First Nations. Among these are the National Assessment of Water and Wastewater Systems in First Nations communities (INAC 2003). This assessment identified that the water supplies for three-quarters of First Nations communities were at high risk of contamination, and led to INAC's First Nations Water Management Strategy (FNWMS), which injected more than $1.5 billion into First Nations water systems between 2003 and 2008 (INAC 2001; INAC 2003; INAC 2008a).

The report of the Commissioner of the Environment and Sustainable Development, released in 2005, assessed and reported on the progress of INAC's 2003 FNWMS. This report found that, despite the substantial funding that was directed at First Nations for water management, First Nations communities did not have comparable levels of protection as exists for other, non-reserve communities in Canada (CESD 2005).

In 2006, INAC released its Plan of Action for Safe Drinking Water in First Nations, which was intended to address the most significant water problems on reserves, establish national standards of operation for water treatment facilities, as well as ensure that all operators of water systems received mandatory training. One component of the plan was the creation of the Expert Panel, which launched a series of cross-country hearings in the summer of 2006 (INAC 2006). The Expert Panel's report (Swain et al. 2006a,b) documents the review of water management that was undertaken by the three members of the panel. This process involved a series of engagement sessions with First Nations people and organizations, environmental NGOs, the private sector and members of provincial and federal agencies. The report provides recommendations for a regulatory regime to govern First Nations' water; it explains the benefits and drawbacks of such options.

In January 2009, INAC released a discussion paper called *Drinking Water and Wastewater in First Nations Communities*. This paper was published in advance of engagement sessions that were to be held regarding the development of a legislative framework. INAC's framework apparently intended to address the "regulatory gap" (INAC 2009a, 3) that currently exists for First Nations' water management and to consider First Nation perspectives, including traditional perspectives, in decision-making.

In addition to the government reports, publications on safe drinking water for First Nations have emerged from non-government organizations as well. These reports include those from the Chiefs of Ontario, the National Aboriginal Health Organization (NAHO), the Polaris Institute, the Canadian Environmental Law Association, and Sierra Legal (now known as Ecojustice). The documents provide a wealth of information about the state of First Nations

water in Ontario and in Canada. For example, the publications from the Chiefs of Ontario focus on the role that traditional knowledge must play in water provision and protection, while Ecojustice discusses water management for all communities in Canada and focus on First Nations' water only in specific sections. The most significant of these reports and a selection of government-sponsored reports are briefly summarized in Table 3.

Each of the papers in Table 3 present unique perspectives on the challenges that First Nations face, and provide ways to address those challenges. This thesis is built upon the basis of those reports, which together provide a thorough picture of the recent history for First Nations' water and provide insight into future directions.

Table 3: Selected Reports on Water Management for First Nations

Organization	Citation	Brief Description
Chiefs of Ontario	COO 2001	Report attempts to provide a theoretical, legal and technical overview of water treatment issues facing Ontario First Nations.
Government of Ontario	O'Connor 2002	Part I reports on the events and explores causes of the Walkerton tragedy. Part II provides recommendations to ensure the safety of drinking water in Ontario.
National Aboriginal Health Organization	NAHO 2002	Report provides a concise view of the state of drinking water safety for Aboriginal communities.
Indian and Northern Affairs Canada	INAC 2003	Report provides a perspective on the state of drinking water safety for Aboriginal communities, based on on-site assessments of First Nations.
Commissioner of Environment and Sustainable Development	CESD 2005	Chapter 5 of Report examines whether funding from the federal government has helped to provide residents of First Nations communities with drinking water of comparable quality to other Canadians from communities of similar sizes and locations.
Sierra Legal Defence Fund (now Ecojustice)	Christensen 2006	Provides an updated analysis of the adequacy of drinking water regulation in Canada, 5 years after the publication of Waterproof 1.
Chiefs of Ontario	COO 2006	Details the Aboriginal Traditional Knowledge (ATK) project. It also acts as a guidance document for considering ATK in water protection efforts.
Expert Panel on Safe Drinking Water for First Nations	Swain et al. 2006	Launched by the federal government in 2006, the 3-member panel was tasked with examining options for a regulatory regime for First Nations' drinking water.
Chiefs of Ontario	COO 2006 & 2007	Through direct engagement of ATK holders, report builds on 2001 COO publication. Report contains information on incorporating ATK in environmental policies.
Indian and Northern Affairs Canada	INAC 2006	Standards for design, construction, operation, maintenance, and monitoring of drinking water systems.
Chiefs of Ontario	COO 2008	The Water Declaration of the First Nations in Ontario. Developed during the First Nations Water Policy Forum, hosted by the Chiefs of Ontario in October 2008.
Indian and Northern Affairs Canada	INAC 2008a	Update report on progress made by INAC since 2006 Plan of Action announcement, to "helping First Nations in the provision of clean, safe drinking water to their communities.
Polaris Institute	Harden & Levalliant 2008	Report profiles 6, to illustrate the water crisis amongst First Nations communities throughout Canada.
Indian and Northern Affairs Canada	INAC 2009a	Discussion paper for engagement sessions on the development of a proposed legislative framework for drinking- and waste-water in First Nations communities

2.2.5. The Future of Water Policy for First Nations

The need for some sort of federal legislation for governing water quality in First Nations communities is widely accepted, however there is also general agreement in the literature that urgent action is required to address current physical water supply deficiencies in First Nations. This action should be undertaken before any legislative options can be successful, through the provision of more resources to First Nations water management (Morris et al. 2007; Notzke 1994; Swain et al. 2006b; Walkem 2007). This notion seems to run counter to recent steps taken by the federal government for the development of a national legislative framework for drinking water and wastewater in First Nations (INAC 2009b). The Expert Panel report (Swain et al. 2006b) makes a clear call for action in order to address deficiencies in water treatment and distribution systems in order to ensure that First Nations have sufficient resources to obtain clean water. The Expert Panel was concerned that excessive focus on creating regulations may take resources away from much-needed efforts to meet basic needs for water supplies. While INAC has, over the past several years funnelled money into the highest-risk First Nations communities based on their own national assessment of First Nations' drinking water systems (INAC 2006; Prudori 2008), there are many communities experiencing poor water quality that are not categorized as high risk (Harden & Levalliant 2008). In April 2009, there were 113 drinking water advisories for First Nations across Canada, 40 of which were in Ontario alone (Health Canada 2009; Poulin 2009). According to the INAC website (INAC 2008b), there are 21 First Nations communities in Canada that are classified as having high risk drinking water systems; eight of these communities are located in Ontario. Unfortunately, a complete list of First Nations experiencing water quality advisories is not available to the public, preventing a comparison of high-risk communities versus those experiencing water quality advisories.

In the report of the Expert Panel, there is discussion about the establishment of a First Nations Water Commission as well as legislative and regulatory developments (Swain et al. 2006b). This Commission as described by the Expert Panel would act as a monitoring body for the legislative process. While this seems to be a significant part of the Expert Panel's findings and discussion (Swain et al. 2006b), it is not explicitly mentioned in the discussion paper for INAC's engagement sessions (INAC 2009a). The Expert Panel's report also describes the

advantages and drawbacks of each of the proposed regulatory options. INAC favours an approach through which provincial laws would be incorporated by reference into the federal legislation. While INAC makes an effort to describe how the laws would be adjusted from area to area as well as the advantages of this approach, the discussion paper does not explicitly address the drawbacks associated with referencing provincial laws that were highlighted in the Expert Panel's report. That INAC appears to have intentionally omitted these drawbacks is concerning, because it implies that INAC selectively chose which aspects of the Expert Panel's recommendations to include, and which aspects to ignore. One drawback of this approach is that provincial legislation may affect the ability of First Nations to practice self-government or it may affect some of First Nations' rights under s.35 of the Constitution Act, 1982 (Swain et al. 2006a, 55). There is currently no universally accepted strategy for addressing water quality challenges in First Nations communities. However any strategy that is introduced in the future will have to objectively consider all of the findings of the Expert Panel and the other commissioned reports on First Nations water issues.

2.3. Action Through Risk Management for Water Quality

According to the World Health Organization's (2008, 48) Guidelines for Drinking Water Quality, risk management is, "the most effective means of consistently ensuring the safety of a drinking-water supply." The Canadian Council of Ministers of the Environment (Canadian Council of Ministers of the Environment [CCME] 2004) describes the goal of risk management to be the protection of public health over the long term.

In part two of the report on the Walkerton Inquiry, Justice O'Connor (2002b) identified the process for ensuring safe drinking water as a form of risk management. O'Connor stated that while risk can never be totally eliminated, "the goal of any drinking water system should be to deliver water with a level of risk that is so negligible that a reasonable and informed person would feel safe drinking it" (O'Connor 2002b, 74). In this discussion, O'Connor referred to a publication by Hrudey (2001)[3], which emphasizes the importance of risk management for

[3] In the literature on risk management for safe water provision, Hrudey emerges clearly as an authority on the topic. Hrudey's publications are cited extensively in the literature for safe drinking water provision and in fact form a significant portion of material on risk management for safe drinking water in Canada.

creating consumer confidence in drinking water, since consumers' perceptions of drinking water supplies are the ultimate determinant of water safety. The CCME (2004) further indicates that if drinking water is not perceived to be safe by the public, consumers may seek alternative and potentially less-safe water sources.

Hrudey and Hrudey (2003) also refer to managing for safe drinking water as a form of risk management. They refer to the Australian Drinking Water Guidelines (National Health and Medical Research Council [NHMRC] 2003) and the World Health Organization's (WHO 2008) water quality guidelines, which had incorporated these principles into drinking water management prior to Ontario's reforms. In both the Australian and World Health Organization (2008) guidelines, distinctions are made between risks, hazards, and hazardous events for water contamination. A hazard is a specific physical substance or organism that has the potential to cause harm. A hazardous event is an occurrence of a hazard. A risk is "the likelihood of identified hazards causing harm in exposed populations in a specific time frame, including the magnitude of that harm and/or the consequences" (WHO 2008, 52). Hrudey & Hrudey (2004) emphasize that managing water for all potential hazards is inefficient and ineffective, because valuable resources are expended on potentially low-risk hazards. Alternatively, managing for risk, or the "probability and severity of consequences," ensures that a water system can deal effectively with a virtually infinite number of potential hazards (Hrudey & Hrudey 2004, 79).

Sources on the risk management approach to safe drinking water indicate that the process involves thorough accounts of potential hazards through risk assessment followed by evaluations of hazards according to their likelihood of occurring (CCME 2004; Hrudey & Hrudey 2004; NHMRC 2003; WHO 2008). Furthermore, while risk management can be considered a general approach to water management, effective risk management must be implemented in a scenario-specific manner, according to local conditions, situations, and preferences with regular reviews and updates. Hrudey (2001) outlines several principles of risk management for ensuring safe drinking water. These include taking preventative rather than reactionary actions in regard to risks, evaluating the levels of risks and addressing the greatest risks first, reflecting on and using lessons from past experiences, recognizing the role

that human behaviour plays, and ensuring that management is flexible and open to changes and new approaches. Finally, Hrudey & Hrudey (2004) touch briefly on the need for consumers to recognize and appreciate the risk management approach, in order for it to be truly successful.

Rizak and Hrudey (2008) stress that approaches to ensuring safe drinking water cannot occur independently of consumers; instead, consumers must value the water that they get. In order to achieve this, consumers must be engaged and involved in the planning and execution of water management. Thus, public participation and involvement in water management and planning play important roles in ensuring safe drinking water. In order for a water management regime to work for a community, the approach must be relevant to the community's concerns, culturally appropriate, and designed with community input. Briggs et al. (1999, 157) maintain that public involvement is, "critical to the successful development and implementation of any environmental health initiative".

While the literature supports the use of risk management approaches for all water systems, one article in particular stood out as an alternative voice. Arquette et al. (2002) provide a critique of contemporary approaches to risk management. They maintain that many of the approaches taken by government bodies in Canada to assess or manage risk do not specifically meet the needs of First Nations people. The authors outline a number of points to support that conclusion. First, communities of Indigenous people are generally not equipped with sufficient resources to meet the requirement of government-designed programs. Second, historically there has been little or no involvement of First Nations in decision-making for risk management on "nation-to-nation" bases. Third, there are inadequacies with the government's approach to risk management for public and environmental health because Indigenous peoples have dramatically different understandings of the concepts "health" and "environment" compared with contemporary Western perspectives. Arquette et al. (2002) draw on concepts from various social disciplines on the topic of sociocultural assessments in order to introduce an alternative, community-designed model for risk management. The authors refer to this as holistic risk-based management, in which the effects of hazards are considered in a way that can be adapted to any community, by any community. For some First Nations communities, holistic approaches involve consideration of the effects that water management regimes will

have on the natural world, as well as cultural, social, spiritual, and subsistence economic practices. It is important to keep in mind that individual nations among Canada's First Peoples have different needs, belief systems, priorities, and cultures. This approach is meant to be a process that can result in nation- and community-specific risk management strategies. If Arquette and others are correct, the implication may be that Canada's approach to ensuring safe drinking water for First Nations should and can be redesigned to better suit First Nations communities.

The practice of risk management for water quality has emerged as a requirement for water management in Canada, Ontario, and for First Nations communities. Specifically, the risk management approach has been implemented in the form of the MBA. At its core, the MBA involves the use of redundancies in order to prevent potential hazards introduced at any point in a water system from reaching consumers' taps. It has been increasingly recognized by water quality policy-makers and practitioners as an effective strategy to protect against possible contamination of water drinking water systems (Christensen 2001) and it is discussed in the following section.

2.4. The Multiple Barrier Approach to Safe Drinking Water

> "Regulation alone will not be effective in ensuring safe drinking water unless the other requirements – a multiple barrier approach, cautious decision-making and effective management systems – are met." (Swain et al. 2006, 18)

In response to the growing awareness of threats to water quality in Ontario, and the call for a risk-management approach to drinking water, the MBA has been endorsed as an appropriate strategy (Christensen 2006). The report on the Walkerton Inquiry (O'Connor 2002b) includes a chapter on the MBA to safe drinking water. The chapter begins with Justice O'Connor's account of expert testimony and his referral to the "voluminous technical literature" (O'Connor 2002b, 72) that supports his conclusion that this approach to drinking water management is necessary. In his reference to implementing a risk-management approach to ensuring water quality, O'Connor refers specifically to the MBA as, "the best way to achieve a healthy public water supply" (*ibid*.). In their report, Swain et al. (2006) describe the failure of water quality

monitoring alone, to safeguard against adverse water quality and the outbreak of water-borne diseases. The MBA's prominence in Ontario's water management regime is also due in part to its endorsement by the CCME (2004, 45) as, "essential to the effective management of drinking water systems." Furthermore, in terms of First Nations, the MBA forms the basis of the federal government's Protocol for Safe Drinking Water in First Nations Communities (INAC 2006, 6), which describes the approach as, "a strategy intended to prevent water-borne contaminants in drinking water by ensuring effective safeguards are in place at each stage of a drinking water system". Thus, in theory at least, First Nations' water is managed according to the MBA. The purpose of this section is to understand the MBA as a strategy for water quality management, the rationale for its application to First Nations, and the manner in and success to which it has been implemented to date.

In a 2003 publication, Hrudey & Hrudey describe the MBA as, "a pragmatic approach [for drinking water risk management] that has been articulated in various forms for guiding the provision of safe drinking water over many decades," and "as the generic approach for achieving robust drinking water systems." (Hrudey & Hrudey 2003, 344). Krewski et al. (2002, 1800) indicate that the MBA is "universally recognized as a fundamental tenet for effective drinking water quality management and for ensuring the supply of safe drinking water." Despite the widespread recognition as a fundamental for water management, the introduction of the CCME's (2004) MBA framework after the Walkerton Inquiry signified a shift to a more prescriptive approach to ensuring multiple barriers are in place for water systems in Ontario, and throughout the rest of Canada as well.

An example of the more technical approaches to providing multiple barriers is taken from the Ecojustice's (formerly known as Sierra Legal Defence) report, *Waterproof* (Christensen 2001, 18). To quote the publication directly, "The B.C. Auditor General's report noted that multiple barrier *water treatment programs* are the most likely to 'cost-effectively maintain a high quality tap water.' " (Emphasis added). The report continues to identify the four primary physical means by which to maintain high quality drinking water:

- Source water protection
- Water treatment
- A well designed water distribution system

- Comprehensive testing of drinking water

Each of these components are in fact part of the CCME's conceptualization of the MBA, however they are characterized only as one part of broader water treatment programs. Alternatively, the CCME describes the MBA in the following way:

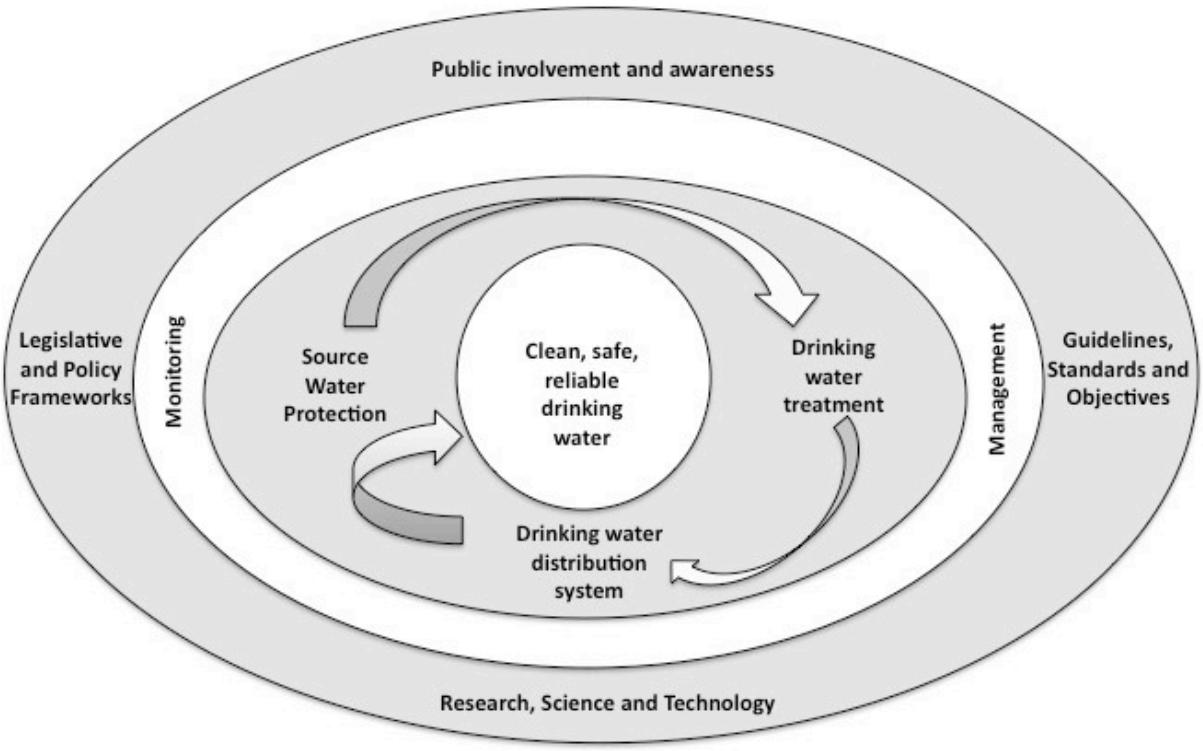
> "The multi-barrier approach aims to reduce the risk of drinking water contamination and to increase the feasibility and effectiveness of remedial controls or preventative options. The ultimate goal of the multi-barrier approach is to protect public health." (2004, 15)

The above statement indicates that a purpose of the MBA is to reduce risk and improve the technical side of water quality management. The CCME's conceptualization of the MBA is displayed in Figure 1. The core goal of the approach is to ensure clean, safe and reliable drinking water. In order to make this goal achievable, the water system must be properly designed, managed and monitored. The water system is composed of three main parts: source water (and the protection of source water), drinking water treatment processes, and the water distribution system. The outer ring of the MBA diagram illustrates the tools and procedures that must be in place to ensure that water systems are designed and managed properly. These non-structural tools and procedures for safe drinking water management include public involvement and awareness, legislative and policy frameworks, guidelines, standards and objectives, and research, science and technology. This thesis is grounded in the interpretation of the MBA outlined in CCME's (2004) publication and not the treatment-oriented, technical version.

Since the publication of O'Connor's (2002b) recommendations, legislation has been introduced in Ontario, which entrenches some aspects of the MBA. New legislation includes the Safe Drinking Water Act, 2002, which outlines standards for water quality, operator training, and facility construction, and the Clean Water Act, 2006, which legislates source water protection for Conservation Authorities, many of which are located in the most densely populated areas of the province. This legislation has embedded the MBA in water management for communities in the province of Ontario. Though water quality management for First Nations is not legislated as of mid 2009, water management is heavily influence by

the MBA through its role in informing the Protocol for Safe Drinking Water for First Nations Communities (INAC 2006).

Figure 1: The Multiple Barrier Approach



Reproduced from: CCME (2004, 16)

2.5. The MBA as a Research Framework

The underlying structure of this thesis is based on the MBA, which is the water quality management framework that is used in water management for First Nations according to INAC (2006). The current prevalence of water quality advisories in First Nations communities implies that the current methods for the design or implementation of the MBA is not producing safe drinking water in many First Nations communities. Using the MBA as a framework has allowed me to understand the shortfalls in its design and implementation and has provided the opportunity to determine what changes can be made to the framework, in order to improve its efficacy for ensuring safe drinking water. In using the MBA as a research framework, lines of

inquiry were developed that pertain to the major components of the approach (see Subsection 3.3.4 for question design). Specifically, these components are:

- Source water protection,
- Drinking water treatment,
- Water distribution systems,
- Monitoring,
- Management,
- Public involvement and awareness,
- Legislative and policy frameworks,
- Guidelines, standards and objectives, and
- Research, science and technology.

Adapted from (CCME 2004)

Previous studies in water quality management have used the MBA as a framework, but in slightly different contexts. Smith et al. (2006) utilized the MBA as the basis for an evaluative tool for risk assessment for public health in First Nations communities, while Hrudey et al. (2002) also made use of the MBA as the "reference framework" for assessing literature on outbreaks of waterborne diseases in affluent nations. While these uses of the MBA are different to the manner in which it is used for this study on drinking water in FN communities of Northern Ontario, the two examples show that the use of the approach as a research framework has been previously documented in academic literature.

3. METHODOLOGY

This research takes a case study approach, consisting of representatives from the institutional environment for water management for three First Nations communities in Ontario. The three communities are Gull Bay First Nation (GBFN), Fort William First Nation (FWFN), and Mattagami First Nation (MFN). See Chapter 4 for descriptions of the case studies. In order to do this research, a number of methods were employed to obtain and analyze relevant data. This process is described in the following sections.

3.1. Research Objectives

The objectives of this study are described in Section 1.2; they were developed through reference to formal and informal bodies of literature on First Nations drinking water. Reports such as the Walkerton Inquiry report (O'Connor 2002a,b), Expert Panel report (Swain et al. 2006a,b), the report of the Commissioner of Environment and Sustainable Development (2005), Waterproof II from Ecojustice (Christensen 2006), and Michael Mascarenhas' (2005) dissertation all highlight pervasive problems with water management for First Nations. However the existing literature does not look critically at the MBA. Similarly, though there are many publications on the MBA and risk management, they typically do not focus specifically on First Nations. The publication by Arquette et al. (2002) is a notable exception to this, particularly where the authors note the need for a holistic risk management framework that is suitable for First Nations. Even so, the Arquette et al. article does not refer specifically to the MBA. This paper is intended to address that gap in the research.

The study was approached with the understanding that the MBA is widely regarded among Canadian water management professionals as a fundamental approach to ensuring safe and clean drinking water (CCME 2004; INAC, 2006; O'Connor 2002). On account of the important role that it plays, the MBA is specifically explored in terms of the challenges and opportunities that its implementation presents to First Nations.

3.2. Ethical Considerations

Ethics approval from the University of Waterloo's Office of Research Ethics (ORE) was received in mid-September 2008, prior to conducting interviews. The ethics approval process involved a review by the ORE office of recruitment materials, sample questions, potential risks posed to study participants, and the informed consent process for use with interviewees.

In order to ensure that all of the necessary ethical considerations for the research were included, I followed a set of guidelines published by the Canadian Institutes of Health Research (CIHR 2007) for research involving Aboriginal participants. This document provides an overview of important considerations for pursuing research with First Nations people and communities. An important factor for ethical research is to approach communities in a manner that is respectful and culturally appropriate. One aspect of my study was to seek approval from band councils prior to any contact with potential interviewees in their communities.

Additionally, the interview process was adapted to suit the preferences of the participants. Some participants wished to remain completely anonymous, while others have allowed for the attribution of their comments. Some of the interviews were recorded with permission of the interviewees, however due to cultural preferences as well as the politically sensitive nature of the research topic, most of the interviews with representatives of First Nations were not recorded. For these interviews, extensive note taking was undertaken both during and following the conversations.

3.3. Interviews

Key informant interviews are identified by Yin (2003) and King (1994) as an effective method of data collection for case study research in the social sciences. Perspectives were sought from amidst the institutional environment that affects the implementation of drinking water policy for the three communities. Many of the interviewees are not only involved in water management for the case study communities but for First Nations throughout Ontario as well. The interviewees' diverse perspectives and experiences have allowed for some inferences to be drawn about communities beyond the case studies. By comparing perspectives of

representatives from the different institutions, I hoped to identify similarities and convergences among perspectives of the sample group in order to draw out common perceptions of the challenges that First Nations communities confront with water quality, and the opportunities that may exist in order to address those challenges. I also anticipated that the results would provide insight into the effectiveness of the MBA to protect water quality for these communities.

3.3.1. Sampling for Interviews

The initial step in the sampling process for interviewees involved a review of public documents (i.e., websites, press releases, reports) as well as contact with researchers from Lakehead University involved in water policy in Northern Ontario. Using information gathered from those sources an initial set of informants was contacted and several agreed to interviews. Further identification of informants was achieved through snowball sampling, a sampling method through which interviewees were asked to recommend colleagues for me to contact. Snowball sampling is often employed in research where individuals are not easy to identify (Babbie 2007). Babbie indicates however that snowball sampling can result in a sample group of, "questionable representativeness" (2007, 185). In this study, I intended to reach the most relevant informants, representing a variety of roles and perspectives in water management for the case study First Nations. Since the people who represent water interest in First Nations are a select group of relatively few leaders, snowball sampling was the most effective way to contact those individuals. A random sampling approach may have resulted in the incorporation of interviewees with less knowledge and expertise on the subject matter. Furthermore, the initial set of contacts that were established though the review of documents and existing research contacts provided a foundation of diverse contacts upon which the snowball sampling built.

3.3.2. Key Informants

Interviews were sought with representatives from various departments at the federal and provincial levels, NGOs, First Nation band councils, PTOs, and various other institutions. Table 4 provides a breakdown of institutions from which the 15 key informants were drawn.

An explanation of the key informants' affiliations is provided in a discussion of the institutional environment for First Nations' water management, in Section 4.1.

Table 4: Breakdown of Institutional Representatives

Institution Type	# of Representatives	Identifier Codes
Band council	2	BC1, BC2
Water operator	1	WM
Federal government	1	FD
Provincial government	2	PR4, PR5
Source protection committees	3	SPC1, SPC2, SPC3
Regional PTOs	1	PTO1
Technical services corporation	1	TSC
Cultural representative	1	ER1
Regional health unit	1	HU
NGOs	2	NGO1, NGO2
Total	**15**	

A total of 15 key informant interviews were conducted. Anonymized identifiers for each of the interviewees are included above in Table 4. All interviewees, with the exception of one, agreed to attribution of their comments. In order to maintain consistency all interviews were coded according to their institutional affiliations, instead of their names. Some interviewees, however, are referred to at times by their positions and specific organizations. Sources are only identified in this way in cases where I was given permission to attribute their comments. The approach to obtaining formal interviewees was standardized and consisted of initial contact (either e-mail, phone call or personal visit). If no response was received, a second attempt was made using a different method of contact than the first attempt. Interviewees who failed to respond to two or three requests were usually excluded from the study.

The research also includes information from a set of 12 informal sources. Table 5 provides a breakdown of these informal sources who were included in the research. Most of these individuals were speakers at the Chiefs of Ontario First Nations Water Policy Forum (FNWPF); they have all remained anonymous because I did not obtain permission to attribute comments. I did, however, receive permission from organizers of the FNWPF to include information from the event in this paper. The informal sources are also identified according to their institutional affiliations.

Table 5: Informal Sources (FNWPF observations)[4]

Institutional Affiliation	Identifier Codes
First Nations representatives	FN3, FN5, FN7, FN15, FN17
PTO Representatives	PTO2
Elders	ER2, ER3
NGO representatives	NGO3
Provincial Agency Representatives	PR1, PR2, PR3
Total	**12**

3.3.3. Interview Process

When situations permitted, formal interviews were conducted in person. Face-to-face interviews totalled seven of the 15 interviewees. Of the remaining eight interviews, six were conducted over the telephone, while two of the interviews took place through e-mail correspondence. During in-person interviews, with permission of the interviewee the conversations were recorded using a digital voice recorder and notes. When interviewees declined voice recording, I made notes by hand during and immediately after the interviews. During two interviews, the situation did not permit voice recording or the taking of notes by hand; in these two cases, notes were made immediately following the discussions. The length of interviews ranged between 0.5 and 1.25 hours. Over the course of the research, I met with a number of individuals to discuss the research topic who did not agree to on-the-record interviews. While the information from these discussions is not explicitly discussed in this thesis, the interactions were helpful in shaping my understanding and knowledge of the topic and they influenced the research process.

3.3.4. Question Template

The interview question template (see Appendix I) was structured in such a way that conversations were be directed to interviewees' perceptions and knowledge of water management, and such that responses were attributable to the MBA framework. During the interviews, the MBA itself was typically not a specific focus of discussion. Instead, questions

[4] Numbering gaps are evident in Table 5 because it was not appropriate to include some sources from the FNWPF. These sources were excluded from the results because the information gained from certain individuals did not address the major themes of this research.

were directed at the main themes of the MBA such as public participation; laws and regulation; research and development; infrastructure operation and maintenance; and so on (see MBA diagram, Figure 1). Questions were general, in order to allow participants to introduce topics or themes that were not formally included in the MBA. This open nature of the dialogue turned out to be a strength of this thesis, as it led to the introduction of themes and concepts that I had not previously considered, but which were very important to include. During the analysis it became clear that many of the discussed themes were relevant to the MBA.

While the interview template was used at the beginning of all interviews, questions were adapted slightly for each key informant in order to ensure that the conversation remained relevant to his or her particular circumstances and expertise and so that discussions included emerging topics and themes. Over the course of interviewing, I learned through experience about certain topics that were inappropriate to discuss with certain interviewees. Throughout all interactions, it was important to ensure that interviewees felt respected at all times, that interviews were conducted with cultural sensitivity, and that I communicated my sincere interest in each of the interviewees' perspectives. The analysis of the interview data is discussed in Section 3.6 and results and discussion can be found in Chapter 5.

3.4. Direct Observation

In addition to interviews and documentation sources, data collection for the case study included direct observation. In order to observe dialogue on water issues among water experts, government agency representatives, and among representatives of First Nations, I sat in on meetings of a conservation authority and I attended the FNWPF at Garden River First Nation. I also visited two of the three sample communities, Gull Bay First Nation and Fort William First Nation, in order to have first-hand observations of the water treatment facilities, the local geographies, and to interact in person with interviewees and other contacts. At Gull Bay First Nation, the water system operator gave me a tour of the community's water and wastewater treatment facilities and drinking water distribution system. I visited Fort William First Nation several times; one visit was specifically for an interview and several other were to spend time with leadership of the Anishinabek of the Gitchi Gami Environmental Programs (a community-based environmental at Fort William First Nation) and to make observations of the decommissioned water treatment plant on Mount McKay. While the volume of observational data that was gathered during these visits was typically low, these excursions helped with the contextualization of interview data, and added substance to the case study descriptions. It was particularly useful to compare my observations with descriptions of the communities that I found in documentary sources.

In October 2008 I had the opportunity visit Garden River First Nation in order to attend the FNWPF. This experience proved to be a rich source of information, primarily through the presentations given by Elders, government agency representatives, members of Indigenous environmental NGOs, and First Nations' regional political leaders. I was generously provided access to closed-door discussions on water management issues however data from those sessions was not included in the results because of a confidentiality agreement. Instead, observations from closed-door sessions served to inform me about the perspectives and issues that are at the forefront of concerns for providing clean water to First Nations communities.

In order to make direct observation a realistic endeavour, I resided in northwestern Ontario (in Thunder Bay) during September and October 2008, while I collected the bulk of my data.

Living in Thunder Bay was advantageous due to its close proximity to sample communities, and because many of the community members and First Nation water managers live in Thunder Bay. In-person visits, particularly with contacts in First Nations administrations, were most effective for relationship building and for obtaining permission to conduct interviews. During my stay in Thunder Bay, I also attended two meetings of the Lakehead Region Source Protection Committee as a public observer. These meetings provided me with exposure to the workings of the provincial source protection process, and they were valuable opportunities to network with people who were involved with water management in the region.

These experiences provided valuable first-hand observations, which served to corroborate the other sources of data, collected during my research. The observational data enhanced my understanding of the context for the research problem. Another benefit of this approach to data collection was that I was able to develop relationships with individuals involved in the study.

3.5. Documentary Materials

In order to elaborate on and corroborate the data that were collected through the interviews and observations, relevant documents were reviewed and incorporated into the results. This process involved the collection of documentation that addresses various aspects of water management for First Nations. Examples of documents that were collected include meeting minutes of relevant source protection committees, reports from the federal government and non-government organizations on water management for First Nations, conference proceedings and presentation slides, policy briefs press releases from First Nations-based organizations, as well as publicly-available information from the websites of the case study communities. This information was used to fill data gaps and to enhance the richness of data collected through the other methods.

3.6. Analysis

The analysis of key informant interview data, as well as data obtained from speakers at the FNWPF, was undertaken through a methodology that is described by Rubin & Rubin (2005) as a hybrid between two approaches of qualitative interview analysis. The two approaches are the

responsive interviewing model and the grounded theory approach. The responsive model involves classification and coding of data and analysis over the course of the research process with the incorporation of applicable literature. Alternatively, the grounded theory approach to qualitative data analysis aims to analyze data in isolation of pre-conceptions and therefore excludes published material (*ibid.*). Rubin & Rubin (2005) describe the open coding process used by grounded theorists, where coding and categorization are undertaken only at the time of analysis, without the influence of the researcher's experience or previous research. The hybrid approach that is used in this thesis allows for benefits of both the responsive and grounded theory models. In the case of this research, I had pre-planned to find connections between the data and components of the MBA framework (this approach is characteristic of the responsive model), however I coded for salient concepts as I went, regardless of whether they were directly attributable to the MBA, or not.

Since the interview questions were originally designed to elicit information about the MBA, much of the data (in the form of notes from the interviews) was already structured in such a way that many of the topics and themes discussed during interviews naturally fit into the research framework. To identify and organize these topics, I used markers based on the main components of the MBA, drawn from CCME's (2004) publication on the MBA, as a structure for coding. The initial set of topic markers are listed in Table 6. These markers served as a starting point only, since I frequently used variations of the original topic markers to accurately capture what each speaker had conveyed. Additional topics were also identified and coded and as described below, many of these new topics fit under one or more of the original MBA-based headings. Observational data, such as my notes from the FNWPF, did not fit as cleanly into the MBA framework. Despite this, I found that many of the topics and themes that emerged from the Forum corresponded approximately to components of the MBA.

Table 6: Topic Markers Drawn from the MBA Framework

MBA Component	Topic Markers
Drinking Water Treatment	[Treatment]
Drinking Water Distribution System	[Infrastructure]
Guidelines, Standards, and Objectives	[Standards/Guidelines], [Standards]
Legislative and Regulatory Frameworks	[Law], [Legislation], [Regulation]
Monitoring	[Monitor]
Management	[Management]
Public Involvement and Awareness	[Public involvement], [Awareness],
Research, Science and Technology	[Research]
Source Water Protection	[SWP]

Adapted from: CCME (2004, 16)

The analytical process involved several steps that are outlined by Rubin and Rubin (2005), including a thorough review of the data and organization through four steps, or levels, of coding. The coding process was followed by an attempt to understand the emergent themes in the context of the MBA framework. Prior to coding, and following the completion of each interview, a thorough account was made of the discussions and my impressions. For those interviews that had been audio recorded, I created separate summaries of the interviews by listening to the recordings and simultaneously making notes. To complete the summaries, I re-read the handwritten notes that I had made during most of the interviews, and combined each source of interview information into single interview summaries. I forwarded the interview summaries to the respective interviewees in order to receive feedback and corrections. Only some of the interviewees provided feedback.

I decided against transcribing the interviews verbatim. In part, I did not transcribe in order to maintain consistency in the format of information that was available. As I mentioned previously, some interviews were not recorded, making me rely solely on summaries for those interviews. To make the process more standard, I ensured that the summary for each interviewee was similarly structured. Verbatim transcripts would not have provided any added

benefit to the study since my intention was to establish and build upon themes that emerged through the interviews; this was possible to do without verbatim scripts. As an exception, where interviewees made particularly notable comments, I transcribed these statements directly and have included them as direct quotes.

Following a thorough review of all notes and recordings and after feedback was received from interviewees on the summaries that I had made of their interviews, I coded the data. Coding took place in several steps: the first round was fairly unstructured, and consisted of my identification of topics that were discussed during the interviews and during the FNWPF. While reading through the notes, I placed topic markers at each new topic discussed. For example, where an informant spoke about infrastructure I inserted the marker [infrastructure], and where an interviewee talked about source water protection I included the marker [SWP]. In cases where a single line of notes held multiple topics, the line was identified with more than one marker. The complete list of all primary codes is provided in Appendix II.

A second round of coding involved the aggregation of topics into themes. Using my computer's basic file-searching function, I scanned the documents for each of the primary codes. Since the initial round of coding was unstructured, the codes were not always uniform; it was therefore also necessary to review the notes manually as well. This second level of coding resulted in a more refined list of codes, with similar topics now listed under a single, aggregating code. For example, discussions of source water protection were originally coded with the following level I markers: [SWP], [SWP doesn't affect community], [SWP not applicable to FN], and [Source water protection participation]. For the second-level coding, these markers were grouped under [SWP] only, however the original markers were also retained in the note, in order to maintain context during my analysis. Level II codes are listed in Appendix II.

The third round of coding involved copying and pasting notes from the original source documents, into topic documents. For instance, all notes with the marker [SWP] were copied from interview summaries and pasted into the source water protection document. Identifying markers were included with all notes, ascribing each note to its original source. After this

process of physical extraction and grouping, any topic summary documents that were populated by two or fewer sources were excluded from the results, leaving only topics that were mentioned by three or more of the sources. In doing this exclusion, I have assumed that three occurrences of a particular topic indicate some level of importance to members of the sample group. The list of level III codes, which correspond to the topic document titles, is listed in Appendix II. The tertiary code list in the appendix includes references to the individuals who mentioned each of the topics.

In the fourth step of coding I manually reviewed each of the topic documents and grouped them into themes. During the development of themes, I intentionally considered the structure of the MBA and where topics aligned with the different MBA components. The themes that were developed are listed in Appendix II. During my review of the themes, I noticed incidents where multiple concepts were discussed together. In order to further draw out these concept overlaps, I used additional markers to identify where multiple topic markers occurred together more than once in the compiled notes. Through this process, I found that some themes overlapped; these insights have been integrated into the discussion in Chapter 5.

For each of the themes, I created narratives based on the compiled data, comparing and contrasting interviewee responses. Throughout each of the narratives, I compared the similarities and differences between the respondents based on their institutional affiliations. During this stage I also looked beyond the interview data into the literature that was reviewed for the study, to explore where literature discussed the same or similar concepts. Rubin and Rubin (2005) describe a similar analytical process identifying it as a useful approach to combine separate sources that focus on different aspects of the same issue, in order to create a single narrative. When combining the different comments into an individual narrative, I always went back to the original conversation in order to be sure that I understood the context of the comments. This process helped to ensure that my interpretation of the data was not blinded by my own perceptions and understanding of the topic that were formed over the course of the research.

The narrative-writing process led me to determine the final four themes under which I have organized the results, discussions and conclusions of this research (Chapters 5 & 6). The themes correspond primarily to the outer layer of the MBA framework, which I have identified as the policy-tool layer. The themes are: 1. Public involvement and awareness; 2. Legislative and policy frameworks; 3. Indigenous traditional knowledge; and 4. Commitment, qualifications and resources. In the conclusions section (Chapter 6), I describe the ways in which these themes relate to the MBA framework. The research design allowed me to capture multiple perspectives from numerous relevant institutions and the data analysis enabled me to identify themes and explore narratives that tie into the MBA.

4. CASE STUDIES

In total, three communities and the institutional environment that affects their drinking water management were selected as case studies for this research. The three communities, Gull Bay First Nation (GBFN), Fort William First Nation (FWFN), and Mattagami First Nation (MFN), each provide different insights into how the MBA impacts First Nations. Several similarities and differences among the communities provided a useful basis for comparison and discussion of the effectiveness of the MBA in their drinking water management programs.

FWFN was initially identified through researchers at Lakehead University, who maintain contact with individuals in that community. It was selected in part because little research has been done on water management challenges in that particular region of Ontario and in part because community and institutional contacts were available through the Lakehead University contacts. GBFN was identified through suggestions from an interview source at FWFN that it would be an appropriate community to approach. MFN was selected because of the community's unique, cooperative relationship with the Mattagami Region Source Protection committee. Secondary considerations for selecting MFN as a study community were the willingness of a community representative to be interviewed and the accessibility of the community by road (unfortunately I was unable visit the community due to time constraints).

Two of the communities that were selected for this research (GBFN and FWFN) are located in northwestern Ontario, in the Thunder Bay District. The third community, Mattagami First Nation (MFN), is located approximately 100 kilometres south of Timmins, Ontario in the Sudbury District (see map, Figure 2). Despite the distance between the communities, all three of the study communities belong to the Anishinawbe cultural group and therefore share some cultural similarities. The terms "Anishinawbe" (singular) or "Anishinabek " (plural) refer to a cultural subgroup of the Ojibwe peoples, with historic homelands within the Great Lakes basin, particularly along the northern shores of Lakes Huron and Superior (McMillan 1995). Many Ojibwe peoples prefer to be referred to as Anishinawbe, which has the meaning of "person" or "first-man", to represent and link all peoples who speak the Ojibwe language (*ibid*.). While

Anishinawbe communities may share many aspects of language and culture, it is important to remember that every community is unique in culture, language, and politics and each must be considered as such.

Other characteristics of the communities that provide useful bases for comparison include that they are all located in Northern Ontario and they are all affected by the same set of federal policies, procedures and guidelines for drinking water management. Alternatively, some important differences between the First Nations are that they have variable populations, geographies, institutional affiliations, water sources and treatment facilities, different types of relationships with adjacent non-First Nations communities, and different levels of participation in provincial water protection efforts. This range of similarities and differences between the study communities has allowed for insights into the variability among different communities and has provided a basis upon which to discuss themes that may be relevant more broadly to First Nations in Canada.

Drinking water for all three of the case study communities is influenced by many of the same government, non-government, and cultural institutions; however the ways in which water management is implemented in each community differs. The following sections begin with a characterization of the institutional environment for drinking water management for the communities (Section 4.1). The communities are then described individually (Sections 4.2, 4.3 and 4.4) and at the end of the chapter, I provide a summary of key similarities and differences among them.

Figure 2: Map Showing Locations of Case Study Communities

Adapted from: Microsoft Corporation (2009)

4.1. Institutional Environment

In examining factors that impact drinking water for First Nations, specific attention was paid to gathering perspectives from the institutional environment. The institutional environment for First Nations' drinking water encompasses those organizations, bodies, and groups that have an impact on the way in which water is managed for the three First Nations in this study. In the case of this research, the institutional environment affecting water management includes the communities themselves, technical service organizations, PTOs, the federal and provincial governments, and cultural institutions. Additional institutions that impact water management for First Nations include non-profit organizations and public health units.

4.1.1. The Institutions

First Nations Communities

When discussing important institutions that impact water management for First Nations people, the chiefs and band councils for First Nations communities should be considered. Current formal governance structures in First Nations communities consist of the elected chief and council (collectively known as the band council). Band councils are generally responsible for the operation of water treatment and distribution systems and they have the authority to introduce resolutions for the protection of water. For day-to-day maintenance and management of drinking water and wastewater systems First Nations typically employ water operators.

A goal of this research was to interview representatives from each of the three case study communities. For FWFN, I interviewed representatives of the chief and council. Unfortunately the FWFN's former treatment facility had recently been decommissioned and former facility staff members were unavailable. The Chief of Gull Bay's band council was interviewed, as well as the community's water operator. For MFN, I interviewed the community's representative on the Mattagami Region Source Protection Committee; unfortunately I was unable to contact this community's water operator.

Technical Service Organizations

Each of the sample communities receives technical advisory and capital assistance from the Ontario First Nations Technical Services Corporation (OFNTSC); this organization serves all 134 First Nations communities in Ontario (Ontario First Nations Technical Services Corporation [OFNTSC] 2009). It was established in 1995 by the Chiefs of Ontario, through a process of devolution that was occurring at INAC (Anon. interviewee from a technical services organization, 2009). Funding for the OFNTSC is currently provided through INAC. The organization performs a variety of functions, including reviews of designs and reports for water and wastewater management. It also plays a role in educating water operators, through the Circuit Rider Training Program. According to the OFNTSC website (OFNTSC 2009), in addition to providing technical advice to First Nations, the organization aims to enhance the

self-reliance of communities. The ONFNTSC collaborates with a number of government agencies, including Indian and Northern Affairs Canada, Canada Mortgage and Housing Corporation, Health Canada, Environment Canada, Public Works and Government Services Canada, Human Resources and Social Development Canada, Natural Resources Canada, the Ontario Ministry of the Environment and, the Ontario Ministry of Natural Resources (OFNTSC 2009).

First Nations Political-Territorial Organizations

Political-territorial organizations (PTOs) perform a variety of formal and informal roles in water management. Examples of PTOs that are associated with the sample communities include the Union of Ontario Indians (UOI) and the Nishnawbe-Aski Nation (NAN).

The UOI (which is also known as the Anishinabek Nation) represents 42 First Nations communities that are located primarily along the North Shores of Lake Superior and Lake Huron, on Manitoulin Island and throughout large tracts of Southern Ontario (UOI n.d). It represents an estimated 42,000 people, approximately one-third of all First Nations people in Ontario. According to the UOI, it is the oldest political organization in Ontario, and its roots can be traced prior to contact with Europeans (*ibid.*). The organization consists of four strategic regions, each with its own grand chief. The UOI delivers programs in health care, social services, treaty research, and education. It includes a land and resources department, with a water resources section. The water resources section has a focus on the Great Lakes-St. Lawrence River Basin Sustainable Water Resources Agreement, under a memorandum of understanding with the Ontario Ministry of Natural Resources (*ibid*). It also serves as a mode of communication between member First Nations and various levels of government on water resources issues and promotes technical and advisory capacity.

The NAN represents 49 communities in Ontario (Nishnawbe Aski Nation [NAN] 2009). The organization represents communities that are within the James Bay Treaty 9 territory, and portions of Treaty 5 territory. According to the NAN website, the institution exists in order to represent, "the political, social and economic interests of the people of Northern Ontario"

(*ibid.*). NAN's lands and resources department is responsible for advocacy and assistance to member communities on natural resources issues.

Federal Government

The Protocol for Safe Drinking Water in First Nations Communities (INAC 2006) indicates that responsibilities for water services for First Nations lies primarily with two federal departments: the Department of Indian and Northern Affairs Canada (INAC) and Health Canada, although numerous federal agencies affect and play roles in water management for First Nations (See Section 2.2 for more details).

INAC's responsibilities in water management include: the funding of water infrastructure (the department provides 80% of funding for water infrastructure capital projects); oversight of facility design and construction; and monitoring compliance with the Protocol. Health Canada holds an advisory and capacity-building role for First Nations' water quality testing. Health Canada also works with First Nations to test water quality, to develop federal guidelines for drinking water quality, to conduct public health risk assessments, and to provide education and training for band councils and water system operators through the First Nations Environmental Public Program (Health Canada, 2008). Public health officers also investigate concerns about drinking water quality as needed. Specific roles and responsibilities of Health Canada are not 100% clear; for instance, a report of the Commissioner of the Environment and Sustainable Development indicates that there are inconsistencies of water testing as well as a lack of clarity of roles for the issuance of Water Quality Advisories (CESD 2005, 22).

Another federal department that impacts drinking water management for First Nations is Environment Canada, which is responsible for providing guidance tools for source water protection to First Nations. Environment Canada provides advice and guidance on regulatory requirements for wastewater systems (INAC 2006) and it also assesses infrastructure from an environmental standpoint, particularly in regard to environmental assessments for new facilities.

The Ontario Government

The provincial government has played an increasingly important role in water management for First Nations, even though the province is not legally obligated to play a direct roles in this. Due in large part to recommendations of the Walkerton Inquiry (O'Connor 2002b), First Nations communities have access to provincial training and certification programs on a cost-recovery basis. Recent developments in source water protection have also led to the inclusion of some First Nations communities in source water protection efforts under the Clean Water Act, 2006 (CWA). First Nations that are located within the boundaries of source protection areas established under the CWA have the option of participating in the source water protection process, as members of the local source water protection committees. However the province does not have jurisdiction for implementing source protection measures on reserve land. The Ministry of Environment oversees source water protection, it conducts reviews of water treatment facility designs on request and it will provide letters-of-conformity if the facility meets or exceeds provincial standards and regulations.

Other Involved Institutions

The involvement of non-government organizations in environmental advocacy and decision-making is becoming increasingly common in First Nations communities. NGOs play important roles in providing citizens' perspectives on environmental issues such as water management and water protection. These organizations can also provide forums for traditional leadership and perspectives to be represented in decision-making processes. NGOs that have become involved in First Nations' water management include the Canadian Environmental Law Association (CELA), Ecojustice, and the Centre for Indigenous Environmental Resources. One of the NGOs that was surveyed for this thesis research is the AGGEP, which is a community-based environmental group that promotes watershed protection, environmental education and stewardship at Fort William First Nation (Anishinabek of the Gitchi Gami Environmental Programs [AGGEP] 2007).

The Chiefs of Ontario was formed in 1975 as, "an unincorporated federation of the four major Ontario First Nation organizations" (COO 2009). Its stated purpose is to, "enable the political leadership to discuss and to decide on regional, provincial and national priorities affecting First

Nation people in Ontario and to provide a unified voice on these issues" (*ibid.*). The Chiefs of Ontario includes membership of 133 of 134 First Nations communities in Ontario. Its political confederacy is composed of the grand chiefs from each of the four PTOs as well as a representative of the independent First Nations. The four PTOs are the Association of Iroquois & Allied Indians, the Nishnabwe Aski Nation, the Union of Ontario Indians, and Grand Council Treaty #3 (*ibid.*). The Chiefs of Ontario is overseen by a regional Elder and an Ontario Regional Chief. The organization works with the federal, provincial and First Nations governments on issues of importance to Ontario's First Nations, including environmental issues. One of its focal areas is water. A number of publications from the Chiefs of Ontario on water and Indigenous traditional knowledge have been incorporated into this study.

Several First Nations hold agreements with local municipalities for drinking water provision. Some of these communities supply water to municipalities, while other First Nations communities receive piped municipal water. An example of this type of relationship is FWFN, which now receives treated drinking water from the municipality of Thunder Bay following a long history of providing source drinking water to part of the City.

Regional public health units occasionally work with First Nations for health monitoring and health training programs, although such relationships vary from region to region. In Northwestern Ontario, the Thunder Bay District Health Unit (TBDHU) is available as a potential informal resource for First Nations. According to a representative of the TBDHU, since FWFN is supplied water from the city of Thunder Bay's municipal water supply, the First Nation would be immediately notified by the TBDHU in case of a water quality advisory.

Finally, cultural institutions play an important role in decision-making in many First Nations communities. Cultural and traditional considerations are not currently incorporated into drinking water policy in a meaningful or substantial way, although as this thesis discusses, the incorporation of Anishinabek culture into water management is an important consideration for the future of water management for First Nations communities. Elders were identified as representatives of Anishinabek culture for inclusion in this study.

4.2. Fort William First Nation Characterization

4.2.1. Geography

Fort William First Nation (FWFN) is located on the north shore of Lake Superior, immediately adjacent to the City of Thunder Bay, on the south bank of the Kaministiquia River (Figure 3). The official name of the reserve is Fort William 52 and it is a member of the UOI. The reserve, which currently covers almost 60 km^2, was established under the Robinson Superior Treaty, which was signed in 1850 between the Crown and representatives of FWFN (Fort William First Nation [FWFN], n.d.). The complete boundaries of FWFN are currently under negotiation with the federal government since land claim has been made on the basis that the current boundary does not conform to the original agreement. The claim was accepted in 1994 by the federal government, and in 2000 by the province of Ontario (*ibid.*). At the time of my visit to the community, treaty negotiations were still under way. An anonymous interviewee at FWFN, who was at that time a band council member, indicated that discussions about land and water are politically sensitive due to these ongoing matters.

Figure 3: Map of Fort William First Nation

Adapted from: Microsoft Corporation (2009)

4.2.2. Census Data

According to recent census data (2006), FWFN has a population of 909 people, 350 private dwellings, and an area of 58.17 km^2 (Statistics Canada 2009b). The median income for all surveyed families in 2006 was $34,848, about $20,000 less than the median for all of Ontario.

4.2.3. Water Source

Prior to the spring of 2008, the First Nation obtained its water from a water plant at Loch Lomond, a natural inland lake located atop Mount McKay. The lake is situated partially on the reserve and partially in Neebing County. Facilities for the intake and treatment of the lake water were located on the First Nation's land, however it was leased and operated by the city of Thunder Bay. Under an agreement between FWFN and the municipality, the water was used to supply the southern portion of the City of Thunder Bay as well as the majority of FWFN residents. The northern portion of Thunder Bay, formerly known as Port Arthur, is supplied by the Bare Point treatment plant, which takes water from Lake Superior. In early 2008 the water supply from Loch Lomond was shut down and decommissioned, following an upgrade of the facility at Bare Point. The upgraded facility now treats and supplies water for the entire City of Thunder Bay, as well as for the First Nation.

During interviews for this thesis and in informal conversations with contacts, the Bare Point water source was frequently characterized as one of the best water treatment facilities in the world. The water quality of Loch Lomond has historically been good, however a 1997 boil water advisory from the detection of giardia and cryptosporidium was enough to convince many that the Bare Point water source was more reliable and of better quality (Haider & Rashid, 2002). While the water quality from the Bare Point facility is considered by many to be very good, there is a general consensus among several FWFN community members, with whom I informally spoke, that the new Bare Point water source tastes over-chlorinated and was thus less preferable than the Loch Lomond source. According to the anonymous band council interviewee at FWFN, there are currently no formal plans by FWFN to use the water from Loch Lomond, however the water plant remains in place and a 2007 economic plan from the FWFN band council included the suggestions of bottling Loch Lomond water for distribution.

An important distinction between FWFN and the two other case study communities is that the former receives drinking water from an adjacent municipality, thereby exempting it from requiring on-reserve water treatment facilities. For this reason, I aimed to interview the individual responsible for monitoring water infrastructure at FWFN (as opposed to a water operator). This individual is an employee of the municipality of Thunder Bay and a member of the First Nation, according to informal sources. Unfortunately, attempts to contact the individual were not successful and as such this person was not included in the study.

4.3. Gull Bay First Nation Characterization

4.3.1. Geography

Figure 4: Sign at Entrance to Gull Bay First Nation

Credit: S. Finn (2008)

Gull Bay First Nation (GBFN), also commonly referred to as Kiashke Zaaging Anishinaabek First Nation, is located approximately 175 kilometres north of the City of Thunder Bay. The official name of the reserve according to the federal government is Gull River 55; in this thesis, the community is referred to as Gull Bay First Nation. The reserve, which covers approximately 3900 km^2, is located at the outlet of the Gull River, on the southwestern shore of

Lake Nipigon (Figure 5). Similar to FWFN, the GBFN is a signatory to the Robinson Superior Treaty of 1850 (FWFN, n.d.), and is a member of the UOI.

Figure 5: Map of Gull Bay First Nation

Adapted from: Microsoft Corporation (2009)

4.3.2. Census Data

According to the most recent census data from Statistics Canada, the population of GBFN was approximately 200 and the community had 86 homes in 2006 (Statistics Canada 2009a). Recent detailed statistics were not available for GBFN.

4.3.3. Water Source for Gull Bay First Nation

The current water source for GBFN is surface water from Lake Nipigon. The water is treated in a small treatment facility that is approximately 40 years old. The primary water treatment processes are chlorination and ozonation. During my visit to GBFN, the water manager indicated that there is currently no filtering mechanism for incoming water. Water is tested twice each day at several sites, including at the treatment plant (post-treatment), the health station, the water manager's house, and at the end of the water line. In an interview, the community's water manager indicated that the reserve's capacity for testing is not rigorous

enough and he expressed concern that potentially harmful chemicals could be going undetected in the water supply. The water manager also fears that the high level of chlorination is reacting with organic compounds in the lake water to form carcinogenic chemicals called THMs (trihalomethanes). Water samples are taken quarterly by Health Canada for additional testing procedures that cannot be done in the community. The results of these tests are subsequently communicated back to Gull Bay, to INAC, and to the OFNTSC. While THMs have been detected through the Health Canada tests, Gull Bay's water manager did not indicate whether any action had been taken to address the problem.

4.4. Mattagami First Nation Characterization

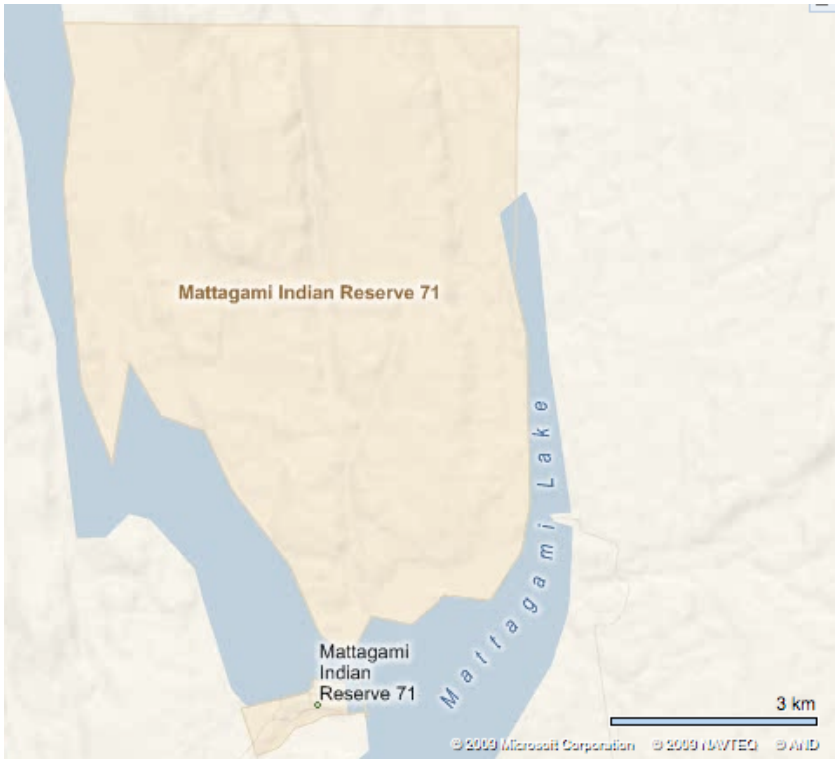
Mattagami First Nation is located in a different area of Ontario and is not a member of the same PTO as the other two case study communities; instead, it belongs to the Nishnawbe Aski Nation (NAN), which is composed of communities that fall under Treaty 9. Furthermore, in contrast to FWFN and GBFN, MFN is involved in provincial-level source water protection. The community has a representative on the Mattagami Region Source Protection Committee (MRSCP) and through this positive relationship MFN has provided input to the source protection planning process. MFN's involvement in Ontario's source water protection initiative makes it unique among the other case study communities. The situation provides an opportunity to gain useful insights into the relationship between the source protection committee and the First Nation.

4.4.1. Geography

The Mattagami First Nation reserve (officially named Mattagami 71) is located near the community of Gogama, approximately 100 km south of Timmins, Ontario. It is connected by road to adjacent municipal centres and is accessible year-round. The establishment of trading posts in the late 1700s and early 1800s heavily influenced the creation of a permanent community site for MFN (COO 2005). The First Nation is also a signatory of Treaty No. 9 (known as the James Bay treaty of 1905). The MFN reserve covers a total land area of approximately 46 km^2. Hydro-electric developments in the early part of the 1900s led to flooding of much of MFN's land and as a result, an additional 0.8 km^2 parcel of land was

provided to the First Nation for the town's site; this is where the community is currently located (Figure 6).

Figure 6: Map of Mattagami First Nation



Source: Microsoft Corporation (2009)

4.4.2. Census Data

The population of MFN was determined in 2006 to be 189 people, which represents a 13% increase in total population in the span of 5 years (Statistics Canada 2009c). The median age of the community is 26.5 years; by contrast, the Ontario median age is 39 years. The community has a total of 79 occupied dwellings.

4.4.3. Water Source

The water source for MFN is groundwater from local aquifers. The Chiefs of Ontario profile for the community (COO 2009) indicates that the community makes use of two wells, two pumping stations and a filtration system, and the community's sewage is handled primarily through the use of private septic systems. In conversation with a member of MFN who sits on

the local source protection committee, it was indicated that the community's water system has recently been upgraded and that it was functioning as expected. The interviewee described the new facility as "state of the art". Unfortunately I was not able to get in touch with the community's water manager and thus information on the type of treatment system was unavailable.

The reserve is situated within the boundaries of the Mattagami Region Conservation Authority, and is therefore also located within the boundaries of the Mattagami Region Source Protection Area. The Mattagami Source Protection Authority's terms of reference document (Mattagami Region Source Protection Committee [MRSPC] 2008) indicates that MFN decided not to include the reserve land in the source protection area. Despite this, MFN participates in the source protection process, having a committee member who sits on the Source Protection Committee.

4.5. Chapter Summary

The three study communities, when compared, provide useful examples to discuss some of the different ways in which the MBA is carried out in First Nations communities. The differences among the communities illustrate the ways in which the same policy framework can have variable effects on separate First Nations. The similarities among the communities, which include their shared institutional environment for water management, also allows for some comparison of the ways in which this environment affects First Nations.

5. RESULTS AND DISCUSSION

As described in the methodology chapter (Chapter 3), the themes were identified on the basis of their salience throughout the interviews, observational data, and documentary data. The themes were narrowed down to the following: participation, involvement, and engagement of First Nations; regulation and jurisdiction in water quality management; Indigenous traditional knowledge of, approaches to and beliefs regarding water; and commitment, qualifications and resources for water treatment programs. These four themes informed the structure of this chapter. In the following sections, the themes are not listed in any particular order; since the research was exploratory and qualitative in nature, all of the themes that showed salience in the data set were considered to hold equal importance. Appendix II contains complete lists of identifiers for each level of coding. Table 7 displays codes that informed the creation of the four salient themes. Each column in Table 7 represents a different level of coding; the table demonstrates the stages of analysis, the combination and the adaptation of topics into themes moving from left (first level codes) to right (fourth level codes and final themes).

Table 7: Coding Breakdown for Themes

Level I	Level II	Level III	Final Codes (Themes)
Accountability/fault	Accountability	Accountability	
Band council responsible	Band council	Band council	
Band council's relationship with community-Based groups			
Band councils' responsibilities			Legislative and policy frameworks
INAC devolution	INAC	Jurisdiction	
INAC funds	Indian act	Law	
INAC Health Canada	Jurisdiction		
INAC support	Law		
Poor planning by INAC	Letter of conformity		
Law of general application	Clean Water Act	Liability	
Legislation	Enforceable regulations		
	Liability		
Community involvement in water management	Awareness	Engage	
Conflict	Buy-in	Involve	
Lack of confidence in water supply	Community interest	Public involvement	
Lack of consultation	Confidence in water supply	Youth	
Youth involvement	Consultation		
	Engage		
	Involve		
	Public involvement		
	Youth		
Democracy	Communication	Access	
Demographic representation	Ignorance	Communication	
Empowerment	Participation	Education	
First Nation involvement in SPC	Partnership	Participation	
FN rep as resource for SPC	SPC	Partnership	
Lack of interest by FN community	Training		Public involvement and awareness
Little interest shown by FN			
Providing a voice for FN people			
Co-management	Community involvement	Community involvement	
Decision-making	Management	Traditional	
Different leadership structures	Traditional perspectives		
Minister has final say			
Stakeholders			
True control remains with non-FN institution			

Level I	Level II	Level III	Final Codes (Themes)
ATK and SWP Importance of water Language Language Research Traditional land use Traditional perspectives Traditional value of water Women Youth involvement	Alternative tech ATK Holistic Long-term Traditional Education SPC Youth	 Alternative technologies ATK Traditional	 Indigenous Traditional Knowledge
Commitment to process Committed and reliable individual/water manager Low salary for operators Monitor Technical staff Testing Call for better water treatment Changing standards a challenge Deficiency in current water setup Expensive to operate water treatment facility Funding for water infrastructure Funding pressures faced by INAC Harsh conditions High-risk systems Infrastructure problems Lack of resources Limited resources Proactive maintenance Recent funding increases Water treated with Javex	Commitment Remote Training Certification Operator Management Location Capacity Deficiency Economies of scale Facility certification Funding Infrastructure Relationship with municipality Resource SPC Treatment	Committed and reliable individual Training Deficiency in water setup Infrastructure Funding	 Commitment, Qualifications, and Resources

5.1. Participation, Involvement, and Engagement of First Nations

The need for participation, involvement, and engagement of First Nations people in all aspects of water management emerged as an important theme in this research. In a recent article, Mascarenhas (2007) writes that opportunities for the involvement of Indigenous people in environmental decision-making in Ontario were hindered by political and social reforms of the Conservative government in the 1990s. During that time, policy changes in Ontario favoured economic production and expansion over environmental regulation, leading to reductions in programs and opportunities for public involvement and input in environmental protection. This was an effect that was not unique to First Nations, but one that affected public involvement generally, across the province. The effects of these changes continue to create challenges for First Nations, particularly because participation in provincial decision-making and access to provincial resources for water management have historically been limited by the fact that First Nations are federal entities under Canadian law (see Subsection 2.2.2 for more details).

While some First Nations have gone to the courts in order to assert their environmental rights and to influence decision-making regarding the natural environment, this is typically an expensive and lengthy process and it is something that many First Nations communities simply cannot afford (Walkem 2007). Frustration with the lack of involvement of First Nations people in their own communities' water management was evident in the data collection. [NGO2] spoke specifically about water policy, saying, "It is like a vehicle [that] is designed for you without any of your input – then you are expected to drive it and to take care of it. This doesn't work. If policy changes are to be successful, they need to be designed by the communities. This might be initially more expensive but the long-term effects will save more monies over the long term."

At first glance, there appears to be evidence of effort to involve First Nations in recent provincial environmental policy-making. Examples in Ontario have included the regulatory requirement under the Clean Water Act, 2006, for source water protection committees to seek the participation of First Nations, and requirements for the Province of Ontario to provide First

Nations with access to provincial drinking water operator certification programs through the provincially operated Ontario Clean Water Agency. An example of First Nations' involvement with federal policy making was the engagement process that was implemented by INAC in spring 2009, for the development of a proposed legislative framework for drinking water and wastewater for First Nations (see INAC 2009a for more information).

Despite these recent developments it is clear that many people are not satisfied with the manner, extent or relevancy to which First Nations people have been involved in water management to date. In policy documents and press releases from the federal and provincial governments, terms like "partnership" and "stakeholder" are often used in reference to the involvement of First Nations. An anonymous speaker at the FNWPF, [FN17], spoke on the use of the term "partnerships", which has been used in reference to the relationship between government departments and First Nations, saying that, "Partnerships are only true when [so-called] partners are part of the final decision-making". The individual continued, saying, "First Nations should be around the decision-making table." Another commenter at the FNWPF took issue with being referred to as a stakeholder in government decision-making processes, claiming that, "We are not stakeholders, Ontarians, or Canadians; we are Anishinabek people with a very unique standing on the land" ([FN5]). These statements indicate an antipathy towards the government's rhetoric for participation by First Nations, and a desire amongst some First Nations people for authentic, nation-to-nation engagement and discussion. A representative of the Source Protection Branch of the Ontario Ministry of the Environment (MOE), [PR4], indicated that this was a common concern raised by First Nations in the provincial source water protection process.

To some extent, the limited involvement of First Nations in decision-making can be attributed to inappropriate and ineffective communication between the various institutions that are involved in water management. [HU] identified poor communication among the numerous government departments and communication with First Nations by those departments as something that adversely affects the ability of communities to manage water quality at the community level. A recent publication from the Safe Drinking Water Foundation's Advanced Aboriginal Water Treatment Team (AAWTT) referred to some of the communication

challenges between federal departments which monitor First Nations' water quality in the following way: "Neither INAC or Health Canada appears to share data or be capable of determining the efficiency of water treatment systems" (AAWTT 2009, 6). [NGO1] expressed some dissatisfaction with the contemporary band council model, and he described the structure as essentially more accountable to INAC than to its own citizens, primarily because INAC provides funding directly to band councils. [NGO1] likened the current structure of band councils to municipalities as opposed to traditional forms of governance. Both [BC2] and [WM] both voiced concern over the poor communication between community Elders, the band council, third-party technicians, and the federal and provincial governments in contributing to the construction of a water plant that does not suit their community's needs in a number of ways (See example of GBFN in Section 5.2).

Issues of inadequate involvement of and participation by First Nations extend far beyond community-level circumstances. In response to the recent INAC engagement sessions for the development of drinking water and wastewater legislation (see INAC 2009a), the Safe Drinking Water Foundation's AAWTT released a statement indicating that the engagement sessions did not constitute acceptable involvement of First Nations (AAWTT 2009). Among the reasons for this were that each of the sessions was only one day long, little notice was provided to First Nations leaders in advance of the meeting, and the federal government began the process with a preferred outcome in mind. According to the AAWTT, through these sessions INAC was not fulfilling, "its fiduciary responsibility and liability for First Nations drinking water quality" (AAWTT 2009, 2). Furthermore, the SDWF's AAWTT (2009) holds the position that, "INAC's engagement sessions and attempts to deal with First Nations drinking water quality are utterly inadequate, do not offer opportunity for meaningful consultation, diminish First Nation Treaty Rights, and attempt to absolve INAC of its fiduciary responsibility" (AAWTT 2009, 4). The report continues to explain that INAC does not allow First Nation leaders to influence funding decisions for water treatment facilities; a situation that is compounded by the SDWF's findings that third-party engineers used by INAC are not required to guarantee that proposed systems will treat water to meet the Guidelines for Canadian Drinking Water Quality (see Health Canada 2008).

The CCME (2004) indicates that public involvement in water management is one of the components of a fully operational MBA. The results of this thesis point to a need for deeper, more authentic, meaningful and extensive involvement of the sample communities and likely of First Nations throughout the province, in decision-making for and implementation of water management regimes. Fortunately, the data collection identified several examples of opportunities for better engagement and involvement of First Nations.

The research found that opportunities for the involvement of First Nations in water management are starting to occur more often, even though they were typically sparse in the past. While some sources identified the recent INAC engagement sessions as a challenge to authentic First Nations' involvement, [NGO2] maintained a positive view of the experience. This interviewee indicated that, while the sessions were far from ideal they represent opportunities to educate people and create awareness about First Nations water issues and the sessions could be forums for environmental NGOs to put pressure on the federal government for action on water issues. [NGO2] emphasized that every problem also represents an opportunity. In speaking about this perspective, [NGO2] likened this notion to the properties of water, which always has multiple ways to move around an obstacle. [PTO1] also referred to recent developments with INAC as opportunities for the participation of First Nations. A representative of a PTO at the First Nations Water Policy Forum, [PTO2], spoke of a Women's Water Commission that was established in 2007 and a growing "water network" for First Nations, as opportunities for increasing communication and awareness of water issues among the organization's member communities. These initiatives, according to [PTO2], will also function to build consensus among First Nations on water-related issues.

Another area of opportunity that was mentioned by [NGO1] is citizen involvement at the local level, in environmental protection through NGOs like the Anishinabek of the Gitchi Gami (AGGEP). [NGO1] suggests that organizations like the AGGEP can provide the opportunities for more democratic and participatory governance than the conventional band council model is able to, and claimed that such civil-based structures can work well alongside the established bureaucracy. [NGO1] also maintained that organizations like the AGGEP can be structures in which traditional and customary forms of governance can be expressed. [NGO1] sees a lot of

opportunities for establishing AGGEP-type organizations in other First Nations; according to the interviewee there is substantial funding available for such initiatives at the current time. [NGO1] also maintains that, "community organization can happen at any stage," and it doesn't matter, "that most people are disconnected from governance at the moment." Even though the AGGEP is a very young and unique organization (it was established in 2006), it continues to grow and involve more people. During my research, I was informed of other First Nations communities who intend to create similar organizations.

Mattagami First Nation provides an interesting example of a First Nation's involvement in water management. [SPC3] represents Mattagami First Nation (MFN) on the MRSPC. Even though the First Nation does not benefit directly from the source protection process (MFN decided not to include their water system in the source protection area), [SPC3] maintains that it is helpful for the First Nation to stay informed of the committee's decisions through his involvement as a committee member. [SPC2], the chair of the MRSPC, claimed that the goals of MFN and the non-First Nation communities in the source protection area are similar, being, "to make sure there is enough [clean water] for the following generations." MFN is among a select group of First Nations that are involved in the source protection process; according to [PR4], of the Ministry of Environment's Source Protection Branch, the following 11 of a possible 27 First Nations were actively involved in Source Water Protection committees as of December 2008:

- Mohawks of the Bay of Quinte
- Algonquins of Pikwakanagan
- Alderville First Nation
- Curve Lake First Nation
- Rama (Mnjikaning) First Nation
- Whitefish Lake First Nation
- Wahnapitae First Nation
- Mattagami First Nation
- Six Nations of the Grand River
- Mississaugas of the Credit
- Chippewas of Kettle and Stoney Point

Comments from [BC1] (who is a member of the FWFN band council) and [SPC1] indicated there had been at least one letter sent from the committee to FWFN, inviting the reserve's participation as part of the committee as per their legal obligation to do so under the Clean

Water Act. In October of 2008, [SPC1], reported that FWFN had not responded to invitations from the source protection committee to participate in the committee's work. [SPC1] mentioned that FWFN had not yet responded as of October 2008. [BC1] implied that the First Nation may be interested in participating in the future, however FWFN had not yet selected a representative from the First Nation to sit on the committee. MFN's experience indicates that, even without direct benefits received from participating on a source protection committee, doing so may be a way to stay abreast of the committee's work and future directions.

The inclusion of First Nations representatives on committees does not guarantee that the relationship or communication between the committee and the reserve will be meaningful. In a conversation about source protection committee members, [SPC1] emphasized it is important that all source protection committee participants are committed to the source protection planning process. Lack of commitment by any committee member can cause delays and create barriers to water protection. For example, according to [SPC1], poor attendance at meetings affects quorum, which must be satisfied for the results of decision-making to be binding according to the source water protection legislation.

A number of sources identified education and training as important and significant opportunities for increased involvement of First Nations. [TSC], a manager at the Ontario First Nations Technical Services Corporation (OFNTSC), expressed a desire to see more individuals from First Nations involved in technical aspects of water management. [TSC] spoke about educational materials that the OFNTSC plans to develop, in order to spark interest among Indigenous youth to pursue careers in water management. Several sources explicitly mentioned education as an important opportunity for addressing water challenges by increasing awareness of water issues ([PTO1]; [NGO2]; [FN5]), and increasing capacity to manage watersheds through training programs ([PTO2]).

Finally, in response to the lack of meaningful government-initiated involvement in water management, some Ontario-based First Nations organizations have been taking steps to involve and to engage government agencies. Several examples are: the Chiefs of Ontario-organized FNWPF in October 2008; the First Nations Water Declaration ceremony in March

2009; and a sacred water retreat at Whitefish River First Nation in June of 2008 ([FN6]). Government representatives were invited to each of these First Nations-driven events. Some participants at the FNWPF seemed dissatisfied with presence of only low-level bureaucrats at the meeting; these individuals called for the participation of high-level politicians and bureaucrats at future meetings, in order that water issues are dealt with at the top. In the words of [FN5], "Next time we don't want the lieutenants, we want the generals."

These findings suggest that the public participation component of the MBA is currently not being fulfilled in water management for First Nations. The research reveals that several challenges remain to be addressed in order to ensure adequate involvement of First Nations people in water management. Some of the biggest obstacles are related to the concentration of decision-making power for water management with INAC, as opposed to with local leadership structures. This situation was poignantly described by [NGO2] as an attitude of INAC representatives thinking that, "they know best for First Nations."

A number of existing (however inadequate) opportunities are available for First Nations to become more involved in drinking water management. Opportunities for engagement are provided by various governments, as well as through First Nations-led initiatives, both at the institutional level (e.g., PTO initiatives) and at the local level (e.g., the AGGEP at FWFN). Maximizing these existing opportunities may be a first step in ensuring that public participation is embedded in water management for First Nations communities, in partial fulfilment of a multi-barrier approach.

5.2. Regulation and Jurisdiction

In this research, the jurisdictional and legal circumstances for First Nations' water quality management were characterized by sources as unnecessarily complex, inappropriately designed for conditions faced by First Nations communities, and generally ineffective for ensuring safe drinking water. These circumstances are outlined in Subsection 2.2.2 and they have been characterized in similar ways by various recent publications including reports of the Walkerton Inquiry (O'Connor 2002a,b), the Expert Panel (Swain et al. 2006a,b), and the report

of the Commissioner of the Environment and Sustainable Development (2005), among others. The following section provides an overview of institutional perspectives on this subject and on the effectiveness (or lack thereof) of existing jurisdictional and legal arrangements. The informants' responses addressed the effects of existing policies on safe drinking water provision for First Nations communities; two of the sources were from a community in which jurisdictional issues have impacted drinking water management. This section also outlines a number of opportunities for addressing jurisdictional challenges to ensure safe drinking water.

During the research, jurisdictional issues were identified as challenging aspects of water management for First Nations. The Safe Drinking Water Foundation's Advanced Aboriginal Water Treatment Team (2009, 6) describes the division of roles and responsibilities for First Nations' drinking water as a "jurisdictional quagmire". This description sums up many of the challenges that are faced by First Nations people in Ontario. Political and institutional environments governing First Nations' water are typically characterized by confusion, uncertainty, and a history of neglect.

A speaker at the FNWPF, [FN5], questioned the federal and provincial governments' authority over water and current legal structures, asking: "Who gave the Crown jurisdiction over the water?" This same speaker described the current jurisdictional arrangements as "not straight-forward". Literature on the subject characterizes the legalities of drinking water in much the same way, and identifies that jurisdiction over water is not explicitly addressed in the treaty, Aboriginal, or constitutional rights (refer to Subsection 2.2.2 for more details).

Other First Nations sources identified jurisdictional issues as significant challenges for ensuring safe drinking water for First Nations, including [NGO2], who described jurisdictional challenges as "huge." Even though provincial standards and regulations do not legally apply to First Nations, funding agreements between First Nations and the federal government usually require that First Nations' drinking water treatment must meet provincial standards. According to the Globe and Mail, in 2006 the Indian Affairs Minister indicated that effective that year, provincial water standards would apply to reserves (Curry 2006). A recent publication by the Safe Drinking Water Foundation (AAWTT 2009, 2) referred unfavourably to the recent

proposal by the federal government to legislate provincial standards to apply on reserves, describing provincial standards as "less strict" than federal guidelines.

Several of the sources who highlighted issues of unclear or unsuitable jurisdiction, also touched on issues of accountability, responsibility, and liability ([NGO2], [BC2], [WM], [NGO3] [FN17]). [NGO2] drew on the example of the water contamination and subsequent evacuation of Kashechewan First Nation in 2005 as an example of the provincial and federal governments "passing around" the responsibility for First Nations' water. The Expert Panel report (Swain et al. 2006a, 21) described this event in the following way: "In the extreme case of the First Nation community of Kashechewan First Nation, in northern Ontario, the provincial government undertook an evacuation for water-related reasons, in part because of confusion over the roles of various other parties in an emergency." The lack of clarity and due process for determining institutional responsibility for water management is a reflection of poorly designed jurisdictional arrangements; in times of crises this can result in the juggling of responsibility, but on a day-to-day basis it can affect the long-term health and well-being of communities.

Without referring to specific communities, [NGO2] spoke of common scenarios for First Nations reserves in which new facilities are funded and built by the federal government without adequate input from the recipient communities. According to [NGO2], the engineers and designers who are contracted by INAC to construct water treatments systems in First Nations often do not even visit the locations prior to the construction of facilities. This approach virtually guarantees that new infrastructure will not meet the specific needs of communities. Furthermore, [NGO2] mentioned that once First Nations "sign on the dotted line" after construction has finished, liability for the facilities' operation is passed from the federal government to the band council. This liability can pose legal problems for band councils when water systems fail to produce safe drinking water. This liability is mentioned in the report of the Expert Panel (Swain et al. 2006b), "there appears to be support in the case law to the effect that bands and band councils may…be sued."

One example of how jurisdictional arrangements and liability concerns have impacted First Nations was revealed in my discussions with representatives from GBFN. The two interviewees from GBFN, the community's chief [BC2] and the water system operator [WM], described how provincial and federal jurisdictional overlap has contributed to the construction of a $6 million water treatment plant in 2004 that has never been commissioned (see Figure 7).

In 2000, GBFN's water supply became contaminated with *E. coli*. This incident led to the allocation of funds by INAC to construct a new water plant, in order to address valid concerns about the community's water treatment and supply. According to [BC2], a letter of conformity[5] for the water treatment plant's designs was never received from the provincial government, as per the community's funding agreement with INAC. While the practice of obtaining a letter of conformity for new water treatment systems to provincial standards is not a legally enforceable policy, it is considered standard practice for First Nations in Ontario ([PR4]; [PR5]; [TSC]). [BC2] indicated that since becoming chief in 2006, he has tried unsuccessfully to determine if a letter of conformity was ever obtained for the new plant. Instead, he found documentation that specifically indicated the plant did not meet provincial specifications. Once construction of the facility was completed, according to [BC2] and [WM] the band council decided not to activate the facility or connect it to the residents' distribution system because they had no proof it was safe to do so. The facility has never been used for fear that the band council will be held liable if the system does not provide safe drinking water.

[5] If a First Nation's drinking water treatment system meets provincial standards, the band council may request and receive a letter of conformity from the Ontario Ministry of Environment.

Figure 7: Gull Bay Water Treatment Plant (Inactive), in September of 2008

Credit: S. Finn (2008)

In addition to the new facility not meeting provincial safety standards, [BC2] and [WM] both identified the location of the facility as inappropriate and in conflict with recommendations of the community. The new building is located on the shore of the Gull River and it draws water from a part of the river that, according to [WM], is known to be a fish spawning area and is at risk of contamination from upstream mining or forestry developments. [WM] and [BC2] maintain that Elders had recommended the shore of Lake Nipigon as a more appropriate location. The recommended location is close to where the current, outdated water treatment facility is located, on the shore of Lake Nipigon. This specific example illustrates where community involvement and participation in infrastructure design would have addressed water safety for a First Nation community.

During the interviews, both [BC2] and [WM] expressed frustration over their community's water supply situation. Each indicated that a factor that led to this outcome may have been the incapacity of the then-band council to understand the complex funding and jurisdictional arrangements for the project. Both representatives agreed that the over-arching responsibility to ensure community consultation and adequate resources for building and designing facilities that meet provincial standards for water quality should ultimately be held by the federal government.

Unfortunately, in October 2008 (the date of this research) the water supply for GBFN remained essentially the same as it was prior to the 2000 incident of water contamination, and in April of 2009, GBFN was placed on a boil water advisory because of turbidity issues. It is unclear whether the new treatment system will ever provide safe drinking water to GBFN. What is clear though is that GBFN's story is not unique among First Nations, and the First Nation's circumstances illustrate some of the challenges that First Nations in Ontario face with the current jurisdictional and legal frameworks in place.

It is important to note that this type of scenario is not isolated to Ontario. At the FNWPF, [NGO3] spoke about a similar occurrence in a First Nation community located in Alberta. The speaker described the liability that the band council experienced when they discovered that their water treatment facilities, which were constructed by and with funding from the federal government, were not treating water to acceptable federal or provincial standards. The report of the Commissioner on the Environment and Sustainable Development (CESD 2005, 14) also identified a community for which a $3 million water treatment plant had been built by INAC in 2001, and in 2005, 50% of the community's 500 homes remained without direct access to the water source. These examples illustrate that there are fundamental inadequacies with the regulation and jurisdiction of drinking water in First Nations. As a result, many communities suffer simultaneously from sub-optimal infrastructure created by INAC and the liability that comes with it.

Perspectives on opportunities to address jurisdictional inadequacies and the lack of regulation for First Nations' drinking water are variable. Despite this variability two themes emerged, both of which address the creation of a national legislative framework.

Certain opportunities do exist, for example the Expert Panel report (Swain et al. 2006b) explores the notion that provincial water laws could be applied to First Nations as laws of general application. The report explains that, while there is some legal precedent to suggest that certain provincial laws can apply on reserves, there is debate as to whether provincial water laws infringe upon federal responsibility for First Nations. Data from the interviews, observations, and from publications revealed various perspectives on the notion of provincial laws and standards being applied to First Nations. Some interviewees, such as [BC2] and [WM], suggested that the application of provincial standards should be accomplished under laws of general application. Both individuals maintain that the creation of a national legislative framework for drinking water management would promote clarity and accountability among the federal and provincial agencies, to ensure safe drinking water for First Nations. Furthermore, on the issue of liability for band councils, the Expert Panel (Swain et al. 2006b, 42) explains that, "the introduction of new federal water legislation would provide the opportunity to clarify any ambiguity about ownership of the water facility and the resulting liability [associated with drinking water facilities on reserves]."

Other sources, such as the Safe Drinking Water Foundation's AAWTT (2009) were not optimistic about the introduction of federal legislation with reference to provincial laws. This group of advocates is adverse to the application of provincial laws through federal legislation to First Nations because it is perceived to shift the fiduciary responsibility for First Nations' water from the federal to the provincial government. The Safe Drinking Water Foundation cites the Assembly of First Nations, saying that, "enacting legislation referencing provincial regulations related to water fails to recognize Aboriginal and treaty rights in water management nor does it respect First Nations' jurisdiction to regulate water in First Nation territories" (Assembly of First Nations [AFN] 2007). Other sources were also not optimistic about the application of federal or provincial legislation to First Nations. Speakers at the FNWPF expressed dissatisfaction with the application of either federal or provincial laws to

First Nations communities. One speaker, [FN7], stated that, "we do not agree to the jurisdiction of the crown." Ultimately, this research reveals that there is a spectrum of perspectives across First Nations communities on how to approach the jurisdictional and legal challenges for water quality management. The results indicate though that under the current circumstances, the legislative and policy frameworks component of the CCME's (2004) MBA is not fulfilled and that there are varied perspectives on possible solutions to this concern.

5.3. Indigenous Traditional Knowledge, Approaches, and Perspectives

The incorporation of indigenous traditional knowledge, beliefs, and practices in water management emerged as a salient theme during interviews and observations. Within this theme, several distinct concepts were apparent from informants' responses. Each of these concepts represents particular challenges and opportunities that are faced by First Nations in water management. For each challenge the data also revealed opportunities for addressing them. The most pervasive concepts include the following: the incorporation of multiple generations in decision-making; the role of women as traditional water protectors; and the nexus between traditional ways of knowing and Western, scientific approaches to water management. The following summary is not intended to outline all aspects of traditional knowledge; instead it identifies and explores concepts that were discussed by interviewees and in publications, during data collection.

5.3.1. Involvement of Multiple Generations

The call for greater involvement of youth and Elders in water management and decision-making was common among interviewees. Multi-generational involvement was addressed specifically by [ER2], [FN5], [NGO1], [SPC2], [SPC3], and [TSC] who represent a variety of institutional perspectives. The informants on this topic included a First Nations youth, Elders, the chair of a source protection committee, a First Nations' representative for a source protection committee, and an engineer with a technical services organization. Despite their different perspectives, the core of the message was uniform: traditional Indigenous beliefs place value on the inclusion of input from multiple generations in decision-making. Elders are knowledge holders who may have deep relationships with the environment and who often

know roles that traditions, ceremonies, and traditional laws must play (Wolfe et al. 1992), and youth represent the generations who will take care of the world for years to come.

Unfortunately, conventional water management has tended to rely on technical expertise, and tends to exclude Indigenous youth and traditional knowledge holders (Mascarenhas 2007). According to Arquette et al. (2002, 260), "Native Nations often are not respected or considered sufficiently competent to have meaningful participation in decisions that affect their Nations, lands, and resources. The traditional, cultural, ecologic, and scientific knowledge of Native people is a tremendous asset to all decision makers." Speakers at the FNWPF ([ER2]; [ER3]) also conveyed this message. They spoke about the need to "reclaim" and "re-learn" Anishinabek traditions, ceremonies and values and the speakers referred specifically to the importance of including youth and Elders in decision-making. Opportunities to do so were also discussed at the FNWPF and in interviews. Below, I have highlighted several of these opportunities.

Several approaches to increasing youth involvement in water management were revealed in the data collection. During the FNWPF, [ER2], who is an Elder, spoke about youth involvement in water management. The Elder commented on the importance of keeping traditions and customs for the protection of water, saying that, "There needs to be a trust that the younger generations are going to take care of such issues." This statement implies a responsibility of the current generations of Elders, traditional leaders, and knowledge holders to teach youth in order that customary laws and practices are passed on. It also presents an opportunity for First Nations to pursue a better future for their drinking water, irrespective of the challenges faced with ineffective and inappropriate jurisdictional and legislative circumstances.

One opportunity for enhancing youth involvement lies with an organization that is already established to assist First Nations with drinking water supplies. [TSC] at the OFNTSC, discussed the organization's plans to develop educational materials that will be designed to create and nurture connections and inspiration among Indigenous youth on water issues. [TSC] hoped that this approach will encourage new generations of First Nations water managers. These materials, according to [TSC], will incorporate input from Elders in order to

integrate traditional knowledge and values into water education. For example, [TSC] specifically mentioned the concepts of "the circle" and "inter-connectedness", as themes that are both important in Indigenous culture, and that also converge with principles in conventional water management. The OFNTSC therefore has a valuable opportunity to educate First Nations youth about water management in a way that is culturally relevant, and that may lead to better water management in the future. The OFNTSC's educational work may also serve as a model for other technical service organizations serving First Nations, to increase opportunities for engaging youth on water issues.

A second approach to inter-generational involvement in environmental management for a First Nation is the Anishinabek of the Gitchi Gami. [NGO1], a founding member of the AGGEP, described the group as an NGO that is, "led by mothers and fathers and youth." According to [NGO1], the organization is intended to be an alternative model for community involvement that can provide a space in which more customary forms of governance can exist alongside the existing band council model. [NGO1] characterized the band council model in the following way: "The Indian Act centralizes all resources at chief and council, and there is a lack of other community voices in the form of groups to raise concerns [and] democratize decision-making." Organizations like the AGGEP may prove to be important forums for connecting youth involvement and traditional leadership with band council leadership structures. These types of organizations may also be useful for providing community input into environmental decision-making. During the fieldwork component of this research, I learned of people at least one other First Nation who hope to create an organization modelled after the AGGEP.

Another opportunity for improving the involvement of First Nations people in water management is through the inclusion of youth in existing decision-making structures. Youth involvement was identified as an important consideration by speakers at the FNWPF ([ER2]; [ER3]), by [SPC3] who is the representative of Mattagami First Nation on the MRSPC and by [SPC2], the chair of the MRSPC. [SPC2] indicated that youth involvement is valuable in order to develop new leaders, increase interest in water management issues, and to "stamp out traditional ignorance" that may be held by individuals of older generations. [SPC2] mentioned that the chief of Mattagami First Nation requested for youth to be involved with the source

protection committee. Interestingly, according to [SPC2] and [SPC3] the Chief's request was for the involvement of both Aboriginal and non-Aboriginal youth. In response to this request, the committee sought (and received) special permission from the Ontario Ministry of Environment (MOE), in order to include youth in the committee's processes. Currently, the MRSPC is unique amongst source protection committees in Ontario, in this characteristic of youth involvement. The committee's work signifies that many opportunities exist for better youth involvement in water management for First Nations.

The involvement of Elders was also identified in the data as an important part of incorporating a multi-generational aspect to water management. The following quote from [TSC], an engineer with the OFNTSC, illustrates that recognition exists in contemporary water management of the important role that Elders, who are often traditional knowledge holders, can play:

> "First Nation Elders are aware of protecting water, they are aware of the uses of water, they are aware of the value of water, they are aware of contaminants in the water. Maybe not as scientifically as you or PhD students are, but they know. They know right from wrong with respect to water… they've got lots of things to teach people with respect to water and they've got many, many years of experience dealing with water, seeing people getting sick, seeing people stay healthy and so on and so forth."

In part, this type of increased recognition of multigenerational involvement within institutions that deal with drinking water for First Nations is due to the work of First Nations-based organizations such as the Chiefs of Ontario. The Chiefs of Ontario have published reports with the input of Elders, on the inclusion of traditional knowledge in source water protection (COO 2006 & 2007). These reports have led to the inclusion of certain aspects of Indigenous knowledge in Ontario's source water protection process. However, this effort is still in its infancy, since source water protection was only legislated for Ontario in 2006 through the Clean Water Act. In October 2008 the Chiefs of Ontario held the FNWPF, where First Nation chiefs and Elders were able to share their concerns and ideas with each other, and with federal and provincial government representatives. One speaker at the FNWPF ([FN5]) called for the establishment of a "traditional knowledge expert panel" to provide advice to the government and to institutions on water policy and management. The involvement of Elders is being

increasingly recognized as an important aspect of safe drinking water provision in water management institutions. Elder involvement is an important area of opportunity that is currently being addressed through organizations like the Chiefs of Ontario and the OFNTSC.

As a final point on the subject of ITK, interviewees [PTO1] and [NGO1] both spoke about the importance of First Nations sharing traditional knowledge among other First Nations communities. According to [NGO1], different communities' Elders hold different knowledge, and it is important for this to be shared. In order to address this, [PTO1]'s organization is creating a network for information sharing, communication, and discussion on water management issues.

Throughout the data collection process, particularly during interviews and during my attendance at the FNWPF, the inclusion of multi-generational perspectives was constantly expressed as an important part of traditional culture that is missing from conventional water management. There appear to be a number of growing opportunities for Elders and youth to become involved in government-sponsored processes, such as source water protection planning through the Clean Water Act, through community-led organizations like the AGGEP and through First Nations institutions, such as the Chiefs of Ontario. Although these efforts are not currently part of the MBA, if they are supported through water policy they will fulfil an important aspect of water management that was emphasized in the data. The incorporation of multiple generations in water management may serve to fulfil, in part at least, the public involvement and awareness component of the MBA.

5.3.2. The Role of Women in Water Protection

According to traditional Anishinabek perspectives on water, women should play an important role in water management. During interviews and observation, women were consistently referred to as the traditional spiritual water keepers in Anishinabwe culture, in particular by [NGO2], [PTO2], [FN7], and [ER1]. Publications from the Chiefs of Ontario on Aboriginal traditional knowledge and source water protection describe women as having the traditional responsibility for water in many First Nations cultures (COO 2007), and as being, "life givers, [having] a special connection," with and ceremonial roles involving water (COO 2006, 15). In

a similar way to the exclusion of youth and Elders from conventional water management through a focus on technical expertise, women have also been excluded from expert-focused conventional water management. The Chiefs of Ontario emphasize, "It is imperative that women are well represented in discussions about water protection."

According to [FN7], the role of women in water protection is exemplified by [ER1], who is an Anishinabek Elder and one of the Mother Earth Water Walkers. The Mother Earth Water Walkers are described on their website (Mother Earth Water Walkers 2009) as, "Anishinawbe Grandmothers, and a group of Anishinawbe Women and Men [who] have taken action regarding the water issue by walking the perimeter of the Great Lakes." In a discussion with [ER1], the Elder described how she was challenged by another Elder to fulfil her traditional role as a protector of water. In order to fulfil this role, she and the Mother Earth Water Walkers have walked along the shores of each of the Great Lakes, carrying a pail of water as a symbol of the traditional women's role of water gatherers and protectors. During my observations at the FNWPF as well as during the Chiefs of Ontario Water Declaration ceremony, held in March of 2009, [ER1] was referred to as an example for and an inspiration to Anishinawbe people. In 2007, the UOI established a Women's Water Commission, with [ER1] serving as its founding Chief Commissioner (UOI 2007). The purpose of this commission is to advise the UOI on water issues and to ensure that traditional beliefs are incorporated into Ontario's water management regime. An example of these traditional beliefs is that water is "living and spoken for by our women" (UOI 2007). The Mother Earth Water Walkers' example and the establishment of the Women's Water Commission, signify a growing movement among Indigenous peoples in Ontario, calling for greater involvement of women in the care and protection of the environment. The inclusion of women in water management is an important step to respecting traditional Anishinabek culture in water management and it is important that opportunities such as the ones described here are maximized and are supported by water management regimes. The current form of the MBA that is applied to First Nations communities does not specifically address this important role of women, whereas the data suggests that this must become a priority in water management for First Nations people.

5.3.3. The Nexus of Conventional and Traditional Approaches to Water

Perspectives on the compatibility between Western science and ITK varied among the project's sources. Nevertheless, agreement about the importance of incorporating traditional knowledge into water management was commonly expressed among First Nations sources. Western perspectives on water management, according to [FN15] and [FN3], tend to simplify water protection whereas traditional perspectives, "go much, much further than protection of drinking water quality" ([FN3]). There is some indication of recent attempts to integrate traditional beliefs into conventional water management. One such example is a recent collaboration between the Chiefs of Ontario and Environment Canada to investigate the incorporation of traditional knowledge into Source Water Protection (COO 2006). [PR2] and [PR4], representatives of the MOE, both spoke of steps taken to incorporate traditional knowledge into source water protection (SWP) in Ontario. Requirements for the involvement of First Nations in SWP planning are embedded in the Clean Water Act (2006) and stand as a unique, albeit limited opportunity for First Nations to provide input into and direction for source water protection. [FN15], while acknowledging the importance of SWP efforts, simultaneously criticized it as being too focused on water quality and human health, rather than holding a more holistic perspective, saying, "Source water protection looks at the end of the pipe, not at the whole world and how it affects us."

The chair of the MRSPC, [SPC2], spoke enthusiastically about information sessions on ITK that were held for the source protection committee, by Mattagami First Nation (MFN). While it is notable that MFN has become involved to some degree in the source water protection planning and decision-making processes, [SPC3], MFN's representative on the committee characterized the information session as merely a basic overview of Indigenous knowledge that will have little impact on the way SWP actually occurs in the region. According to [SPC3], the information sharing between MFN and the MRSPC clearly does not constitute true incorporation of traditional Indigenous perspectives and beliefs into the water management process. The over-arching impression provided by First Nations sources is that ITK must inform the conceptualization and design of water management strategies, and that it should not simply be integrated piecemeal into already existing frameworks for water management. Biswas (2004) noted that conventional, expert-oriented approaches to water management often

neglect unique cultural, social, institutional, and physical environments of communities for which they were not originally designed. A speaker at the FNWPF, [FN5], characterized the relationship between contemporary approaches to water management and traditional Indigenous perspectives on water as being "philosophically at odds." Finding an appropriate and authentic way to incorporate ITK into water management for First Nations in Ontario continues to be a challenge; this was evident in my discussions with [SPC3] and through comments from speakers such as [FN5] at the FNWPF.

The lack of harmony between contemporary water quality management processes and traditional Anishinabek perspectives on water is a challenge that is faced in water management for First Nations. A conversation with [ER1] of the Mother Earth Water Walkers focused on water as having spiritual qualities. [ER1] spoke of bodies of water having different personalities that can be known and understood through personal experience. Several sources, including [ER1] and participants in the FNWPF, touched on ways in which conventional water treatment and management can disrupt and disrespect these spiritual attributes of water. One common criticism of conventional water treatment methods was in regard to the practice of chlorination. Traditional belief holds that the disinfection of water through chemical means, such as chlorination, affects the spiritual component of, and actually kills the water ([ER1]; [NGO3]). [TSC] referred briefly to this aversion to chlorination as a problem in some communities:

> "In some cases the Elders, or senior people in the First Nation simply don't want chlorinated water. Of course that's part of the regulations – you have to have chlorinated water for disinfection purposes. So you can run into some significant difficulties with perceptions in the community as to what's good drinking water and what's bad drinking water. And often, water with chlorine will not be considered as good water because it's got chemicals in it, and also the perception that the natural water that you can pull out of the pond over there, which is spring fed, is perfect H_2O."

For this reason some individuals choose to consume untreated water, which can pose a great risk to health, given the degraded state of many water sources ([ER2]). Unfortunately, chlorination is the status quo for water treatment in many First Nations communities. Even when alternative technologies are used, chlorination is usually used in the post-treatment process, according to [TSC]. This type of conflict between conventional approaches to water

treatment and traditional Indigenous values constitutes a challenge for ensuring safe drinking water for many First Nations communities. Fortunately, there are a number of people and organizations who are working to find ways that water management can satisfy conventional standards for water quality, while incorporating traditional perspectives as well.

Despite the challenges faced practically and philosophically between traditional Indigenous knowledge and Western science, this research finds that there is some agreement among water management practitioners, Elders, and others (such as NGO staff, scientists, and policymakers), that the two perspectives can work together in some ways. Research, science and technology constitute one component of the MBA's outer ring (Figure 1). According to the CCME (2004, 42) this component of the MBA implies that, "Growing demands on drinking water quality and quantity are creating an urgent need to link research from a wide range of sources in order to improve drinking water quality from source to tap." This research reveals that demand exists to incorporate ITK in water management for First Nations. Since this has not yet been done to a significant extent, opportunities exist for research into the development of appropriate technologies and approaches for water management; these efforts would fall under the research, science and technology component of the MBA. This research should occur in order to replace the very basic, old and frequently ineffective technologies have been used for treating many First Nations communities' drinking water. The example of GBFN's idle treatment facility illustrates the notion that new infrastructure does not necessarily translate directly into safe drinking water for communities.

An example of recent research into water treatment technologies that incorporate ITK was highlighted during the FNWPF by [NGO3], who spoke on behalf of an NGO that specializes in research, development and promotion of alternative water treatment technologies for First Nations communities. [NGO3] explained that the use of membrane filtration and biological filtration has produced clean water in several First Nations communities with histories of poor water quality. These methods, according to [NGO3], are more compatible with traditional beliefs and they allow the use of less chlorination than conventional treatment methods. The speaker described that the use of these technologies took time to gain acceptance from

regulatory bodies, but that in the end, it satisfied the requirements of all institutions and individuals involved.

Despite the optimism by [NGO3] for alternative treatment technologies, [TSC] mentioned that, while technologies such as membrane filtration are in use in some communities, they are not appropriate solutions for all water systems. [TSC] also emphasized that alternative technology systems can be complex and expensive to operate, particularly since they require a lot of energy, which can be both unreliable and expensive in remote communities. Regardless of the challenges that existing alternative technologies present, ongoing research and innovation are necessary in order to provide safe drinking water under CCME's (2004) conceptualization of the MBA.

The Protocol for Safe Drinking Water for First Nations Communities states that, "Alternative approaches may be used if these have been demonstrated to the satisfaction of INAC to be equivalent or better ways of achieving the same objectives" (INAC 2006). This statement indicates that the development and use of alternative technologies is a potentially viable option for fulfilling the research, science and technology component of the MBA and constitutes a significant opportunity for First Nations in Ontario.

5.4. Commitment, Qualifications, and Resources

In addition to the topics and themes discussed in Sections 5.1 through 5.3 that are directly relevant to the MBA, there are two other themes that emerged from the data, which relate more generally to the provision of safe drinking water. The themes are: (1) the need for committed and qualified water system operators; and (2) the availability of sufficient financial resources for communities to operate and maintain water treatment and distribution facilities. Both of these themes were discussed in interviews and are also reinforced in recent publications on water management, such as the CCME's MBA guidance document which says, "it is very important for the participants of the drinking water program to have accountable leadership, appropriate staffing with properly trained personnel, and adequate financial resources" (CCME 2004, 21).

5.4.1. Committed and Qualified Water Operators

Several publications emphasize the importance of committed and qualified individuals for ensuring safe drinking water. On the subject of capacity for water management, Biswas (1996, 401) underscores the importance of committed people for successful water management, saying: "Competent, well-trained, and committed individuals can and will always perform their tasks irrespective of policy constraints, absence of appropriate legal frameworks and unresponsive institutional settings." In a list of several key factors for ensuring drinking water safety, Hrudey et al. (2002, 406) includes that, "systems operators must be personally dedicated to continuously providing consumers with safe water." The Expert Panel reflects a similar perspective in its report when it quotes an engineer who says, "you can have a great plant, a Cadillac, and a not-so-good operator, and you can have a terrible plant and a great operator. I'll take the latter anytime because they have passion" (Swain et al. 2006a, 13). During fieldwork, interviewees specifically stressed the importance of committed water system operators in ensuring safe drinking water.

Several sources indicated that many First Nations communities in Ontario do not have committed and qualified water managers. Interviewees [TSC], [NGO2], [PTO1], [BC2], and [WM] each indicated that the training and retention of qualified individuals are significant challenges that are currently faced by First Nations communities. One of the barriers that communities face to increasing the number of committed and qualified water professionals is the rate of pay offered to water operators by many band councils ([BC2]; [NGO2]; [TSC]; [WM]). When water operators complete their training to become qualified water managers, they are frequently lured to work outside of their own communities, where pay rates can be much higher ([JT]; [NGO2]; [WM]; Swain et al 2006a). The Expert Panel's report (Swain et al. 2006a) supports the conclusion that First Nations communities face a particularly difficult challenge finding and keeping qualified and willing operators, especially in small and remote communities. The report emphasizes that a contributing factor to retaining such individuals for reserves is that, "funding for operations is inadequate, and where the chief and council do not or cannot compensate operators adequately for the responsibility they are being asked to

discharge, " (Swain et al. 2006a, 13) and, "operators must be compensated for the level of responsibility they carry; the health of the community is in their hands" (*ibid.*, 14).

In communities where it is not possible to secure qualified water operators, this research found that committed individuals are often the difference between safe and unsafe drinking water. [WM], the water system operator for GBFN, illustrates this well. [WM] described a number of challenges that he faces as the community's water manager. These challenges include that, although he has completed the required courses, he has not been able to receive the appropriate certification to manage his community's water. [WM] also does not have access to a qualified assistant or back-up operator and the community lacks some water quality testing equipment (for example, [WM] is unable to test the quality of source water). Furthermore, [WM] indicated that he is paid less than half of what he could earn as a water operator in the private sector. Fortunately for GBFN, [WM] is an example of a committed water operator who is dedicated to ensuring safe water is provided to his community. The data suggests that many First Nations communities in Ontario are not as fortunate as GBFN and do not have a dedicated water operator like [WM]. Such communities may be at greater risk than communities that have committed water operators, for having adverse incidents of poor drinking water quality. Water operators are the individuals who are supposed to ensure that water treatment, monitoring, and distribution occur successfully. These three roles of water managers constitute the core of the MBA and are critical to maintaining safe drinking water supplies in any community.

Despite the challenges highlighted above, a number of opportunities are available to First Nations that may address the need for additional trained and committed water managers. [TSC], for instance, indicated that there is potential for First Nations communities to utilize services that are offered by the OFNTSC more effectively. [TSC] indicated that, "everything that we do in the provision of technical services should be accompanied by some sort of training opportunity… First Nations generally don't make use of that opportunity to connect the two." The OFNTSC provides technical services such as engineering studies and capital planning, while it simultaneously administers the Circuit Rider Training Program (CRTP) in partnership with the federal government (OFNTSC 2009). The CRTP is designed to, "raise the

competency level of operators of water and wastewater systems." [TSC] also mentioned that the OFNTSC is hoping to increase and nurture interest in commitment to clean water through education. The organization is making efforts to bolster communities' connections to water issues through the development of educational materials that would, according to [TSC], tie water management to cultural beliefs. The idea of tying technical services provision closer with education and training of First Nations people on water issues in a culturally relevant manner constitutes an opportunity to address the apparent deficit of committed and qualified water operators.

[PTO1] discussed several opportunities to address the challenge of too few trained water managers for First Nations. The interviewee cited recent improvements to provincial training programs as positive steps, primarily because prior to the introduction of the new training programs, water managers often did not have access to such opportunities. The interviewee did not name a specific program, although one example may be the training that is available through the provincially operated Walkerton Clean Water Centre (WCWC). According to its website, the WCWC provides water operator training to water system operators of small, older, and remote water systems throughout the province, including to operators of First Nations water systems (WCWC 2009). [PTO1] also described web-based training that is being developed, as an emerging opportunity to increase capacity in watershed management among First Nations in Ontario. Finally, [PTO2] mentioned that one opportunity for increasing the future availability of water system operators is to train operators to levels beyond what their communities' systems currently require. This training would ensure that their qualifications remain relevant with changing communities and changing infrastructures.

According to the sources, acquiring and retaining qualified and committed water system operators is an ongoing challenge for First Nations communities. The importance of such individuals is exemplified by [WM] at GBFN. Ideally, through an increased focus on training opportunities and the nurturing of personal and cultural connections with water management, along with better funding for compensating qualified water managers, this challenge can be addressed. Currently, the presence of committed and qualified water operators is not specifically incorporated into the CCME's (2004) MBA framework. Despite this, this research

suggests that the presence of such individuals should have a prominent place in any water management regime for First Nations.

5.4.2. Funding for Water Management

> "Since the early 1990's, the federal government has incrementally downloaded responsibility for operation and maintenance of water treatment on to local band councils. However the transfer of responsibility has not been accompanied by the transfer of adequate resources."
>
> (COO 2001, 2)

The above quotation was taken from the submission of the Chiefs of Ontario to the Walkerton Inquiry. It captures the nature of funding challenges for First Nations' water, which were identified by both Aboriginal and non-Aboriginal sources in this research. In discussions with interviewees and in presentations at the FNWPF, it was made evident that funding for water management is generally inadequate ([FN5]; [NGO2]; [PR4]; [TSC]). [FN5] indicated that First Nations would address ongoing water quality issues if communities were, "provided the resources to do so". According to [TSC] of the OFNTSC, "operations and maintenance funding is generally acknowledged to be insufficient." [NGO2] mentioned several challenges that First Nations face with their limited funding, including the high costs associated with upgrading water systems to meet frequently changing standards and the expenses related to providing adequate compensation for water operators.

Contributing factors to the funding problem, according to [NGO2], are the poor designs of many First Nations' water treatment systems. [NGO2] indicated that water systems are often designed according to population growth projections of typical North American communities. Such designs are problematic because the populations of First Nations communities typically grow much faster than non-First Nation communities; as a result many communities outgrow systems sooner than expected. Statistics Canada (2008) indicates that according to the 2006 census, the number of registered[6] First Nations people in Canada increased by 24% between 2001 an 2006, which is almost three times the population growth rate among Canada's non-Aboriginal population. While these increases may be linked in part to an increase in the

[6] The term "registered" indicates registry as having "Indian status" under the Indian Act and Bill C-31 (Statistics Canada 2008).

number of First Nations people were registered as "Status Indians" during that period, Statistics Canada associates this with higher population growth rates (*ibid.*). Two of the case study communities exhibit high population growth: FWFN saw a 51.8% increase in total population between 2001 and 2006, and MFN experienced population growth of 13.9% during the same period (census data for GBFN shows a decrease by 18.3% in population in the same period). Having to upgrade or build new systems because of rapidly growing populations can place enormous financial burdens on band councils. [FD], a representative of INAC, also acknowledged limitations to funding for infrastructure maintenance in First Nations, particularly in the context of recent changes to more stringent facility designs and water quality standards citing "funding pressures faced by INAC" as a major challenge.

Even though [FD] discussed the funding pressures faced by INAC, [FD] also emphasized that funding for First Nations' water during 2008 was increased by almost 15% from the previous year (from approximately $75 million to more than $86 million). These funds are intended for the, "construction, maintenance, operation, management of water and wastewater facilities" ([FD]). Another source, [PTO1], also described this increase in funding as an opportunity for First Nations. Perspectives amongst other interviewees differed, however. In a recent publication, the Safe Drinking Water Foundation (2009, p.4) addresses recent increases in federal funding for First Nations' water, saying, "INAC announcements of millions of dollars in expenditures do not necessarily result in First Nations having safe drinking water." It is inevitable that opportunities are viewed differently, among those with different perspectives. Despite injections of federal funds into First Nations' water management since 2000, this research suggests that federal funding for First Nations' water remains too low to achieve safe drinking water for all communities. The interview and documentary data indicate that further increases of funding for First Nations' water is an opportunity that was mentioned frequently among the interviewees, and is recognized in reports on First Nations' water.

Sufficient funding for water management is currently not explicitly incorporated into the MBA. Even though funding is likely not the ultimate determinant of water safety (Christensen 2006), according to this research it remains an important requirement for ensuring that

communities are able to maintain water systems and to retain qualified operators. It may therefore be appropriate to incorporate funding considerations into a MBA for First Nations.

5.5. Chapter Summary

The interviews that were conducted for this research and the discussions that I observed during the FNWPF exposed a multitude of challenges that the case study communities and other First Nations face for ensuring safe and clean drinking water, as well as some of the opportunities that are available to address those challenges. I have organized the findings into four focal areas, three of which correspond closely to components of the MBA. The fourth focal area includes themes that are do not specifically pertain to the MBA but are nonetheless important considerations for drinking water management. The three MBA-related themes are: participation, involvement and engagement; regulation and jurisdiction; and Indigenous traditional knowledge, beliefs, and approaches to water management (which I categorize in the research science and technology component of the MBA). The fourth focal area relates to the qualifications and commitment of water operators and sufficient funding for water management in First Nations.

The three MBA-related themes constitute most of the MBA's outer ring (see Figure 1). The outer ring is briefly described in Section 2.4; it consists of the non-structural, policy tools that make the technical aspects of water quality management possible. The one aspect of the outer ring that was not discussed in my research and therefore is not included in the results is the guidelines, standards and objectives component. In theory, guidelines, standards, and objectives already exist for First Nations' water, for example in the Protocol for Safe Drinking Water for First Nations Communities. However, in the absence of the other three outer-ring components, the positive effect it can have for First Nations is minimal at best.

The challenges that are faced by the case study communities form quite a long list. Barriers to participation include policy and regulatory changes that were introduced in Ontario during the 1990s, and the obstacles that exist for First Nations face in asserting their rights though the legal system in Canada. Regulatory and jurisdictional challenges arise from the lack of

enforceable policies and the jurisdictional quagmire for drinking water on reserves, as well as the liability that band councils are exposed to when they are provided with inadequate water infrastructure. This research also found that traditional beliefs and values are not typically integrated into conventional water management regimes that are used in First Nations communities. Finally, the respondents identified the process of retaining qualified and committed water managers and obtaining adequate funding for water management as obstacles that serve to compound the other challenges that First Nations face.

Fortunately, the data from interviews, observations, and documents also revealed a list of opportunities to address the above challenges. For instance, participation in water management can be increased through: improved consultation and involvement of First Nations by government agencies in decision making; the ongoing initiatives of organizations such as PTOs and NGOs; education of First Nations people on water issues; and the involvement of the government at all levels by First Nations-based organizations in initiatives like the FNWPF. Opinions regarding possible solutions to address the regulatory and jurisdictional difficulties experienced by First Nations vary among different First Nations people and organizations. Two examples of opportunities to address regulatory and jurisdictional challenges include the introduction of federal drinking water quality legislation and the application of provincial water laws to reserves. Respondents indicated that it may be possible to facilitate the incorporation of ITK into water management through the efforts of organizations like PTOs, NGOs, and technical service organizations. For example, these organizations can increase the involvement of Elders, youth, and women in water management. Organizations like the one represented by [NGO3] are currently working to encourage innovative solutions to water treatment that respect traditional values. Finally, the shortage of qualified and committed water managers can be addressed through education of youth about water, in order to foster interest in water management, and through the allocation of adequate funding for First Nations to pursue successful water quality management.

These challenges and opportunities are drawn primarily from the case study communities of FWFN, GBFN, and MFN, and from discussions at the FNWPF. However the literature that was reviewed for this thesis confirms that many of the issues presented here are not unique to

the case study communities, nor are they isolated only to First Nations in Ontario. Reports, such as those of the Walkerton Inquiry (O'Connor 2002a,b), the Commissioner of the Environment and Sustainable Development (2005), and that of the Expert Panel on Safe Drinking Water for First Nations (Swain et al. 2006a,b) describe many issues that are similar to those discussed here and that are experienced by First Nations communities throughout the country. The existence of these reports indicates that the research may have relevance to settings beyond the case study communities.

6. CONCLUSIONS

First Nations communities in Ontario appear to face a range of challenges for ensuring safe and clean drinking water for their residents. The MBA has been established as a fundamental basis for water quality management for First Nations communities, yet it seemingly fails to address challenges for drinking water provision that sources for this research identified as important and ongoing. The results indicate that it may be possible to address several of the difficulties that communities are faced with, using aspects of the MBA framework.

The following sections are organized to correspond to the categories of the MBA that are included in the results. The MBA categories include: public involvement and awareness; legislative and policy frameworks; guidelines, standards and objectives; and research science and technology. Together, these categories constitute the components of the MBA's outer ring, which contains the policy tools necessary for implementation of the technical aspects of water quality management. The outer ring is discussed in Section 2.4 (also see Figure 1 in that section). Section 6.5 discusses two aspects of water protection that may be beneficial to incorporate into the MBA if it is to be effective for First Nations. These aspects are: the presence of committed and qualified water operators and the availability of sufficient funding for water management to occur.

6.1. Public Involvement and Awareness

> "Without a comprehensive, well-planned effort to include the public in the development and implementation of drinking water management plans, it is unlikely that the program will be successful." (CCME 2004, 30)

Public involvement and awareness is identified by the CCME (2004, 170) as, "extremely important for achieving the [drinking water] program's goals and objectives." The report also emphasizes that public involvement, "should not be underestimated" (*ibid.*). Furthermore, the concept of public involvement in decision-making for natural resource management has a long history and extensive literature that extends far beyond the First Nations context. Arnstein's (1969) seminal publication, *A ladder of participation*, discusses the notion that public

participation in decision making can lead to the empowerment of disaffected and marginalized citizens. In the 40 years since Arstein's ladder of participation was introduced, literature on the roles that public participation can play in environmental resource management has grown tremendously. Reed (2008) provides a concise overview of literature on stakeholder participation for environmental management; in the article, Reed suggests that despite some weakness of participatory approaches, stakeholder involvement should be embedded in institutional structures and processes. This thesis research suggests that public involvement and awareness is unacceptably low for many aspects of First Nations' water management.

The data point to several factors that impact the participation of First Nations people in water management. One factor is that in government-controlled decision-making, the rhetoric of participation is often used without true and tangible participation. This phenomenon is illustrated in the following comments on the engagement sessions held by INAC (see INAC 2009a) for the development of federal legislation for drinking water and wastewater by the SDWF (Advanced Aboriginal Water Treatment Team [AAWTT] 2009, 5): "It is the opinion of the SDWF's [Advanced Aboriginal Water Treatment Team] that these participant expectations were not met, and that the sessions were simply a means to 'sell' the concept of provincial guidelines". Furthermore, the SDWF emphasized that, "Few First Nation voices were heard at the engagement sessions, but enough were present that INAC is able to claim they were 'engaged'." The second factor impacting participation and engagement is the poor communication between the various institutions that hold responsibilities or in some way impact drinking water for First Nations. In part, this poor communication may be linked to the jurisdictional disarray surrounding First Nations' drinking water that is described in Subsection 2.2.2. A third issue is the current approach to governance in First Nations, which is consistently characterized as unreflective of traditional Indigenous leadership structures and processes.

Considered together, these inadequacies in the involvement of First Nations people in drinking water management suggest that the public involvement and awareness component of CCME's (2004) MBA framework is not currently fulfilled. Fortunately the research revealed several

possible solutions to improve the involvement and engagement of First Nations communities in safe water provision. These opportunities include:

- Maximizing existing initiatives for First Nations' involvement in water management.
- The increased efforts by First Nations-based organizations to facilitate communication about water issues through special water-focused commissions, networks, and forums.
- An ongoing movement for culturally relevant education and training.
- An increasing trend towards the incorporation of traditional values into decision-making.
- Encouraging innovative community-based governance structures, like the AGGEP, to provide alternative forms of governance.

Considered together, these opportunities demonstrate that the involvement of First Nation people in the provision of safe and clean drinking water is both possible, and is in fact already gaining momentum in the case study communities. Even though this study provides a number of specific potential opportunities, it is ultimately up to each community and to individual community members themselves to define what meaningful, appropriate and full involvement will be for them. If the MBA is to be used appropriately in First Nations' water management, then the participation component must be structured and implemented to meet the needs and desires of each specific community.

Policy Recommendation: *To overcome barriers to involvement, participation of First Nations people should be sought in all aspects of water management. Efforts should be characterized by: improved communication between the government and First Nations and among communities; increased cultural and educational opportunities to understand drinking water quality; and the utilization and encouragement of traditional governance structures in decision-making for water management.*

6.2. Legislative and Policy Frameworks

> "Legislation and regulations formalize the various responsibilities of governments and authorize them to oversee the provision of safe drinking water." (CCME 2004, 22)

The above statement summarizes the importance of legislative frameworks for safe drinking water provision and describes a goal that has not yet been met in water management for First

Nations. The data presented and discussed in Section 5.2 support the CCME's conclusion and indicate that the establishment of a legal structure for water management may lead to safer drinking water for First Nations communities in Ontario. Legislative and regulatory frameworks were characterized in the data as important for establishing, implementing, and enforcing water quality management standards. They were also characterized as useful for assigning and clarifying jurisdiction over water and for ensuring accountability when systems fail to provide safe drinking water. While policies are in place for managing First Nations water through the Protocol for Safe Drinking Water for First Nations communities (INAC 2006), the absence of tools that make policy enforceable, namely legislation and regulation, is a clear indication that the legislative and policy framework component of the MBA is not fulfilled at this time. Instead, the current policy environment for First Nations communities' drinking water across the country has led to unclear roles and responsibilities, blame shifting when water contamination occurs, and a disproportionate amount of liability being placed upon First Nation band councils.

As outlined in Section 5.2, the research reveals a number of opportunities for addressing these policy challenges. The most significant opportunity to emerge from among the respondents and from literature is the development of national legislative and regulatory frameworks for drinking water management; fortunately, an initiative to do so is currently under way by INAC. Views among the sources varied regarding the role that national legislation can or should play in water management. These perspectives ranged from support for the current efforts by INAC to develop a national legislative framework, to the complete rejection of further control over First Nations by federal government. Some respondents instead put more emphasis on the need for philosophical changes to environmental governance, through the incorporation of more traditional leadership structures and principles in water management.

The common messages derived from interviewees and from reference materials did not dictate one particular direction that water management for First Nations should take. Rather, they communicated that First Nations people and communities must be thoroughly and authentically involved in the design and implementation of unique legislation and policy, instead of leaving this process up to technical experts and political representatives alone. Only

then can policy truly be effective at addressing the unique needs of First Nations communities. The ultimate goal of policy and legislative frameworks must be to ensure the provision of clean and safe drinking water through enforceable standards, and to designate clear roles and responsibilities amongst all parties involved in drinking water management for First Nations.

Policy Recommendation*: A variety of perspectives exist among First Nations on the approach to introducing enforceable policies for water quality management (for example through the creation of federal water legislation versus the use of provincial laws in First Nations). It is evident however that there must be enforceability in one form or another. To develop this, First Nations citizens must be involved in the conceptualization, creation, and implementation of policy tools, to ensure that standards for drinking water quality are consistently met for their communities.*

6.3. Guidelines, Standards and Objectives

According to the Protocol for Safe Drinking Water for First Nations (INAC 2006, 3), "At the point where it is delivered to a user for human consumption, drinking water must meet the quality criteria set out in the latest edition of Health Canada's Guidelines for Drinking Water Quality (CGDWQ)." This requirement of the Protocol means that the guidelines, standards, and objectives component of the MBA framework is theoretically fulfilled for First Nations. Unfortunately however, the interviews and documentary data suggest that these guidelines and objectives are failing to protect many communities from adverse water quality.

While guidelines, standards and objectives are an important component of the MBA, if they are not actually implemented in the communities to which they apply, their utility is limited. In order to guarantee the utility of these policy tools, it is important that their application and implementation are legally enforceable. In the publication *Boiling Point!*, Harden and Levalliant (2008, 7) share this perspective, saying that, "administrative guidelines, policies and funding arrangements do exist with First Nations on behalf of INAC and Health Canada but are not being implemented consistently and do not cover all of the elements that a regulatory regime would entail."

Policy Recommendation: *Existing policy tools such as the CGDWQ should be more effectively utilized. Specifically, Health Canada should routinely check for more potential*

contaminants. In order to decide which contaminants should be tested for, Health Canada should consult with communities, regarding local water contamination concerns. Furthermore, guidelines, standards and objectives should be made enforceable under water legislation.

6.4. Research Science and Technology

> "Growing demands on drinking water quality and quantity are creating an urgent need to link research from a wide range of sources in order to improve drinking water quality from source to tap." (CCME 2004, 42)

As indicated above there is an ongoing need for research on drinking water management, as part of the MBA. While the statement seems to imply a need for research in multiple disciplines, the CCME (2004, 42) report emphasizes the importance of, "a greater *scientific* understanding of [water] issues" (emphasis added). Alternatively, this thesis research has revealed a narrative that runs throughout the data, which identified a need for the incorporation of traditional Indigenous perspectives, values, practices and knowledge into environmental decision-making and into the physical processes of water management. "Water management" includes the protection, treatment, and distribution of drinking water. A key finding of this research was that the absence of ITK in drinking water management for the case study communities constitutes a deficiency in the research, science, and technology component of the MBA framework. Reports from organizations such as the Chiefs of Ontario (2006 & 2007) and the work of the Safe Drinking Water Foundation (SDWF 2009), which operates primarily in Alberta and Saskatchewan, indicate that this is a problem facing First Nations throughout Ontario and the rest of Canada.

In Section 5.3, descriptions of several traditional practices and beliefs are provided that are relevant to water management and that were discussed during interviews, during observations, and in publications. The traditional beliefs presented in this paper are merely a selection of possible considerations that may be beneficial if incorporated into water management for First Nations communities. Instead of recommending these or other specific aspects of traditional Indigenous culture for inclusion in water management, this thesis recommends that First Nations communities be provided with opportunities to incorporate ITK into the water management regime that is applied to their communities.

Numerous opportunities exist to include traditional knowledge and beliefs in conventional drinking water management. These opportunities include: the incorporation of ITK into source water protection in Ontario; the integration of Western approaches to water quality management with traditional values through innovation by First Nations-based NGOs; the success of the Mattagami Region Source Protection committee incorporating youth involvement into its operations; and the establishment of the AGGEP as a forum that can be useful for incorporating traditional leadership structures into environmental decision-making. The examples provided in Section 5.3 represent existing opportunities that should be further explored, as well as starting points for future initiatives, in order that the provision of safe drinking water is achieved in a way that is culturally appropriate and acceptable to First Nations communities.

Policy Recommendation: *If policy is to be appropriate and effective at meeting the needs of First Nations communities, policy makers must recognize the importance of incorporating ITK into water management. Furthermore, knowledge holders and First Nations communities must define the process by which ITK is incorporated into drinking water policy.*

6.5. Commitment, Qualifications, and Resources

The two aspects of water management in Section 5.4 that are identified as distinct from the MBA are nevertheless important to the framework as a whole. Specifically, these aspects are the presence of committed and qualified water system managers in First Nations communities, and the availability of sufficient resources to implement each component of the MBA.

Without sufficient finances, guidelines, policies and regulations will remain unenforceable, activities that involve the public will not be affordable, ongoing research to incorporate ITK in water management will not be undertaken, and water infrastructure on reserves will remain inadequate. However, even if a wealth of financial resources are provided to First Nations, drinking water quality management processes cannot be successfully implemented without the presence of qualified and most importantly, committed water managers. It is ultimately the people who are responsible for safeguarding water systems who make safe drinking water a reality for any community.

Over the course of this research I was privileged to meet with the water manager at Gull Bay First Nation and several other committed individuals who are passionate about making safe water available to their communities and to other First Nations. This research suggests that more effort and resources must be put into nurturing water managers, and sufficient financial resources must be made available by the federal government or by band councils to acquire and retain qualified and committed people for safeguarding drinking water resources for First Nations communities. While these results are based primarily on the feedback from case study communities, several reports on drinking water for First Nations (e.g. CESD 2005; O'Connor 2002a,b; Swain et al. 2006a,b) and other documentary materials underscore the absence of qualified and committed water managers as a common challenge for First Nations throughout the country.

Policy Recommendation: *Ultimately, the presence of committed individuals is the keystone to ensuring safe drinking water. Such individuals must be nurtured through educational and awareness programs, and these individuals must be acquired and retained with compensation that is comparable to what they would receive in non-First Nation communities. Furthermore, sufficient finances must be made available to fully implement all of the MBA components.*

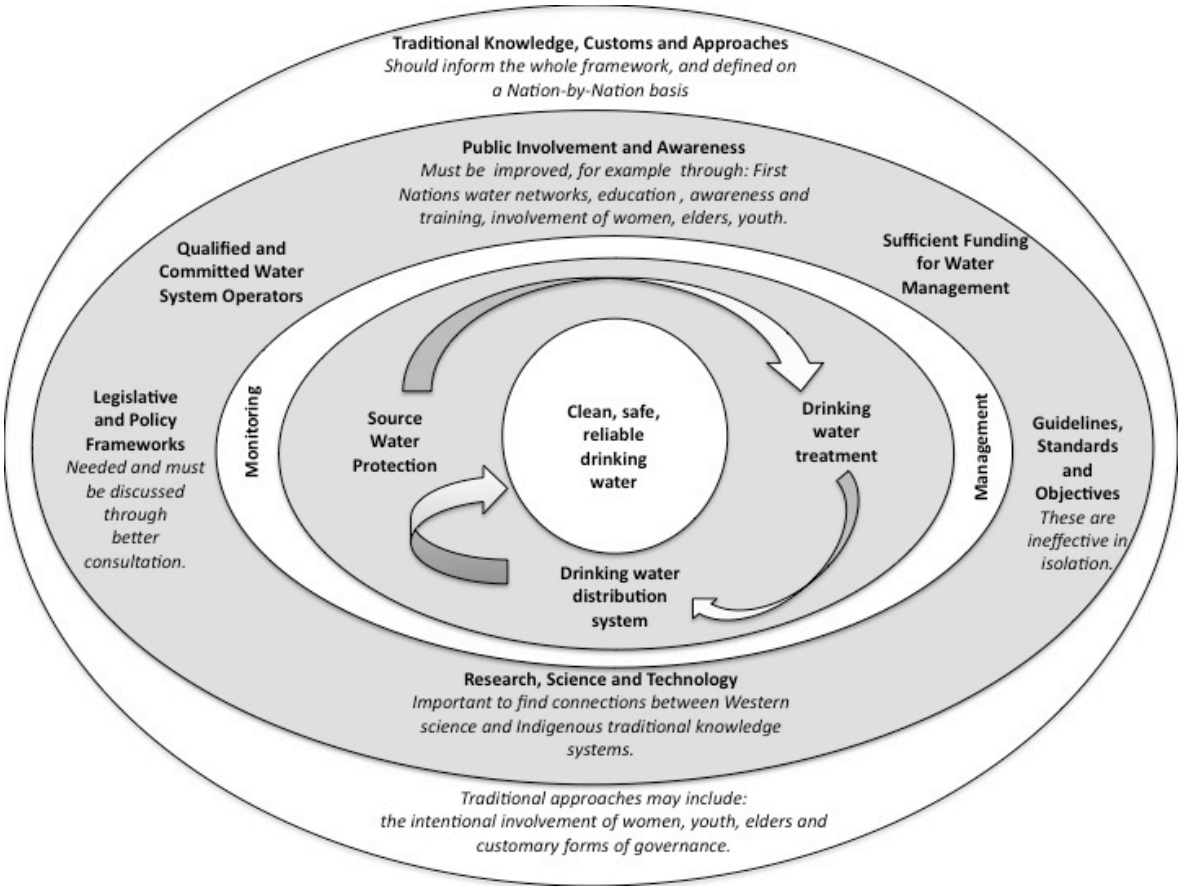
6.6. Modified MBA Framework

The research findings indicate that the challenges some First Nations face for ensuring safe drinking water and the opportunities to address those challenges can be organized according to the MBA's outer ring. The results imply that it may be possible to adapt this framework, for it to meet the needs of certain First Nations communities with poor drinking water quality. There are some individuals, as I discuss in Subsection 2.2.1, who believe that Western notions of water management are incompatible with traditional Indigenous perspectives on water. Most respondents and sources in this research however, indicated that there may be ways to find connections and complementarities between these different paradigms. This study's conclusions emphasize that potential for synergy, although it is important to recognize that some individuals and groups may disagree.

Using the research findings, I have created a modified version of the CCME's (2004) MBA framework. The adapted framework is pictured in Figure 8 and has been changed in several ways. I have added subtext to the three 'outer ring' components that are already featured in CCME's framework. The subtext suggests changes that can be made to those components, to make them more effective for and relevant to First Nations in need of better water quality management. Two new features have been added to the policy tool ring, namely: qualified and committed water managers, and sufficient funding for drinking water management, which were identified in the research as important for safe water provision in First Nations. Another change to the MBA framework that appears in Figure 8 is the addition of a new outer ring. The new ring illustrates the important role that Indigenous traditional knowledge, customs and approaches to water must play in every aspect of water quality management.

The purpose of the modified MBA framework is to adapt the current water management regime that is theoretically applied to all First Nations communities under the Protocol for Safe Drinking water, in order to be suitable for the circumstances that are faced by many First Nations communities. The CCME's version of the MBA is embedded in the Protocol for Safe Drinking Water for First Nations communities. Ideally, the adaptations that I have outlined in this section will be incorporated into the Protocol in order that water management can address the unique needs of First Nations communities. Furthermore, this adapted framework may serve as a foundation or springboard for future approaches to water quality management that are developed with First Nations' needs and circumstances in mind.

Figure 8: Modified MBA Framework



Modified from: CCME (2004, 16)

6.7. Final Thoughts

Through seeking to understand some of the main challenges and opportunities that First Nations face in the struggle to ensure safe and clean drinking water, this research has gained insight into the role that the MBA plays in the case study communities. Perspectives and information on the topic of water quality management were gathered from a variety of sources within the institutional environment affecting water management for the case study communities. In short, this research was intended to find answers to the following questions:

Primary Questions

What challenges and opportunities do Fort William, Gull Bay and Mattagami First Nations face for ensuring safe drinking water under the current water quality

management regime and in what ways do those findings apply beyond the case study communities?

Sub Questions

a. In what ways does the multiple barrier approach to safe drinking water succeed or fail to meet the needs of First Nations communities?
b. What recommendations can be made to drinking water policy, in order to improve safe water provision, on the basis the research findings?

With approximately 40 First Nations in Ontario communities under water quality water advisories in early 2009, it is clear that the multiple barrier approach for water quality management that is used for these communities is failing. This research finds that for the three case study communities and other communities discussed by the project's sources, key challenges in drinking water management can be directly associated with certain components of the MBA. The proposed modified MBA framework (Figure 8) may serve as a starting point to address some of these challenges. The MBA has been adapted to include findings from this research. Ideally, the modifications presented in this paper will be considered by the institutions that are responsible for managing First Nations' water and incorporated into water management for First Nations communities. Relevant institutions include band councils, federal agencies (e.g. INAC, Health Canada) PTOs, technical service organizations, public health departments, provincial agencies, NGOs, and cultural institutions. Despite certain limitations of this study, I believe that the research described here serves as a basis for future studies into the challenges and opportunities that First Nations communities face for ensuring safe drinking water throughout the country.

6.8. Study Limitations

Several limitations of this study are important to mention. Since the research was exploratory by design, I believe that these limitations do not significantly weaken the usefulness of the findings for making policy recommendations, as the basis for future studies, and as a contribution to the research community’s general understanding of water quality management for First Nations.

Limitations of the study include the following. First, as I am not a First Nations person, my understanding of certain cultural and political issues may not be as complete as would be someone who is of First Nations descent. Second, limited time and funds prevented me from interviewing citizens of the case study communities, instead of relying primarily on institutional-level contacts. Third, I was unable to interview some institutional representatives who would have added valuable perspectives to the research. These include several water system managers as well as certain representatives from Health Canada, the Ontario Ministry of Environment, Environment Canada, and Indian, and Northern Affairs Canada. Prior to fieldwork, I had been advised to anticipate reluctance of representatives from First Nations institutions to speak with me. Interestingly, once I was in the field the most difficult people to reach were non-Indigenous, provincial and federal government representatives. While it was frustrating to encounter barriers to reaching potential interviewees, the experience has provided me with a deeper understanding of the challenges that exists in addressing water issues for First Nations, and added depth to the conclusions of this research.

In regard to my analysis of the data, I have assumed that three mentions of a particular topic by interviewees indicated some level of significance to members of the sample group. It should be noted that this value was selected because of the small number of interviewees and that the significance of these findings should be supported by future research. Finally the inclusion of only three case study communities and few representatives from each community limit the generalization of the findings. Therefore while it is not possible to draw conclusions about communities beyond those directly studied in this research, the findings may resonate with First Nations people, as well as NGOs, advocacy groups, and political leaders who encounter similar circumstances in other areas of the country.

6.9. Future Research Directions

This study investigated the specific experiences of only three communities. Even though several interesting themes have emerged that correlate with previous literature and other publications on safe drinking water for First Nations in Canada, further research would be

useful to explore those themes in more depth in each provincial region. Also, research at the community level, involving the perspectives of community members would contribute valuable insight into the issues explored in this thesis.

Some additional topics that were beyond the scope of this research include: the effect of climate change on water quality management for First Nations communities; water quality management for communities of "non-status Indians", Métis, and Inuit people; and studies comparing the experiences with the application of the MBA to Indigenous communities in different countries. Future studies may also identify additional changes to the MBA framework that will improve its usefulness to provide safe and clean drinking water in First Nations communities.

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APPENDICES

Appendix I: General Interview Questions

1. Please briefly describe your and your organization's work regarding water policy.
    a. Where its focus currently lies.

2. What are some of the opportunities that exist for First Nations to ensure safe and secure drinking water supplies, as well as treatment and distribution systems.
    a. For example, programs, information, funding, legislation, organizations, examples of success, community groups
    b. Are these opportunities fully utilized and as effective as they could be?

3. Who influences water policy formation and implementation in the province?
    a. What influence do communities have?
    b. How much influence can individuals have?

4. What are some of the common challenges that face First Nation communities in maintaining clean and safe drinking water?
    a. At the community level?
    b. At the policy level?
    c. At the institutional level?

5. Are there common threats to water quality for First Nations, or are threats typically unique to each community?

6. Is there much variation in water management capacity from community to community?
    a. What form does variation (if any) take?
    b. If so, what do you think causes this?

7. What characteristics would enable a First Nation community to maintain a reliable supply of clean and safe drinking water?

8. What are some reasons that some First Nations communities are at higher risk for unsafe drinking water than other First Nation communities?

9. How is water typically treated in First Nations communities?
    a. Have these treatment methods been effective? Why or why not?

10. What steps can be taken at the policy level to continue to improve drinking water for First Nations?

Appendix II: Codes

First Level Codes

Access to high quality municipal water
Accountability
Accountability/fault
Alternative technologies
ATK
ATK and SWP
Autonomy
Awareness
Band council
Band council responsible
Band Council's Relationship with Community-Based Groups
Band councils' responsibilities
Buy-in
Call for better water treatment
Capacity
Certification
Challenge
Challenges
Changing standards a challenge
Chlorine
Circuit Rider Program
Co-management
Commitment to process
Committed and reliable individual/water manager
Communication
Community action
Community Interdependence
Community interest
Community involvement
Community involvement in water management
Concerns about water system ignored until a problem arises
Confidence in water supply
Conflict
Consultation
Contamination – internal and external
Cooperation
CWA limited to SPAs
Decision-making
Deficiency in current water setup
Democracy
Demographic representation
Demographics

Differences between water
Different leadership structures
Different priorities
Diversity
Diversity among communities
Economies of scale
Education
Effects of CWA on community
Election
Election sidetracked
Empowerment
Enforceable regulations
Engagement
ENGO
ENGO involvement
Environmental racism
Expensive to operate water treatment facility
Expert panel
External impacts on FN water
External water quality threats
Facility certification
First Nation involvement in SPC
First Nations Ontario Water Declaration
First Nations Technical Support and First Response Program
FN environmental protection group
FN involvement in SWP
FN rep as resource for SPC
FN/non-FN Cooperation
FNs in South Vs. North
Funding
Funding for water
Funding for water infrastructure
Funding pressures faced by INAC
FWFN
Gaps
Geography
Harsh conditions
Health
Health Canada
High-risk systems
Holistic
Ignorance
Immediate action
Impact analysis
Importance of water
Improvements

INAC
INAC deceit
INAC devolution
INAC funds
INAC funds
INAC Health Canada
INAC support
Inclusion
Inclusion in SWP
Indian Act
Infrastructure
Infrastructure problems
Interdependence
Internal support for operators
Internal water quality threats
Jurisdiction
Kashechewan
Lack of confidence in water supply
Lack of consultation
Lack of interest by FN community
Lack of resources
Land Claims and Water
Language
Law
Law of general application
Legislation
Letter of conformity
Liability
Limited resources
Little interest shown by FN
Little need for concern
Location
Loch Lomond
Long-term solutions
Low salary for operators
Management
MBA
Minister has final say
MNR
MOE
Monitor
Needs
Neglected opportunity
NGO-external
Now vs. Future
Off-reserve Indigenous population

OFNTSC
Operator retention
Operator training
Opportunities
Opportunity
Parallel with FWFN
Parameters
Participation
Partnership
Policy
Politics
Poor planning by INAC
Precautionary principle
Priorities
Proactive maintenance
Providing a voice for FN people
Public involvement
Quantity
Racism
Recent funding increases
Reduction of risk
Regulation
Relationship with municipality
Remoteness / location
Remoteness and distance
Requests for assistance ignored
Research
Resource extraction effects on traditional land
Resources
Risk
Role of health unit
Safe Water Operator Program (SWOP)
Scepticism
Self-determination
Self-sufficiency
Senate
Sincere understanding of FN
Size
Source water protection participation
SPC
SPC went above and beyond requirements
Stakeholders
Standards
Standards/guidelines
Staying informed through SWP participation
SWP

SWP doesn't affect community
SWP not applicable to FN
Technical staff
Testing
Tradition
Traditional land use
Traditional perspectives
Traditional value of water
Training
Treatment
Treaty
True control remains with Non-FN institution
Uncertainty about future
User fees
Water parameters of concern
Water quality incident
Water quality not seen as priority
Water quantity
Water treated with Javex
Watershed management
Women
Youth
Youth involvement

Second Level Codes

Note: Nesting of first level codes are shown as indented.

Access to
Accountability
    Accountability/fault
Alternative tech
ATK
    ATK and SWP
    Importance of water
    Language
    Traditional land use
    Traditional perspectives
    Traditional value of water
    Women
Autonomy
Awareness
Band council
    Band council responsible
    Band Council's Relationship with Community-Based Groups
    Band councils' responsibilities
Buy-in
Capacity
Certification
Chlorine
Circuit rider
Clean water act
Commitment
    Commitment to process
    Committed and reliable individual/water manager
    Low salary for operators
Communication
Community interest
Community involvement
    Community involvement in water management
    Conflict
Confidence in water supply
    Lack of confidence in water supply
Consultation
    Lack of consultation
Contamination
    Contamination – internal and external
Cooperation
    FN/non-FN Cooperation
Deficiency

MOE
OFNTSC
Operator
Opportunity
    Neglected opportunity
Participation
Partnership
Policy
Politics
Poor planning
    Different priorities
Priority
Public involve
Racism
    Environmental racism
Regulation
    Enforceable regulations
Relationship with municipality
Remote
Resource
    Lack of resources
    Limited resources
    Technical staff
Risk
    Reduction of risk
Self-sufficiency
Self-determination
Sincere
    Sincere understanding of FN
Size
SPC
    First Nation involvement in SPC
    FN rep as resource for SPC
    SPC went above and beyond requirements
SWP
    CWA limited to SPAs
    Effects of CWA on community
    Inclusion in SWP
    Source water protection participation
    Staying informed through SWP participation
    SWP not applicable to FN
Traditional
    Language
    Traditional land use
    Traditional perspectives
    Traditional value of water

Training
Treatment
    Call for better water treatment
    Water treated with Javex
Uncertainty
Water parameter
Youth
    Youth involvement

Third Level Codes

Note: Sources are indicated in brackets.

Access to:	[PR2], [BC2], [SPC1], [FD]
Accountability:	[WM], [BC2], [FN17], [NGO1]
Alternative technologies:	[NGO3], [FN11], [PTO1], [ER], [TSC]
ATK:	[FN3], [FN1], [FN14], [PTO2], [FN7], [NGO3], [PR2], [FN15], [ER], [NGO1]
Band Council:	[SPC1], [HU], [NGO1], [BC1], [PR4], [WM], [NGO2], [FD], [BC2]
Certification:	[WM], [NGO2], [PR4], [PR2], [PTO1], [PR5], [TSC], [FD], [BC2]
Commitment:	[SPC1], [SPC2], [WM], [PR4]
Committed and reliable individual:	[WM], [ER], [PTO1], [SPC1], [BC1]
Communication:	[PTO1], [[FN5]], [HU], [PR4], [NGO2]
Community involvement:	[NGO1], [BC1], [TSC], [WM], [PTO1], [NGO2]
Deficiency:	[NGO3], [TSC], [WM], [NGO2], [FD], [BC2]
Deficiency in Water Setup:	[WM], [TSC], [NGO2], [BC2]
Diversity:	[PTO1], [TSC], [NGO1]
Education:	[FN5], [PTO2], [TSC], [WM], [PTO1], [NGO2], [ER], [SPC3]
Engage:	[PR1], [FN5], [PR2], [SPC2], [PTO1], [NGO2]
Funding:	[FN5], [HU], [SPC2], [PR4], [TSC], [WM], [PTO1], [PR5], [NGO2], [FD], [BC2]
Infrastructure:	[BC2], [WM], [NGO2], [FD], [HU], [TSC]
Involve:	[SPC1], [FN2], [SPC3], [NGO1], [SPC2], [BC1], [PR4], [TSC], [WM], [NGO2], [BC2]
Jurisdiction:	[SPC1], [FN5], [HU], [NGO1], [PR4], [TSC], [PTO1], [PR5], [NGO2]
Law:	[BC2], [SPC2], [NGO1], [FN7]
Liability:	[NGO3], [WM], [NGO2]
Location:	[NGO1], [PR4], [WM], [PTO1], [NGO2]
Parameter:	[NGO3], [WM], [PTO1]
Participation:	[PR1], [FN17], [SPC3], [NGO1], [BC1], [PR4]
Partnership:	[FN17], [SPC3], [PR4], [PTO1]
Poor planning:	[WM], [PTO1], [NGO2], [BC2]

Public involvement:	[FN2], [NGO2], [BC2]
Relationship with municipality:	[SPC1], [HU], [SPC2], [BC1]
Remote:	[NGO1], [TSC], [FD], [FN2]
Risk:	[PR1], [NGO3], [NGO1], [TSC], [WM], [PTO1], [NGO2], [FD], [BC2]
Size:	[PR4], [TSC], [PTO1], [NGO2]
Traditional:	[FN2], [FN5], [FN14], [FN17], [PTO2], [NGO3], [PR2], [HU], [SPC3], [NGO1], [SPC2], [BC1], [PR4], [TSC], [ER], [WM], [PTO1], [NGO2], [BC2]
Training:	[PR1] [PTO2], [HU], [PR4], [TSC], [PTO1], [NGO2], [FD], [BC2]
Youth:	[NGO1], [FN2], [SPC3], [SPC2], [BC1], [FN2], [FN14]

Final Set of Themes

Public involvement and awareness,
Legislative and policy frameworks,
Indigenous traditional knowledge,
Commitment, qualifications, and resources.