Drinking Water Safety Plans for Small Canadian Communities

Garry Drachenberg, P.Eng,
OWWA/OMWA Joint Annual Conference, May 2014 – London
Presentation Overview

- Drinking Water Safety Plans
  - What are they
  - Drivers behind them
- Where they have been adopted.
  - What’s involved in developing them
- Observations / Learnings To Date
- Wrap-Up Comments
  - Applicability in today's Market
1974 and 2001: 288 infectious disease outbreaks in Canada linked to a drinking water source (Schuster et al., 2005)

2/3 of the reported outbreaks occurred in small drinking water systems (189 of 288)

*Highlights unique challenges facing small systems for improving public health protection*

2006: 99% of boil water advisories in Canada were serving populations < 5000
“The water safety plan approach that is being implemented around the world offers Canada a valuable model and a timely opportunity to place a greater emphasis on drinking water providers knowing their own water systems much better, regardless of system size. Currently, Canada appears to be a “water safety plan-free zone” because we have had little evident institutional interest in or demonstrated uptake of this concept.”

STEVE E. HRUDEY, (Issue NO. 323, FEBRUARY 2011)
“These elements are key features of a “know your own system” approach to assuring safe drinking water that has become international best practice since first being proposed in 2004, almost simultaneous by the World Health Organization and the Australian drinking water guidelines. This approach calls for every water system to develop its own water safety plan.”

STEVE E. HRUDEY, (Thursday, May 23, 2013)
Drinking Water Safety Plans
What is a Drinking Water Safety Plan?

According to WHO 2011

“The most effective means of securing the safety of a drinking water supply is through the use of a comprehensive risk assessment and risk management approach that encompasses all steps in the water supply from catchment to consumer”
Drinking Water Safety Plans

What are they

- Catchment-2-Tap Approach
- Risk assessment & Risk management
- A way of looking at things differently
Drinking Water Safety Plans?

Drivers Behind Them

Why use one?

- Regulatory approach is prescriptive, based on ability to meet certain standards
- Regulations may prescribe a robust system
- If a compromise is detected, issue has already occurred – reactive approach
- Drinking Water Safety Plan provides a proactive approach of dealing with risks (real or potential)
- Enhances the assurance to provide the best quality water and to better protect the public
Hazard Analysis and Critical Control Point (HACCP) was developed in the 1960s in the United States to ensure food safety for the first manned National Aeronautics and Space Administration space missions (NASA).

NASA required a ‘zero defect’ program to guarantee safety in the foods astronauts consumed in space.
Drinking Water Safety Plans
Origin – Has been adopted by the food industry

- **Hazard**
  - WHAT hazards can enter the product?

- **Analysis**
  - Where do these hazards occur?

- **Critical**
  - How can we control or eliminate these hazards?

- **Control Point**
  - HACCP
Drinking Water Safety Plans

Origin – Has been adopted by the food industry

Look at each stage / ingredients input - Determine possible hazards & How are they controlled?
Drinking Water Safety Plans

Origin – Has been used in the food industry

- Does not rely on end product testing
  - hazards not be evenly distributed and can be missed in sampling
  - need to test large quantities
  - product would need to be destroyed or reworked

Look at each stage / ingredients input - Determine possible hazards & How are they controlled?
Drinking Water Safety Plans

WHO Model – Safe & Secure Drinking Water

Effective Management Systems & Procedures

Effective O & M Monitoring

Risk Assessment (Catchment to Consumer)
Drinking Water Safety Plans

WHO Model – Safe & Secure Drinking Water

A documented plan that:

- **Identifies** hazards, **Assesses** risks from catchment to consumer

- **Prioritises** risks → focus on highest risks

- **Mitigates** risks through control measures
A documented plan that:

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- **Mitigates** risks through control measures

**Meaning:**

- **Less** **output** monitoring (final water)
- **More** **input** monitoring (is the system working?)
Benefits

- Develop a better understanding of risk, how risks are controlled
- Identify potential weak points in current processes
- Help identify critical maintenance and investment requirements
- Make assets more robust, make water quality safer, make operators lives easier
- Take a step back and look at things from a different perspective
Risk

We don’t see what we don’t look for
Risk

We don’t see what we don’t look for
Risk

We don’t see what we don’t look for
Obvious Risks
Not So Obvious Risks
Sooner or Later!!!!
Where Have They Been Adopted
DWSP - International Perspective

United Kingdom

ALBERTA

SCOTLAND
ENGLAND
WALES

Caribbean

LATIN AMERICA

UGANDA

SOUTH AFRICA

SOUTH EAST ASIA

Australia

New Zealand

India
Risk Assessment vs DWSP

- RA is achieved by using the DWSP template

Information Letter 2/2012

- Defines DWSP
- Stds & Guidelines changed Apr 30, 2012
- Approval and registration holders were required to prepare a DWSP in accordance with Stds & Guidelines
- Had to be completed by December 31, 2013
- Intention: to be completed by operators
Alberta Version of DWSP

- Represents a **system-wide approach** to ensuring that the quality of water delivered to consumers is of good and consistent quality.

- Based on a **comprehensive assessment of risk factors** that could adversely affect the quality of water delivered to consumers, and sets out how these risk factors are to be monitored and managed.
Drinking water systems regulated by AESRD by population (2012)

<table>
<thead>
<tr>
<th>Population</th>
<th>Number of waterworks systems</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;500</td>
<td>434</td>
</tr>
<tr>
<td>&gt;500 - &lt;1500</td>
<td>94</td>
</tr>
<tr>
<td>&gt;1500 – &lt;10,000</td>
<td>82</td>
</tr>
<tr>
<td>&gt;10,000</td>
<td>30</td>
</tr>
</tbody>
</table>
Drinking Water Safety Plan

General Steps (WHO Model)

**Preparation**
- Assemble the WSP team

**System assessment**
- Describe the water supply system
- Identify the hazardous events and assess the risk
- Determine and validate control measures reassess and prioritise risks
- Develop, implement and maintain an improvement/upgrade plan

**Operational Monitoring**
- Define monitoring of the control measures

**Management and communication**
- Verify the effectiveness of the WSP
- Prepare management procedures
- Develop supporting programmes

**Feedback and improvement**
- Plan and carry out periodic review of the WSP
- Revise the WSP following an incident
Drinking Water Safety Plan – Principal Processes

- Collecting and collating the best information
- Analysing and understanding the risks
- Assessing what is required to reduce risks to an acceptable level
- Determining how to obtain the necessary resources to achieve this
Drinking Water Safety Plan – The Alberta Approach

- Developed template
- Source, treatment, distribution and customer nodes
  - 190 typical risks identified
- Risks are assessed by “likelihood and consequence” with scored rating (> 32 high risk)
- Interventions and action summary plans
Risk Matrix

Note: The score of "0" should only be applied if the risk is not applicable in this water supply system.
# The Key Risk Sheet

<table>
<thead>
<tr>
<th>Risk Description</th>
<th>Risk I.D.</th>
<th>Likelihood</th>
<th>Consequence</th>
<th>L'hood Score</th>
<th>Cons. Score</th>
<th>Risk Score</th>
<th>Key Risk</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Source Risks</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Microbiological contamination of raw water as a result no restriction in access to source</td>
<td>DWSP-S-001</td>
<td>Probable</td>
<td>Severe</td>
<td>8</td>
<td>8</td>
<td>64</td>
<td>Yes</td>
</tr>
<tr>
<td>Insufficient water available for abstraction</td>
<td>DWSP-S-023</td>
<td>Almost Certain</td>
<td>Minor</td>
<td>16</td>
<td>2</td>
<td>32</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Treatment Risks</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Loss of supply caused by failure of inlet control valve</td>
<td>DWSP-T-005</td>
<td>Probable</td>
<td>Moderate</td>
<td>8</td>
<td>4</td>
<td>32</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Network Risks</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Loss of supply and/or deterioration of water quality as a result of broken main</td>
<td>DWSP-N-004</td>
<td>Almost Certain</td>
<td>Severe</td>
<td>16</td>
<td>8</td>
<td>128</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Customer Risks</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lead in water in supply picked up from the service pipes and other fittings</td>
<td>DWSP-C-001</td>
<td>Medium</td>
<td>Severe</td>
<td>4</td>
<td>8</td>
<td>32</td>
<td>Yes</td>
</tr>
</tbody>
</table>
Drinking Water Safety Plan – Principal Processes

- Collecting and collating the best information
- Analysing and understanding the risks
- Assessing what is required to reduce risks to an acceptable level
- Determining how to obtain the necessary resources to achieve this

The Key is taking action based on Learnings.
<table>
<thead>
<tr>
<th>Action</th>
<th>Action</th>
<th>Completion date</th>
<th>Person responsible</th>
<th>Improvement completed</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Meet with everybody who has a responsibility in this timetable to discuss and agree on what has to be done, and ensure they have a copy of the Action Timetable.</td>
<td>31 Jan 2015</td>
<td>Water Supply Committee Secretary</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Arrange for a visit to a local EHO or HPO to get advice on how best to improve the FAC monitoring.</td>
<td>4 Feb 2015</td>
<td>Water Supply Committee Secretary</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Arrange for a visit to the local authority by those who look after the maintenance of the reticulation system to discuss good practices for making repairs.</td>
<td>4 Feb 2016</td>
<td>Water Supply Committee Secretary</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Visit the DWOS contacted (Action 2) for a discussion and advice on bio monitoring.</td>
<td>13 Feb 2014</td>
<td>Supply operator (Mr Smith)</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Draw up a new monitoring plan and start using it.</td>
<td>14 Feb 2002</td>
<td>Supply operator (Mr Bens)</td>
<td></td>
</tr>
</tbody>
</table>
Alberta Approach Summary

- DWSP’s mark a change from being reactive to being more proactive.
- DWSPs will become embedded in the culture and become part of “the day job”.
- DWSP were not considered for completion by consultants. But initially undertaken by operators.
- Regulated requirement in Alberta by December 31, 2013
DWSP: Development and Implementation
Late 2011 - Early 2012 Initiative

- Prepared and delivered 15 workshops (1 day) across the province in late 2011 and early 2012.
  - 251 municipalities attended
- Another ½ day workshop at Banff Seminar on March 2012
  - 33 municipalities attended
- DWOS available for on-site assistance
2013 Closer-to-Home Initiative – AWWOA

- 14 Group completion sessions (3 days duration)
- 195 certified operators
- 131 communities

Drinking Water Safety Plan (DWSP) Completion Sessions

The Closer to Home (C2H) Initiative has one-time funding available to strengthen smaller municipality and local group collaboration so that drinking water is safe and wastewater is responsibly managed. The C2H Initiative will pay for an initial CEU accredited DWSP education session and local project launch. No-cost assistance and technical support is also available over a three to six month period to help facilitate the completion of your Drinking Water Safety Plan.
Observations / Learnings to Date
Overall the sessions were well received. A couple of reasons:

- They heard it enough times and it is finally sinking in.
- It’s the only time they can actually get away from work and sit down for 4-5 hrs to get at it and also pick up some CEU’s.
- Rather than look at the massive template, it got them started little by little and made it look not that difficult.
Observations / Learnings to Date

The importance of Facilitation (3 days of sessions)

- The explanation of the intent of the DWSP and the meaning behind the risk description helped them understand and relate.

- Interactions between neighbors and seeing others with similar challenges brought some comfort
  
  * More honesty about the risks (“I’m not alone”)
Observations / Learnings to Date

Like usual:

- 20 – 30 % really embraced the whole concept;
- 30 -40 % did it because they had to; and
- the rest went kickin’ and cursin’

Most folks tended to rate potential risks at moderate or low. There appeared to be a reluctance to rate high risk in case it translates to meaning the water is at high risk and therefore they’re not doing the job properly.
Observations / Learnings to Date

The importance of Facilitation (3 days of sessions)

Challenges:

• Groups that had varying participants from surface water, groundwater to distribution only. Hard to maintain interest and focus with such disparity

• Very small systems and co-ops who really didn’t want to be there struggled with the whole exercise.

Opportunities:

• Provides great communication vehicle for operator / management interactions
Observations / Learnings to Date

We don’t see what we don’t look for

- A picture is worth a thousand words and so out of all the slides we used this one had the most impact and made them see the light!

_Deal with the real risks, the ones that are always there just waiting to happen ……_
Observations / Learnings to Date

Understanding Risk Concept

Control Measures
This little guy was used to demonstrate why some control measures may look like a good idea but are not well thought out! For example: when we hook up an on-line chlorine analyzer, it’s a great idea except if it doesn’t alarm to anywhere, it really isn’t that effective. This illustrated that each control requires careful consideration to make sure it does what it is intended to do to ...control the risk.
Wrap-Up Comments
Drinking Water Safety Plan

Benefits

- Develop a **better understanding** of risk and how this can be controlled
- Identify **potential weak points** in your system
- Take a **step back** and look at things from a different perspective
- Help **identify** critical interventions required
Drinking Water Safety Plans

Applicability

- This is **not limited** to small systems
  - DWSP is about looking at the system holistically

Operator Training Observations

- In Small WTPs - Ops tend to see the cradle to crave services – their challenge is often is they don’t have the time – over taxed
- In Big WTPs – Cradle to crave exposure to all aspects in a wtp is hard to come by (silos of duties / tasks) – DWSPs – could help to address shortcomings
Starting Point – Not End Point

Operational Awareness
“Know Your System”
(Initial check-up)

Drill down for more Detailed Info
(Confirm the ills)

Implementation
(Address the ills)

Getting on Scale
(What’s readily visible)

HAZOP ...Vulnerability Assessment
Detailed Condition Assessments
Operation & Procedures Assessments
Performance Assessments
Operational Improvements
Capital Improvements
Procedural Improvements

Doing a DWSP does not make your water safe – it gives you a high level awareness of areas you may need to address and very likely areas where you may need to get more detailed information to confirm the best-fit path forward to address risks.
Things are not always as they initially appear

Some Food For Thought
QUESTIONS?