Stantec

LATORNELL 2018

# How Cool Are Cooling Trenches? Trench Monitoring in KW

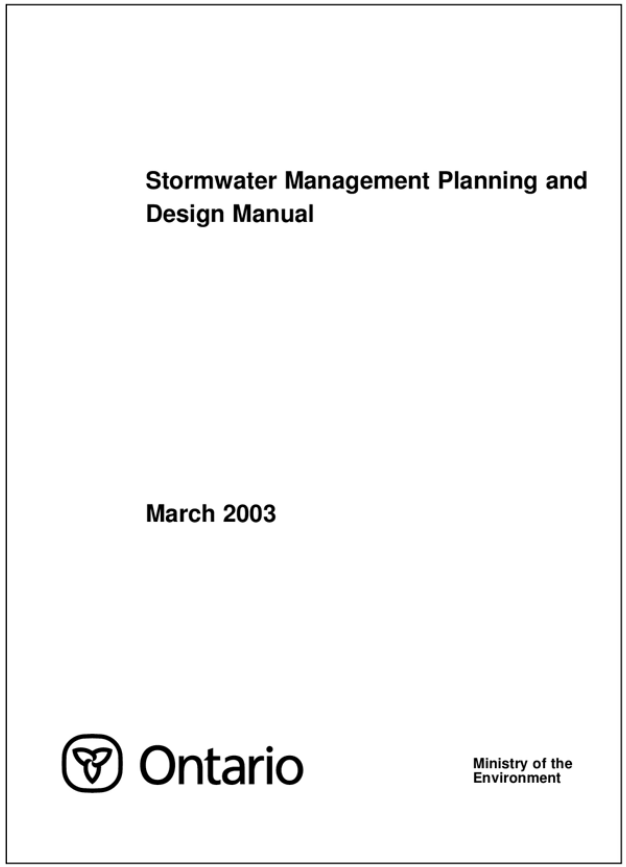
# Agenda

1. A Cold Topic
2. Cooling Down – W+H?
3. A Refreshing Program
4. Interpretation
5. Other Techniques
6. Moving Forward

Introduction

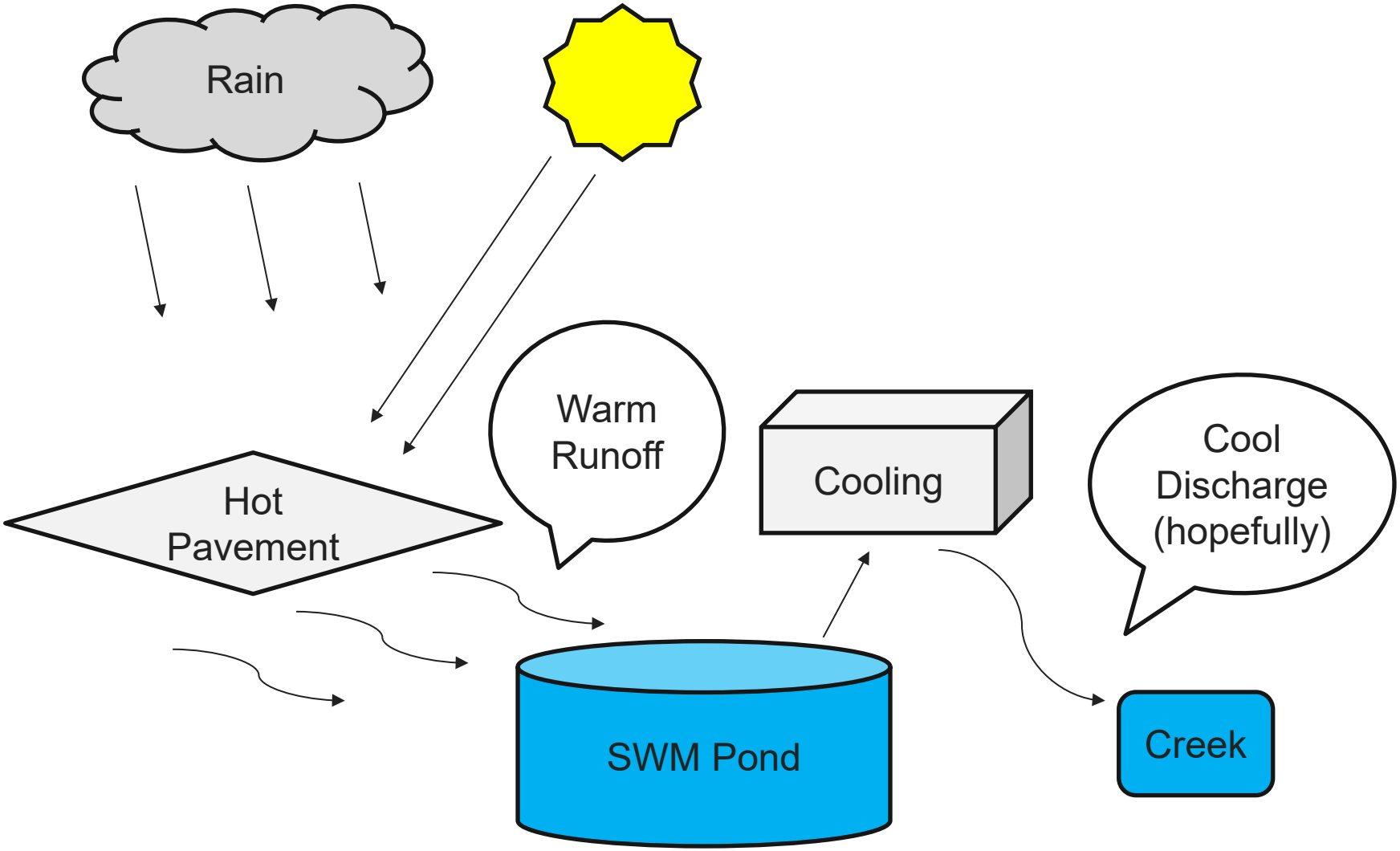
# A Cold Topic

# A Cool Introduction




- What is thermal mitigation?
- MOE (2003)
  - Pond Configuration
  - Riparian Planting Strategies
  - Bottom Draw Outlets
  - Subsurface Trench Outlet
  - Night-time Release
  - Outlet Channel Design

# The Process – Simple Stuff



Cooling Down

# The Why and the How

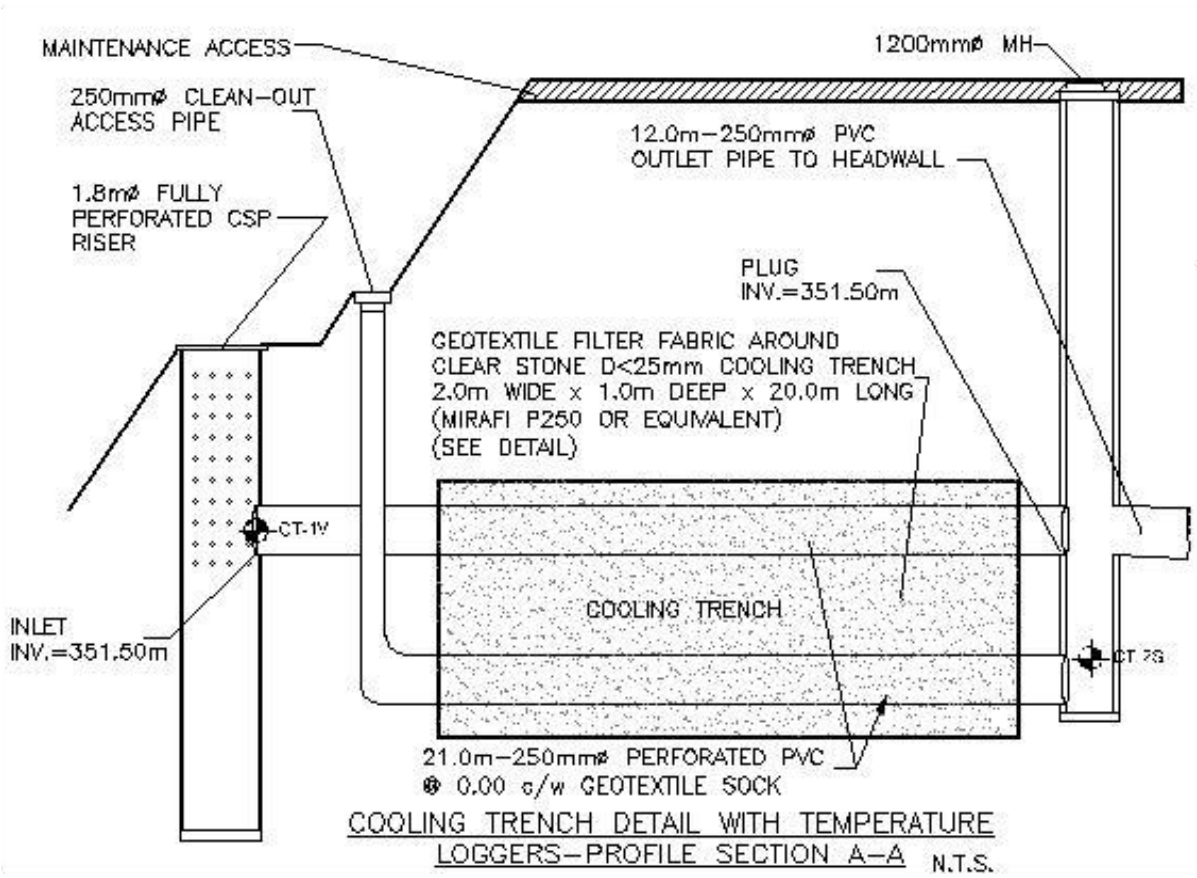
# Why Be Cool in KW?

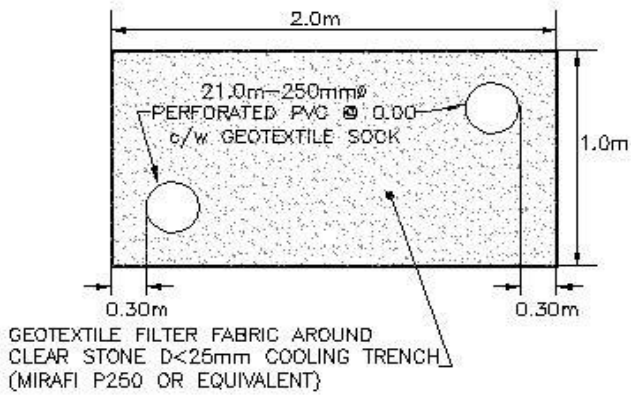
- Fish!
- Subwatershed Studies
- Regulations/Policies
- Development

# How To Be Cool in KW

- Different approaches over the years
  - Subsurface outlet
  - Residence time calculations
  - Heat transfer calculations
  - Groundwater
  - Design Storm Event
- Consistency

# A Cross-Section




COOLING TRENCH DETAIL
CROSS-SECTION C-C
N.T.S.


DEERE


DEERE

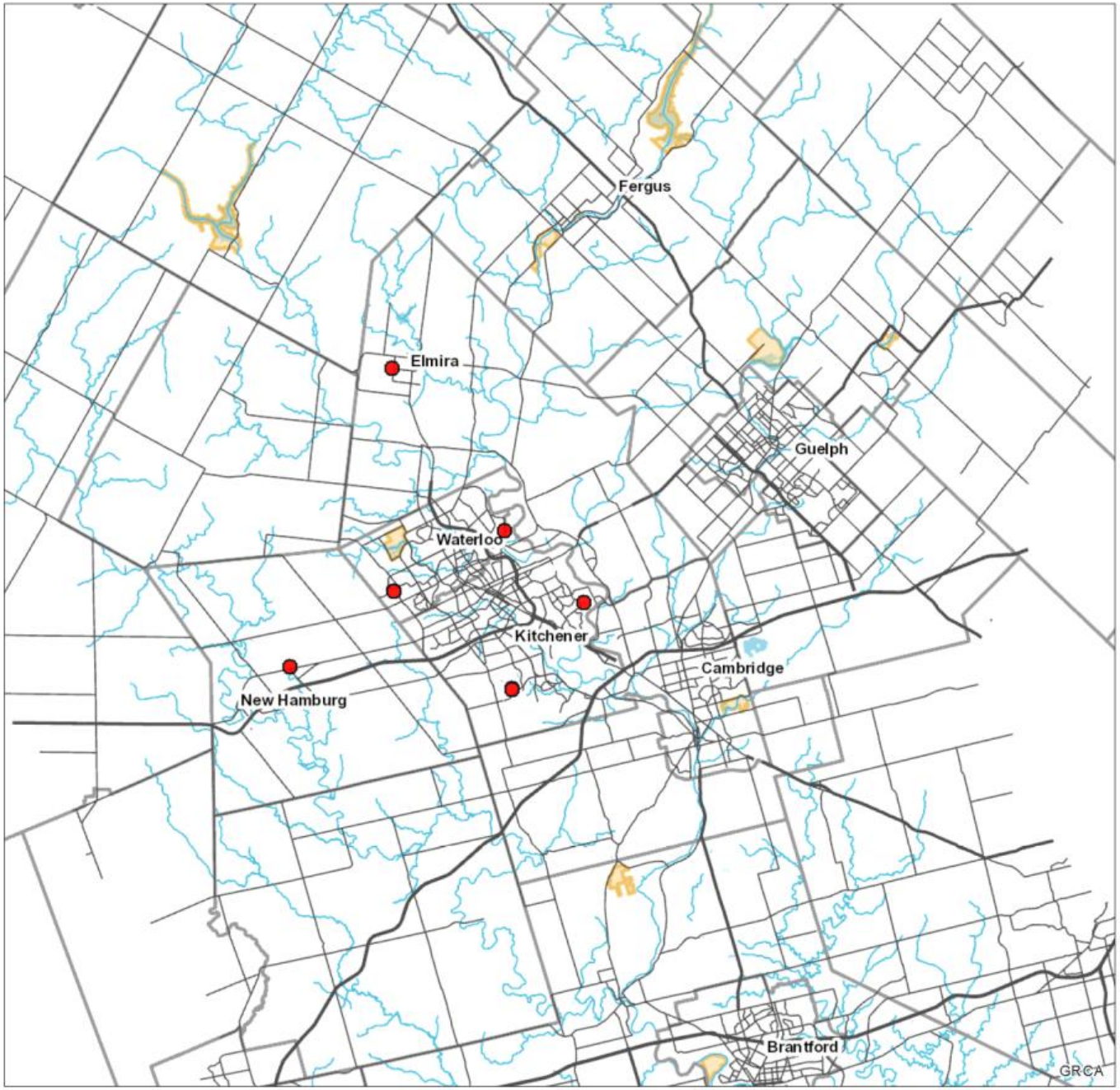

CHICOPEE HILLS

A Refreshing Program

# Monitoring Program

# Specifics!

- 2 Trenches in the City of Waterloo
- 3 Trenches in the City of Kitchener
- 1 Trench in Elmira (north of Waterloo)
- 1 Trench in the Booming Metropolis of Baden (west of Kitchener)
- 2 years (minimum)




Grand River Conservation Authority

Date: Mar 18, 2018

Author: Stantec

# Cooling Trench Locations in RMOW

Mapping from Grand River Conservation Authority

## Legend

- Municipal Boundary (GRCA)
- Watercourse - Regional (GRCA)
- Park - Regional (GRCA)
- Waterbody - Major (GRCA)
- Great Lakes - Regional (GRCA)



0 2,375 4,750 9,500 14,250 Metres

N

Map Centre (UTM NAD83 z17): 545,807.38 4,814,436.36

This map is not to be used for navigation

NAD 1983 UTM Zone 17N

Scale: 392,313

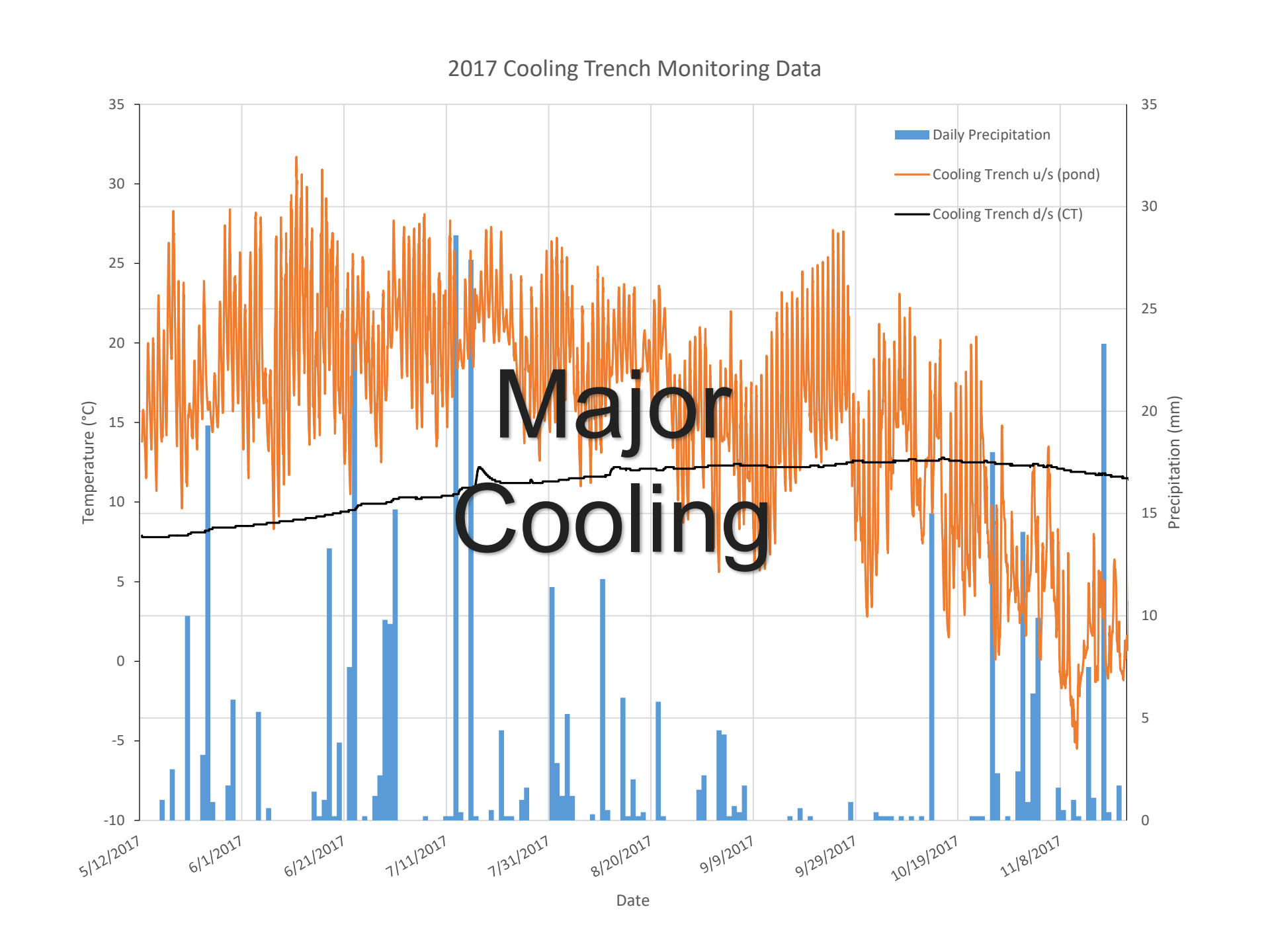

ITANTEC

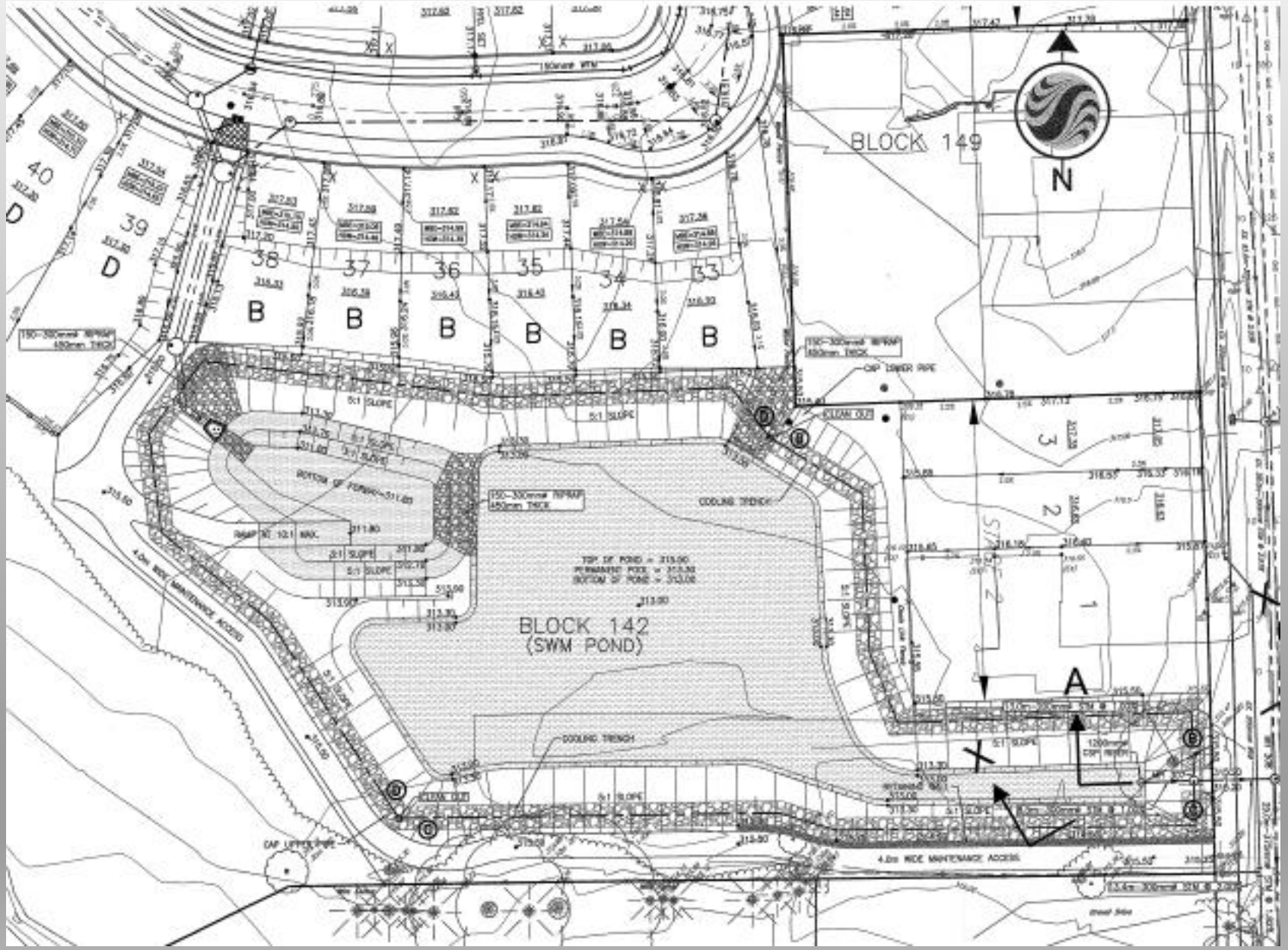
# Design Parameters - Effectiveness

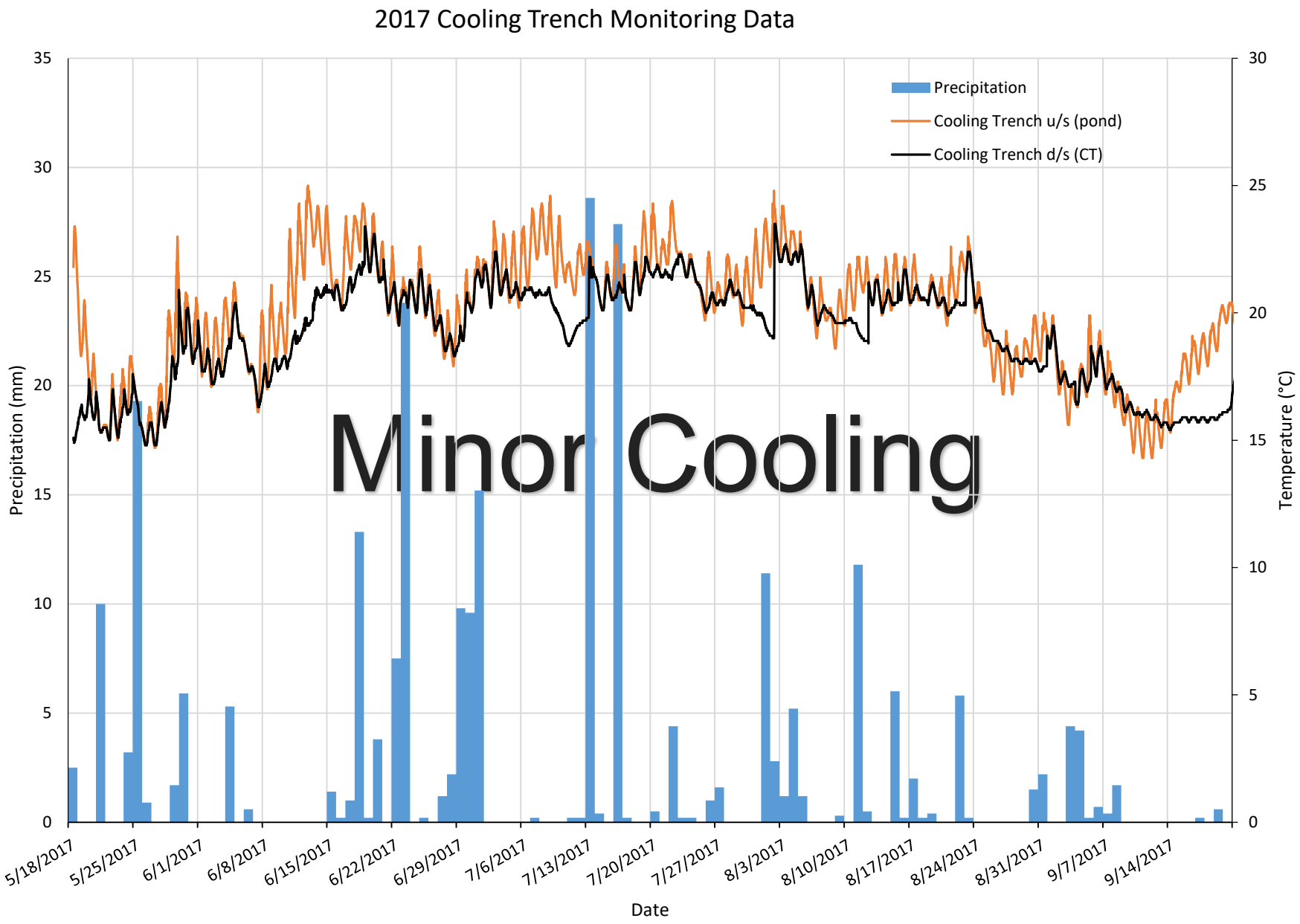
- Upstream catchment area characteristics
- Groundwater
- Residence time/flow path
- Length : Width
- Outlet design of pond
- Cost

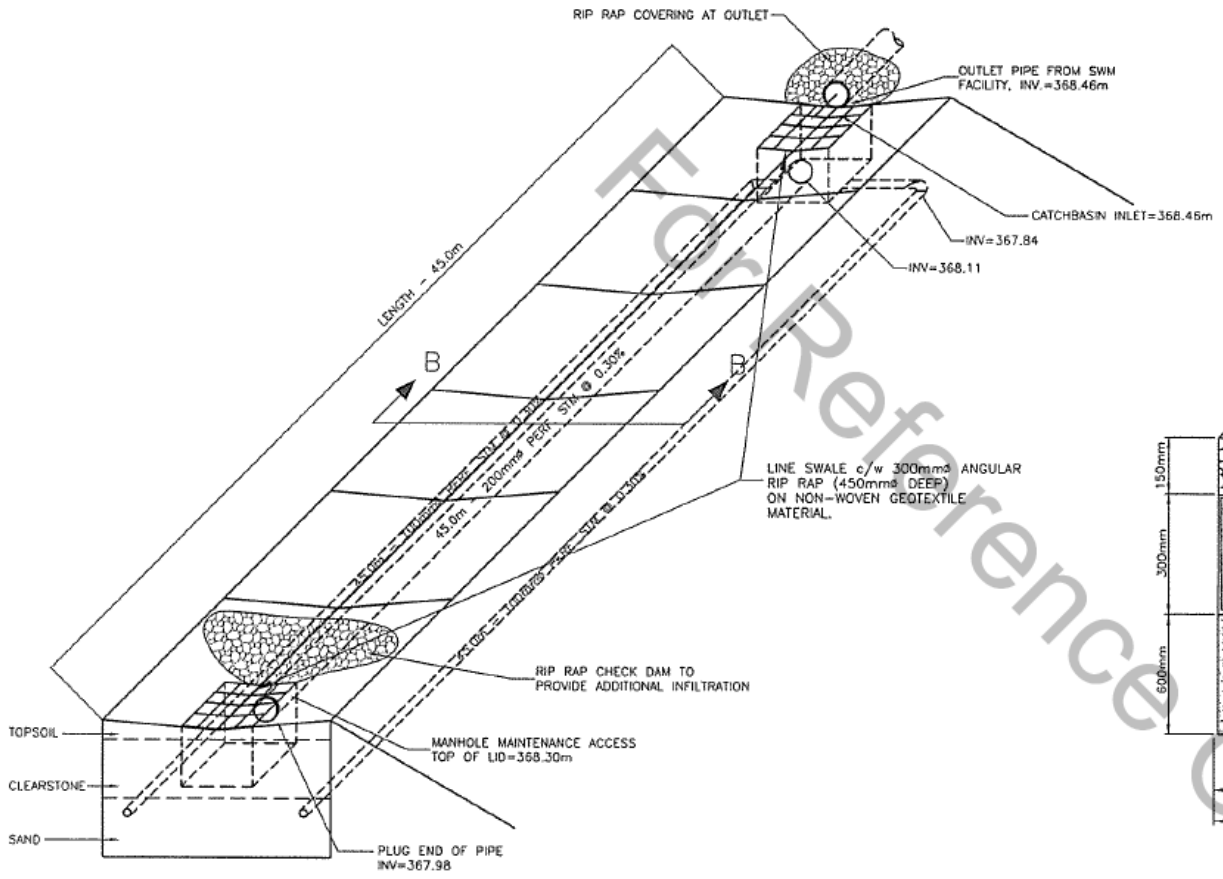
Interpretation

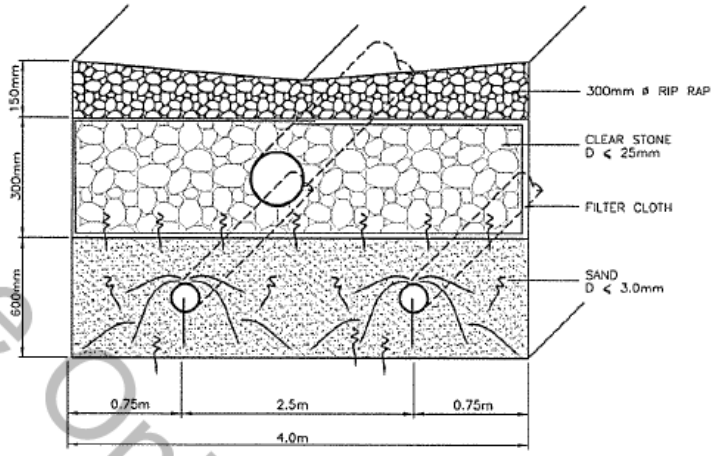
# Results, Graphs, Numbers, Etc.


2017 Cooling Trench Monitoring Data
Daily Precipitation
Cooling Trench u/s (pond)
Cooling Trench d/s (CT)
Major Cooling
Temperature (°C)
Precipitation (mm)
Date
35
30
25
20
15
10
5
0
-5
-10
5/12/2017
6/1/2017
6/21/2017
7/11/2017
7/31/2017
8/20/2017
9/9/2017
9/29/2017
10/19/2017
11/8/2017

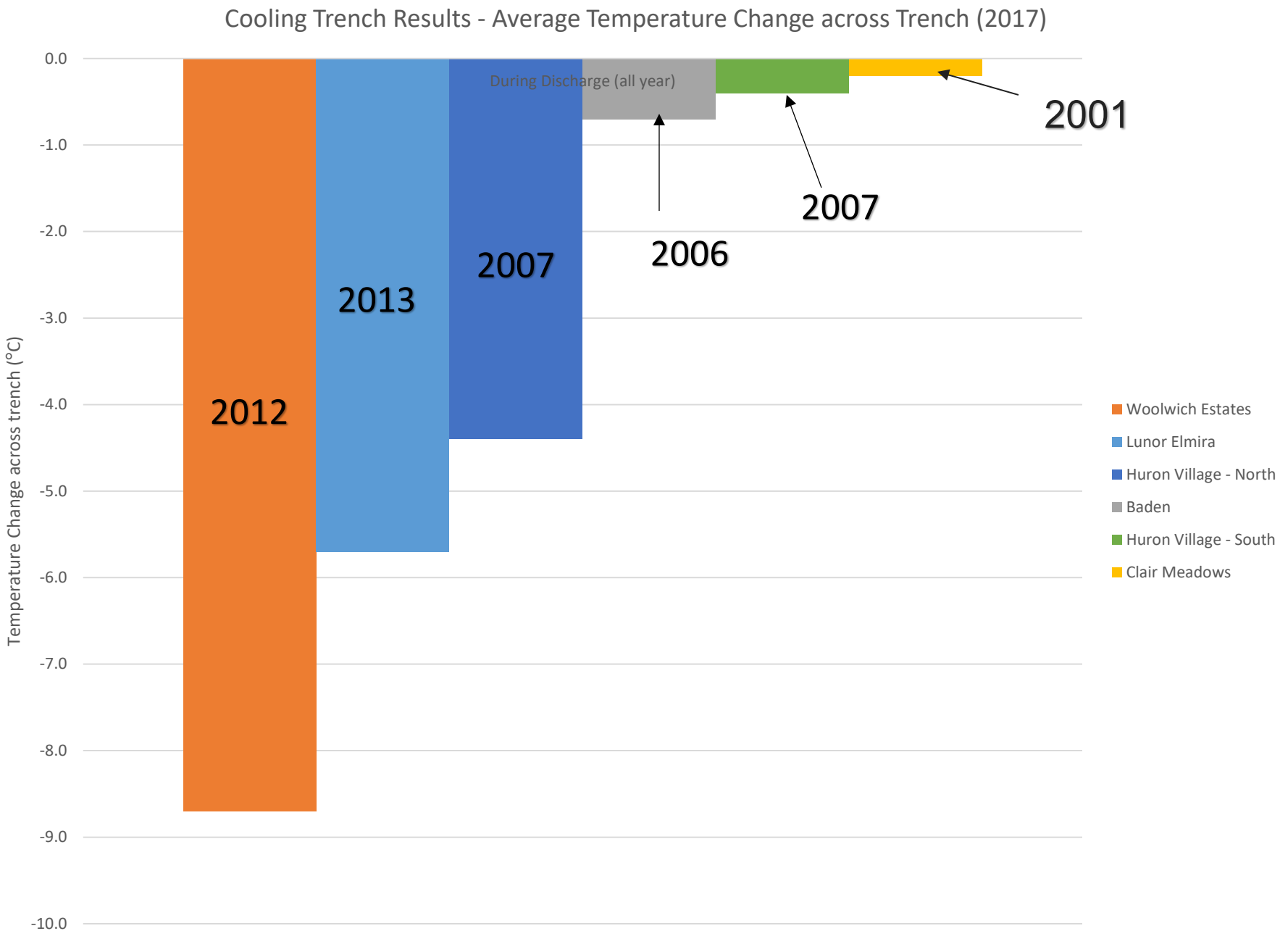

BLOCK 149
N
BLOCK 142
(SWM POND)
4.0m WIDE MAINTENANCE ACCESS
COOLING TRENCH
5:1 SLOPE
CAP LOWER PIPE
A
X


2017 Cooling Trench Monitoring Data
Precipitation
Cooling Trench u/s (pond)
Cooling Trench d/s (CT)
Minor Cooling
Precipitation (mm)
Temperature (°C)
Date
35
30
25
20
15
10
5
0
5/18/2017
5/25/2017
6/1/2017
6/8/2017
6/15/2017
6/22/2017
6/29/2017
7/6/2017
7/13/2017
7/20/2017
7/27/2017
8/3/2017
8/10/2017
8/17/2017
8/24/2017
8/31/2017
9/7/2017
9/14/2017




SECTION 'B'–'B'
TYPICAL CROSS–SECTION


Cooling Trench Results - Average Temperature Change across Trench (2017)
Temperature Change across trench (°C)
0.0
-1.0
-2.0
-3.0
-4.0
-5.0
-6.0
-7.0
-8.0
-9.0
-10.0
2012
2013
2007
During Discharge (all year)
2006
2007
2001
Woolwich Estates
Lunor Elmira
Huron Village - North
Baden
Huron Village - South
Clair Meadows

# What Have We Found?

- Groundwater
  - Effective
- Outlet design of pond
  - Bottom draw outlet may also contribute to cooling
- Residence time/flow path
  - Longer flow path = longer residence time = cooler temp
- Cost
  - More money = less problems = cooler temps (to a point)

Next Steps

# Where Next?

# Next Steps

- Low Impact Development (LID) – treat at-source is preferred
- MECP Design Guidelines (20XX?)
- Multi-component approach is probably best
- Is there a place for cooling trenches?

Questions?
https://ideas.stantec.com/low-impact-development