## **Re-Evaluation of CSO Abatement Approach Saves Small Maine Community Over \$2 Million**



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#### Agenda

- Project Overview
- CSO Abatement: Past, Present and Future
- Related Project Elements
- Project Costs
- Schedule









#### **Location Map**





#### **Gardiner Wastewater Collection and Treatment System**

- Regional system serving City of Gardiner and Towns of Farmingdale and Randolph
  - Farmingdale via gravity
  - Randolph via pumping across the Kennebec River
- WWTF located in South Gardiner
  - 4.5 MGD design flow (secondary using RBC)
  - Up to 9.5 MGD in wet weather (flows above 4.5 MGD receive primary treatment/seasonal disinfection)
- 7.0 MGD Maine Ave. PS conveys flow from Farmingdale and downtown Gardiner to the WWTF





## **History of CSO Abatement**

- City's initial CSO plan was prepared in 1995
- Plan was updated in 2002, 2008 and 2013
- Abatement program was based on an adaptive "build and measure" approach
- Two licensed outfalls: CSO 002 at Rolling Dam Brook and CSO 003 at Cobbossee Stream
- CSO 002 has been eliminated and in full compliance (primary treatment/seasonal disinfection)







### **CSO Abatement Status**

- Estimated 20 MGY of untreated overflow in 1995
- Current CSO Discharges:
  - 33 activations between 2008 and 2013 averaging 4.61 MGY
  - 14 activations within the May 15-September 30 disinfection season averaging 0.83 MGY
  - The 4.61 MGY of remaining untreated overflow at CSO 003 represents a 77% systemwide reduction from 1995







#### **CSO Abatement Objectives**

- Bring CSO 003 at the MAPS into compliance (relocated from Cobbossee Stream as part of an earlier abatement project)
- Determine the optimal size, location and shape of the tank
- Coordinate with the installation of the mechanical screen at the MAPS



Earlier plan had suggested off-line storage to capture 100% of discharge volume and became the "placeholder" for the 2013 plan update



### What is Compliance?

- Meets the goals of EPA and DEP CSO policies and guidelines
- CSOs are eliminated (as was the case with CSO 002)
- If they can't be eliminated, the remaining CSOs:
  - Are stored for later treatment at the WWTF
  - Receive a minimum of primary treatment plus disinfection between May 15 - September 30

By switching from purely storage to storage/treatment, Gardiner could achieve these abatement criteria and a high degree of compliance at lower costs



#### **Annual Overflow Volumes at CSO 003**



Total Overflow Volume
Disinfection Season (May 15 to Sept 30)



	Event
Data Analysis (2008 to 2013)	11
Voorround	12
• Year-round:	ŏ
<ul> <li>– 33 total events</li> </ul>	4
– 27.7 MG total	6
– Mean: 0.84 MG	4
– Median: 0.43 MG	12
Max: 2 51 MC	10
	7
	7
<ul> <li>Disinfection season:</li> </ul>	2
-14 CSO events	1
	1
– 5.01 MG total	10
– Mean: 0.36 MG	1
- Median: 0.12 MG	9
	6
– Max: 2.90 MG	11
<ul> <li>Next highest: 0.73 MG</li> </ul>	10
	, in the second s
	4

Event End	Total Rainfall	Total CSO
	in	gal
11/27/2013	2.96	430,000
9/2/2013	2.50	133,000
8/9/2013	2.72	728,000
12/21/2012	1.28	471,600
8/16/2012	4.05	194,200
6/4/2012	5.02	2,897,500
4/24/2012	4.12	892,100
9/5/2011	1.54	135,000
6/10/2011	1.45	95,000
4/17/2011	1.52	915,000
3/7/2011	3.45	3,510,000
12/13/2010	3.05	1,519,000
11/7/2010	2.42	881,000
10/15/2010	1.06	142,883
7/21/2010	1.46	118,000
7/10/2010	1.00	95,578
3/30/2010	3.63	3,381,800
2/25/2010	4.00	2,819,000
1/28/2010	0.12	300
1/25/2010	1.40	1,496,200
11/14/2009	4.30	1,321,000
10/24/2009	1.70	9,000
10/9/2009	0.35	447,000
9/25/2009		5,000
8/11/2009	0.79	59,000
6/19/2009	0.48	800
11/25/2008	3.41	1,550,000
10/26/2008	2.02	505,000
9/27/2008	3.57	129,000
9/6/2008	4.15	408,000
7/1/2008	1.16	10,000
4/30/2008	4.48	2,051,000
3/8/2008	1.95	327,000
Total	33	27,676,961

Data Analysis: May 15 to Sept. 30         in         gal           Outlier Removed from Data         11/27/2013         2.50         133,000           9/2/2013         2.72         728,000         19/2/2013         2.72         728,000           9/2/2012         1.28         471,600         8/9/2013         2.72         728,000           9/2/2/2012         1.28         471,600         8/9/2012         4.05         19/200           • From 2008 to 2013 data:         -         4/24/2012         4.12         892,100           - 13 CSO events         -         13/17/2011         1.54         135,000           - 2.11 MG total         11/17/2010         3.45         3,510,000           - Mean: 0.16 MG         7/12/2010         1.06         142,883           - Median: 0.12 MG         3/2/25/2010         4.00         2,819,000           - Max: 0.73 MG         11/28/2010         1.14         1,860,200           Note: The 2.9 MG outlier makes         10/2/2009         1.70         9,000           11/1/2/2009         0.33         1.321,000         3,03         3,341,000           11/1/2/2009         0.79         59,000         50,000         9/25/200         50,000           9/25/2009		Event End	Total Rainfall	Total CSO
Data Analysis: May 15 to Sept. 30         11/27/2013         2.96         430,000           Outlier Removed from Data         9/9/2/2013         2.50         133,000           0         8/9/2013         2.72         728,000           12/21/2012         1.28         471,600           8/9/2013         2.72         728,000           9/9/2013         2.50         133,000           12/21/2012         1.28         471,600           8/9/2013         2.72         728,000           9/9/2013         2.50         2.897,500           4/24/2012         4.12         892,100           9/9/2011         1.54         135,000           9/9/2011         1.54         95,000           - 13 CSO events         3/7/2011         3.45           - Nean: 0.16 MG         11/7/2010         1.46           - Median: 0.12 MG         2/2/2/2010         1.00           - Max: 0.73 MG         1/2/2/2010         1.40         1.46,62.00           10/24/2009         1.70         9,000           9/25/2010         1.40         1.346,020           11/1/4/2019         0.33         347,000           11/22/2009         0.35         447,000 <tr< th=""><th></th><th></th><th>in</th><th>gal</th></tr<>			in	gal
Outlier Removed from Data         9/2/2013         2.50         133.000           8/9/2013         2.72         728.000           12/21/2012         1.28         471.600           8/16/2012         4.05         194.200           6/10/2011         5.02         2.307.500           9/5/2011         1.54         135.000           9/5/2011         1.54         135.000           9/5/2011         1.54         135.000           9/5/2011         1.54         135.000           9/5/2011         1.54         135.000           9/5/2011         1.45         95.000           9/5/2011         1.45         135.000           9/5/2011         1.45         95.000           9/5/2011         1.45         95.000           9/5/2011         1.45         95.000           9/5/2011         3.05         1.51.000           9/5/2010         0.06         142.883           9/5/2010         1.06         142.883           9/30/2010         3.63         3.381.800           10/5/2010         1.66         142.883           9/5/2010         1.40         1.466.200           11/14/2009         3.33.381.80	Data Analysis: May 15 to Sept. 30	11/27/2013	2.96	430,000
• From 2008 to 2013 data: <ul> <li>- 13 CSO events</li> <li>- 2.11 MG total</li> <li>- Mean: 0.16 MG</li> <li>- Median: 0.12 MG</li> <li>- Median: 0.12 MG</li> <li>- Median: 0.12 MG</li> <li>- Max: 0.73 MG</li> </ul> <ul> <li>Note: The 2.9 MG outlier makes up 58% of the total disinfection season overflow volume from 2008 to 2013.</li> <li>- 10/24/2012</li> <li>- 11/25/2010</li> <li>- 11/25/201</li></ul>	Outlier Removed from Date	9/2/2013	2.50	133,000
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$\begin{array}{rrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrr$		6/4/2012	5.02	<del>2,897,500</del>
<ul> <li>From 2008 to 2013 data:         <ul> <li>13 CSO events</li> <li>13 CSO events</li> <li>2.11 MG total</li> <li>Mean: 0.16 MG</li> <li>Median: 0.12 MG</li> <li>Max: 0.73 MG</li> </ul> </li> <li>Note: The 2.9 MG outlier makes up 58% of the total disinfection season overflow volume from 2008 to 2013.</li> <li>Note 2013.</li> </ul>		4/24/2012	4.12	892,100
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$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	• From 2008 to 2013 data:	0/10/2011	1.40	95,000
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$		4/17/2011	3.45	915,000
<ul> <li>2.11 MG total</li> <li>Mean: 0.16 MG</li> <li>Median: 0.12 MG</li> <li>Max: 0.73 MG</li> <li>Note: The 2.9 MG outlier makes up 58% of the total disinfection season overflow volume from 2008 to 2013.</li> <li>Note 2013.</li> </ul>	– 13 CSO events	12/13/2010	3.45	3,510,000
- 2.11 MG total       10/15/2010       1.06       142,883         - Mean: 0.16 MG       7/21/2010       1.46       118,000         - Median: 0.12 MG       3/30/2010       3.63       3,381,800         - Max: 0.73 MG       2/25/2010       4.00       2,819,000         - Mote: The 2.9 MG outlier makes       11/25/2010       1.40       1,496,200         11/14/2009       4.30       1,321,000       11/14/2009       1.35       447,000         10/9/2009       0.79       59,000       8/11/2009       0.79       59,000         2008 to 2013.       10/26/2008       2.02       505,000         9/27/2008       3.57       129,000         4/30/2008       4.15       408,000         7/11/208       1.16       10,000		11/7/2010	2 42	881.000
<ul> <li>Mean: 0.16 MG</li> <li>Median: 0.12 MG</li> <li>Max: 0.73 MG</li> <li>Note: The 2.9 MG outlier makes up 58% of the total disinfection season overflow volume from 2008 to 2013.</li> <li>Note 2013.</li> </ul>	-2.11 MG total	10/15/2010	1.06	142 883
- Median: 0.10 MG       7/10/2010       1.00       95,578         - Median: 0.12 MG       3/30/2010       3.63       3,381,800         - Max: 0.73 MG       1/28/2010       0.12       300         Note: The 2.9 MG outlier makes up 58% of the total disinfection season overflow volume from 2008 to 2013.       10/24/2009       1.70       9,000         8/11/2009       0.79       59,000       5,000       9/25/2009       5,000         9/25/2009       0.48       800       9/25/2009       5,000         9/25/2009       0.48       800       11/25/2008       3.41       1,550,000         9/27/2008       3.57       129,000       9/27/2008       3.57       129,000         9/27/2008       4.15       408,000       7/1/2008       1.16       10,000         3/3/2010       3/3/2010       3/3/2010       3/3/2010       3/3/2010       3/3/2010       3/3/2010	- Mean: 0.16 MG	7/21/2010	1.46	118,000
<ul> <li>Median: 0.12 MG</li> <li>Max: 0.73 MG</li> <li>Note: The 2.9 MG outlier makes up <u>58%</u> of the total disinfection season overflow volume from 2008 to 2013.</li> <li>3/30/2010</li> <li>3.63</li> <li>3,381,800</li> <li>2/25/2010</li> <li>4.00</li> <li>2,819,000</li> <li>1/28/2010</li> <li>1.40</li> <li>1,496,200</li> <li>11/14/2009</li> <li>4.30</li> <li>1,321,000</li> <li>10/24/2009</li> <li>0.35</li> <li>447,000</li> <li>9/25/2009</li> <li>5,000</li> <li>8/11/2009</li> <li>0.79</li> <li>59,000</li> <li>8/11/2009</li> <li>0.48</li> <li>800</li> <li>11/25/2018</li> <li>4.41</li> <li>1,550,000</li> <li>9/27/2008</li> <li>3.57</li> <li>129,000</li> <li>9/6/2008</li> <li>4.15</li> <li>408,000</li> <li>7/1/2008</li> <li>1.16</li> <li>10,000</li> <li>4/30/2008</li> <li>4.48</li> <li>2,051,000</li> <li>3/8/2008</li> <li>95</li> <li>377,000</li> </ul>		7/10/2010	1.00	95,578
- Max: 0.73 MG       2/25/2010       4.00       2,819,000         - Max: 0.73 MG       1/28/2010       0.12       300         Note: The 2.9 MG outlier makes up 58% of the total disinfection season overflow volume from 2008 to 2013.       10/24/2009       1.70       9,000         11/25/2019       5,000       5,000       5,000       5,000         9/25/2009       5,000       5,000       8/11/2009       0.79       59,000         9/25/2009       0.48       800       11/25/2008       3.41       1,550,000         9/27/2008       3.41       1,550,000       9/27/2008       3.57       129,000         9/6/2008       4.15       408,000       7/1/2008       1.16       10,000         4/30/2008       4.48       2,051,000       3/8/2008       1.95       377.000	– Median <sup>.</sup> 0 12 MG	3/30/2010	3.63	3,381,800
- Max: 0.73 MG Note: The 2.9 MG outlier makes up 58% of the total disinfection season overflow volume from 2008 to 2013. (1/28/2010) (1/24/2009) (1/24/2009) (1/24/2009) (1/24/2009) (1/24/2009) (1/26/2009) (1/26/2008) (1/26/200		2/25/2010	4.00	2,819,000
Note: The 2.9 MG outlier makes       1/25/2010       1.40       1,496,200         11/14/2009       4.30       1,321,000         10/24/2009       1.70       9,000         10/9/2009       0.35       447,000         9/25/2009       5,000       8/11/2009       0.79         2008 to 2013.       6/19/2009       0.48       800         11/25/2008       3.41       1,550,000         9/27/2008       3.57       129,000         9/6/2008       4.15       408,000         7/1/2008       1.16       10,000         4/30/2008       4.48       2,051,000         3/8/2008       1.95       327.000	– Max: 0.73 MG	1/28/2010	0.12	300
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Note: The 2.9 MG outlier makes       10/24/2009       1.70       9,000         up 58% of the total disinfection       9/25/2009       0.35       447,000         season overflow volume from       8/11/2009       0.79       59,000         2008 to 2013.       6/19/2009       0.48       800         11/25/2008       3.41       1,550,000         9/27/2008       3.57       129,000         9/6/2008       4.15       408,000         7/1/2008       1.16       10,000         4/30/2008       4.48       2,051,000         3/8/2008       1.95       327,000		11/14/2009	4.30	1,321,000
Note. The 2.9 MG outlier makes       10/9/2009       0.35       447,000         up 58% of the total disinfection       9/25/2009       5,000         season overflow volume from       6/19/2009       0.48       800         2008 to 2013.       10/26/2008       3.41       1,550,000         9/27/2008       3.57       129,000         9/6/2008       4.15       408,000         7/1/2008       1.16       10,000         4/30/2008       4.48       2,051,000         3/8/2008       1.95       327,000	Note: The 2.0 MC outlier makes	10/24/2009	1.70	9,000
up <u>58%</u> of the total disinfection       9/25/2009       5,000         season overflow volume from       8/11/2009       0.79       59,000         2008 to 2013.       6/19/2009       0.48       800         11/25/2008       3.41       1,550,000         9/27/2008       2.02       505,000         9/27/2008       3.57       129,000         9/6/2008       4.15       408,000         7/1/2008       1.16       10,000         4/30/2008       4.48       2,051,000         3/8/2008       1.95       327,000	Note. The 2.9 WG outlier makes	10/9/2009	0.35	447,000
season overflow volume from       8/11/2009       0.79       59,000         2008 to 2013.       6/19/2009       0.48       800         11/25/2008       3.41       1,550,000         9/27/2008       3.57       129,000         9/6/2008       4.15       408,000         7/1/2008       1.16       10,000         4/30/2008       4.48       2,051,000         3/8/2008       1.95       327,000	up 58% of the total disinfection	9/25/2009		5,000
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2008 to 2013.       11/25/2008       3.41       1,550,000         10/26/2008       2.02       505,000         9/27/2008       3.57       129,000         9/6/2008       4.15       408,000         7/1/2008       1.16       10,000         3/8/2008       1.95       327,000	season overflow volume from	6/19/2009	0.48	800
10/26/2008       2.02       505,000         9/27/2008       3.57       129,000         9/6/2008       4.15       408,000         7/1/2008       1.16       10,000         4/30/2008       4.48       2,051,000         3/8/2008       1.95       327,000	2008 to 2013	11/25/2008	3.41	1,550,000
9/2//2008       3.57       129,000         9/6/2008       4.15       408,000         7/1/2008       1.16       10,000         4/30/2008       4.48       2,051,000         3/8/2008       1.95       327,000		0/27/2008	2.02	505,000
3/8/2008       4.15       408,000         7/1/2008       1.16       10,000         4/30/2008       4.48       2,051,000         3/8/2008       1.95       327,000		9/27/2008	3.07	129,000
4/30/2008       4.48       2,051,000         3/8/2008       1.95       327,000		9/0/2000 7/1/2008	4.10 1.16	408,000
3/8/2008 1 95 327 000		4/30/2008	1.10	2 051 000
		3/8/2008	1.40	2,001,000

Total

33

27,676,961

## CSO 003 Annual Seasonal Averages 2008 to 2013





#### CSO 003 Overflow Events by Month (2008-2013)





#### Total Rainfall vs. CSO 003 Overflow Volume (2008-2013)



October 1 to May 14 OMay 15 to September 30



#### Percent Capture for Various Tank Sizes (2008-2013)







#### **Number of Overflows for Various Tank Sizes**





#### **Percent Compliance During Disinfection Season**

	0.25 MG	0.41 MG	0.50 MG	0.75 MG
	Tank	Tank	Tank	Tank
Disinfection Season (All Events Included)	21%	44%	48%	57%
Disinfection Season (2.9 MG Outlier Removed)	70%	85%	89%	100%
Overflow Event Frequency*	1 event every	1 event every	1 event every	1 event every
(All Events Included)	2 years	3 years	3 years	6 years

\*Note: 2.9 MG storage tank required for zero overflows.

Annual disinfection season average volume was 0.83 MG from 2008 to 2013.



#### **Total Cost vs. Tank Volume**





#### **Cost Estimates**

Alternative	Total Project Cost	Cost per Gallon
0.25 MG Rectangular Tank	\$ 2,703,000	\$ 10.80
0.41 MG Rectangular Tank	\$ 3,544,000	\$ 8.64
0.50 MG Rectangular Tank	\$ 4,250,000	\$ 8.50
0.75 MG Rectangular Tank	\$ 5,583,000	\$ 7.44
0.41 MG Circular Tank	\$ 3,666,000	\$ 8.94
0.75 MG Circular Tank	\$ 4,995,000	\$ 6.66



#### **Total Cost vs. Percent Compliance**



Annual Average (4.61 MG 2013 Baseline)



#### **Percent Compliance During Disinfection Season**



---Disinfection Season with 2.9 MG Outlier



#### **Conceptual Layouts**

#### 0.75 MG 70' x 80' x 18'



#### 0.41 MG 50' x 61'x 18'





#### **Preliminary Linear Storage Conduit Concept**





### Findings of the 2014 LTCP Update

- Abatement of CSO 003 adjacent to the MAPS is highly feasible
- Open space enhancement opportunities exist
- Full compliance with CSO policies is not feasible
- Compliances greatly increases when the tank has the dual function of storage and treatment, a RTB
- 0.41 MG rectangular tank is the preferred size and shape of the RTB
- Would be the final major capital phase of the City's CSO abatement program



## 0.41 MG RTB Offers

- 100% compliance for all non-disinfection season CSOs
- 44% compliance during the disinfection season
- 85% disinfection season compliance excluding the outlier storm\*
- Overall 89% year-round compliance

\* Greater than half (59%) of total disinfection season volume from 2008 to 2013 from this single extreme event.



#### CSO 003 Overflow Events by Month (2008-2013)





#### **Existing and Proposed CSO 003 Flow Diagrams**





## **Flow Control Structure**

- Mechanically-cleaned screen has limited capacity due to width of single 36-inch MAPS influent channel
  - 9-10 MGD vs. 12-13 MGD extreme wet weather peak
- FCS will "shave" the peak of rare events
- FCS will also be used during screen maintenance



#### Final RTB Layout (0.41 MG, 32' x 96' x18')







#### **RTB Plan View**





#### **RTB Cross Section**





# Concepts for Future, Longer-Term Additional CSO Compliance (as warranted)

- Continued I/I removal and infrastructure renewal
- Additional, targeted small-scale off-line storage at:
  - Hannaford parking lot upstream of Cobbossee siphon
  - Arcade parking lot
- Disinfection of tank effluent during disinfection season
  - Consider use of emerging single-chemical process



#### **Total Project Cost**

Component	Cost
0.41 MG RTB	\$ 3,544,000
Mechanical Screen	\$ 635,000
Total Project Costs	\$ 4,179,000





#### Schedule

DEP Approval of PDR	October 2014
Submit Substantially Complete Design Documents	March 2015
DEP Approval of Final Design	May 2015
Bid Advertisement	June 2015
Bid Opening	August 2015
Construction Begins	Fall 2015
Construction Complete	December 2016



#### Conclusions

- Build and measure approach has worked well for phased CSO abatement in Gardiner
- RTB rather than simple storage allowed for decreased project costs and improved compliance
- City is committed to increased level of control of the RTB through continued I/I reductions





## **Questions?**

AECOM



