ACLU
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ACLU/ACLU Fund of Michigan

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Sept. 29, 2015

FOIA Coordinator
Department of Environmental Quality
P.O. Box 30457
Lansing, MI 48909-7957
deqfoia@michigan.gov

10 DAY EXT ISSUED

WAIVER DENIED RW

6857-15
RMD-EXEC-WRD
Lansing
DUE: 10-21-15

To Whom It May Concern,

Under the provisions of Michigan's Freedom of Information Act, I respectfully request that the Michigan Department of Environmental Quality, or its agents, provide me with the following records, documents and other related materials covering the period from Jan. 1, 2011 to June 30, 2014:

(1) All reports, studies, analyses, memoranda, and similar records evaluating the suitability and/or feasibility of using the Flint River as a source of municipal drinking water.

(2) All reports, studies, analyses, memoranda and similar records that include evaluations of the economic impact of using the Flint River as a source of municipal drinking water.

(3) All documents, reports, memoranda and similar records involving permit applications and waivers related to the use of the Flint River as a municipal water source.

(4) All communications, including but not limited to electronic communications, sent and received by the Michigan Department of Environmental Quality, or its agents, related the use or potential use of the Flint River as a municipal water source and/or the water quality of the Flint River. Included in this request are all communications containing information, comments and opinions about the use of the Flint River as a municipal water source, the economic impact of using the Flint River as a municipal water source as well as communications related to any permitting process involving the Flint River. This request for communications includes, but is not limited to, all communications with any elected or appointed government officials; and any unit of municipal, county, state or federal government regarding or related to items (1), (2) and (3) listed above.

Exempt Records

Should you decide to invoke a FOIA exemption as the basis for withholding any record responsive to this request, please include in your full or partial denial letter sufficient information for the ACLU of Michigan to appeal the denial pursuant to MCL 15.235(4)(a). To comply with legal requirements, the following information must be included:

1. Basic factual material about each withheld item, including the originator, date, length, general subject matter, and location of each item; and

2. Explanations and justifications for denial, including the identification of the category within the governing statutory provision under which the document (or portion thereof) was withheld and a full explanation of how each exemption fits the withheld material.

If you determine that portions of a record requested are exempt from disclosure, please redact the exempt portions and provide the remainder of the record to the ACLU of Michigan.

Format of Records Requested

To reduce or avoid the costs and labor of printing and/or photocopying records, we request that records be provided in electronic format wherever possible if that is the least-costly option, including but not limited to records that are stored or maintained in electronic format. We will provide a USB drive or other media storage device for the records at our expense if requested.

Fee Waiver Request

The ACLU of Michigan requests that you waive all fees in connection with this request as provided by MCL 15.234(1) (waiver of fee is appropriate where search for and provision of copies of the public record can be considered as primarily benefiting the general public). The ACLU of Michigan will use the information to contribute significantly to public understanding of water issues in Flint. The ACLU of Michigan will make all records received available to the public. The ACLU of Michigan is a non-profit organization registered as a charitable organization in Michigan, with no commercial interest in obtaining the requested information.

Willingness to Pay Fees Under Protest

While a fee waiver should be granted for the reasons set forth above, the ACLU of Michigan is seeking these records regardless of the MDEQ's ultimate decision on the fee waiver request. The ACLU of Michigan thus is willing to pay fees in keeping with the applicable statutory and regulatory

requirements, if necessary and under protest, to enable the timely delivery of the records. Fees must be limited to actual costs of labor and copying, and the means for copying must be the most economical available. MCL 15.234(1) and (3). Furthermore, fees may only be assessed based on procedures and guidelines published by the MDEQ. Id. at (3).

Please notify me if costs exceed $500.

Record Delivery

Pursuant to MCL 15.232(2), we expect a response to this request within 5 business days. We request the MEDQ, in responding to this request, to comply with all relevant deadlines and other obligations set forth in the Michigan FOIA. To reduce or avoid the costs and labor of printing and/or photocopying records, if it is the most cost-effective way we request that records be provided in electronic format wherever possible, including but not limited to records that are stored or maintained in electronic format. We will provide a USB drive or other media storage device for the records at our expense.

Please produce the requested records on a rolling basis; at no point should the search for – or deliberation concerning – certain records delay the production of others that the MDEQ has already retrieved and elected to produce.

Please contact me so that I can pick obtain these records as soon as possible. If you find that this request is unclear in any way please contact me immediately so I can clarify the request or otherwise expedite and simplify your efforts to comply.

Sincerely,

Curt Guyette
Investigative Reporter
ACLU of Michigan
2966 Woodward Ave.
Detroit, MI 48201
Phone: 313-578-6834
Fax: 313-578-6811
Email: cguyette@aclumich.org

Rennaker, Joanne (DEQ)

From: Benzie, Richard (DEQ)
Sent: Wednesday, January 23, 2013 10:25 AM
To: Prysby, Mike (DEQ); Bloemker, Jon (DEQ); Busch, Stephen (DEQ); Shekter Smith, Liane (DEQ)
Cc: Butler, Sonya (DEQ)
Subject: RE: Flint - Dept of Treasury

Great answers, Mike. The only comments/clarifications I have are in regards to the question on the use of the DWRF to operate the treatment plant full time. The DWRF may be used to construct facilities necessary to make full time operation feasible. However, it should be clear that "operating costs" are not eligible.

Also, any application to the DWRF requires a comprehensive, 20-year project plan, not a one-time, project specific request. The fact that the city of Flint recently turned down a DWRF loan even with a significant portion of it to be "forgiven" that was intended to address high priority distribution system needs cannot be overlooked. The city would have to include these needs in any revised/new project plan and satisfactorily explain any decision to not include these distribution improvements in this new loan application.

From: Prysby, Mike (DEQ)
Sent: Wednesday, January 23, 2013 10:01 AM
To: Bloemker, Jon (DEQ); Busch, Stephen (DEQ); Benzie, Richard (DEQ); Shekter Smith, Liane (DEQ)
Subject: Flint - Dept of Treasury

I spoke with Mr. Randy Byrne from the Dept. Treasury – Office of Fiscal Resp. concerning the Flint WTP. Below is a brief summary of our discussion. I can fill you on more details this afternoon just prior or immediately after our KWA meeting.

Q1: The city of Flint has considered using the Flint River as a source of drinking water to be treated at their WTP; however,

The city may be somewhat reluctant to use the river as their source, what is your assessment of this issue?

A: The city could utilize the Flint River ranging from 100% utilization – to a certain percent blending (either Detroit or KWA) or

zero percent utilization of the river. I agree that the city should have concerns of fully utilizing the Flint River (100%) for the following; the need to soften, the potential for more advanced treatment after next round of crypto monitoring, available capacity in Flint River at 100-year low flow, residuals management (disposal of lime sludge). As the percent utilization of the river decreases (blending options), the need for softening, residuals disposal, capacity issues do not pose as much of a concern.

Q2: When comparing the treatment of Lake Huron water vs. Flint River water, are more treatment chemicals needed to effectively treat the water?

A2: Flint river water will require a larger amount of primary coagulant (Ferric) due to poorer raw water quality than Lake Huron water. Also, a different type of primary coagulant (Alum) may be more suitable for the treatment of Lake Huron water. I can confirm that based on what the Detroit Lake Huron WTP uses. Also, since softening would need to be employed, treatment compounds including lime, soda ash, and carbon dioxide would be necessary.

Q3: If the city needed to borrow money to be able to operate full time (KWA or blending), does the DEQ offer funding via the DWRF?

A3: The city could apply for DWRF funding and their eligibility would be based upon how well they score in the overall DWRF ranking process. Also, the total amount of the loan and their ability to repay the loan would be considered.

Q4: Flint has put forth a significant capital investment over the past 10 years to maintain their WTP, is the condition of the WTP sufficient for full time treatment of raw water from Lake Huron ? Are the operators qualified to operate the WTP?

A4: The Flint WTP has demonstrated its ability to treat raw water (Flint River) and meet the drinking water standards based on quarterly test runs since 2009 and two pipeline emergencies that occurred in 2009 where water from the WTP was distributed to the city. Successful operation of the WTP on an intermittent basis is difficult. WTP operators face the constant challenge of maintaining WTP components in good working order while the plant is normally out of service over 90% of the time. The reliability of WTP and its components are better maintained through continuous operation. The operating experience and knowledge of the operators is also better established with full-time operation. WTP operators have the required operator certification and are very familiar with the operation of the Flint WTP, meeting drinking water standards, and troubleshooting operational problems. The Flint WTP is capable of meeting the drinking water standard if the plant was utilized to treat raw water from Lake Huron.

Q5: Do you see any weak links in the WTP or significant improvements if the WTP were to be fully utilized?

A5: I would not see any major treatment changes or additions needed if Lake Huron water was utilized; however, in order for the city to fully utilize its storage capacity, a pumping station would need to be added immediately after the WTP such that treated water can be pumped into the city's 20-Mgal Dort reservoir. In the current configuration, water from Detroit flows by gravity through this reservoir and then into the WTP's 3 Mgal reservoir followed by pumping via Pump Station No. 4 into the city's distribution system. Improvement in stand-by power may also be necessary. Finally, if a component of Flint River water were to

be treated, then more advanced treatment based upon higher bin classification (UV disinfection, etc.) could be required based upon crypto. results.

Michael Prysby, P.E.
District Engineer
Office of Drinking Water and Municipal Assistance
517 335-6122

Rennaker, Joanne (DEQ)

From: Alexander, Michael (DEQ)
Sent: Tuesday, March 26, 2013 3:20 PM
To: Busch, Stephen (DEQ)
Cc: Alexander, Christine (DEQ); Creal, William (DEQ)
Subject: RE: Flint River Intake Location

Hi Steve,

Based on the listing from Michigan's 2012 Integrated Report, the Flint River from just upstream of the City of Flint to the upstream end of the Holloway Reservoir is not meeting its designated uses for;

Fish consumption due to PCB in fish tissue and water column
Total and partial body contact due to E. coli in water column
Other indigenous aquatic life due to nutrients and phosphorus in the water column

These are just the major categories for the designated uses currently not being met within this subject stretch of the Flint River. If you would like the complete lists or any additional information regarding these listing please let me know.

Mike

Michael Alexander, Chief
Lakes Erie, Huron and Superior Unit
Surface Water Assessment Section
Water Resources Division
Department of Environmental Quality
Office Phone 517-335-4189
alexanderm2@michigan.gov

From: Busch, Stephen (DEQ)
Sent: Tuesday, March 26, 2013 12:08 PM
To: Alexander, Christine (DEQ); Alexander, Michael (DEQ)
Subject: Flint River Intake Location

Mike and Chris,

Sorry, I forgot to hit send. See red dot on attached picture.

Stephen Busch, P.E.
Lansing and Jackson District Supervisor
Office of Drinking Water and Municipal Assistance
MDEQ
517-643-2314

Rennaker, Joanne (DEQ)

From: Creal, William (DEQ)
Sent: Wednesday, March 27, 2013 1:27 PM
To: Sygo, Jim (DEQ); Wyant, Dan (DEQ)
Cc: Busch, Stephen (DEQ); Argiroff, Phil (DEQ); Alexander, Christine (DEQ)
Subject: FW: Flint Scenarios
Attachments: Flint Scenarios FY 2013-14.pdf; Recent DWSD Flint Supply Cost Options.pdf; TYJT Recommendaton DWSD vs Flint.pdf; flint water supply assessment final report 2-6-13.pdf; KWA - DWSD for WRD.docx

Importance: High

The attached word document includes WRD review of this situation, including what a withdrawal from the Flint River of 10 mgd would mean to NPDES dischargers.

From: Argiroff, Phil (DEQ)
Sent: Wednesday, March 27, 2013 12:27 PM
To: Creal, William (DEQ)
Cc: Alexander, Christine (DEQ)
Subject: FW: Flint Scenarios
Importance: High

Bill:

Please see the attached Word write-up. It also includes the information you requested of Chris. Thanks.

-Phil

From: Creal, William (DEQ)
Sent: Friday, March 22, 2013 12:24 PM
To: Argiroff, Phil (DEQ)
Subject: FW: Flint Scenarios
Importance: High

Please take a look at this from a financial impact on DWSD – can we figure out if this will be a major hit for them?

From: Sygo, Jim (DEQ)
Sent: Thursday, March 21, 2013 6:07 PM
To: Shekter Smith, Liane (DEQ); Creal, William (DEQ)
Cc: Willard, Veronica (DEQ); Smith, Laura (DEQ)
Subject: FW: Flint Scenarios
Importance: High

Bill and Liane,

Please have the attached documents reviewed and comments provided relative to the City of Flint water supply needs and relative to the impacts that are possible to the Detroit System.

Treasury needs an assessment as to the need for the alternative water supply and it's impacts so they can provide input to the financial managers.

We need comments by next week and will likely meet with the Director on Thursday.

Bring in whatever staff you need for the review and ple3ase try to have your assessments by Wednesday morning.

Sorry for the tight time frame but this one is out of my hands. I will also be looking at the report.

From: Wyant, Dan (DEQ)
Sent: Thursday, March 21, 2013 5:10 PM
To: Sygo, Jim (DEQ)
Cc: Shaler, Karen (DEQ); Thelen, Mary Beth (DEQ); Wyant, Dan (DEQ)
Subject: FW: Flint Scenarios
Importance: High

Jim,

Director asked that you reivew and coordinate this with with Liane Shekter Smith and/or Bill Creal and their appropirate staff. Director also asked that I schedule an internal meeting with you and staff on this for next week. After your review, please let me know who you want in the meeting. It needs to happen on Tuesday, Wednesday or Thursday of next week.

Thank you.

Mlary Beth

From: Stibitz, Brom (Treasury)
Sent: Thursday, March 21, 2013 5:00 PM
To: Wyant, Dan (DEQ)
Cc: Dillon, Andy (Treasury)
Subject: FW: Flint Scenarios

Andy asked that I pass this information along to you.

Summary of FY 2013-14 DWSD Cost Allocations to Flint Under Various Scenarios

Flint Only

		Revenue Requirement	Rates and Charges: Fixed	Rates and Charges: Commodity	Rates and Charges: *Avg Unit Cost*
1	**Status Quo *(Flint Portion)***	12,574,900	379,304	13.01	*20.39*
2	**Suggested Cct *(Flint Portion)***	11,281,100	351,661	12.06	*19.27*
3	Change	(1,293,800)	(27,643)	(0.95)	*(1.12)*
4	% Change	-10.3%	-7.3%	-7.3%	*-5.5%*
5	**Max Day Only**	9,904,300	294,542	10.87	*16.91*
6	Change	(1,376,800)	(57,119)	(1.19)	*(2.36)*
7	% Change	-13.9%	-19.4%	-10.9%	*-14.0%*
8	**Add CTA Line to BP**	10,093,100	310,271	10.87	*17.23*
9	Change	188,800	15,729	0.00	*0.32*
10	% Change	1.9%	5.1%	0.0%	*1.9%*
11	**CTA to BP / Flint only to FWTP**	12,446,300	506,371	10.87	*21.25*
12	Change	2,353,200	196,100	0.00	*4.02*
13	% Change	18.9%	38.7%	0.0%	*18.9%*
14	**Add CTA Line to FWTP**	10,191,200	318,450	10.87	*17.40*
15	Change	(2,255,100)	(187,921)	0.00	*(3.85)*
16	% Change	-22.1%	-59.0%	0.0%	*-22.1%*
17	**CTA to FWTP / Buy existing 72**	10,009,600	303,315	10.87	*17.08*
18	Change	(181,600)	(15,135)	0.00	*(0.32)*
19	% Change	-1.8%	-5.0%	0.0%	*-1.9%*
20	Cumulative Change	(2,565,300)	(75,989)	(2.14)	*(3.31)*
21	Cumulative % Change	-20.4%	-20.0%	-16.4%	-16.2%

		Assumptions: Avg Day *mgd*	Assumptions: Max Day *mgd*	Assumptions: Peak Hour *mgd*	DWSD Investment: CTA *$*	DWSD Investment: Flint Only *$*
1	**Status Quo**	24.6	45.6	47.7	0	0
2	**Suggested Contract**	23.4	**40.6**	**42.4**	0	0
3	**Max Day Only**	**12.0**	**18.0**	**18.0**	0	0
4	**Add CTA Line to BP**	12.0	18.0	18.0	62,290,800	0
5	**CTA to BP / Flint only to FWTP**	12.0	18.0	18.0	62,290,800	32,391,300
6	**Add CTA Line to FWTP**	12.0	18.0	18.0	94,682,100	0
7	**CTA to FWTP / Buy existing 72**	12.0	18.0	18.0	94,682,100	(2,500,000)

DWSD Worksheet : 18 MGD Maximum Day Customer with Model Contract Twinning Line and Owning both to the Flint WTP

Capacity

Flint ADD:	0.00	MGD	- MCF/Day
DWSD ADD:	12	MGD	1,604 MCF/Day

Annual Volume

Flint:	-	MCF
DWSD:	585,561	MCF

2013 Cost of Supply

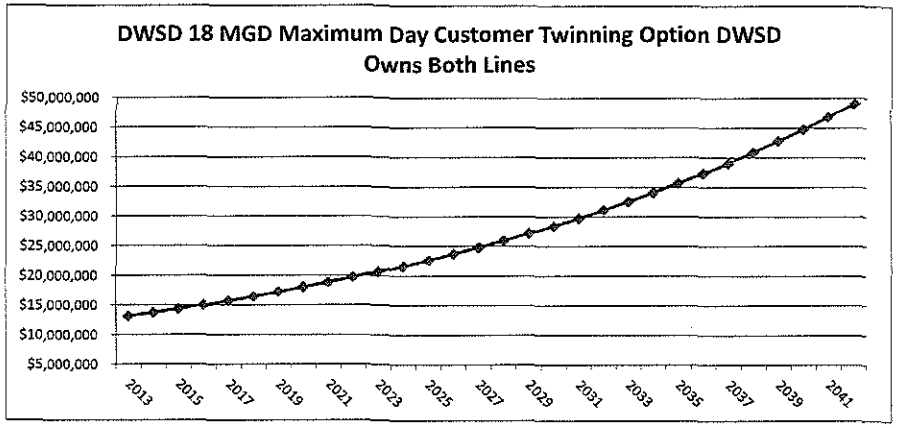
Flint WTP O&M:	-	/MCF	$ - /Yr
DWSD:	$ 17.08	/MCF	$ 10,001,390 /Yr

Escalation/Inflation Rate

Flint:	4.51% /Yr
DWSD:	4.7% /Yr

Capital Expenditure

Amount:	$ -		
Reserve:	$ -	0%	Reserve Rate: 0.00%
Amount plus Reserve:	$ -		
Revenue Bond Rate:	5%		
Number of Years:	25		
Annual Cost:	$0		



	Year	Flint WTP O&M	Water Purchase	Revenue Bond Payment	Interest on Reserve	TOTAL
1	2013	$ -	10,001,390		-	$ 10,001,390
2	2014	$ -	10,471,456		-	$ 10,471,456
3	2015	$ -	10,963,614		-	$ 10,963,614
4	2016	$ -	11,478,904	-	-	$ 11,478,904
5	2017	$ -	12,018,412	-	-	$ 12,018,412
6	2018	$ -	12,583,278	-	-	$ 12,583,278
7	2019	$ -	13,174,692	-	-	$ 13,174,692
8	2020	$ -	13,793,902	-	-	$ 13,793,902
9	2021	$ -	14,442,216	-	-	$ 14,442,216
10	2022	$ -	15,121,000	-	-	$ 15,121,000
11	2023	$ -	15,831,687	-	-	$ 15,831,687
12	2024	$ -	16,575,776	-	-	$ 16,575,776
13	2025	$ -	17,354,838	-	-	$ 17,354,838
14	2026	$ -	18,170,515	-	-	$ 18,170,515
15	2027	$ -	19,024,529	-	-	$ 19,024,529
16	2028	$ -	19,918,682	-	-	$ 19,918,682
17	2029	$ -	20,854,860	-	-	$ 20,854,860
18	2030	$ -	21,835,039	-	-	$ 21,835,039
19	2031	$ -	22,861,286	-	-	$ 22,861,286
20	2032	$ -	23,935,766	-	-	$ 23,935,766
21	2033	$ -	25,060,747	-	-	$ 25,060,747
22	2034	$ -	26,238,602	-	-	$ 26,238,602
23	2035	$ -	27,471,816	-	-	$ 27,471,816
24	2036	$ -	28,762,992	-	-	$ 28,762,992
25	2037	$ -	30,114,852	-	-	$ 30,114,852
	2038	$ -	31,530,250	-	-	$ 31,530,250
	2039	$ -	33,012,172	-	-	$ 33,012,172
	2040	$ -	34,563,744	-	-	$ 34,563,744
	2041	$ -	36,188,240	-	-	$ 36,188,240
	2042	$ -	37,889,088	-	-	$ 37,889,088
		$ -				

25 Yrs Cummulative
$ 458,060,853

30 Yrs Cummulative
$ 631,244,349

DWSD Worksheet : 18 MGD Maximum Day Customer with Model Contract Twinning Line and Owning Only New Line to the Flint WTP

Capacity

Flint ADD:	0.00	MGD	-	MCF/Day
DWSD ADD:	12	MGD	1,604	MCF/Day

Annual Volume

Flint:	-	MCF
DWSD:	585,561	MCF

2013 Cost of Supply

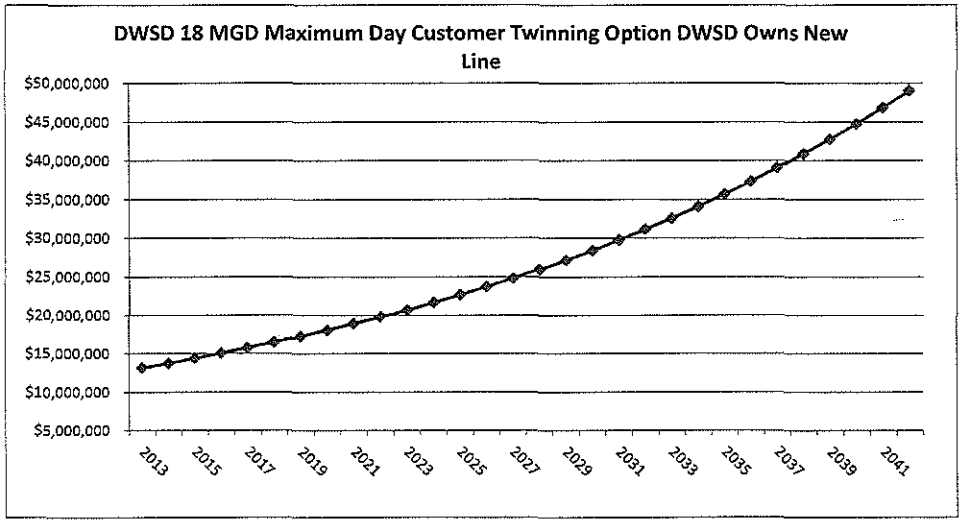
Flint WTP O&M:	-	/MCF	$ -	/Yr
DWSD:	$ 17.40	/MCF	$ 10,188,770	/Yr

Escalation/Inflation Rate

Flint:	4.51% /Yr
DWSD:	4.7% /Yr

Capital Expenditure

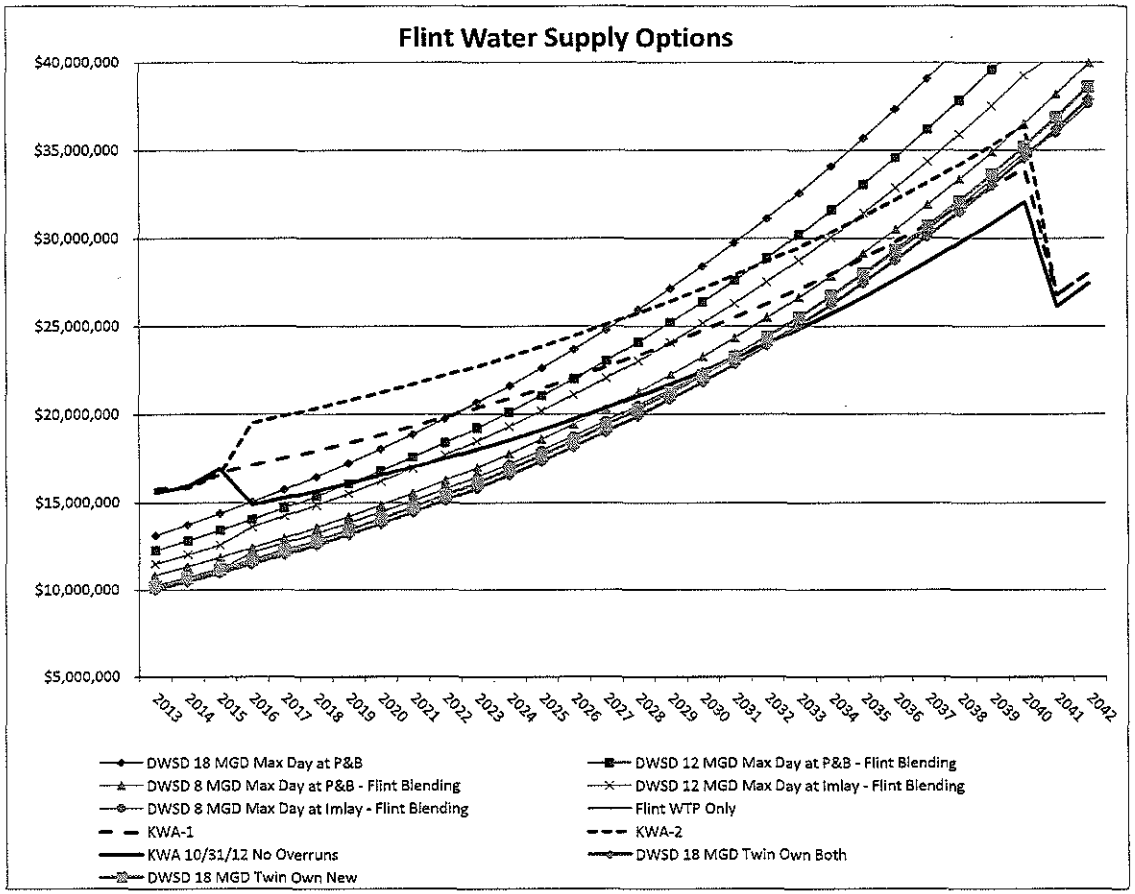
Amount:	$ -		
Reserve:	$ -	0%	Reserve Rate: 0.00%
Amount plus Reserve:	$ -		
Revenue Bond Rate:	5%		
Number of Years:	25		
Annual Cost:	$0		



	Year	Flint WTP O&M	Water Purchase	Revenue Bond Payment	Interest on Reserve	TOTAL
1	2013	$ -	10,188,770		-	$ 10,188,770
2	2014	$ -	10,667,642		-	$ 10,667,642
3	2015	$ -	11,169,021		-	$ 11,169,021
4	2016	$ -	11,693,965	-	-	$ 11,693,965
5	2017	$ -	12,243,582	-	-	$ 12,243,582
6	2018	$ -	12,819,030	-	-	$ 12,819,030
7	2019	$ -	13,421,525	-	-	$ 13,421,525
8	2020	$ -	14,052,336	-	-	$ 14,052,336
9	2021	$ -	14,712,796	-	-	$ 14,712,796
10	2022	$ -	15,404,297	-	-	$ 15,404,297
11	2023	$ -	16,128,299	-	-	$ 16,128,299
12	2024	$ -	16,886,330	-	-	$ 16,886,330
13	2025	$ -	17,679,987	-	-	$ 17,679,987
14	2026	$ -	18,510,946	-	-	$ 18,510,946
15	2027	$ -	19,380,961	-	-	$ 19,380,961
16	2028	$ -	20,291,866	-	-	$ 20,291,866
17	2029	$ -	21,245,584	-	-	$ 21,245,584
18	2030	$ -	22,244,126	-	-	$ 22,244,126
19	2031	$ -	23,289,600	-	-	$ 23,289,600
20	2032	$ -	24,384,211	-	-	$ 24,384,211
21	2033	$ -	25,530,269	-	-	$ 25,530,269
22	2034	$ -	26,730,192	-	-	$ 26,730,192
23	2035	$ -	27,986,511	-	-	$ 27,986,511
24	2036	$ -	29,301,877	-	-	$ 29,301,877
25	2037	$ -	30,679,065	-	-	$ 30,679,065
	2038	$ -	32,120,981	-	-	$ 32,120,981
	2039	$ -	33,630,667	-	-	$ 33,630,667
	2040	$ -	35,211,309	-	-	$ 35,211,309
	2041	$ -	36,866,240	-	-	$ 36,866,240
	2042	$ -	38,598,953	-	-	$ 38,598,953
		$ -				

25 Yrs Cummulative
$ 466,642,790

30 Yrs Cummulative
$ 643,070,941



Option	Costs through 2042	Ranking
Flint WTP Only	$ 590,441,893	1
DWSD 8 MGD Max Day at Imlay	$ 634,795,488	2
KWA 10/31/12 Update	$ 649,775,166	3
DWSD 8 MGD Max Day at P&B	$ 672,671,705	4
KWA-1	$ 707,279,715	5
DWSD 12 MGD Max Day at Imlay	$ 725,576,803	6
DWSD 12 MGD Max Day at P&B	$ 762,110,308	7
KWA-2	$ 766,784,313	8
DWSD 18 MGD Max Day at P&B	$ 821,226,268	9
DWSD 18 MGD Max Twin Own Both	$ 631,244,349	
DWSD 18 MGD Max Own New Line	$ 643,070,941	

STATE OF MICHIGAN CONTRACT NO. 271N3200089

CITY OF FLINT WATER SUPPLY ASSESSMENT

At the request of the Treasurer, Tucker, Young, Jackson, Tull, Inc. (TYJT) makes the following recommendation to the Department of Treasury concerning Flint's water supply alternatives. Based on the financial analysis performed of the various options presented by DWSD to continue treated water service to Flint compared to Flint being supplied by the new KWA untreated water system, TYJT believes that several of the options presented by DWSD are lower in cost currently and over the long run than the one offered by KWA. TYJT also believes that DWSD's most recent offer (subsequent to the submittal of our report) to build a smaller parallel water main from Imlay to Flint, funded by the entire DWSD base of customers, is the best solution offering the least cost alternative and the required redundancy by MDEQ.

Furthermore, since a majority of the KWA system has not been designed and none of the system has been constructed, there is an additional risk that the cost of the KWA system may actually be higher than estimated due to potential construction delays and unforeseen conditions. This risk to Flint could be substantial since the city is responsible for 30 percent of the KWA design and construction costs while still having to purchase water from DWSD during the construction period.

Finally, there are other issues that were identified in our report that may result in risks to Flint if it were to join KWA that should be considered by the Treasury in determining how Flint's potable water should be supplied. These issues are related to redundancy and reliability, other items affecting cost, and Flint's desire to control its own destiny related to its water supply. These are described further below.

- DWSD's supply to Flint is via a 72-inch water main from Imlay City. This main also supplies Imlay City, Mayfield and the Greater Lapeer County Utilities Authority (GLCUA). The volume of water contained within the 72-inch main is approximately 30 million gallons. If Genesee and Flint move to KWA then the three remaining communities' consumption would most likely not be large enough to maintain fresh water in DWSD's pipeline (due to loss of chlorine residual). DWSD may consider shutting down the 72-inch line completely due to the water quality concerns, which would then create an additional burden for Imlay, Mayfield and GLCUA to finance treated water supplies.
- The KWA supply option is counter to the Treasury's Competitive Grant Assistance Program (Formerly EVIP Grant). This program has been put in place to allow for communities to consolidate their services and save money. Two existing customers of DWSD (Flint and Genesee County) along with the potential of others customers (GLCUA, Mayfield, Imlay City) separating from another water system is in contradiction to the program.
- There is a concern over the ability of smaller systems (KWA) over larger systems (DWSD) to pay for future unfunded mandates and regulations. Obviously, identifying regulation requirements over 30 years is hard to determine. However, it is widely accepted that a large system has greater ability to respond to unfunded mandates because the cost can be distributed over a large customer base.
- Although Flint will be responsible for 30 percent of the construction cost, they will only have a minority vote on the KWA board. Furthermore, there are other communities (Lapeer County, the City of Lapeer, and Sanilac County) that sit on the board and vote. However, they are not purchasing water nor contributing to the construction costs. Their position on the KWA Board will not provide them an ability to "control their own destiny," as they have stated to the Treasury.

City of Flint Water Supply Assessment (TYJT; for Treasury)

DEQ-Drinking Water engineers are responsible for this review. WRD offers one comment however. The KWA pump stations are not supplied with a secondary power source. It would appear that we should ask if this meets "10 States" for drinking water facilities. If power is lost to the pump stations, the Flint WTP would have to be used to supply finished water (with Flint River as the raw source, apparently). It would seem that independent secondary power sources should be provided to the KWA pumping stations to more reliably ensure Lake Huron as the source water.

Potential Financial Impacts on the DWSD (Sewerage Fund):

It is difficult to quantify the potential financial impact of lost drinking water customers in Flint on the Sewerage Fund. Flint is supplied currently with DWSD drinking water but provides their own wastewater treatment. However, the following is offered:

- Some common functions in DWSD serve both Water and Sewerage. These include HR, purchasing, IT, legal, and top administration (including the Water Board). Further, under the proposed EMA organizational approach it appears that some services units would serve both water and sewer. It would follow that lost revenue to the Water Fund would have some incremental effect on the Sewerage Fund to make up for fixed costs.
- Lost revenue to the Water Fund would not translate to less outstanding water system debt. Would an increased level of water debt service to revenue result in a lower credit rating of an independent DWSD? The rating applies to DWSD as a whole. A lower rating would potentially increase costs to borrow on the sewerage side; for such items as CSO correction and WWTP improvements.
- Some have suggested that financial impact on residents consider both water rates and sewerage rates, combined. Although this is not what WRD currently does, should this type of assessment be presented in the future then lost revenue on the water side will increase costs to those remaining in DWSD (to cover the fixed costs). This could potentially increase the residential financial costs as a % of MHI for City residents, and thus further lengthen the time needed to completed non-core CSO corrections as described in the new permit.

Effects on NPDES Dischargers:

1) Which NPDES permits would be affected?
Flint WWTP, Flushing WWTP, and Genesee Co-Ragnone WWTP are in the Flint River model/WLA, so all of these and no others are potentially affected (at least in this immediately d/s WLA).

2) Would we expect permit limits would be modified as a result of this proposal (and decreased background flows)?
Since it appears the withdrawal would be near the head of or upstream of the modeled reaches, it would be assumed that all three facilities' limits would become more restrictive, depending on how we approach any load reductions to meet the DO std.

3) What would be the percent reduction in flow coming out of Holloway Reservoir?

A 1988 WRC 'ruling' requires that Holloway Reservoir release 85 cfs minimum in the summer, fall, and winter seasons. 232.4 cfs was used in spring modeling. 10 MGD = 15.5 cfs, so

15.5 cfs / 85 cfs = 18.2% reduction
69.5 cfs would remain

The withdrawal is below Holloway Reservoir, so the flow out of the reservoir itself wouldn't have to change, but the flow at the first WLA facility (Flint WWTP) is reduced. Maybe the Holloway release flow could be increased 10 MGD. Erik believes that the 85 cfs minimum was to protect the fishery.

Rennaker, Joanne (DEQ)

From: Prysby, Mike (DEQ)
Sent: Wednesday, March 27, 2013 3:12 PM
To: Busch, Stephen (DEQ)
Subject: FW: Flint River as a Source
Attachments: Flint WTP Report Revised August 29, 2011.pdf

Here's the Flint WTP 2011 report – all 91 pages of it....I am going through it looking for the high points

Michael Prysby, P.E.
District Engineer
Office of Drinking Water and Municipal Assistance
517 335-6122

From: Brent Wright [mailto:bwright@cityofflint.com]
Sent: Wednesday, March 27, 2013 3:01 PM
To: Prysby, Mike (DEQ)
Subject: Flint River as a Source

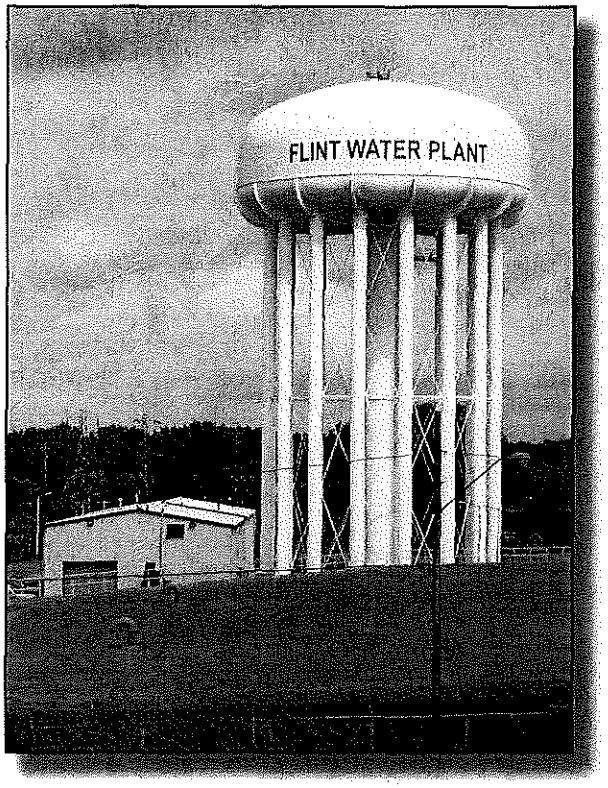
Hope this works...Brent

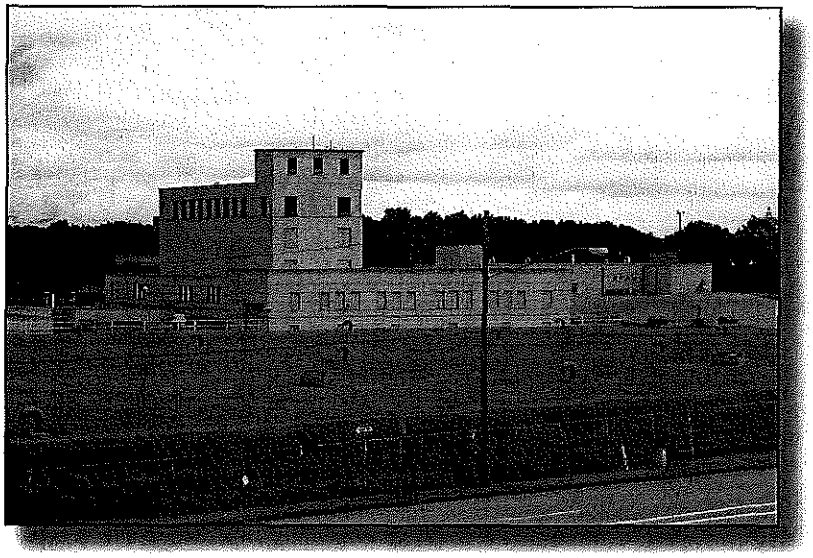
July 2011

Analysis of the Flint River as a Permanent Water Supply for the City of Flint

Prepared for:

City of Flint
1101 S. Saginaw Street
Flint, MI 48502
(810) 766-7346





ROWE

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Table of Contents

I. Purpose 1

II. History 1

III. Regulatory Requirements for Quantity of Source Water 1

IV. Demands 2

V. Drought Flows 2

VI. Reservoir Losses 2

A. Evaporation 3

B. Sedimentation 3

C. Seepage 3

VII. Other Water Uses 3

VIII. Analysis of Adequacy of Flint River 4

IX. Dams 5

A. Holloway Dam 6

B. Mott Dam 6

C. Utah Dam 6

D. Hamilton Dam 6

E. Kearsley Dam 7

F. Thread Lake Dam 7

X. Source Water Quality 7

XI. Water Treatment 8

A. Lime Sludge Disposal 8

B. Soda Ash Feed System 8

C. Chemical Storage 8

D. Electrical and SCADA 9

E. Post Chlorination and Zebra Mussel Control 9

F. Security Issues 9

G. Pumping System Improvements (Low and High Service Pumps in PS No. 4) 9

H. Filter Transfer Station to Dort Reservoir and UV Inactivation 9

I. Emergency Interconnect 9

XII. Cost Summary 10

XIII. Implementation 12

XIV. Intangibles 12

XV. Summary 12

List of Tables

Table 1: City Customer Demand Summary 2
Table 2: Source Water Requirements 2
Table 3: Storage Requirements 4
Table 4: Summary of Dams 5
Table 5: Project Costs 10

List of Figures

Figure 1: Cost of Water Using Flint River as Source 11
Figure 2: Comparison of Alternatives 11

Appendices

1. Holloway Reservoir Management Plan
2. Excerpt of Flint WWTP NPDES permit
3. Analysis of Adequacy of Flint River as a Water Supply
4. Holloway Dam Drawings
5. 2008 Holloway Dam Safety Report
6. 2008 Utah Dam Safety Report
7. 2008 Hamilton Dam Safety Report
8. Cost of Service Study – Flint Water Treatment Plant

I. Purpose

This study evaluates the feasibility of utilizing the City of Flint's Water Treatment Plant (WTP) and Flint River as the primary water supply for the City of Flint. The study evaluates whether the Flint River is an adequate source of water for the City of Flint and identifies upgrades needed to reliably supply water on a continuous basis.

II. History

The City of Flint's WTP was constructed in 1917 and supplied water to city customers for drinking and industrial uses. Records indicate that Flint supplied approximately 16 mgd in 1940 and that by the mid-1950s water use had increased to about 45 mgd. This significant increase coincided with increases in automobile production and population in the area. The Holloway Reservoir was constructed in 1954 to increase water supply capacity to meet the growing demand. Because of continued concerns regarding the adequacy of the Flint River for meeting the future water supply needs of the area, the city evaluated alternatives for a new water supply and ultimately contracted with the City of Detroit in 1967 for water supply. Detroit continues to supply water to Flint and its customers today. Detroit supplies finished water to the city via a single transmission pipeline. For reliability, the city's WTP has been maintained as a backup water supply in the event of a disruption to the single supply pipeline.

Because of recent concerns with the cost and reliability of the existing water supplies, the City of Flint, Genesee County, Lapeer County, the City of Lapeer, and Sanilac County are evaluating alternatives for their long-term water supply. The most recent study (Preliminary Engineering Report, Lake Huron Supply, Karegnondi Water Authority; September 2009) focused on two primary alternatives: Alternative 1 – continued supply by Detroit, and Alternative 2 – development of a new Lake Huron water supply. This study evaluates a third alternative. Alternative 3 provides for utilizing the existing City of Flint WTP to treat water from the Flint River. Alternative 3 assumes that water will be supplied only to customers within the city.

To evaluate the feasibility of Alternative 3, the river and WTP will be examined to determine their ability to supply water in sufficient quantity meeting current and anticipated regulations. There have been many new rules and regulations for treatment of surface water since 1967 when Flint's WTP was last used as a primary water supply.

III. Regulatory Requirements for Quantity of Source Water

Regulations require that the quantity of water at the source shall:

- Be adequate to meet the maximum projected water demand of the service area as shown by calculations based on a one in fifty year drought or the extreme drought of record, and should include consideration of multiple year droughts. Requirements for flows downstream of the intake shall comply with requirements of the appropriate reviewing authority.
- Provide reasonable surplus for anticipated growth.
- Be adequate to compensate for all losses such as silting, evaporation, seepage, etc.
- Be adequate to provide ample water for other legal users of the source.

IV. Demands

The alternative of utilizing the city's WTP and Flint River as a water supply will be evaluated on the basis of supplying water to Flint's direct customers only. Although Flint currently supplies water to GCDC-WWS, for this analysis it is assumed that GCDC-WWS receives its primary water supply by another source. Table 1 summarizes the city's current and projected demands for direct customers of the city. Projections have been provided by city representatives.

Table 1: City Customer Demand Summary

	2010	2035
Average Day Demand (ADD)	14.0 mgd	15.0 mgd
Maximum Day Demand (MDD)	17.5 mgd	18.0 mgd

Actual water requirements will be greater than the amount of water provided to customers. About ten percent additional water must be added for treatment processes and system operation. Water for fire-fighting is not included in customer demands and must be added to the quantity of water needed.

Surface water sources must be adequate to supply water through a drought period. Although the MDD is projected to be 18 mgd, the sustained maximum demand over a longer period will be less than the MDD. Analysis of records of water use indicates that the 30-day sustained maximum demand is about 80% of the MDD. Table 2 summarizes the source water requirements to supply the city's future needs.

Table 2: Source Water Requirements

Future Maximum Day Demand (Customers)		18.0 mgd
Future Maximum Day Demand (WTP Backwash / Process Water)		2.0 mgd
Subtotal (Future Maximum Day Demand)		20.0 mgd
Sustained (30 day) Future Maximum Day Demand	(80% of MDD)	16.0 mgd
Replenish Water from Fire Fighting		0.7 mgd
Future Maximum Day Demand (Source Water)		16.7 mgd

V. Drought Flows

USGS records indicate that the most severe drought in Michigan occurred between 1930 and 1937, and that the low stream flows experienced during this period have a recurrence interval of 50 to 70 years. River flow records which include the drought of the 1930s will be used to evaluate the adequacy of the river as a permanent water source.

VI. Reservoir Losses

Both the Holloway Dam and Mott Dam were constructed since the drought period of the 1930s. If used to simulate the "design drought conditions", the records of flow on the Flint River from the 1930's should be adjusted for potential impact from the addition of these two dams and resulting reservoirs.

A. Evaporation

If the two reservoirs had existed during the drought period, the flows in the river would have been a little less because of the volume of water which would have been lost to evaporation from these two bodies of water.

B. Sedimentation

The July 2001 Flint River Assessment completed by the MDNR indicates that sedimentation occurs in the Holloway Reservoir at an accelerated rate, but does not provide specific volumes. Sedimentation reduces the storage volume of reservoirs. No investigation to determine the amount of sedimentation has been completed in the Holloway Reservoir since its construction, but the storage volume of the reservoir has certainly decreased since its construction.

Mott Dam maintains a fixed water level, so storage for water supply is not available. Therefore, sedimentation in Mott Lake is not a concern with respect to water supply.

C. Seepage

The land adjacent to both the Holloway Reservoir and Mott Lake has a relatively high groundwater table. Any loss of water by seepage from the bottom of the reservoirs seems likely to flow back to the river downstream of the respective dams, resulting in little or no impact to the quantity of water available for water supply or flow augmentation. Loss from the reservoirs by seepage is not considered a significant factor.

VII. Other Water Uses

Since 1967 when Detroit began supplying water to Flint, the Holloway Reservoir has been utilized as a backup water source, source of flow augmentation for the river, and for recreational purposes. Although the city maintains control over the dam and water levels; the city has leased their surrounding lands to the Genesee County Parks and Recreation Commission (GCPRC) for park, recreational, and conservation purposes. In 1987, the city and GCPRC adopted the Holloway Reservoir Management Plan (HRMP) which defined how water levels in the reservoir were to be maintained to achieve the goals above. The HRMP establishes a summer water level of 755 and a winter level of 751. Discharge from the reservoir is to be maintained above 65 cfs except when the level is less than 751; outflow from the reservoir is not to exceed inflow to the reservoir. A copy of the HRMP is included in Appendix 1.

Flow augmentation for the city's WWTP discharge is another consideration. The city's NPDES permit for their WWTP indicates that a Flint River drought flow of 85 cfs was used to determine the permitted limits for WWTP effluent. It appears that the HRMP requirement to maintain a 65 cfs minimum at the Holloway Reservoir was established to provide adequate flow in the river at the city's WWTP outfall. An excerpt of the city's WWTP NPDES permit is included Appendix 2.

The existing water supply contract between the city and Genesee County Drain Commissioner Division of Water and Waste Services (GCDC-WWS) provides that both the city and GCDC-WWS supply the other up to 8 mgd of finished water in the event of an emergency or supply disruption. For this analysis, it is assumed that the Flint WTP and river must be able to supply 8 mgd to GCDC-

WWS in the event of an emergency in addition to the quantity consumed by the city's water customers. The need to provide backup to GCDC-WWS is assumed to be limited to a period of two weeks. Over a 14 day period, 125 million gallons of water should be reserved to meet the commitment for an emergency supply.

VIII. Analysis of Adequacy of Flint River

A detailed analysis of the adequacy of the Flint River as a water supply source is included in Appendix 3. This section provides an overview.

In 1977 when the HRMP was executed, water was not withdrawn from the Flint River for water supply. In 1977 without any withdrawal for water supply, the HRMP provided for a minimum discharge of 65 cfs from the Holloway Reservoir, to provide for a river flow of 85 cfs at the city's WWTP. If water is withdrawn from the river for water supply, the minimum flow from the reservoir must be increased by the rate of WTP withdrawal if the 85 cfs base flow is to be maintained at the city's WWTP. With Flint's future sustained demand estimated to be 16.7 mgd (26 cfs), a minimum flow of 91 cfs (65 cfs + 26 cfs) will be needed from the Holloway Reservoir to maintain the 85 cfs base flow at the WWTP.

The United States Geological Survey (USGS) in a 1963 report Water Resources of the Flint Area Michigan examined the Flint River as a water supply for Flint. Using river flow records between 1930 and 1952, the USGS report includes a Draft-Storage curve for the Holloway Reservoir. If a minimum discharge of 91 cfs is to be maintained during a drought period, 6.2 billion gallons water would need to be withdrawn from the reservoir to supplement natural river flow.

In addition to the 6.2 billion gallons of storage to maintain the existing rates of flow in the river plus water supply, additional storage is required to provide GCDC-WWS an emergency supply and to make up for reservoir losses. The following table summarizes the total storage needed.

Table 3: Storage Requirements

Storage to meet sustained demand and WWTP flow	6.20	billion gallons
Storage to provide backup supply to GCDC-WWS	0.11	billion gallons
Storage to make up loss by evaporation	0.90	billion gallons
Storage lost by siltation	0.64	billion gallons (assumed)
Storage to provide loss by seepage	0.00	billion gallons
Storage Needed to Supplement River Flow	7.85	billion gallons

To provide 7.85 billion gallons of storage, the Holloway Reservoir operating level must be raised by at least three feet to 758 feet. Although possible, there are many challenges associated with operating the Holloway Reservoir at the 758 feet level.

- The existing drum gates used to control reservoir level are designed for adjustment over a four feet range (751 feet to 755 feet). The design of the dam is such that the existing gates cannot simply be replaced with larger ones to increase the upper level to 758 feet. The dam spillway will likely need to be reworked to accommodate the larger drum gates. Drawings showing the details of the dam are included in Appendix 4.

- Although operation at the 758 water level provides five feet of freeboard to the top of the dam, the watershed contributing to the reservoir is quite large and has resulted in quick increases in the reservoir level during extreme rain events. The reduction in freeboard will result in a reduced safety factor for managing flood events.
- Seepage through the earthen dam embankment will increase as a result of the increased hydraulic pressure with the higher water level. Increased seepage through the dam's embankment will reduce the strength and integrity of the embankment and is likely to increase maintenance needs.
- The 758 feet water level is based on an assumption regarding the loss of the reservoir volume by siltation. The depth of siltation should be measured to better determine the quantity of siltation and its impact on storage and reservoir level.
- Recreational activities, the fishery, and adjacent properties will be impacted by use of the reservoir for water supply. Normal water levels will be increased by three feet and during dry periods, the water levels may vary by several feet. During an extreme drought period, water levels may be as much as 11 feet below normal levels.
- If the 85 cfs drought flow at the city's WWTP cannot be achieved, a new NPDES permit with stricter discharge limits may issued by the MDEQ. This could result in higher WWTP costs for the city.

Analysis shows that without modification, the Holloway Reservoir can support a sustained maximum day demand of 11.6 mgd for water supply through a drought period.

IX. Dams

If the Flint River is to be used as water supply, existing dams will continue to be critical for management of the flows in the river and water supply. Following is a summary of the dams on and adjacent to the river.

Table 4: Summary of Dams

Facility	Construction Completed	Catchment Area (sq. mi.)	Surface Area (Acres)	Storage (Acre-Feet)	Ownership	Hazard Classification	Condition
Holloway Dam	1954	523	1,973	17,678	Flint	High	Good
Mott Dam	1972	612	684	0	GCPRC		Good
Kearsley Dam	1929	115	175	2,000	Flint	Significant	Satisfactory
Utah Dam	1928	729		0	Flint	Low	Poor
Hamilton Dam		748	17		Flint	High	Poor
Thread Creek Dam	1973	63	80	320	Flint	Significant	Poor

A. Holloway Dam

The Holloway Dam was last inspected in 2008 and was reported to be in good condition. A copy of the 2008 Dam Safety Report is included in Appendix 5. Other than routine maintenance, the following upgrades / modifications are recommended to provide a water supply of up to 11.6 mgd:

- Replacement of drum gate bearings
- Installation of river flow gage on North Branch of Flint River
- Improved instrumentation to measure and monitor gate positions and water surface level

If the river is to be used as a water supply of greater capacity than 11.6 mgd, additional modifications are required at the Holloway Dam to allow for operation at an increased water level. These improvements will include replacement of gates with larger ones and reworking of the dam spillway to accommodate the larger gates. The existing embankment should be armored to strengthen the dam's embankment and protect against erosion from wave action. A budget of $2.57 million is established for the upgrades to the Holloway Dam to provide adequate capacity for the projected future demands.

B. Mott Dam

The Mott Dam is under the jurisdiction of the GCPRC. The reservoir level is maintained by a fixed weir so the reservoir volume is not available for storage. The dam has been reported to be in good condition.

C. Utah Dam

Utah Dam is inoperable and in poor condition. A copy of the 2008 Dam Safety Report is included in Appendix 6. Recent studies and evaluations conclude that the dam is of little benefit and should be removed. The 2010 Hamilton Dam Modifications and Riverfront Restoration PER provides a budget of $1.9 M for removal of the Utah Dam, including replacement with a pedestrian bridge, construction of a boat launch, and local storm sewer upgrades.

D. Hamilton Dam

The Hamilton Dam is in poor condition and considered unstable. A copy of the 2008 Dam Safety Report is provided in Appendix 7. The dam has been the subject of extensive study and recommended for removal and replacement. The 2010 Hamilton Dam Modifications and Riverfront Restoration PER provides a budget of $7.1 M for the removal and replacement of the dam, including ancillary upgrades to adjacent portions of the river.

The new Hamilton Dam is proposed at a lower elevation than the existing dam to reduce potential for flooding. A reduced water level upstream of the dam will reduce the water pool depth at the WTP intake, unless the Utah Dam is replaced or another dam is added. Testing of pumps at the WTP was completed to determine the impact of a reduced water depth at the WTP intake. Allowing for two feet of loss through the WTP intake screens after operation, reduction of the height of the Hamilton Dam by 1.5 feet or more will impact WTP's ability to draw water from the river.

E. Kearsley Dam

The Kearsley Dam is reported in satisfactory condition. Although the dam is located downstream of the city's WTP, water from the dam and Kearsley Lake supplements the river flow in advance of the Hamilton Dam, therefore contributing to the impoundment from which the WTP draws water. Water from the Kearsley Creek also serves to augment river flow at the city's WWTP located further downstream.

The storage volume of Kearsley Lake is relatively minor in relation to the storage deficit from Section VIII. Supplemental flows to the river from the Kearsley Creek are included in the USGS records included in this analysis

The dam is an important component of the city's water supply system because of its potential contribution to the WTP intake. Although currently in satisfactory condition, there will be ongoing maintenance needs to be addressed.

F. Thread Lake Dam

The Thread Lake Dam is reported to be in poor condition. Flow from the Thread Creek supplements the river flow prior to the city's WWTP. The storage provided by Thread Lake is negligible and flow from Thread Creek is included in the USGS records of river flow used for this analysis.

The Thread Lake Dam remains a facility of the city which because of its poor condition needs to be addressed. However, since the dam appears to be of little benefit to the water supply considered in this analysis, a budget for upgrades or removal has not been included in the costs for water supply.

X. Source Water Quality

Since the Flint WTP is the backup water supply in the event of a disruption to the supply from Detroit, raw water at the WTP intake is regularly sampled and analyzed. Available records provide a good understanding of the characteristics of the raw water and ranges of variances, and will be helpful to design water treatment processes and estimate operating costs.

Preliminary analysis indicates that water from the river can be treated to meet current regulations; however, additional treatment will be required than for Lake Huron water. This results in higher operating costs than the alternative of a new Lake Huron supply.

Although water from the river can be treated to meet regulatory requirements, aesthetics of the finished water will be different than that from Lake Huron. As an example, the temperature of water supplied to customers during the summer will be warmer than the present Lake Huron supply, because of the increased summer temperature in the relatively shallow river.

A detailed investigation of potential sources of contamination has not been completed. The MDEQ has reported that the Richfield Landfill is considering an application for an NPDES permit to allow

for discharge of stormwater and/or treated leachate to the Holloway Reservoir. If an NPDES permit is issued, there may be an impact on the quality of source water.

If used for water supply, a source water protection management plan should be developed to study the watershed, identify potential sources of contamination, and enact safeguards to prevent or control future threats.

XI. Water Treatment

For comparison with other alternatives, it is assumed that the Flint WTP will treat water from the river to provide a finished water of similar quality to the other alternatives being considered (continued Detroit supply and new Lake Huron supply).

A review of the city's WTP has been completed (Technical Memorandum, Cost of Service Study, Flint Water Treatment Plant prepared by Lockwood, Andrews, and Newnam (LAN), dated June 2011) to evaluate its ability to treat water from the river on a continuous basis to meet current and anticipated regulations and produce high quality finished water. Details regarding this review and analysis are provided in Appendix 8.

Although the WTP has been maintained and operated as a backup water supply, there have been numerous changes in regulations and standards since the WTP last supplied water on a continuous basis. Although equipment and systems at the WTP have been used sparingly, some existing equipment and systems require replacement from deterioration or obsolescence to provide reliability for continuous operation.

Following is a summary of upgrades needed.

A. Lime Sludge Disposal

Prior to supply of water by DWSD, the city's WTP disposed of lime sludge from water treatment operations at the Bray Road disposal site. The city is working with the MDEQ to address concerns at the Bray Road site; for this study it has been assumed that new sludge handling and disposal provisions will be utilized. Lime residual handling and disposal facilities have an estimated project cost of $15.1 million. No costs have been included for remediation of the Bray Road site.

B. Soda Ash Feed System

Records of analyses of the source water indicate non-carbonate hardness. To remove the non-carbonate hardness and provide softening, soda ash should be added during treatment. The addition of a soda ash feed system has an estimated project budget of $0.5 million.

C. Chemical Storage

Bulk chemical storage of at least 30 days is needed if the plant operates on a continuous basis. New storage tanks for liquid carbon dioxide, liquid oxygen, and liquid nitrogen will be needed. The project budget for chemical storage is $2.1 million.

D. Electrical and SCADA

The power requirements of equipment at the WTP exceed the capacity of the substation which supplies the plant. Backup power generators at the WTP are not currently operable. Upgrades are recommended to power feeders for several of the existing systems. New SCADA is recommended to provide control and monitoring of operations at the WTP. The project budget for these upgrades is $8.1 million.

E. Post Chlorination and Zebra Mussel Control

Zebra mussels are an invasive shell fish which have been introduced to the Great Lakes basin, including the Flint River. Zebra mussels can obstruct pipes and water intake screens. A sodium permanganate feed system is proposed for zebra mussel control. The project budget is $0.3 million.

F. Security Issues

Additional security measures to guard against malevolent threats or terrorism which target the new water source will be required. A project budget for this is $0.3 million.

G. Pumping System Improvements (Low and High Service Pumps in PS No. 4)

The pumps are in poor condition and their capacity is not consistent with the projected demands of the city. The pumps should be replaced with new, more efficient pumps. The project budget for these is $7.8 million.

H. Filter Transfer Station to Dort Reservoir and UV Inactivation

Recent USEPA regulations require additional treatment or enhancement of existing treatment processes for microbial contaminates such as giardia, cryptosporidium, viruses, and bacteria. It is anticipated that enhanced contact time and ultraviolet light deactivation will be required to comply with these new standards. A project budget of $7.0 million is established for compliance with the new surface water treatment rules.

I. Emergency Interconnect

The GCDC-WWS and City of Flint have a mutual aid agreement providing for each to provide the other up to 8 mgd of water as a back-up supply in the event of an emergency with either system's supply. A pumping station and piping interconnect is needed to effectively complete this exchange. The project budget for these upgrades is $8.6 million.

The total of all WTP upgrades above is $49.9 million.

In addition to upgrades to the treatment plant, there will be increased operating costs associated with the continuous operation of the WTP. For comparison with other alternatives for a long-term water supply, only the additional operational costs have been determined.

- Labor – Full scale operation of the WTP and dams on a continuous basis will require additional staffing. It is estimated that labor costs will increase by $2,034,000 per year.
- Chemicals – The cost of chemicals used for water treatment are estimated at $423 per million gallons of water produced.
- Residual Disposal – Disposal costs for lime sludge is estimated to be $453,000 annually.

- Power – Increased power costs are estimated to be $104 per million gallons of water produced.
- Ozone – Ozone treatment will be needed to meet new treatment standards. A budget of $208,000 is assumed.
- Maintenance – Maintenance costs are assumed to be 20% of the O&M budget. Maintenance costs of the WTP and other facilities are expected to be relatively high because of the age of the facilities.

XII. Cost Summary

Upgrades to dams and the WTP will be needed for the Flint River to reliably supply drinking water on a continuous basis to Flint's customers. The cost of these upgrades is presented in the following table. Costs have been adjusted to an ENR Construction Cost Index of 8688 to allow for comparison with the 2009 Study. It has been assumed that design/construction commenced in 2010, to allow for comparison with the alternatives in the 2009 study.

Table 5: Project Costs

WTP Upgrades	$49,888,000
Hamilton Dam Replacement	$7,100,000
Holloway Dam /Reservoir Upgrades	$2,570,000
Utah Dam Removal	$1,900,000
Total Capital Cost	**$61,458,000**

Costs shown are based on upgrades to existing facilities to supply the projected future maximum day demand of 18.0 mgd. These upgrades are based on the assumption that the HRMP is modified to allow for operation over a greater range of water levels. Other options for supplying the projected maximum day demand will result in higher costs.

Operating costs in the initial year of operation are estimated to increase $7 million above current operating costs. Operating costs are projected to increase annually because of inflation and projected growth in demand over the study period.

Figure 1 shows the cost of water for Alternative 3, utilizing the existing WTP and Flint River for water supply. The cost of water is comprised of three components: continued purchase of water from Detroit during construction, debt for construction of facility upgrades, and ongoing operating costs.

Figure 1: Cost of Water Using Flint River as Source

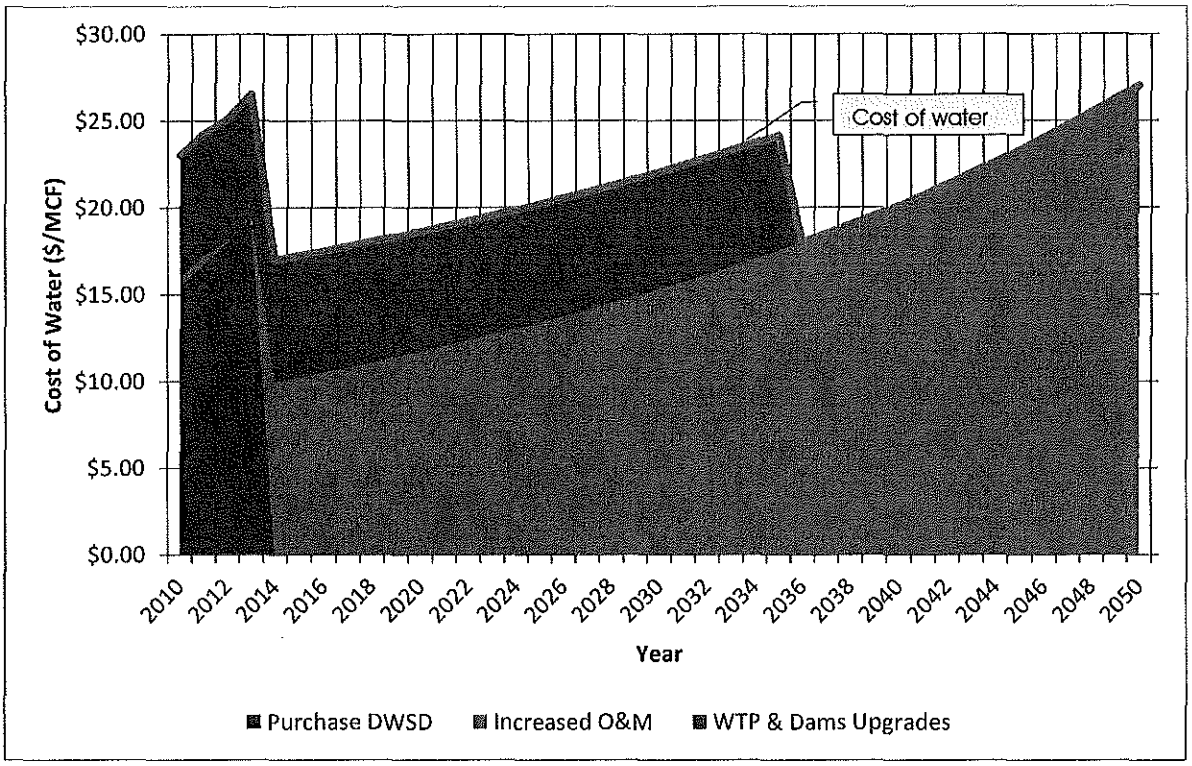
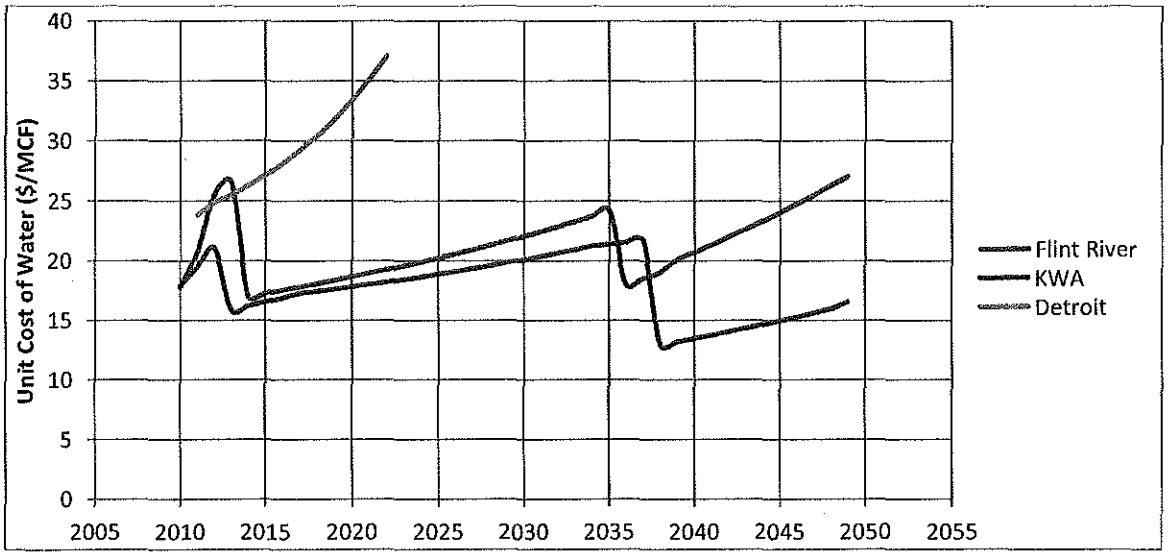


Figure 2 compares the cost of water for all three alternatives. Continued Supply by the City of Detroit results in a higher cost for water supply than the other two alternatives. The city's costs for The KWA-New Lake Huron Supply have been based upon the terms of the current KWA Raw Water Supply Contract, and the assumption that the city purchases 18 mgd capacity in the KWA system. The KWA alternative is projected to result in the lowest cost for water.

Figure 2: Comparison of Alternatives



XIII. Implementation

Planning, design, construction, and start-up will require 52 to 60 months for completion. Additional time may be required to address ancillary issues such as modifications to agreements, permits, and "non-construction related" environmental issues.

XIV. Intangibles

In addition to the upgrades identified for the dams and WTP, other issues will potentially need to be addressed if the Flint River is to be used as a water supply. Examples of these include:

- Environmental impact of work on dams or removal of sediment from the river or reservoirs
- Impact of construction and reservoir operation on the fishery
- Impact to recreational users and land owners adjacent to the Holloway Reservoir
- Potential upgrades to the city's WWTP if river flows are reduced and stricter effluent limits are included in future NPDES permits
- Impacts of the replacement of the Hamilton Dam at a lower level for improved flood control may impact the ability for the WTP to draw water from the river
- Results of a Source Water Protection Plan which may identify potential threats of contamination or other impacts to the water supply

XV. Summary

Analysis indicates that the cost of supplying water from the Flint River on a continuous basis will be greater than the proposed KWA Raw Water Supply Contract, but less than continued supplied from Detroit. Additionally, if the Flint River is to be used for a water supply for city customers, there will need to be some modifications to existing facilities, operating agreements, and permits. Upgrades will be required at the city's dams and the water treatment plant to reliably supply water to the city on a continuous basis. To meet the future maximum day demand of 18 mgd projected by city staff, one or more of the following will be required.

- Modify the Holloway Dam and Reservoir to provide additional storage
- Modify the HRMP to provide for more variance in water levels and/or modify limits on minimum discharge
- Modify the WWTP NPDES permit based on reduced flows in the river and provide resulting upgrades to WWTP for higher treatment
- Provide other raw water storage reservoirs

Addressing the preceding items is likely to require a great deal of time and effort because of the impacts on many other parties. Without making the modifications above, the river is limited to supplying a maximum day demand of about 11.6 mgd.

Appendices

1. Holloway Reservoir Management Plan
2. Excerpt of Flint WWTP NPDES permit
3. Analysis of Adequacy of Flint River as a Water Supply
4. Holloway Dam Drawings
5. 2008 Holloway Dam Safety Report
6. 2008 Utah Dam Safety Report
7. 2008 Hamilton Dam Safety Report
8. Cost of Service Study – Flint Water Treatment Plant

Appendix 1 - Holloway Reservoir Management Plan

March 13, 1987

TO: Members of the Ad Hoc Committee to Work With City of Flint Officials on Management of the Holloway Reservoir

FROM: Kenneth J. Smithee, Director
Genesee County Parks & Recreation Commission

SUBJECT: Action of the Parks & Recreation Commission

CITIZEN REPRESENTATIVES:

GERALD H. RIDEOUT
PRESIDENT

ARCHIE HALFORD, JR.
VICE PRESIDENT

CHARLES E. OLIVER, JR.
SECRETARY

JAMES S. SHEAFFER

GENESEE COUNTY BOARD OF COMMISSIONERS

SUSAN H. BAILEY
ROSALYN A. BOGARDUS
CANDACE A. CURTIS

EX OFFICIO MEMBERS:

ROBERT S. GAZALL
CHAIRMAN, GENESEE COUNTY METROPOLITAN PLANNING COMMISSION

RAYMOND M. NEWMAN
CHAIRMAN, GENESEE COUNTY BOARD OF ROAD COMMISSIONERS

ANTHONY RAGNONE
GENESEE COUNTY DRAIN COMMISSIONER

KENNETH J. SMITHEE
DIRECTOR

Please be advised that the recommendations as outlined on Attachment A were approved by the Genesee County Parks & Recreation Commission meeting in formal session on March 12, 1987.

On behalf of the Commission, I would like to extend our personal thanks to each of you for the assistance which you rendered which led to the agreement between the Parks & Recreation Commission and the City of Flint and will provide protection for recreational users of the Holloway Reservoir, adjacent property owners and also help protect the fish and other aquatic life.

Thanks again.

Sincerely,

Kenneth J. Smithee
Director

KJS:jp
Attachment

G-5055 BRANCH ROAD FLINT, MICHIGAN 48506 PHONE (313) 736-7100
AFFILIATED WITH
MICHIGAN RECREATION AND PARK ASSOCIATION NATIONAL RECREATION AND PARK ASSOCIATION

R-22

AGENDA ITEM: (5). i.

PRESENTED: 3/9/87

ADOPTED: 3/9/87

By the Mayor:

WHEREAS, the City of Flint in adopting ordinance 2208 granted to the Genesee County Parks and Recreation Commission the right to establish and operate park and recreational facilities and conservations programs on property owned by the City of Flint in the Holloway Reservoir area; reserving unto itself the power to control and regulate the dams and water levels of the Holloway Reservoir, and

WHEREAS, it is in the interests of the City and the Genesee County Parks and Recreation Commission to establish a Management Plan which optimizes the summer recreational programs available to the public while preserving downstream usages of the Flint River, and which will assist the City in implementing the provisions of ordinance 2208.

NOW, THEREFORE, BE IT RESOLVED, that the City of Flint adopts the attached Holloway Reservoir Management Plan.

APPROVED AS TO FORM:

Chief Legal Officer

R990

COUNCIL MARCH 9, 1987

HOLLOWAY RESERVOIR MANAGEMENT PLAN

GENERAL OBJECTIVE:

To operate Holloway Dam in a manner that optimizes summer recreation on the Holloway Reservoir while preserving downstream usages of the waters of the Flint River and assuring availability of a back-up water supply for Flint.

GENERAL OPERATING PROCEDURE:

Spring Fill - The City of Flint shall operate the dam with the intention of capturing a sufficient quantity of spring run-off to maintain the reservoir at a minimum elevation of 755 feet no later than May 1 of each year.

Summer Operation - The City of Flint shall maintain a minimum outflow of 65 cfs until the level of the reservoir falls to an elevation of 752.7 feet. At any time that the level reaches elevation 752.7 feet the city shall operate the dam such that the outflow does not exceed inflow, on any given day, provided, however, that the city shall not be obligated to make more than one adjustment to flow during any given day.

Winter Drawdown - The City of Flint shall operate the dam to gradually drawdown the reservoir during the first two weeks of November to an elevation of 751 feet in order to prevent structural damage to the dam from freezing.

Notification - The City of Flint shall provide prior notification to the Genesee County Parks and Recreation Commission before making a change in dam operations which result in significant drawdown.

Maintenance and Construction - Routine maintenance shall be scheduled to avoid conflicts with major events and peak usage periods on the reservoir. A minimum of 30 days notification shall precede all maintenance and construction involving significant drawdown. The Genesee County Parks and Recreation Commission shall promptly receive copies of all dam maintenance permit applications made by the City of Flint to the Michigan Department of Natural Resources.

Gauging of Water Flow into Reservoir - The City of Flint shall be a cooperator with the U.S.G.S. and State of Michigan to establish a stream gauge on the north branch of the Flint River upstream of the Holloway Reservoir and be a cooperator on the annual maintenance and operation of the existing gauge on the south branch of the Flint River and the new gauge on the north branch of the Flint River.

EMERGENCIES:

In emergency situations affecting public health, safety and welfare the City of Flint shall operate the Holloway dam in a manner to protect the public health, safety and welfare. This shall be done even though recreational users and others may be temporarily inconvenienced. Situations which shall be identified as emergencies shall include but not be limited to the following: flood conditions, interruption of the City of Flint's public water supply, and event(s) which threatens the structural integrity of the dam, and acts of God. However, low flow augmentation for sewage treatment shall not be considered as an emergency.

MONITORING:

The City of Flint in cooperation with the Genesee County Parks and Recreation Commission will assure conformance with the Holloway Reservoir Management Guidelines. A standing oversight committee shall be created to provide monitoring of the reservoir management and facilitate exchange of timely information regarding the Holloway dam and reservoir. The committee shall be composed of two members from both the City of Flint and the Genesee County Parks and Recreation Commission and shall meet in April and November of each year. The Genesee County Parks and Recreation Commission shall provide the City of Flint with a schedule for summer events on Holloway Reservoir at the April meeting of the Oversight Committee.

PERIOD AND EXECUTION OF AGREEMENT:

The Holloway Reservoir Management Plan shall be in full force and effect when officially adopted by the Flint City Council and the Genesee County Parks and Recreation Commission and shall remain so until altered by mutual agreement.

MANAGEMENT PLAN STATUS:

This management plan establishes targets for optimal operation of the Holloway Dam and Reservoir but does not replace the terms and conditions of Flint City Ordinance No. 2208.

p:DAM(a)

Appendix 2 - Excerpt of Flint WWTP NPDES permit

PART I

Section A. Limitations and Monitoring Requirements

1. Final Effluent Limitations, Monitoring Point 001A

During the period beginning on the effective date of this permit and lasting until the expiration date of this permit, the permittee is authorized to discharge treated municipal wastewater from Monitoring Point 001A through Outfall 001. Outfall 001 discharges to the Flint River. Such discharge shall be limited and monitored by the permittee as specified below.

	Maximum Limits for Quantity or Loading				Maximum Limits for Quality or Concentration				Frequency	Sample
Parameter	Monthly	7-Day	Daily	Units	Monthly	7-Day	Daily	Units	of Analysis	Type
Flow	(report)	---	(report)	MGD	---	---	---	---	Daily	Report Total *Daily Flow*
Carbonaceous Biochemical Oxygen Demand ($CBOD_5$)										
4/1-4/30	6,672	10,000	---	lbs/day	16	---	24	mg/l	Daily	24-Hr Composite
5/1-10/31	2,920	3,750	---	lbs/day	7	---	9	mg/l	Daily	24-Hr Composite
11/1-11/30	4,590	6,672	---	lbs/day	11	---	16	mg/l	Daily	24-Hr Composite
12/1-3/31	5,420	8,340	---	lbs/day	13	---	20	mg/l	Daily	24-Hr Composite
Total Suspended Solids										
5/1-10/31	8,340	12,500	---	lbs/day	20	30	---	mg/l	Daily	24-Hr Composite
11/1-/4/30	12,500	18,800	---	lbs/day	30	45	---	mg/l	Daily	24-Hr Composite
Ammonia Nitrogen (as N)										
4/1-4/30	2,920	4,170	---	lbs/day	7.0	---	10.0	mg/l	Daily	24-Hr Composite
5/1-10/31	667	1,460	---	lbs/day	1.6	---	3.5	mg/l	Daily	24-Hr Composite
11/1-11/30	2,080	2,920	---	lbs/day	5.0	---	7.0	mg/l	Daily	24-Hr Composite
12/1-3/31	2,500	3,128	---	lbs/day	6.0	---	7.5	mg/l	Daily	24-Hr Composite
Total Phosphorus (as P)	417	---	---	lbs/day	1.0	---	---	mg/l	Daily	24-Hr Composite
Fecal Coliform Bacteria	---	---	---	---	200	400	---	cts/100 ml	Daily	Grab
Total Residual Chlorine	---	---	---	---	---	---	0.038	mg/l	Daily	Grab
Total Mercury										
Through 12/31/2008	---	---	---	lbs/day	(report)	---	---	ng/l	Quarterly	Grab
Beginning 1/1/2009	0.0042	---	---	lbs/day	10	---	---	ng/l	Quarterly	Grab
Acute Toxicity										
Through 12/31/2008	---	---	---	---	---	---	(report)	TU_A	Quarterly	24-Hr Composite
Beginning 1/1/2009	---	---	---	---	---	---	1.0	TU_A	Quarterly	24-Hr Composite
Chronic Toxicity										
Through 12/31/2008	---	---	---	---	(report)	---	---	TU_C	Quarterly	24-Hr Composite
Beginning 1/1/2009	---	---	---	---	1.5	---	---	TU_C	Quarterly	24-Hr Composite
					Minimum Daily		Maximum Daily			
pH	---	---	---	---	6.5	---	9.0	S.U.	Daily	Grab

The following design flow was used in determining the above limitations, but is not to be considered a limitation or actual capacity: A rated design capacity of 50 MGD and the 1988 Water Resources Commission directive to use a 95 percent exceedance (Flint River drought) flow of 85 cfs (Holloway Reservoir Management Plan) for limit calculations.

Appendix 3 - Analysis of Adequacy of Flint River as a Water Supply

Technical Memorandum
Analysis of Adequacy of Flint River as Water Supply

1.0 Quantity of Water Required

Recommended Standards for Water Works, 2003 Edition indicates that the quantity of surface water at the source shall:

- Be adequate to meet the maximum projected water demand of the service area as shown by calculations based on a one in fifty year drought or the extreme drought of record, and should include consideration of multiple year droughts. Requirements for flows downstream of the intake shall comply with requirements of the appropriate reviewing authority.
- Provide reasonable surplus for anticipated growth
- Be adequate to compensate for all losses such as silting, evaporation, seepage, etc.
- Be adequate to provide ample water for other legal users of the source.

2.0 Demand Summary

City staff has indicated the future maximum day demand of the city is 18 mgd.

In addition to the water used by customers, some water will be required for water treatment processes and filter backwash. An allowance for WTP Backwash and Process water of 2 mgd is assumed.

Water used for fire-fighting is not included in customer demand or sales. An allowance 0.7mgd for replenishing water used for fire-fighting is assumed.

The maximum day demand represents the quantity of water which must be supplied on the particular day that the highest use (demand) occurs. Treatment and pumping must be designed to deliver the maximum day demand. During peak periods, storage from the Holloway Reservoir can be utilized to supplement the natural river flow. For analysis of the river as a source, the maximum month will be used as the demand.

A review of the city's water demands and precipitation records suggest that maximum month demand is about 80% of the maximum day demand.

The maximum sustained demand to be withdrawn from the river is computed in the following table:

Table 1: City of Flint Design Demand Summary

Future Maximum Day Demand (Customers)		18.0 mgd
Future Maximum Day Demand (WTP Backwash / Process Water)		2.0 mgd
Subtotal (Future Maximum Day Demand)		20.0 mgd
Sustained (30 day) Future Maximum Day Demand	(80% of MDD)	16.0 mgd
Replenish Water from Fire Fighting		0.7 mgd
Future Maximum Day Demand (Source Water)		16.7 mgd

3.0 Additional Demands and Requirements

In addition to the demands from Section 2, the following demands must be accounted for:

3.1 Mutual Aid

The City and GCDC-WWS have a mutual aid agreement to supply each other water in the event of a disruption in supply or other emergency. The agreement provides that the city will supply GCDC-WWS up to 8 mgd.

For this analysis, it is assumed that an emergency will be corrected within 14 days. The volume of water that may be required is therefore: 14 days * 8,000,000 gal/day = 112,000,000 gal. This volume will be reserved from the reservoir volume.

3.2 Evaporation

Both the Holloway and Mott dams have been constructed since the drought period of the 1930's, which is being used as the base river flow for analysis. Evaporation from the Holloway Reservoir and Mott Lake will reduce the amount of available from the river. The NWS publishes an atlas which shows evaporation rates. Evaporation is primarily a factor during the "growing season"; the atlas shows that about 24" of water is lost via evaporation from open water surfaces in Genesee County over the May through October period. Loss by evaporation will be offset by the addition of rainfall directly upon the water surface. Since the analysis is based upon drought conditions, the low rainfall having a recurrence rate of 100 years will be used. During the May through October period, 11.5 inches of rain is estimated during the 1 in 100 dry year. The net loss by evaporation is therefore 12.5 inches.

The following table summarizes the loss by evaporation, over the six month period from May through October.

Table 2: Reservoir Evaporation Loss

Reservoir	Surface Area (Acres)	Evaporation (inches)	Precipitation (inches)	Net Loss by Evaporation (Gallons)
Holloway Reservoir	1,973	24	11.5	669,646,065
Mott Lake	684	24	11.5	232,153,020
Total				901,799,085

3.3 Siltation

The July 2001 Flint River Assessment completed by the MDNR indicates that sedimentation occurs in the Holloway Reservoir at an accelerated rate, but does not provide quantities. Measurements of the silt accumulation in the reservoir have not been completed. Accumulations of several feet have occurred in other reservoirs. Sedimentation of an average of 1 foot across the Holloway Reservoir will result in the loss of 643,000,000 gallons of storage, or about ten percent of the total volume available.

Mott Lake is not used as a water storage reservoir. Its level is controlled by a fixed weir. Although siltation likely occurs in Mott Lake too, it has no impact on storage for water supply.

3.4 Seepage

Seepage is not believed to have a significant impact on the availability of water at the WTP. Seepage through the embankments of either the Holloway or Mott dams or through the bottom of the reservoirs seems likely to migrate back to the Flint River, although perhaps downstream of the reservoirs, prior to the WTP.

3.5 Flint WWTP

The City's WWTP discharges treated wastewater to the Flint River. The NPDES permit issued to the WWTP has established limits for the treated effluent, based on a drought flow in the river of at least 85 cfs.

3.6 Holloway Reservoir Management Plan

In 1977 the City and Genesee County executed the Holloway Reservoir Management Plan (HRMP) which established parameters for the operation of the dam and reservoir. In 1977, water was no longer withdrawn from the river for water supply and the HRMP appears to have been developed to address four primary issues:

- Availability to utilize the reservoir for water supply as a backup or alternative supply
- Provide for physical maintenance of the dam
- Provide for the recreational use of the reservoir
- Provide flow augmentation to Flint WWTP

The HRMP establishes a summer operating level of 755 and a winter level 751. The summer level maximizes the volume of water available during the dry period in the event that the river is to be used as a water supply. The higher level also supports recreational activities on the reservoir. The 751 winter level provides protection against damage from freezing during the winter. The HRMP establishes a minimum discharge of 65 cfs from the dam, presumably to provide a minimum flow of 85 cfs in the river at the WWTP.

4.0 Analysis

It is assumed that the demands and other requirements identified above are to be maintained in the event that water is withdrawn from the Flint River for water supply. In 1963, USGS published Water Resources Flint Area Michigan, which includes an analysis of the river as a water supply. This publication includes design information regarding the Holloway Reservoir and its operation for water supply.

In 1977 when the HRMP was executed, water was not withdrawn from the river for water supply. If the HRMP required a minimum discharge of 65 cfs at the Holloway Dam to provide for adequate flow in the river at the WWTP, the minimum discharge from the Holloway Dam should be increased by the amount of water withdrawn for water supply if the current river flow at the WWTP is to be maintained.

65 cfs + 16.7 mgd (25.8 cfs) = 90.8 cfs (58.7 mgd)

Figure 1 shows the sustained discharge which can be maintained from the Holloway Reservoir during a drought period. This graph is based on USGS records of flow in the river between 1930 and 1952. This period includes the drought period of 1930 to 1937, which is USGS considers the most severe drought in Michigan history, having a recurrence period of 1 every 50 to 70 years. This period was prior to the construction of Holloway Dam, so river records reflect the natural flow of the river without impact by dam operations.

Figure 1: Draft-Storage Curve, Flint River near Otisville (excerpt from USGS Water Resources Flint Area Michigan)

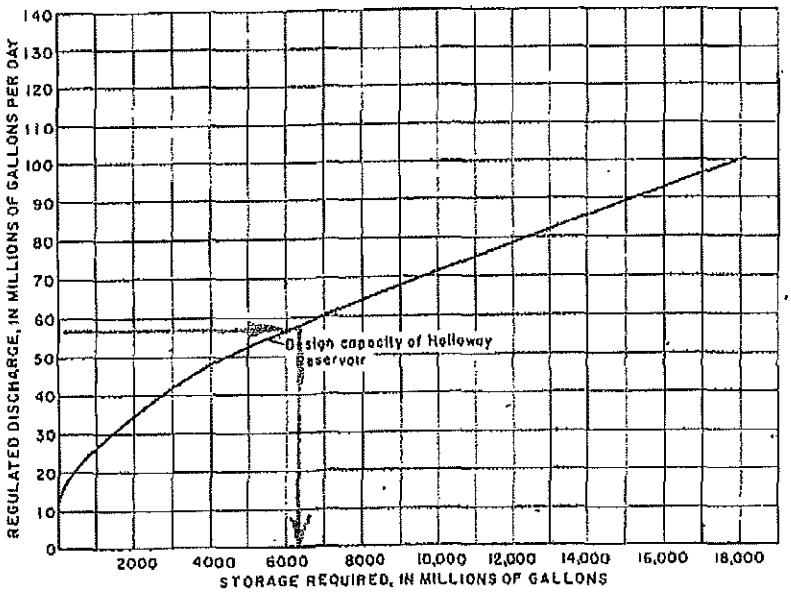


Figure 1 indicates that about 6.2 billion gallons of storage is needed to maintain a sustained discharge of 58.6 mgd from the reservoir to provide the minimum river flow of 85 cfs at the WWTP.

In addition to the 6.2 billion gallons of storage, additional storage is required to provide GCDC-WWS an emergency supply and to make up for reservoir loss by evaporation.

Table 3: Storage Requirements to Maintain Current Conditions plus Water Supply

Storage to meet sustained demand and WWTP flow:	6.20	billion gallons
Storage to provide backup supply to GCDC-WWS:	0.11	billion gallons
Storage to make up loss by evaporation:	0.90	billion gallons
Storage lost by siltation:	0.64	billion gallons (assumed)
Storage to provide loss by seepage:	0.00	billion gallons (assumed)
Storage Needed to Supplement River Flow:	7.85	billion gallons

For this analysis, it is assumed that storage is available from the Holloway Reservoir to supplement the natural river flow.

- The Holloway Reservoir was designed to provide storage for water supply in the 1950's
- The Mott Dam is a fixed weir, so storage is not available. The dam is owned by the Genesee county Parks Department and provides recreational benefit.
- The Hamilton Dam impoundment is limited to the river channel; storage volume is negligible.
- The Utah Dam is inoperable.

- The Kearsley Dam is not directly located on the Flint River, but on the Kearsley Creek just prior to its confluence with the Flint River. The Kearsley Creek discharges to the Flint River downstream of the City's WTP so storage from the river is not available for water supply; however, discharge from the Kearsley dam can be used to supplement downstream river flows, including the flow in the river at the WWTP. The Kearsley Reservoir can provide a maximum of 650 million gallons of storage.
- The Thread Lake Dam is not located on the Flint River, but the Thread Creek discharges into the Swartz Creek which discharges into the Flint River just west of the downtown area. The Thread Lake dam provides a maximum storage volume of 100 million gallons of storage. Discharge from the Thread Lake dam could be used to supplement downstream river flows, but not for water supply.
- For this analysis, storage from neither the Kearsley Reservoir nor Thread Lake is included. Both dams were constructed prior the Holloway Reservoir and discharges from the Kearsley Dam and Thread Lake Dam are assumed to be included in the analysis presented in the USGS publication.

Following is a capacity curve for the Holloway Reservoir, from the USGS Water Resources Flint Area.

Figure 2: Holloway Reservoir Storage Capacity (excerpt from USGS Water Resources Flint Area Michigan)

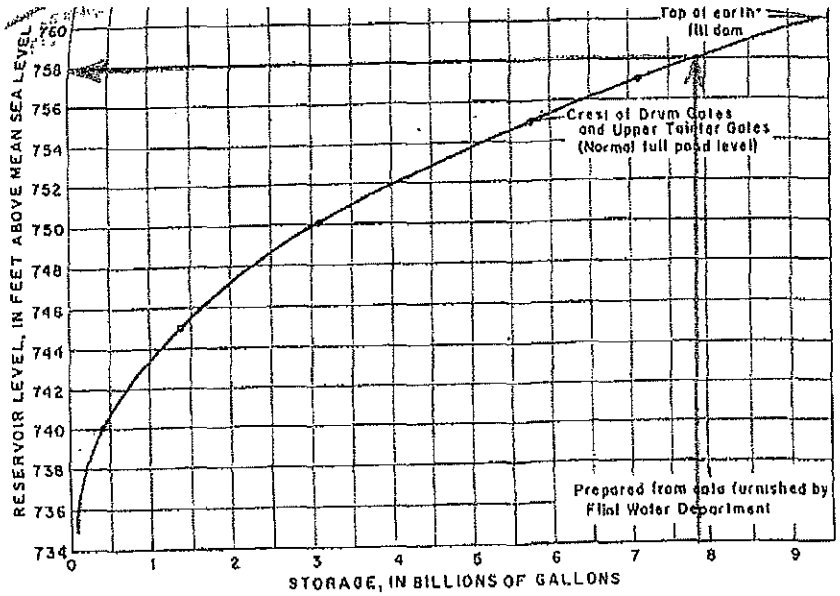


Figure 2 indicates that a Holloway Reservoir level of 758.0 feet provides storage of 7.85 billion gallons.

Review of design drawings of the Holloway Dam indicates that the dam was designed to use drum gates to maintain the normal water level(s) of the reservoir. The drum gates can rotate to allow for reservoir levels ranging from a low level of 751 feet to a high level of 755 feet. If the reservoir is to be maintained

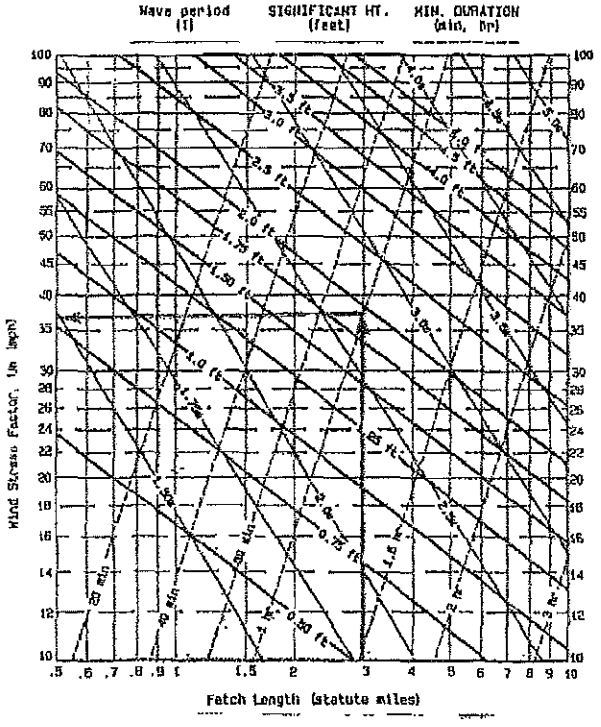
at a higher level than the current summer level of 755 feet, modifications will be required to the drum gates.

According to the original dam design drawings, the dam embankment was constructed to elevation 763 feet (however, the USGS reports shows the top elevation as 760 feet). If the reservoir level is raised to 758 feet, only about five feet of freeboard will be provided to guard against overtopping. There are three concerns regarding increasing the reservoir level from 755 to 758 feet.

The increased hydraulic pressure resulting from the higher water level on one side of the dam will result in increased seepage through the embankment, and a reduction in its integrity.

The reservoir has a fetch of about three miles east from the dam. Figure 3 shows that a 37 mph wind sustained for one hour duration from the east can result in waves capable of two feet. The original design drawings show rip-rap armoring on the reservoir side of the dam embankment to an elevation of 757 feet. Rip-rap armoring should be extended to at least two feet higher than the 758 feet level to protect against wave action.

Figure 3: Predicted Wave Action – Holloway Reservoir



The reservoir is tributary to a large watershed. There have been rapid increases in river flow (and reservoir level) soon after intense rain events in the watershed. A rain storm in June 1996 resulted in a 1.62 foot increase in the water level of the reservoir resulting in the opening of dam gates and discharge of 7,740 cfs. Reducing the freeboard also reduces the volume available for flood management.

5.0 Quantity of Water Supply Available

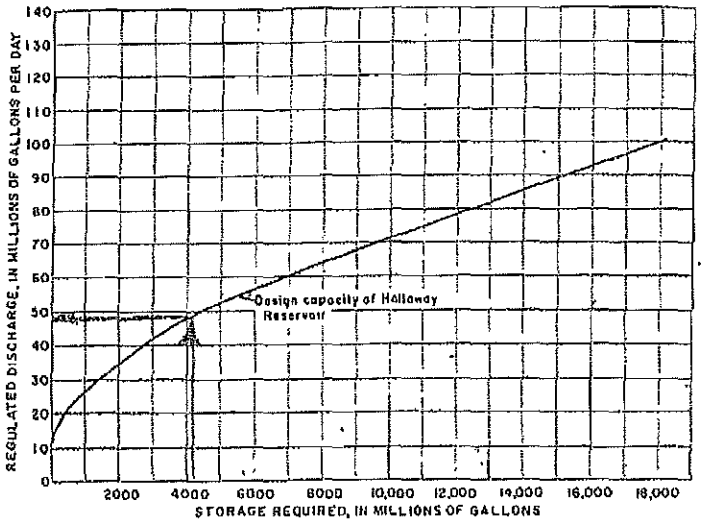
Analysis has shown that without modifications to facilities and/or permits and agreements, the river cannot supply the future maximum demand of the city.

Table 4: Storage Available for Water Supply

Original Storage Volume of Holloway Reservoir (elevation 755')	5.76	billion gallons
Storage lost by Sedimentation (assumed)	0.64	billion gallons
Storage to make up for Evaporation	0.9	billion gallons
Storage to provide backup supply for GCDC-WWS	0.11	billion gallons
Storage available to supplement river flow	4.11	billion gallons

The following figure shows that 4.11 billion gallons of storage can sustain a supplemental flow of 48 mgd.

Figure 4 – Sustained Discharge Available from Holloway Reservoir



A minimum discharge of 48 cfs from the Holloway Reservoir can support a sustained water withdrawal of about 11 mgd and maintain 85 cfs at the WWTP, as shown in the following table.

Table 5 – Maximum Sustained WTP Withdrawal Available

	1978 - Holloway Reservoir Management Plan	Future
Minimum Reservoir Discharge	65 cfs	48 cfs
River Inflow	20 cfs	20 cfs
WTP Withdrawal	0 cfs	17 cfs (10.99 Mgd)
River Flow at WWTP	85 cfs	85 cfs

A sustained water withdrawal of 11 mgd will support a maximum day demand of 11.6 mgd, as shown in the following table.

Table 6 – Available WTP Maximum Day Demand

Sustained Withdrawal Available		11.0 mgd
Water to replenish fire fighting		0.7 mgd
Sustained (30 day) Future Maximum Day Demand Available		10.3 mgd
Future Maximum Day Demand Available	(Multiply by 125%)	12.9 mgd
Water available for WTP Backwash/Process		1.3 mgd
Water available for customer Max Day Demand		11.6 mgd

Appendix 4 - Holloway Dam Drawings

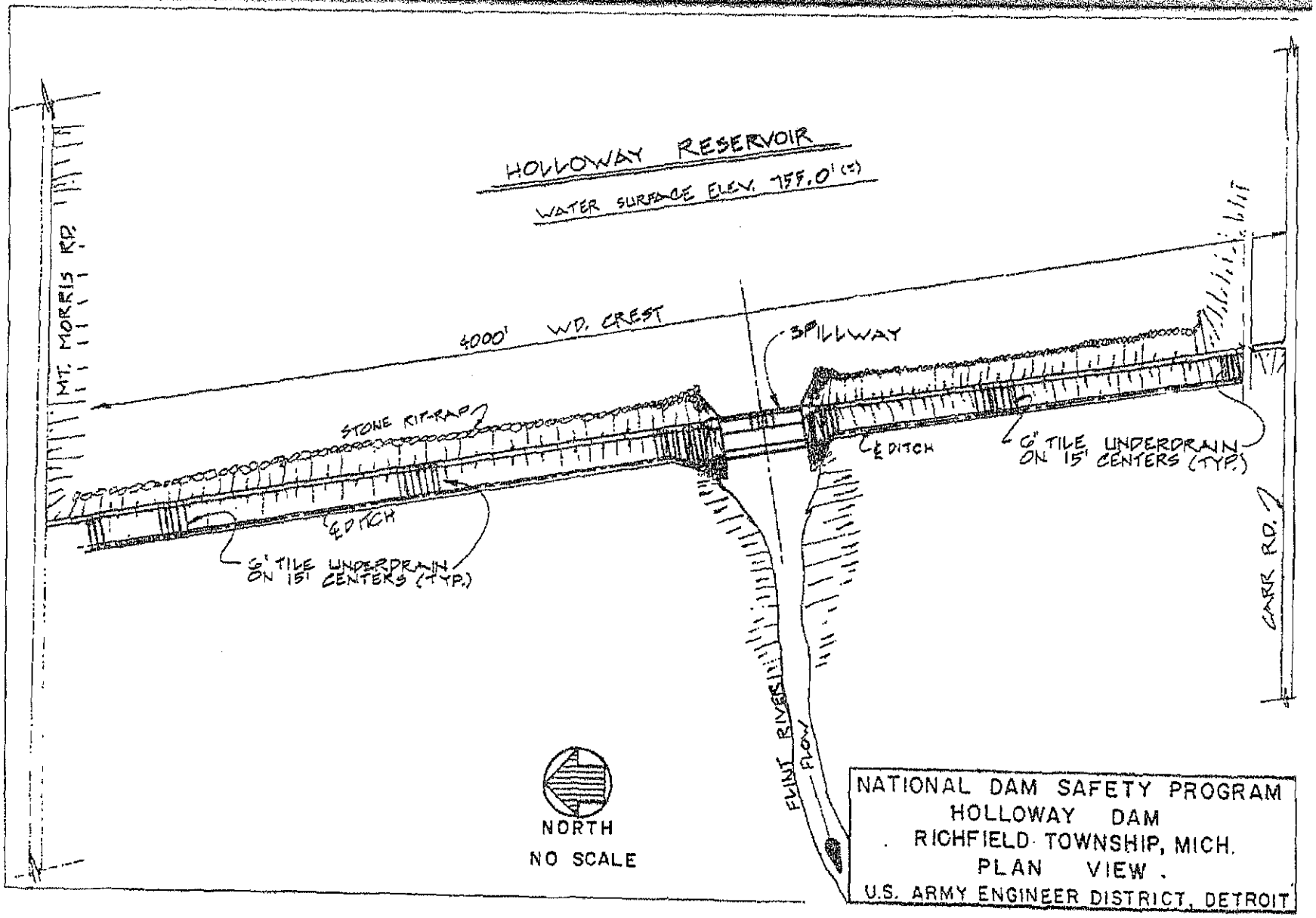


FIGURE No. 5

000781

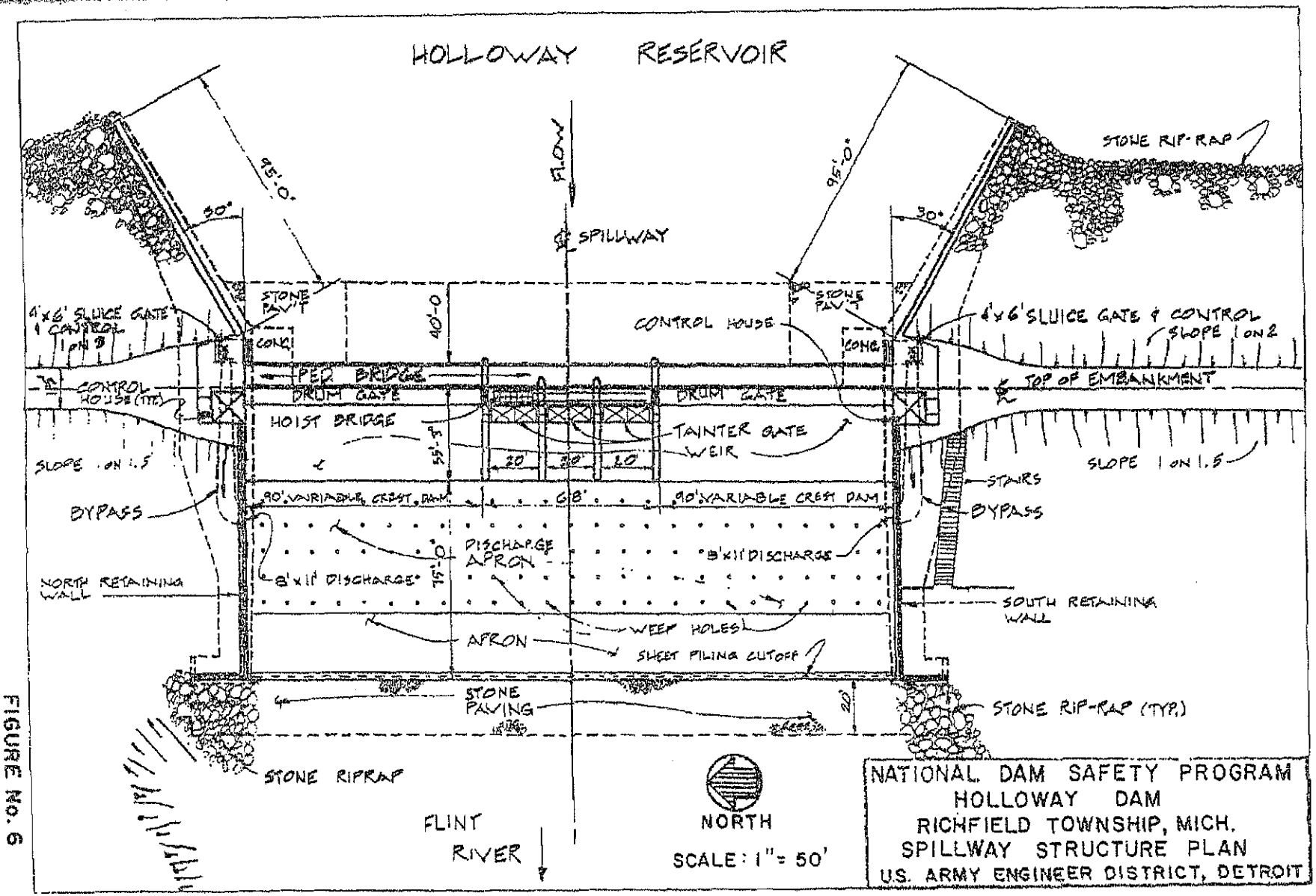

HOLLOWAY RESERVOIR
FLOW
SPILLWAY
95'-0"
30°
STONE RIP-RAP
STONE PAVING
CONC.
40'-0
4'x6' SLUICE GATE & CONTROL
CONTROL HOUSE
6'x6' SLUICE GATE & CONTROL
SLOPE 1 ON 2
CONTROL HOUSE (TYP.)
FOOT BRIDGE
DRUM GATE
TOP OF EMBANKMENT
HOIST BRIDGE
TAINTER GATE
WEIR
55'-5"
20'
30'
10'
SLOPE 1 ON 1.5
STAIRS
BYPASS
90' VARIABLE CREST DAM
68'
DISCHARGE APRON
8'x11' DISCHARGE
NORTH RETAINING WALL
SOUTH RETAINING WALL
WEEP HOLES
APRON
SHEET PILING CUTOFF
STONE PAVING
STONE RIP-RAP (TYP.)
STONE RIPRAP
FLINT RIVER
NORTH
SCALE: 1" = 50'
NATIONAL DAM SAFETY PROGRAM
HOLLOWAY DAM
RICHFIELD TOWNSHIP, MICH.
SPILLWAY STRUCTURE PLAN
U.S. ARMY ENGINEER DISTRICT, DETROIT

FIGURE NO. 6

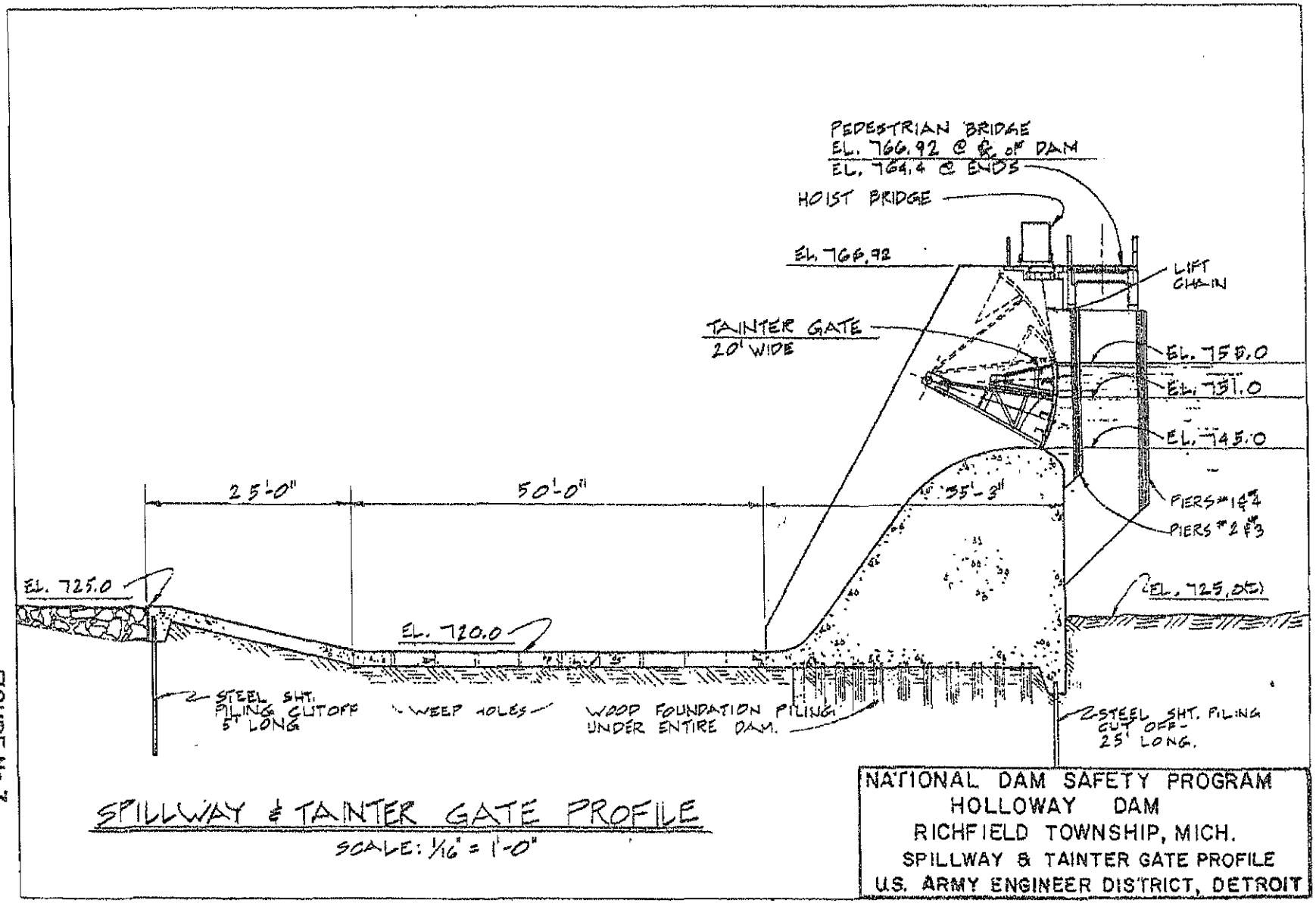
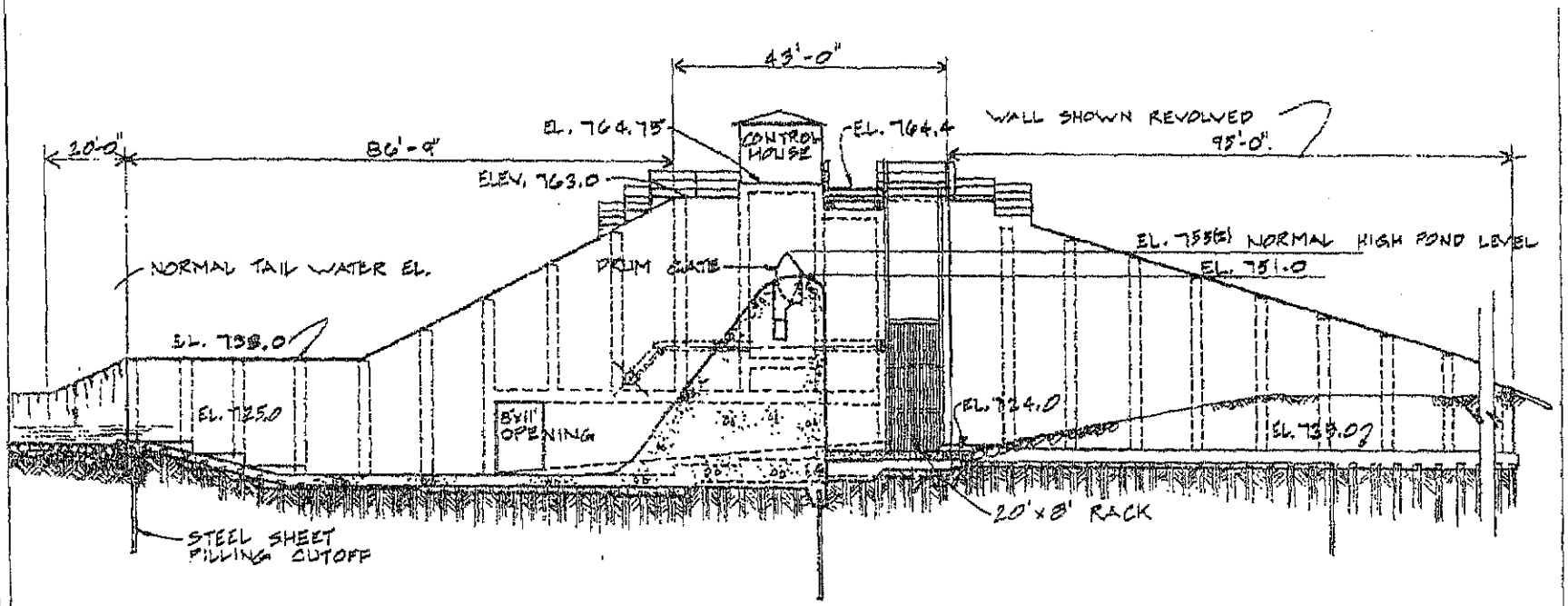


FIGURE No. 7

SPILLWAY & TAINTER GATE PROFILE

SCALE: 1/16" = 1'-0"

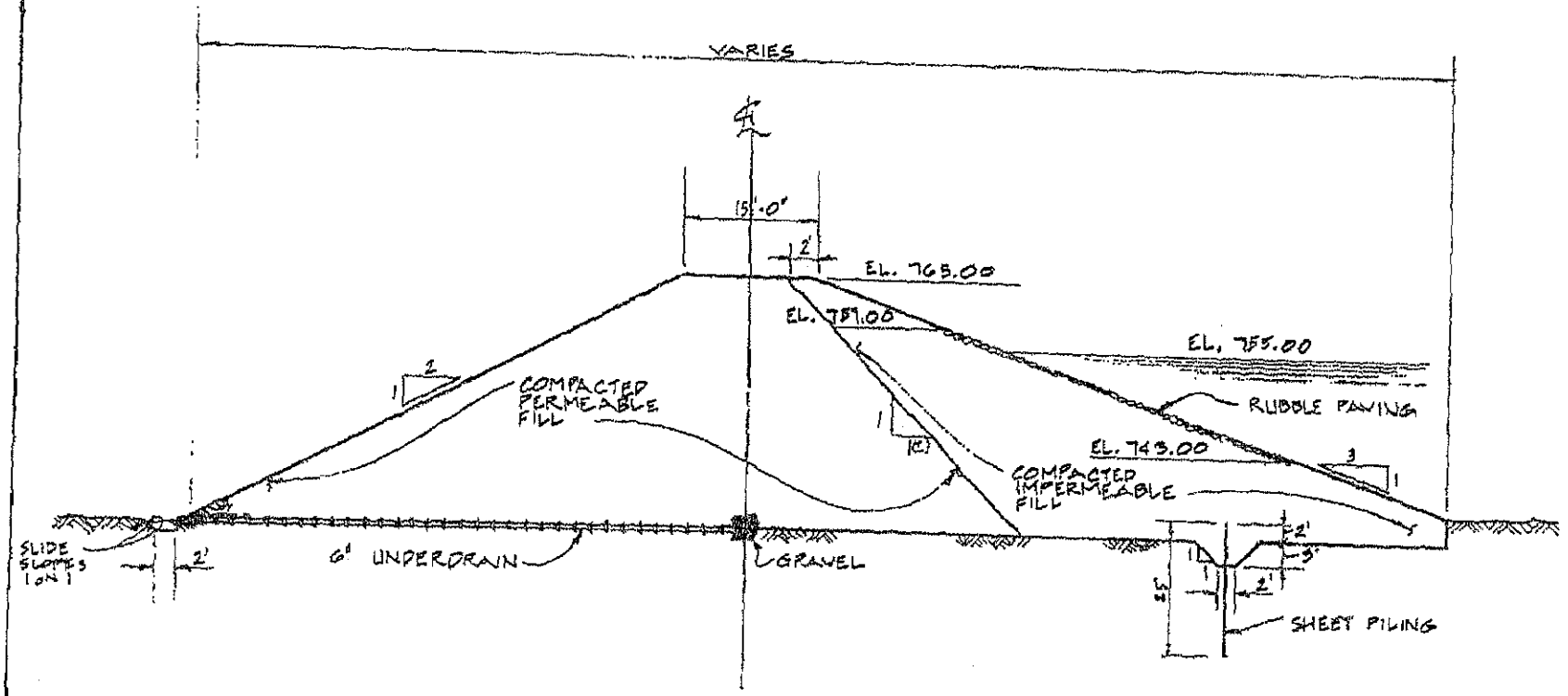
NATIONAL DAM SAFETY PROGRAM
HOLLOWAY DAM
RICHFIELD TOWNSHIP, MICH.
SPILLWAY & TAINTER GATE PROFILE
U.S. ARMY ENGINEER DISTRICT, DETROIT



SPILLWAY AND DRUM GATE PROFILE
NO SCALE

NATIONAL DAM SAFETY PROGRAM
HOLLOWAY DAM
RICHFIELD TOWNSHIP, MICH.
SPILLWAY & DRUM GATE PROFILE
U.S. ARMY ENGINEER DISTRICT, DETROIT

FIGURE No. 8

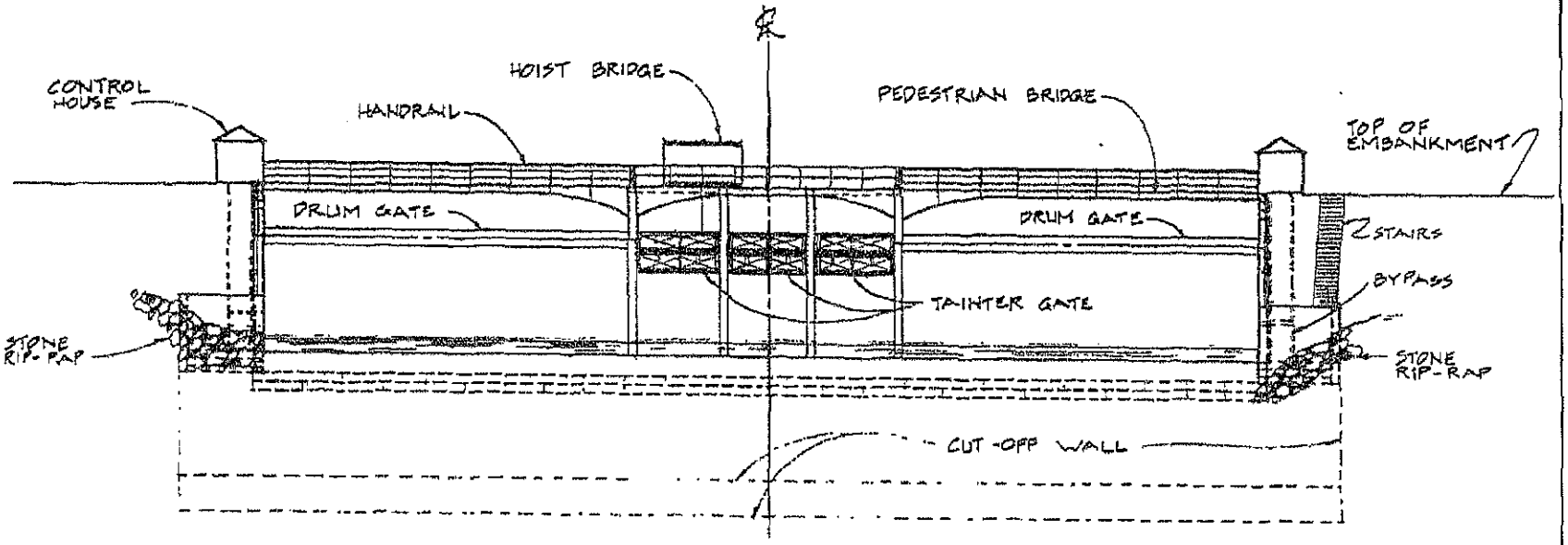


TYPICAL DAM SECTION

NO SCALE

FIGURE No. 9

NATIONAL DAM SAFETY PROGRAM
HOLLOWAY DAM
RICHFIELD TOWNSHIP, MICH.
EARTH EMBANKMENT PROFILE
U.S. ARMY ENGINEER DISTRICT, DETROIT

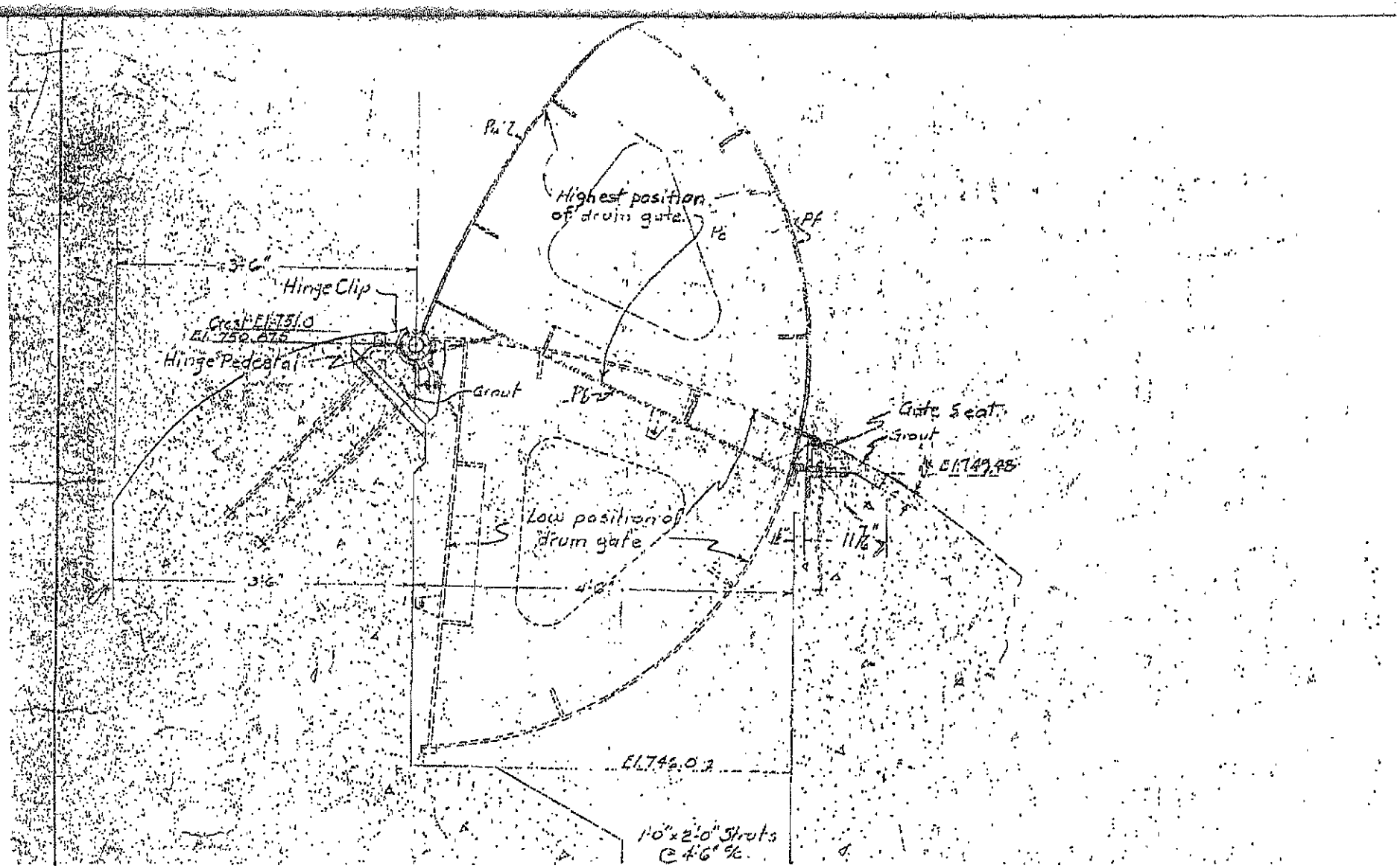


SPILLWAY ELEVATION VIEW

SCALE: 1" = 40'

NATIONAL DAM SAFETY PROGRAM
HOLLOWAY DAM
RICHFIELD TOWNSHIP, MICH.
SPILLWAY ELEVATION VIEW
U.S. ARMY ENGINEER DISTRICT, DETROIT

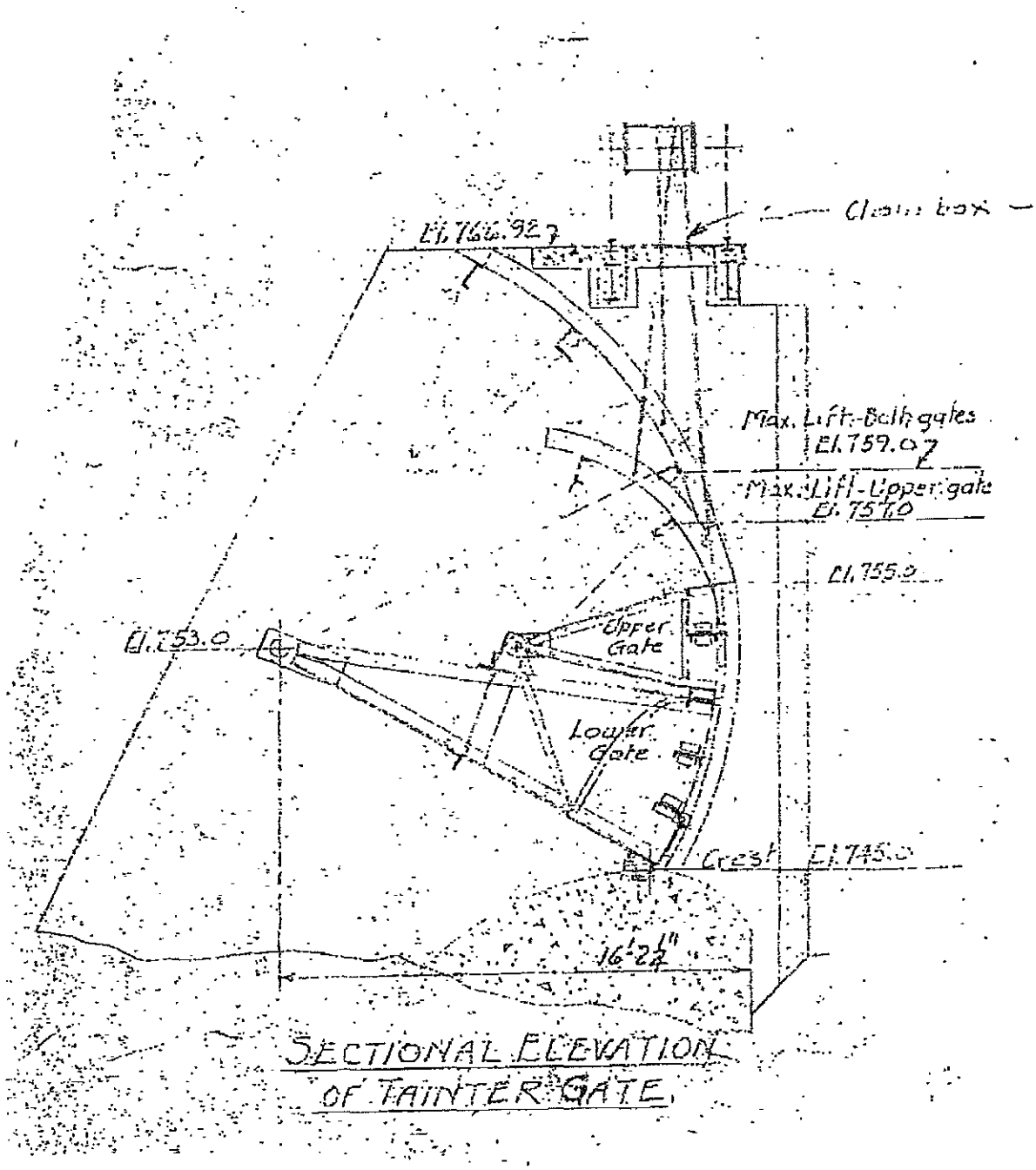
FIGURE No. 10



DRUM GATE SECTION

000787

000788



SECTIONAL ELEVATION OF TAINTER GATE

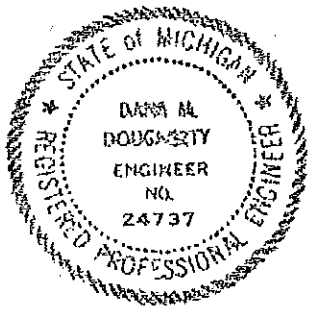
Appendix 5 - 2008 Holloway Dam Safety Report

MICHIGAN PUBLIC ACT 451, PART 315
INSPECTION REPORT
HOLLOWAY DAM
GENESEE COUNTY, MICHIGAN
INVENTORY NUMBER 064 – HIGH HAZARD

FOR

CITY OF FLINT
WATER TREATMENT PLANT
4500 N. DORT HIGHWAY
FLINT, MICHIGAN 48505
ATTN: MR BRENT WRIGHT
(810) 787-6537

BY
Stantec Consulting Michigan Inc.
Engineers – Planners – Surveyors
3959 Research Park Drive
Ann Arbor, Michigan 48108-2219
(734) 761-1010



INSPECTOR(S): Dana M. Dougherty – Stantec Consulting Michigan Inc.

DATE OF INSPECTION: October 19, 2008

PROFESSIONAL ENGINEER: Dana M. Dougherty, PE
STANTEC CONSULTING MICHIGAN INC.
3959 RESEARCH PARK DRIVE
ANN ARBOR, MICHIGAN 48108-2219

Dana M. Dougherty, PE #24737

HOLLOWAY DAM
CITY OF FLINT
GENESEE COUNTY, MICHIGAN

Table of Contents

1.0 PURPOSE AND AUTHORITY 1.1

2.0 CONCLUSIONS AND RECOMMENDATIONS 2.1

3.0 PROJECT INFORMATION 3.1
3.1 PERTINENT DATA 3.1

4.0 FIELD INSPECTION 4.1
4.1 SPILLWAY 4.1
4.2 RIGHT EMBANKMENT 4.1
4.3 LEFT EMBANKMENT 4.2

5.0 STRUCTURAL STABILITY 5.1

6.0 HYDROLOGY AND HYDRAULICS 6.1

7.0 OPERATION AND MAINTENANCE 7.1

LIST OF APPENDICES

APPENDIX A – BACKGROUND INFORMATION

1. Location Map
2. Project Information (1978 USACE Report)
3. Project Drawings

APPENDIX B – HYDROLOGY/HYDRAULICS

1. MDEQ Flood Discharge Data
2. Hydraulic Calculations

APPENDIX C – PHOTOGRAPHS

APPENDIX D – EMERGENCY ACTION PLAN NOTIFICATION LIST

HOLLOWAY DAM
CITY OF FLINT
GENESEE COUNTY, MICHIGAN

1.0 Purpose and Authority

The purpose of the report is to present a summary of findings for the field inspection of the Holloway Dam completed by Stantec Consulting Michigan Inc. (Stantec) on October 19, 2008 pursuant to the requirements of Part 315, Dam Safety, of the Natural Resources and Environmental Protection Act, 1994 P.A. 451, Section 31518.

This dam inspection Report and associated inspection activities were commissioned by the City of Flint, Michigan, the dam owner. The Holloway Dam is registered with the Michigan Department of Environmental Quality (MDEQ) as Dam Number 064.

References in the report to "left" and "right" are based on the observer facing downstream.

HOLLOWAY DAM
CITY OF FLINT
GENESEE COUNTY, MICHIGAN

2.0 Conclusions and Recommendations

The Holloway Dam was inspected on October 19, 2008 in accordance with Michigan P.A. 451, Part 315 criteria. The dam, including spillway and embankments was found to be in good condition. A summary of comments/recommendations is as follows:

1. The City of Flint should continue their operation and maintenance procedures as outlined in the "Holloway Reservoir Operation and Maintenance Plan".

2. The Emergency Action Plan should be exercised annually and Notification List concurrently updated.

3. Small brush should be removed from the left and right embankments.

4. Minor spalls and cracks in the spillway concrete should be monitored. These do not require immediate correction, but should be planned and budgeted in the City's long term Capital Improvement Plan (CIP).

5. The seepage monitoring weirs should be placed back into operation by repairing the eroded channel. Periodic observations of seepage rates and observed fines deposition should be performed and logged for long term data comparison.

6. Warning signs on the concrete abutments should be re-painted.

7. The security fence in the downstream right embankment should be repaired.

8. Monitor the sloughed area in the downstream right embankment and repair as needed.

9. Further inspections should be performed in accordance with P.A. 451, Part 315 regulations.

HOLLOWAY DAM
CITY OF FLINT
GENESEE COUNTY, MICHIGAN

3.0 Project Information

The Holloway Dam is located on the Flint River in Richfield Township, Genesee County, Michigan (Section 11, T8N, R5E). The dam and lower one fourth of the reservoir are in Genesee County while the upper three fourths of the reservoir are in Lapeer County. The dam was built in 1954 to maintain a base flow in the Flint River for water supply and sewage dilution requirements. The Holloway Dam was previously referred to as the Richfield Storage Dam. Presently the reservoir's uses are primarily, base water flow implementation, sewage dilution and recreation. The dam consists of earth embankments and a 248 ft long gated concrete spillway structure. The total length of the dam is approximately 3,350 ft between the natural moraine banks. The top of the embankment serves as a gravel road for maintenance purposes. A steel framed walkway spans the top of the spillway structure for operation and maintenance of the gates. The embankment side slopes are 3 horizontal to 1 vertical on the upstream face and 2 horizontal to 1 vertical on the downstream face.

3.1 PERTINENT DATA

The embankment is comprised of two zones: an upstream section and key trench of compacted impervious clay; and a larger downstream section of essentially granular material, predominantly sand with some gravel.

The plans show a sheet pile cutoff wall along the full length of the dam near the upstream toe, extending 23 ft below the base of the embankment and two feet into the embankment. A subdrain system, originating just downstream of the centerline of the crest and transverse to the dam axis, is also shown. The plans indicate that this subdrain system is formed by tile drain pipes with a center-to-center drain spacing of 15 ft. Plan details indicate a graded filter surrounding the tile drain pipes. The pipes empty into a collection ditch at the toe of the downstream slope. The right embankment has been modified by installation of fill at the toe with a bench located mid point on the slope. Weep drains were extended with 6" PVC pipe.

The outlet works of the dam consist of a reinforced concrete spillway controlled by seven gates. There is a control house on each end of the spillway. A telemark water level recording gage is in the left control house.

The following is a tabulation of principal data obtained from the construction drawings.

Hazard Classification – High (per 1978 USACE report).

Length of Dam – Overall length of the dam including the concrete spillway structure and the right and left embankments is approximately 3,350 ft.

Height of Dam – The total height of the dam, defined in P.A. 451, Part 315 as the difference in elevation between the natural stream bed and the design flood elevation, is approximately 30 ft. the crest of the dam is at El. 763.0 ft.

Crest Width of Embankments – Approximately 15 ft.

Side Slopes – The earth embankments have 3.0 H to 1.0 V slopes on the upstream face and 2.0 H to 1.0 V slopes on the downstream face. The right embankment downstream slope has been modified with fill at the toe and a bench at midpoint.

Spillway: 248 ft long concrete spillway structure with:

a) two 90 ft long drum gates

b) three 20 ft long taintor gates

c) two 4 ft by 6 ft sluice gates perpendicular to the dam axis

d) 75 ft by 248 ft wide discharge apron

Cutoff: 25 ft deep steel sheet pile cutoff wall at the upstream toe of the full length of the dam, and 15 ft deep steel sheet pile cutoff wall along the downstream side of the spillway structure.

Embankments: Upstream section and key trench of compacted impervious clay and a larger downstream section of granular material, predominantly sand with some gravel.

Further details of the spillway structure and embankments are shown in **Appendix A.** These figures have been taken from the 1978 Phase I Inspection Report.

HOLLOWAY DAM
CITY OF FLINT
GENESEE COUNTY, MICHIGAN

4.0 Field Inspection

An inspection of the facilities was performed by Dana M. Dougherty, PE (Stantec) on October 19, 2008. The weather on the date of inspection was clear with temperature at approximately 55°F. The impoundment elevation was near normal (summer) i.e. 755. Flow was passing over the drum gates as well as through the left (looking downstream) sluicegate.

The following items were noted: (Referenced photographs can be found in **Appendix C.**)

4.1 SPILLWAY

Overall the spillway appeared to be in excellent condition. Recent preventative maintenance work includes painting of miscellaneous metals including handrails, gates, and support beams, installation of new galvanized steel grating on the gate operator platform and patching concrete at the upper downstream end of the taintor gate piers.

Some minor items were noted with regard to concrete condition including:

1. There was spalled concrete on the top of the upstream right wingwall. The face of the wall exhibited cracking and efflorescence at this location (Ref. Photos #3 and #4).

2. There was a small crack in the right abutment immediately above the drum gate. There is no evidence of movement or displacement at this crack (Ref. Photo #6). This should be monitored.

3. Minor alligator cracking was noted in the taintor gate piers (Ref. Photos #7 and #8). These do not pose any immediate concern but should be monitored.

4. There were cracks in the left abutment and left downstream retaining walls. No displacement was noted. These cracks should be monitored for future movement (Ref. Photos #9 and #10).

5. The upper portion of the downstream end of the left downstream retaining wall has alligator cracking and effervescence. This should be monitored (Ref. Photo #12).

6. The warning signs that are painted on the upstream abutment/wingwall faces are faded and difficult to read. These should be repainted.

4.2 RIGHT EMBANKMENT

Overall the condition of the right embankment appears to be good with no significant erosion, seepage, settlement, sloughing or animal burrows noted. The following specific items were noted:

1. There was a minor amount of erosion beneath the riprap on the upstream embankment face immediately adjacent to the spillway.

2. Some brush has begun to grow on the upstream slope. This should be selectively removed (Ref Photos #14 and #16). Small natural growth such as wildflowers and grasses should remain.

3. Considerable brush was observed on the downstream embankment face and within the toe-of-slope drain. This should be removed (Ref. Photos #17 and #20).

4. For the most part weep tiles are dry. There is one section midway in the embankment where the weep tiles are active. Some sloughing of the slope was observed in this area. It appeared that this has been addressed through addition of a blanket drain with geotextile fabric. This should be monitored for further displacement.

5. A short section of the security fence was in disrepair. This should be corrected (Ref. Photo #23).

6. The seepage monitoring weir is not functioning. Flow was passing around the weir through an eroded section. This should be corrected (Ref. Photo #24).

4.3 LEFT EMBANKMENT

The observed condition of the left embankment was good to excellent. There was no evidence of significant erosion, seepage, settlement, sloughing or animal burrows. The following specific items were noted:

1. A minor amount of small brush should be removed from the downstream slope (Ref. Photo #28).

2. There was no evidence of seepage from the weep drains, however the toe-of-slope drain was flowing, in particular the final 100 ft (Ref. Photo #29).

3. The seepage monitoring weir is not functioning similar to the right side. Flow was passing around the weir through an eroded section. This should be corrected (Ref. Photo #30).

HOLLOWAY DAM
CITY OF FLINT
GENESEE COUNTY, MICHIGAN

5.0 Structural Stability

The assessment of stability is based on visual observations made during our field inspection (10/19/08).

No deficiencies were noted that would impact the structural integrity of the dam; however minor items were noted that should be proactively addressed to mitigate potential future deficiencies. Over all the condition of the facility remains good.

HOLLOWAY DAM
CITY OF FLINT
GENESEE COUNTY, MICHIGAN

6.0 Hydrology and Hydraulics

The MDEQ has estimated the required spillway capacity at the Holloway Dam to be 9900 cfs (reference **Appendix B**). This equates to the 200 year frequency flood which is mandated by statute – P.A. 451, Part 315, Section 324.31516.

Headwater rating curves previously produced by the USACE (1978) and Acres International (1993) indicate that this discharge capacity can be met at an impoundment elevation of approximately 755. This would allow for approximately 8 feet of freeboard. Thus, the spillway discharge capacity is sufficient to meet P.A. 451, Part 315 requirements. Furthermore, the spillway capacity at overtopping (El. 763) is approximately 40,000 cfs or ½ PMF.

The spillway capacity has also been determined with the assumption that the drum gates fail to operate and are locked in the up position (reference Ayres, Lewis, Norris & May, Inc. (ALNM) Report – 1996). The resultant 200 year impoundment elevation is computed to be approximately 761 or two feet of freeboard. Therefore, the required spillway design capacity can be met through operation of the taintor gates only.

HOLLOWAY DAM
CITY OF FLINT
GENESEE COUNTY, MICHIGAN

7.0 Operation and Maintenance

The dam is operated and maintained by staff from the City of Flint Water Treatment Plant. Routine operation and maintenance is performed in accordance with the Holloway Reservoir Operation and Maintenance Plan which is on file at the City of Flint WTP.

Impoundment elevation is continuously monitored via an on-site level transducer. Instantaneous level information is available remotely to assist operations personnel in maintenance of the impoundment elevation.

During summer months, the drum gates are in a raised position and taintor gates closed. The impoundment elevation is maintained between 755.0 and 755.75 by operating the drum and/or taintor gates as needed.

The impoundment elevation is lowered in the winter to approximately elevation 751.0. The drum gates are lowered during this period.

Emergency backup power is available to operate the taintor gates in case of a power loss. An *Auxiliary Generator Power System Report is available at the WTP.*

The City has performed routine maintenance of the facilities on an "as needed" basis. The most recent work consisted of painting exposed steel components including the taintor gates and access platform support steel.

In addition to routine surveillance by operations staff, supervisor staff also performs an annual inspection of the facilities. Noted deficiencies are scheduled for correction the following year.

Appendix 6 - 2008 Utah Dam Safety Report

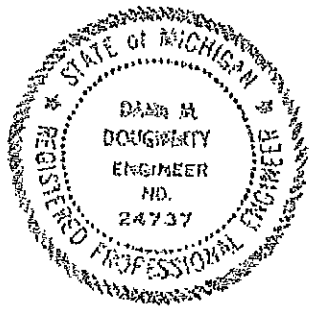
MICHIGAN PUBLIC ACT 451, PART 315
INSPECTION REPORT
UTAH DAM
GENESEE COUNTY, MICHIGAN
INVENTORY NUMBER 1275 – LOW HAZARD

FOR

CITY OF FLINT
WATER TREATMENT PLANT
4500 N. DORT HIGHWAY
FLINT, MICHIGAN 48505
ATTN: MR BRENT WRIGHT
(810) 787-6537

BY

Stantec Consulting Michigan Inc.
Engineers – Planners – Surveyors
3959 Research Park Drive
Ann Arbor, Michigan 48108-2219
(734) 761-1010



INSPECTOR(S): Dana M. Dougherty – Stantec Consulting Michigan Inc.

DATE OF INSPECTION: October 19, 2008

PROFESSIONAL ENGINEER: Dana M. Dougherty, PE
STANTEC CONSULTING MICHIGAN INC.
3959 RESEARCH PARK DRIVE
ANN ARBOR, MICHIGAN 48108-2219

Dana M. Dougherty, PE #24737

Stantec
INSPECTION REPORT
UTAH DAM
CITY OF FLINT
GENESEE COUNTY, MICHIGAN

Table of Contents

1.0 PURPOSE AND AUTHORITY 1.1

2.0 CONCLUSIONS AND RECOMMENDATIONS 2.1

3.0 PROJECT INFORMATION 3.1

4.0 FIELD INSPECTION 4.1

5.0 STRUCTURAL STABILITY 5.1

6.0 HYDROLOGY AND HYDRAULICS 6.1

7.0 OPERATION AND MAINTENANCE 7.1

LIST OF APPENDICES

APPENDIX A – BACKGROUND INFORMATION

1. Location Map
2. Project Drawings

APPENDIX B – HYDROLOGY/HYDRAULICS

1. MDEQ Flood Discharge Data
2. FEMA Flood Insurance Map
3. 1993 Acres Report (Excerpts)

APPENDIX C – PHOTOGRAPHS

UTAH DAM
CITY OF FLINT
GENESEE COUNTY, MICHIGAN

1.0 Purpose and Authority

The purpose of the report is to present a summary of findings for the field inspection of the Utah Dam completed by Stantec Consulting Michigan Inc. (Stantec) on October 19, 2008 pursuant to the requirements of Part 315, Dam Safety, of the Natural Resources and Environmental Protection Act, 1994 P.A. 451, Section 31518.

This dam inspection Report and associated inspection activities were commissioned by the City of Flint, Michigan, the dam owner. The Utah Dam is registered with the Michigan Department of Environmental Quality (MDEQ) as Dam Number 11275.

References in the report to "left" and "right" are based on the observer facing downstream.

UTAH DAM
CITY OF FLINT
GENESEE COUNTY, MICHIGAN

2.0 Conclusions and Recommendations

The Utah Dam was inspected on October 19, 2008 in accordance with Michigan P.A. 451, Part 315 criteria. The dam was found to be in fair to poor condition. A summary of comments/recommendations is as follows:

1. The stability of the exposed portion of the structure is poor and is no longer capable of serving its intended purpose.

2. The operating components of the facility (floodgates) have been decommissioned for sometime and are no longer functional.

3. The purpose of the dam (impound water for the upstream water treatment plant) is no longer needed as the Hamilton Dam, which is located downstream, provides this capability.

4. The Hamilton Dam is currently being evaluated for potential reconstruction and should the decision be made to proceed with that project the Utah Dam will serve no useful future function.

5. The spillway hydraulic capacity is deficient with regard to P.A. 451, Part 315, Section 324.31516 rules. This is further exacerbated by the fact that the partially open gates impede high flows resulting in an increased backwater.

6. The City should consider full or partial removal of the dam. It is possible that the foundation and submerged portion of the piers may be reused to support a new pedestrian crossing bridge. The minimum removal effort would consist of removing the gates from the dam. Due to the aforementioned deficiencies and related public safety liabilities the City should take immediate action perhaps concurrent with the proposed Hamilton Dam reconstruction.

UTAH DAM
CITY OF FLINT
GENESEE COUNTY, MICHIGAN

3.0 Project Information

Utah Dam is located on the Flint River in the City of Flint, Genesee County, Michigan (T08N, R07E, Section 32) at the south end of Whaley Park. The site location map is shown in **Appendix A.**

Utah Dam is owned by the City of Flint and plans for the dam are on file with the City. It was designed by the Ambursen Dam Company of New York and San Francisco and built around 1928. The dam was constructed to maintain a reservoir at El. 711 to provide sufficient head on the City's water treatment plant intake pipe. The pool created by the dam was limited to the main channel of the Flint River. The dam was built between the two banks of the river and has a total length of 240 ft. It consists of a concrete gravity structure with six spillway bays and 4 ft wide piers. Each bay has a 12 ft high by 25 ft long vertical lift gate.

There are two bridge decks on the structure. The upper deck is approximately 11 ft wide and it is used to move the gate hoist along the length of the dam. The gate hoist travels the length of the dam on two No. 40 rails, each of which is supported by 15 inch "I' beams. The beams are supported by the piers.

The lower bridge deck is separated by the vertical lift gates. The downstream side of the deck is 7 ft wide and it serves as a pedestrian walkway. The upstream side of the deck is 5 ft wide and it is used by the operator to gain access to the upper deck via a steel ladder.

Presently, the dam serves as a walkway over the Flint River and as a backup for Hamilton dam for providing a head on the water intake pipe. The gates of Utah Dam are currently locked open above the normal backwater elevation created by Hamilton Dam, which is 2.2 miles downstream. Elevations given in this report are referenced to National Geodetic Vertical Datum.

Six spillway bays and vertical lift gates are contained within the structure. Pertinent data about Utah Dam is give below.

Height of Dam – The total height of the dam, defined in P.A. 451, Part 315 as the difference in elevation between the natural stream bed (El. 696.8 ft) and the design flood elevation (El. 717.2 ft) is approximately 20.4 ft.

Crest Width of Structure – 30 ft as measured along the lower deck.

Sill of Vertical Lift Gates – El. 697.3 ft.

Sketches of the dam are included in **Appendix A.**

UTAH DAM
CITY OF FLINT
GENESEE COUNTY, MICHIGAN

4.0 Field Inspection

An inspection of the facilities was performed by Dana M. Dougherty, P.E. (Stantec) on October 19, 2008. The weather on the date of inspection was clear with temperature at approximately 55°F. The impoundment elevation was approximately 1.9 ft below normal elevation. The City was in the process of lowering the Hamilton Dam impoundment per directive from the MDEQ. This directive requires that the Hamilton Dam impoundment be lowered 3.25 ft.

The following items were noted (Reference photographs can be found in **Appendix C**):

1. The concrete condition on the downstream face of the dam is fair to poor. The right downstream retaining wall shows significant spalling in its top and outside corner. The left downstream retaining wall has significant spalling and cracking. The pier noses (three of five) are spalled. The access platform or walkway or the dam, concrete is in fair to poor condition. There is effervescence and cracking in the access platform support beams. There is no displacement. (Ref. Photos #1 and #5.)

2. The concrete condition of the upstream dam face is fair to poor. The noses of all piers show effervescence and some alligator cracking. This is also true for the right and left upstream retaining walls. There does not appear to be any substantial structural cracking in any of these members or displacement. There is spalling of concrete at the top of the piers as well as at the top of the abutment walls where the access platform rests. There is also some indication of spalling in the access platform beams and in some cases at the bottom of the beams themselves (Ref. Photos #2 and #6).

3. The gates are randomly open. The left gate, Bay No. 1, is 2 feet above the water level on this date. Bay No. 2 and No. 3 from the left, are 4 feet above water level on this date and Bay No. 4, 5, and 6 are 6.5 feet above water level. All dimensions reference water level to the bottom of the gate.

4. The superstructure appears to be in very poor condition. Concrete is in fair to poor condition. The operating platform, which housed a single moveable gantry crane for all six gates, has spalling in the beams as well as the piers. Protective railings are all intact, but in poor condition and require painting (Ref. Photos #7 and #8).

5. The top of the right embankment has a paved walkway with chain link fence on either side of the walkway. This is also true for the left embankment. There is also lighting at the site, utility poles in each embankment with a light fixture (Ref. Photos #3 and #4).

6. The embankments have some tree growth which should be removed.

7. On the date of the inspection, the water level is about 10.6 feet below the operating/walkway platform (El. 706.6 NGVD).

8. There is a 4 foot wide opening in the fence on the left downstream face of the dam, next to the utility pole, which allows access and is a safety issue. Also, the safety fencing that was installed on the upstream side of the dam, between the walkway and the gates, has been removed and is a safety issue.

UTAH DAM
CITY OF FLINT
GENESEE COUNTY, MICHIGAN

5.0 Structural Stability

The assessment of stability is based on visual observations made during our field inspection (10/10/08).

The overall structural condition of the Utah Dam is categorized to be fair to poor. Substantial deteriorated concrete is evident with numerous spalls, cracks, and some exposed reinforcing steel. The superstructure concrete is in the poorest condition with the gate lift support structure no longer capable of supporting its intended function i.e. gate operation.

The condition of the access platforms and exposed portions of the piers is somewhat better than the superstructure but still would be categorized as poor. The submerged portion of the peirs and foundation were not inspected as part of this report, however experience with similar structures would imply that their condition would be better than the exposed components.

In conclusion, the Utah Dam structural stability will no longer support gate operation. Furthermore, continued use of the access platforms for pedestrian crossing will be dependent on future evaluation, repair and/or modification of those components.

UTAH DAM
CITY OF FLINT
GENESEE COUNTY, MICHIGAN

6.0 Hydrology and Hydraulics

The MDEQ has established the required spillway capacity at the Utah Dam to be 11,800 cfs (reference **Appendix B**). This equates to the 100 year frequency flood which is mandated by statute, P.A. 451, Part 315, Section 324.31516, for dams classified as low hazard such as the Utah Dam.

The hydraulic capacity of the Utah Dam is greatly impacted by the downstream Hamilton Dam. The normal impoundment elevation of the Hamilton Dam impoundment is approximately El. 708.0 (NGVD) while the gate sill elevation of the Utah Dam is 697.3. Thus, the Utah Dam is partially submerged under normal conditions.

Overtopping of the right embankment occurs at or near El. 714.0. The 1993 Acres Report (**Appendix B**) indicates that overtopping of this embankment will be experienced at flows over 7,830 cfs. The FEMA Flood Insurance Study (**Appendix B**) shows the 100 year flood elevation at the Utah Dam to be approximately El. 716.0. Thus the right embankment is overtopped under high flow conditions due to backwater impacts from the Hamilton Dam. It should be noted that the FEMA Flood Insurance Study assumes that all six gates are operable at Hamilton Dam. Since 1991 only three gates have been operable thus the backwater impact would be greater than shown on the FEMA maps.

The Utah Dam's hydraulic capacity is further diminished by the fact that the floodgates are currently locked in a partially open position. The bottom of gate elevation for each bay (numbered left to right locking downstream) is approximately:

Bay No. 1	708.5
Bays No. 2 and 3	710.5
Bays No. 4 through 6	713.0

Under high flows (100 year El. 716.0) the gates will impede flow thereby further exacerbating flood conditions.

For the above described reasons, it is concluded that the Utah Dam does not meet spillway capacity requirements as required by statute.

UTAH DAM
CITY OF FLINT
GENESEE COUNTY, MICHIGAN

7.0 Operation and Maintenance

The Utah Dam is operated and maintained by staff from the City of Flint Water Treatment Plant. The floodgates are currently non-functional and are locked in a partially open position. Power has been disconnected from the gate operators. The impoundment elevation is maintained by the downstream Hamilton Dam thereby negating the usefulness of the Utah Dam.

The City staff therefore maintains a minimal surveillance effort at the dam. Minimal preventative maintenance has been performed in the recent past. It is the City's intent to remove all or a portion of the structure as funds become available. Until that time maintenance will be limited to those items necessary to insure public safety with regard to the pedestrian bridge crossing.

Appendix 7 - 2008 Hamilton Dam Safety Report

MICHIGAN PUBLIC ACT 451, PART 315
INSPECTION REPORT
HAMILTON DAM
GENESEE COUNTY, MICHIGAN
INVENTORY NUMBER 060 – HIGH HAZARD

FOR

CITY OF FLINT
WATER TREATMENT PLANT
4500 N. DORT HIGHWAY
FLINT, MICHIGAN 48505
ATTN: MR BRENT WRIGHT
(810) 787-6537

BY
Stantec Consulting Michigan Inc.
Engineers – Planners – Surveyors
3959 Research Park Drive
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(734) 761-1010

INSPECTOR(S): Dana M. Dougherty – Stantec Consulting Michigan Inc.

DATE OF INSPECTION: October 19, 2008

PROFESSIONAL ENGINEER: Dana M. Dougherty, PE
STANTEC CONSULTING MICHIGAN INC.
3959 RESEARCH PARK DRIVE
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Dana M. Dougherty, PE #24737

Stantec

INSPECTION REPORT
HAMILTON DAM
CITY OF FLINT
GENESEE COUNTY, MICHIGAN

Table of Contents

1.0 PURPOSE AND AUTHORITY 1.1

2.0 CONCLUSIONS AND RECOMMENDATIONS 2.1

3.0 PROJECT INFORMATION 3.1

4.0 FIELD INSPECTION 4.1

5.0 STRUCTURAL STABILITY 5.1

6.0 HYDROLOGY AND HYDRAULICS 6.1

7.0 OPERATION AND MAINTENANCE 7.1

LIST OF APPENDICES

Appendix A – Background Information

1. Location Map
2. Project Information (1978 USACE Report)
3. Project Drawings

Appendix B – Hydrology/Hydraulics

1. MDEQ Flood Discharge Data
2. FEMA – FIS Information
3. Acres International (1993) Headwater Rating Curve
4. USACE (1981) Spillway Rating Curves
5. Stantec (2008) Headwater Curve Computations

Appendix C – Photographs

Appendix D – Emerency Action Plan Notification List

Stantec
INSPECTION REPORT
HAMILTON DAM
CITY OF FLINT
GENESEE COUNTY, MICHIGAN

1.0 PURPOSE AND AUTHORITY

The purpose of this report is to present a summary of findings for the field inspection of the Hamilton Dam completed by Stantec Consulting Michigan Inc. on October 19, 2008 pursuant to the requirements of Part 315, Dam Safety, of the Natural Resources and Environmental Protection Act, 1994 P.A. 451, Section 31518.

This Dam Inspection Report and associated inspection activities were commissioned by the City of Flint, the dam owner. The Hamilton Dam is registered with the Michigan Department of Environmental Quality (MDEQ) as Dam Number 060.

References in this report to "left" and "right" are based on the observer facing downstream.

2.0 CONCLUSIONS AND RECOMMENDATIONS

The Hamilton Dam was inspected on October 19, 2008 in accordance with the Michigan P.A. 415, Part 315 criteria. The dam was found to be in poor condition which supports the conclusion found in previous dam safety reports. Specific comments/recommendations are as follows:

1. The stability of the exposed structural components including gate piers, access and operating platforms, and abutments is poor. These components are no longer capable of serving their intended purpose.

2. Three of the floodgates have been decommissioned while the reliability of the remaining gates is suspect. With three gates operating inadequate freeboard exists at the right embankment (looking downstream). In addition upstream flood elevations will be greater than those included in the FMEA Flood Insurance maps.

3. The MDEQ mandated drawdown should be adhered to until the dam is reconstructed.

4. The City should proceed immediately to implement the preferred option from the 2008 Reconstruction Feasibility Study.

5. In the interim, the City should exercise the Emergency Action Plan (EAP) annually to insure an efficient implementation when and if needed.

3.0 PROJECT INFORMATION

Hamilton Dam is located on the Flint River in downtown Flint, Michigan near the Flint Branch of the University of Michigan campus, and approximately 800 ft. upstream from the Saginaw Street Bridge.

Plans for the current dam are on file with the City of Flint, but original design data is not available. The dam was designed by Fargo Engineering Company of Jackson, Michigan, and was constructed about 1920 by Price Brothers Company of Lansing, Michigan on the site of a previous mill dam. The dam was constructed to sustain a head for the upstream water treatment plant intake.

The existing structure is a reinforced concrete gravity dam with six gated spillway bays. Each bay has a tainter gate on the fixed crest of a concrete spillway. The six bays, each 33 ft. long, and the five piers, each four feet thick, make a total length of 218 ft. There is an end sill below the spillway and an 18 ft. concrete apron beyond the end sill. The gates are operated during flood flows.

The original 1920 dam had seven bays with tainter gates. In 1964, the southern (left) most gate, its spillway and headrace were removed.

A fish ladder was constructed through the right abutment sidewalls in 1978. Also in 1978, the right concrete abutment was modified to install an Archimedean screw pump.

Repairs to Hamilton Dam were carried out in the summer of 1992. Steel sheet piling was placed just upstream of the gates for Bays 1, 2 and 6 because of the deteriorated condition of the gates. The sheet piles were to maintain the headpond in case of gate failure. The top elevation of the sheet piles was placed near the top of the tainter gates (Elev. 707.8 ft.) in a closed position. Gate repairs were completed in Bays 3, 4, and 5. These repairs included the complete removal of the existing gates and replacement with new gates, repair of buttress and sill concrete, repair of gate trunnions, replacement of lift chains, and painting of all exposed gate steel.

The top deck of the structure is divided lengthwise into a pedestrian walkway and the gate hoist rails for the two gate hoists. The hoist rails consist of two "I" beams (18 inch and 15 inch) that are supported by the piers. The two hoists for raising the spillway tainter gates are driven by attached electric motors.

A U.S. Army Corps of Engineer's bronze disk is set flush with the bridge deck in the walkway at the second pier from the right end. Unless otherwise noted, data given in this report is based on the assumption that the E1 715.06 ft. elevation given for this benchmark is on National Geodetic Vertical Datum (NGVD).

The terrain near the dam and reservoir is urban and gently rolling. Five borings from the original plans show sand with an occasional pocket of clay or gravel in the soils overlying a soft sandstone which is 40 or 50 ft. below ground surface.

Six spillway bays and tainter gates make up the structure. Only Gates 3, 4 and 5 are currently operable. Sketches and pertinent data about Hamilton Dam are shown in **Appendix A**.

Hamilton Dam was classified by the U.S. Army Corp of Engineers as High Hazard in the 1980 Phase I Inspection Report. This classification remains in effect to date.

Plans for the original Dam construction in 1920 and plans for repairs performed in 1992 are on file with the City of Flint. Past inspection reports on file include the following:

- 1980 USACE, Phase I, National Dam Safety Program Report
- 1986 Ayres, Lewis, Norris & May, Inc. (ALNM) and Sublakes Diving Inspection Report
- 1988 MDNR Inspection Report
- 1989 Ayres, Lewis, Norris & May, Inc. (ALNM) Structural Evaluation and Reconstruction of Hamilton Dam Report
- 1993 Acres International Corp., Dam Inspection Report
- 1996 Ayres, Lewis, Norris & May, Inc. (ALNM) Inspection Report
- 1999 Paul C. Rizzo Associates, Inc. Dam Inspection Report
- 2000 USACE Hamilton Dam Condition Survey
- 2005 Soil & Materials Engineers, Inc. Dam Inspection Report
- 2008 Stantec Feasibility Study for Reconstruction

These reports have been consistent in their recommendations to undertake corrective action to address structural deficiencies within the facility. The 1989 Ayres, Lewis, Norris & May, Inc. (ALNM) and 2000 USACE Reports included estimated costs of $3,830,000 and $5,588,000 respectively to make the necessary improvements to insure dam safety and integrity. The 2008 Stantec Report estimated the reconstruction cost to be $4,901,000.

On March 14, 2008, acting under the authority of Part 315, Dam Safety of the Natural Resources and Environmental Protection Act, 1994 P.A. 451 as amended, the Michigan

Stantec

INSPECTION REPORT
HAMILTON DAM
CITY OF FLINT
GENESEE COUNTY, MICHIGAN
PROJECT INFORMATION
December 2008

Department of Environmental Quality issued an order to the City of Flint to drawdown the Hamilton impoundment 3.25 ft. to an elevation not greater than 705.25 NGVD for the purpose of public health, welfare and safety protection. The depth of necessary drawdown was computed by the MDEQ to eliminate the danger of loss of life downstream in the event of a sudden dam failure.

A permit under Part 301, Inland Lakes and Streams was issued for this activity on September 30, 2008. The City of Flint has subsequently abided by the conditions of this permit and has lowered the normal impoundment elevation to the prescribed elevation. It should also be noted that the MDEQ permit requires permanent deflation of the Obermeyer (Inflatable) Dam.

4.0 FIELD INSPECTION

An inspection of the facilities was performed on October 19, 2008 by Dana M. Dougherty, PE. The weather on the date of the inspection was clear with temperatures at approximately 55°F. The impoundment elevation was below normal by approximately 1.5 ft. The City was in the process of lowering the impoundment per directive from the MDEQ. This directive requires that the impoundment be lowered 3.25 ft. The floodgate in Bay #3 has been opened to accomplish this task.

The following items were noted during the field inspection (referenced photographs can be found in **Appendix C**):

1. The condition of the exposed concrete including piers, slabs, abutments is poor with numerous spalls, cracks and exposed reinforcing steel (Ref. Photos #1 through #4, #7, #8, #10).

2. The floodgates in Bays 1, 2 and 6 have been decommissioned by placement of steel sheeting across the face of these bays (Ref. Photos #2 and #8).

3. The City reports that the remaining floodgates (Bays 3 through 5) are operative, however, Bays 4 and 5 have not been operated with any frequency and thus their reliability is suspect.

4. The access walkway/platform remains closed to the public due to safety concerns (Ref. Photos #3 and #4).

5. Overall the condition of the dam continues to worsen with the structural integrity of numerous components compromised.

5.0 STRUCTURAL STABILITY

The assessment of stability is based on a visual observation made during our field inspection (10/19/08) and visual observations made during preparation of the 2008 Reconstruction Feasibility Study, as well as the 1989 condition survey (concrete corings).

The overall structural condition of the Hamilton Dam is poor. Exposed surfaces including gate piers, access and operating platforms and abutments all exhibit conditions that indicate these components have exceeded their useful life. Numerous spalls, cracks and exposed reinforcing steel exist.

In conclusion, the Hamilton Dam structural stability is deficient and thus this facility represents a potential liability with regard to public health, welfare and safety.

6.0 HYDROLOGY AND HYDRAULICS

The dam is regulated under State of Michigan P.A. 451 Part 315 statute. Guidelines that accompany this statute require high hazard potential dams with heights less than 40 ft. to be capable of passing a 200-year flood or the flood of record whichever is greater. For the Hamilton Dam, the 200-year flood controls and has been computed by the Michigan Department of Environmental Quality to be 13,000 cfs (reference **Appendix B**).

The computed maximum impoundment elevation for the 200-year flood event varies dependent on assumptions made with regard to the number of floodgates that are operative. In 1981, calculations were performed by the United States Geologic Survey and form the basis for the FEMA Flood Insurance mapping that is used to this day. The USGS assumed that all six floodgates were operational. The USACE also computed the maximum impoundment elevation in their 1981 National Dam Safety Inspection Report. They assumed that just two gates were operational due to the fact that the gates could not be locked in an open position and only two operators existed. In 1993 after decommissioning of Gates 1, 2 and 6, Acres International Corporation computed the maximum headwater elevation assuming that gates were operational in Bays 3, 4 and 5.

The results of these various studies is as follows (refer to **Appendix B** for more information):

Source	Estimated 200-year Impoundment Elevation NGVD Datum
1981 F.I.S. (U.S.G.S.)	709.05*
1981 Dam Safety Inspection Report (USACE)	711.6
1993 Dam Safety Inspection Report (ACRES)	712.8

** USGS added 0.95' to the computed impoundment elevation for the purpose of floodplain mapping. Therefore the floodplain mapping indicates a 200-year flood elevation of approximately 710.0 NGVD.*

It should be noted that there is uncertainty as to whether or not adequate freeboard exists at this site. The Acres report indicates that freeboard is sufficient based on the fact that the upstream right streambank area was raised in the mid 1980's. However, a recent survey conducted as part of the 2008 Reconstruction Feasibility Study indicates the elevation of this area to be similar to that shown in the 1981 USACE report i.e. ± 711.5 NGVD. Thus, it would appear that inadequate freeboard currently exists.

7.0 OPERATION AND MAINTENANCE

The Hamilton Dam is operated and maintained by staff from the City of Flint Water Treatment Plant. Floodgates in Bays 1, 2 and 6 are currently non-functional. Floodgates in the remaining bays can be operated, however their reliability is diminished due to the deteriorated condition of the operating slab.

City staff maintains the impoundment elevation by operating the gates on an as needed basis. The impoundment is currently being maintained at the MDEQ mandated level of 705.25 NGVD i.e. 3.25 ft below normal.

The City has performed minimal maintenance to the structure in anticipation of reconstruction.

Appendix 8 - Cost of Service Study – Flint Water Treatment Plant

DRAFT

Technical Memorandum
Cost of Service Study
Flint Water Treatment Plant

I. Introduction

This Technical Memorandum describes the proposed improvements needed at the Flint Water Plant to treat Flint River water on a continuous basis. The primary foundations for this evaluation were the "Water Treatment Plant Rehabilitation – Phase II" report dated December 2003 and the "Preliminary Engineering Report, Lake Huron Water Supply, Karegnondi Water Authority" dated September 2009. The findings, as presented in the following sections, address the improvements required for the water plant to produce finished water in conformance with the current federal and state drinking water regulations. In addition, operation and maintenance costs for continuous operation have been evaluated and included in order to determine the total cost associated with using the Flint River as a source of water.

Improvements, as proposed in this evaluation, along with those previously made during the Phase I improvements program, will produce a finished water quality equal to the current water quality as received from the DWSD. The design parameters are as follows:

1) Minimum Day Demand – 10-mgd
   Average Day Demand – 15-mgd (14-mgd in 2010 increasing to 15-mgd in 2050)
   Maximum Day Demand – 28-mgd

2) Turbidity – 0.20 NTU

3) Hardness – 80 to 100 mg/l as $CaCO_3$

4) Cryptosporidium – 3-Log Inactivation

5) Giardia – >3-Log Inactivation

6) Viruses – >4-Log Inactivation

7) Taste and Odor – Eliminated with pre-ozonation

8) Trihalomethanes – Less than 80 µg/l

9) HAA5 – Less than 60 µg/l

As part of this investigation, an inspection of the Flint Water Plant was performed on May 3, 2011. The purpose of this inspection was to determine if the recommendations in the Phase II report, as referenced above, needed to be revised due to changed conditions or water supply needs. Based on findings from this meeting, the major adjustment to be made is the reduction of average day demand from 20-mgd to 14-mgd and maximum day demand being reduced from 36-mgd to 28-mgd. Required improvements as recommended in this study have taken these new demands into account. The conceptual design of these new facilities would allow cost effective expansion to 36-mgd, as needed, to meet future demands.

II. Required Capital Improvements

The following describes the required improvements as required for the Flint Water Plant to operate on a continual basis using the Flint River as a water source. Most of these improvements are more fully described in the Phase II report and are not repeated to avoid duplicative effort.

A. Lime Sludge Disposal

Lime sludge is proposed to be pumped from the east and west softening basins to two new 42-ft diameter thickeners (25-ft SWD) located adjacent to the plate settling building. Decant from the thickener will flow by gravity to the primary clarifier influent channel. Thickened sludge (12% solids) will be pumped to a new plate-and-frame filter press located at the north end of the WTP 1 primary settling basin. A new two-story building would be constructed at that location to house the pumping facilities and presses. Each press, located on the second floor, will have a 225-cf per hour capacity and will drop the dewatered sludge into a first floor bunker area. The dewatered cake will be transferred to a lime storage concrete bunker located approximately 60 feet north of the sludge press building. The storage bunker (100-ft x 192-ft) will have the capacity to store three to four months of dewatered lime sludge cake. About every three months, contract haulers will remove the lime sludge and place on agricultural lands that are permitted for final disposal.

The capacities of these facilities are based on average day flow of 15-mgd, maximum day demand of 28-mgd and water quality softening requirements. Based on raw water quality data provided by the City of Flint, a lime dosage of 209 mg/l, soda ash dosage of 47 mg/l and carbon dioxide dosage of 37 mg/l were used to estimate lime sludge quantities and flows.

Opinion of Probable Cost:

Site and Access:			
Site Demolition	$ 129,000		
Roadway Improvements	$ 385,000		
Partial Settling Basin Demolition	$ 129,000		
On-site Truck Scale	$ 257,000		
	Subtotal Construction:	$ 900,000	
	Construction Contingencies (15%):	$ 135,000	
	Design Contingencies (5%):	$ 45,000	
	Engineering, Legal, Bonds & Administration (17%):	$ 153,000	
		Opinion of Probable Cost:	**$ 1,233,000**

Thickener Basins - 42 ft Diameter:			
Two Thickener Mechanisms	$ 310,000		
Two Concrete Basins (25 ft SWD)	$ 513,000		
Two Geodesic Dome Covers	$ 180,000		
Install Equipment	$ 257,000		
Site Work	$ 97,000		
Utilities, Piping and Process	$ 193,000		
	Subtotal Construction:	$ 1,550,000	
	Construction Contingencies (15%):	$ 232,500	
	Design Contingencies (5%):	$ 77,500	
	Engineering, Legal, Bonds & Administration (17%):	$ 263,500	
		Opinion of Probable Cost:	**$ 2,124,000**

Filter Presses and Building:			
Two-225 cf Plate & Frame Press	$	1,650,000	
Building (70 ft x 60 ft)	$	3,331,000	
MEP	$	1,089,000	
Site Utilities	$	129,000	
Subtotal Construction:			$ 6,199,000
Construction Contingencies (15%):			$ 929,850
Design Contingencies (5%):			$ 309,950
Engineering, Legal, Bonds & Administration (17%):			$ 1,053,830
Opinion of Probable Cost:			**$ 8,493,000**

Lime Storage Bunker and Site Work:			
12 ft Concrete Walls and Slab	$	833,000	
Frame and Fabric Building Cover	$	325,000	
Site Improvements	$	385,000	
Front End Loader (5 cyd)	$	308,000	
Site Utilities	$	513,000	
Subtotal Construction:			$ 2,364,000
Construction Contingencies (15%):			$ 354,600
Design Contingencies (5%):			$ 118,200
Engineering, Legal, Bonds & Administration (17%):			$ 401,880
Opinion of Probable Cost:			**$ 3,239,000**

Total for Lime Disposal : $ 15,089,000

B. Soda Ash Feed System

In order to remove the non-carbonate hardness, soda ash will be needed to meet the finished water hardness concentrations. Two new 800 #/hour feeders will be needed to meet the dosage requirements. Each of these feeders will be connected to the existing silos.

Opinion of Probable Cost:

Demolition of Existing Feeders	$	20,000	
Two 800 #/hr Feeders	$	112,000	
MEP	$	109,000	
Chemical	$	77,000	
New Pneumatic Fill System	$	58,000	
Subtotal Construction:			$ 376,000
Construction Contingencies (15%):			$ 56,400
Design Contingencies (5%):			$ 18,800
Engineering, Legal, Bonds & Administration (17%):			$ 63,920
Opinion of Probable Cost:			**$ 516,000**

C. Additional Chemical Storage

During the Phase I improvements, the MDEQ did not mandate 30-day chemical bulk storage requirements since the plant was a redundant water supply to the DWSD. However, if the facility becomes a continuously operated treatment plant, then additional chemical storage must be added to meet the minimum storage volume requirements. To comply with the regulations, new oxygen, nitrogen and carbon dioxide storage facilities must be provided as follows.

Liquid Carbon Dioxide:
- Capacity – 34 tons
- Vaporizer – 750 #/hour @ 300 psig
- Piping – Schedule 80 Carbon Steel and Schedule 40 - 304L Stainless Steel

Liquid Oxygen
- Capacity – 9000 gallons
- Operating pressure – 75 psi
- Feed Rate – 175 scfm
- Piping – Type K Copper

Liquid Nitrogen
- Capacity – 540 gallons
- Operating pressure – 100 psi
- Feed Rate – 1 scfm
- Piping – Type K Copper

Opinion of Probable Cost:

Carbon Dioxide Storage Facilities	$	328,000	
MEP	$	103,000	
Oxygen & Nitrogen Storage Facilities	$	961,000	
MEP	$	109,000	
	Subtotal Construction:	$	1,501,000
	Construction Contingencies (15%):	$	225,150
	Design Contingencies (5%):	$	75,050
	Engineering, Legal, Bonds & Administration (17%):	$	255,170
	Opinion of Probable Cost:	**$**	**2,057,000**

D. Electrical and SCADA Improvements

Section 9, relating to power and controls, of the Phase II study was prepared by Dmytryka Jacobs Engineers (DJE). The scope of the Phase II work did not include detailed investigations of the water plant site-wide power distribution nor the secondary power distribution within each of the facility structures. However, a number of observations and basic recommendations were presented in Section 9 by DJE.

The Flint Water Plant currently uses 2400V as primary power throughout the facility. All of the power feeders in the plant site are 5kV rated and it appears the existing switchgear is also rated at 5kV. Most of the major electrical improvements installed during Phase I were dual voltage (2400/4160) equipment in anticipation of the plant power being changed to 4160V in the near future. This change would allow the existing network of power feeders to handle approximately twice the power and would eliminate running new feeders to various portions of the plant.

The current sub-station has two 2.5MVA transformers running in parallel for a total capacity 5 MVA. These old transformers are not equipped with cooling fans. The full connected load to these transformers is estimated to be 6.97 MVA while the estimated power load at 36 MGD is 4.22MVA. Based on these estimates there is sufficient power for the plant with both sub-station transformers in service. Even though the transformers are owned by Consumers Energy, it could take weeks to replace one of these main transformers in the event of a unit failure, which will result in reduced treatment and pumping capacity. The sub-station switchgear was installed in 1960 and is antiquated and difficult to maintain.

The two existing Fairbanks Morse generators are currently inoperable and would cost approximately $1M to rehabilitate. The DJE team recommended installing two new emergency generators in lieu of re-building the existing units.

Section 9 of the Phase II report provides sufficient detail for the purposes of this report, but a detailed electric system evaluation of the entire plant should be performed prior to any major improvements to this facility.

While LAN did not perform a detailed review of the WTP electrical system during our site visit, it appears that all of the DJE findings are still pertinent. We, therefore, concur with the improvements as recommended by DJE in the Phase I report.

Opinion of Probable Cost:

Substation Upgrade	$ 961,000	
Standby Power Generation	$ 2,242,000	
Pump Station No. 4 Upgrade	$ 1,365,000	
Filter Press Building Feeder	$ 87,000	
WTP SCADA, Equipment & Programming	$ 720,000	
Telemetry System Equipment & Programming	$ 103,000	
Computers, Software & Training	$ 155,000	
Filter Transfer PS Power Feeders	$ 135,000	
Emergency PS Power Feeders	$ 145,000	
Subtotal Construction:		$ 5,913,000
Construction Contingencies (15%):		$ 886,950
Design Contingencies (5%):		$ 295,650
Engineering, Legal, Bonds & Administration (17%):		$ 1,005,210
Opinion of Probable Cost:		**$ 8,101,000**

E. Post-Chlorination and Zebra Mussel Control

The previous report recommended changing the disinfection system from gaseous chlorine to sodium hypochlorite due to the potential for hazardous gas release and the requirements imposed by new federal regulations. Previous treatability studies have not addressed the potential impact of re-growth in the system due to ozonation by-products. These impacts should be addressed prior to proceeding with final plans for using river water.

The Flint River is known to be infested with Zebra mussels and mitigation measures will have to be implemented if the plant is placed into continuous operation. A sodium permanganate feed system is proposed to address these concerns.

Opinion of Probable Cost:

Demolition of Existing Equipment	$ 39,000		
Storage Tanks	$ 9,000		
Metering Pumps and Tables	$ 11,000		
Piping, Valves & Tables	$ 9,000		
Containment	$ 59,000		
Installation	$ 108,000		
	Subtotal Construction:	$	235,000
	Construction Contingencies (15%):	$	35,250
	Design Contingencies (5%):	$	11,750
	Engineering, Legal, Bonds & Administration (17%):	$	39,950
	Opinion of Probable Cost:	**$**	**322,000**

F. Security Issues

For water plant security issues, please refer to City of Flint Vulnerability Assessment. Details are omitted in this report due to confidentiality.

Not available at the time of the previous report, a source water monitoring system is included in the study due to recent advancements in technology. The proposed system design is based on Hach Model SC1000, equipped with UVAS, NH4D, pH, ORP, turbidity and DO probes.

Opinion of Probable Cost:

Security Improvements	$ 145,000		
Source Water Monitoring System	$ 95,000		
	Subtotal Construction:	$	240,000
	Construction Contingencies (15%):	$	36,000
	Design Contingencies (5%):	$	12,000
	Engineering, Legal, Bonds & Administration (17%):	$	40,800
	Opinion of Probable Cost:	**$**	**329,000**

G. PS No. 4 - Low and High Service Pumps

Section 7 of the Phase II report included recommendations to replace two of the low lift pumps and two of the high lift pumps along with various other improvements. During the site visit, it was apparent the condition of this facility has continued to deteriorate. Furthermore, with the reduction in water system demands, the various pump capacities are no longer properly sized to efficiently meet the new plant flow ranges. The pumps and motors are oversized and are operating outside their best efficiency ranges and should be replaced due to age, condition and cost to operate.

Additionally, some of these pumps cannot be operated due to excessive vibrations in the shaft and steady bearings. Existing vibration monitors are functioning as designed and are shutting the power off to the motors to avoid damage.

For low lift service, it is proposed to install two 10-mgd and two 15-mgd (nominal ratings) vertically mounted pumps equipped with low voltage inverter duty motors. The motors would be powered by low

voltage variable frequency drives. This will provide a firm rated capacity of approximately 35-mgd in low lift capacity.

For high lift service, it is proposed to install one 10-mgd, two 15-mgd and one 20-mgd (nominal ratings) pumps equipped with medium voltage inverter duty motors. These motors will be power by medium voltage variable frequency drives. This combination of pumps will provide a firm rated capacity of 40-mgd.

Opinion of Probable Cost:

Demolition of Existing Equipment	$	135,000	
Install Two (2) 10 MGD @ 40 ft of TDH Vertically Mounted Pumps with 125 HP, 480 V Inverter Duty Motor with 20 ft of Shaft & Steady Bearings	$	473,000	
Install Two (2) 15 MGD @ 40 ft of TDH Vertically Mounted Pumps with 150 HP, 480 V Inverter Duty Motor with 20 ft of Shaft & Steady Bearings	$	495,000	
Install One (1) 10 MGD @ 190 ft of TDH Vertically Mounted Pump with 450 HP, 4160 V Inverter Duty Motor with 20 ft of Shaft & Steady Bearings	$	245,000	
Install Two (2) 15 MGD @ 190 ft of TDH Vertically Mounted Pumps with 700 HP, 4160 V Inverter Duty Motor with 20 ft of Shaft & Steady Bearings	$	520,000	
Install One (1) 20 MGD @ 190 ft of TDH Vertically Mounted Pump with 800 HP, 4160 V Inverter Duty Motor with 20 ft of Shaft & Steady Bearings	$	285,000	
Piping, Valves, Supports & Bearings	$	480,000	
Intermediate Platforms, Ladders & Stairs	$	360,000	
Ventilation & Boiler Systems	$	340,000	
Install Three (3) Low Voltage VFD Units	$	85,000	
Install Four (4) Medium Voltage VFD Units	$	2,250,000	
Subtotal Construction:	$		5,668,000
Construction Contingencies (15%):	$		850,200
Design Contingencies (5%):	$		283,400
Engineering, Legal, Bonds & Administration (17%):	$		963,560
Opinion of Probable Cost:	**$**		**7,766,000**

H. Filter Transfer Station to Dort Reservoir and UV Inactivation

Under the requirements as outlined in the USEPA drinking water regulations addressing potential microbial contaminants, additional treatment technologies and enhancement of existing processes must be implemented to comply with these regulations.

As required under the enhanced surface water treatment rules, it is essential for water utilities to address giardia, cryptosporidium, viruses and bacteria in finished water. The level of treatment is dependent on

the source water classification. The City of Flint will need to perform a two-year source water study to determine the bin placement for the Flint River. For the purposes of this report, a Bin 4 placement was selected due to the nature of the watershed and, therefore, it is assumed enhanced Ct and UV inactivation will be required.

Reservoir No. 3 does not provide sufficient Ct to meet the current regulations, therefore, Dort Reservoir will need to be placed into the process train. Since Dort Reservoir does not match the hydraulic profile of the plant, an intermediate pump station will be required. This new facility will also include a UV inactivation system to comply with the enhanced water quality regulations.

This proposed facility, located west of the filters and south of Dort Reservoir, will house three 14-mgd (nominal rating) variable speed pumps with inverter duty, low voltage motors for a firm rated capacity of 28-mgd. Housed in a separate part of this same structure will be the UV system that will be equipped with three 12" medium pressure units with a rated capacity of 28-mgd.

Opinion of Probable Cost:

Site Work & Utilities	$ 77,000	
Building (80 ft x 60 ft)	$ 1,440,000	
Three (3) 14 MGD @ 40 ft of TDH, Vertically Mounted Pumps with 150 HP, 480 V Inverter Duty Motor	$ 535,000	
MEP	$ 940,000	
Valves and Controls	$ 205,000	
Install Three (3) 12" MP UV Units	$ 590,000	
UV Piping & Controls	$ 368,000	
Ventilation & Boiler Systems	$ 165,000	
Install Three (3) Low Voltage VFD Units	$ 85,000	
Piping Connections	$ 125,000	
200 ft of 30" Water Main	$ 200,000	
600 ft of 36" Water Main	$ 420,000	
Subtotal Construction:		$ 5,150,000
Construction Contingencies (15%):		$ 772,500
Design Contingencies (5%):		$ 257,500
Engineering, Legal, Bonds & Administration (17%):		$ 875,500
Opinion of Probable Cost:		**$ 7,056,000**

I. Emergency Interconnect Pumping Station

The City of Flint and Genesee County DWWS have entered into an agreement to provide 8-mgd of back-up service to each other under emergency conditions. There are several alternatives for pumping station locations and configurations to accomplish this interconnect. For the purposes of this report, a station located west of the filter building was selected as the most practical from and operational cost perspective. While the opinions of cost presented below indicate that these pumps will be housed in their own structure, it is feasible to house the pumps in the filter transfer station for potential savings.

Preliminary design for this pumping station include two constant speed 8-mgd pumps equipped with soft starts and medium voltage motors. A reverse flow control station will be included within the same structure to allow for flow from the DWWS to assist the City of Flint. Approximately three miles of 24-inch pipeline will be needed to connect the two systems.
Opinion of Probable Cost:

Site Work & Utilities	$	90,000	
Building (32 ft x 24 ft)	$	245,000	
Install Two (2) 8 MGD @ 290 ft of TDH, Vertically Mounted Pumps with 600 HP, 4160V Motor	$	380,000	
MEP	$	335,000	
Valves and Controls	$	128,000	
Reverse Flow Control Station	$	110,000	
Ventilation Systems	$	35,000	
16000 ft of 24" Water Main	$	4,992,000	
	Subtotal Construction:	$	6,315,000
	Construction Contingencies (15%):	$	947,250
	Design Contingencies (5%):	$	315,750
	Engineering, Legal, Bonds & Administration (17%):	$	1,073,550
	Opinion of Probable Cost:	**$**	**8,652,000**

The opinions of capital cost presented in the preceding sections are tied to an ENR Index of 8688 to match the September 2009 Lake Huron Water Supply Report. Furthermore, the contingency percentages included with each opinion of cost are the same as in the September 2009 report. The total opinion of probable project cost of these proposed improvements is as follows:

Lime Sludge Disposal	$	15,089,000
Soda Ash Feed System	$	516,000
Additional Chemical Storage	$	2,057,000
Electrical and SCADA Improvements	$	8,101,000
Post-Chlorination and Zebra Mussel Control	$	322,000
Security Issues	$	329,000
PS No. 4 - Low & High Service Pumps	$	7,766,000
Filter Transfer Pumping Station & UV	$	7,056,000
Emergency Interconnect Pumping Station	$	8,652,000
Total Opinion of Probable Project Cost:	**$**	**49,888,000**

III. Cost of Additional Operation

The City of Flint currently operates the water treatment plant periodically during the year to maintain the systems and to meet regulatory requirements. The water treatment plant is staffed with various classifications of employees to operate and maintain the facility for these minimal operations.

As part of this work, and to develop all costs of providing water service from the Flint River, it is necessary to determine the probable cost for operating and maintaining this facility for continuous operation. Water quality differences between the Flint River and Lake Huron are significant and require different treatment chemicals and dosages. Most noticeable is the fact that Lake Huron water does not require softening which negates the need for softening process and the associated lime sludge disposal.

The primary cost parameters that are included in this difference are labor, chemicals, residual disposal and electrical power. Each will be discussed in the following sections. These costs were projected through the year 2050.

A. Labor

Additional staffing was discussed and developed with representatives from the City of Flint to provide full time coverage on a 24/7/365 schedule, plus provide staff for residual management and operations of the various dams. Hourly rates and fringe benefits were based on current budget figures and inflated at a rate of 3% for future costs. The following table outlines the proposed staffing a cost for this operational element.

Classification	Number	Cost/Hr	Hrs/Year	Total	Fringe (%)	Total
Operators	12	$ 20.00	2080	$ 499,200	90.40%	$ 950,477
Maintenance	4	$ 25.00	2080	$ 208,000	90.40%	$ 396,032
Laboratory QA/QC	2	$ 24.00	2080	$ 99,840	90.40%	$ 190,095
Laboratory SDWA	2	$ 20.00	2080	$ 83,200	90.40%	$ 158,413
Planned Overtime	NA	MIXED	8320	$ 178,048	90.40%	$ 339,003

This estimate represents approximately $2,034,000 per year of additional labor.

B. Chemicals

Chemical costs are based on the projected average day water demand of 14-mgd and the average dose for each of the chemicals based on the raw water quality information and other operational records. Further, data from the previous treatability work performed during the Phase I improvements was also incorporated into these estimates. Chemical suppliers and other water utilities were contacted to obtain current chemical purchase costs which were adjusted by the ENR ratio back to an index of 8688. Where necessary, transportation costs to the Flint, MI area were included. The following summarizes the chemical costs associated with treating the Flint River water.

Chemical	Dose(mg/l)	Cost/#	Cost/ MGD
Ferric	44.50	$0.24	$89.07
Lime	209.00	$0.10	$174.31
Soda Ash	47.00	$0.29	$113.67
CO_2	37.00	$0.10	$30.86
Cl_2	3.00	$0.34	$8.51
Fluoride	1.00	$0.33	$2.75
Phosphate*	1.00	$0.51	$4.25
		Cost per MGD	$423.42

*Costs range from $0.51 to $0.96 per pound

In addition to the above, the cost of ozone will need to be added which is approximately $20.08 per million gallons per day per mg/l dose. This cost includes oxygen, nitrogen and power costs.

C. Residual Disposal

This category is divided into two groups: clarifier sludge collected in the plate settling basins and lime sludge from the softening process. The clarifier sludge is pumped from the clarifier basins by zone (six zones per train, three trains, total of 18 zones) to the plant main drain. As part of the Phase I work, the main drain was connected to a new wastewater pumping station located south of the filter gallery building. This pump station discharges the collected residuals to the city's sanitary sewer system. Nearly all of the filter wash water is recirculated back to the head of the ozone facility for re-use.

The cost to treat clarified sludge discharged into the sanitary sewer system is calculated as follows:

Plate Clarifier Sludge	
Flow (MGD)	14
SS (mg/l)	75
Primary Sludge (#/d	13,435
% Solids	2%
Sludge (gals/day)	80,500
Sludge (cf/day)	10,762

Based on the City of Flint's current wastewater charges of $1.00 per 100 cf, the annual cost would be $39,200 per year.

Lime/Soda Ash softening generates large quantities of residual wastes that have high disposal costs. The treatment proposed in this study involves pumping the sludge, at about 4% concentration, from the softening basins to two gravity thickeners, where it will concentrate to about 12% solids. After thickening, sludge will be pumped to the filter presses to be dewatered to approximately 55% solids. The filter presses will drop the cake into a lower bunker where it will be removed by an end loader to the main storage bunker. About every three months, the sludge will be loaded onto trucks and applied to agricultural land.

The volume of sludge is estimated as follows:

Sludge Production from Clarifier					
Reaction	meq/l	meq/l as $CaCO_3$		meq/l as $Mg(OH)_2$	
CO_2	0.25	0.25		0	
$Ca(HCO_3)_2$	4.65	9.30		0	
$Mg(HCO_3)_2$	0.30	0.60		0.30	
$MgSO_4$	0.89	0.89		0.89	
Excess Lime	1.25	1.25		0	
Total meq/l		12.28		1.19	
Less Practical Limits meg/l		0.60		0.20	
Precipitate Produced meq/l		11.68		0.99	
Precipitate Produced mg/l		584		49	
Precipitate Produced #/MG		4872		412	
Total #/MG		5284			
WTP Flow (MGD)	14	27			
Dry Sludge Production in #/day	73,983	142,681			
@ 4% Solids (gals/day)	221,771	427,701			
@ 12% Solids (gals/day)	73,924	142,567			
@ 12% Solids (gals/week)	517,466	997,970			
Dry Sludge Production (tons/week)	259		SG $CaCO_3$	2.71	
Number of Hours per Week to Press	48		SG $Mg(OH)_2$	2.36	
Dry Sludge Processed (#/hr)	10,789		SG solids	2.68	
@ 55% Solids Sludge Processed (#/hr)	19,617				
55% Solids Sludge (#/cy)	2571		Sludge Solids =	55% as $CaCO_3$	
@ 55% Solids Sludge Processed (cf/hr)	206		Sludge Unit Wt. =	95.22 pcf	

Based on the preceding, 471 tons of softening sludge at 55% solids will be handled each week based on average flow and chemical dosage. Several Michigan water facilities were contacted to obtain lime sludge hauling and disposal costs. From this data a rate of $18.50 per wet ton was selected as a reasonable rate for disposal cost. This rate will result in an annual cost of $453,000.

D. Power

Practically all of the additional power costs are associated with low lift, intermediate transfer and high service pumping. Additional power costs will be used for process and handling of the softening sludge. The City of Flint is currently paying $0.07 per kwhr for service at the water plant. Power costs are calculated as follows:

TDH (ft) - High	190
TDH (ft) - Filter Transfer	40
TDH (ft) - Low	40
TDH Total (ft)	270
Pump Eff. (W to W)	80.00%
$/kwhr	$0.070
Pumping Cost Per MGD	$99.51
Solids Handling per MGD	$4.98
Total Power Cost per MGD	$104.49

Annual costs associated with the operation and maintenance of the Flint Water Plant are summarized in the attached tables following this section.

IV. Project Implementation Schedule

There are a number of issues that will impact the implementation schedule for this work. The source water studies to define bin number associated with cryptosporidium and giardia will take approximately two years. Part of these studies can be performed concurrently with design, but sufficient work will need to be performed to avoid impacting design schedule or work. A planning period of one year should be allowed for preliminary water quality and regulatory evaluations prior to initiating design work. Design of this project will require 10 to 12 months, with an additional three months required for permitting. After permits are received, allow three months for bidding and contract execution. Major equipment procurement and construction will take from 24 to 30 months. Plant commissioning will take about 2 months.

Total time required from notice to proceed to project completion 52 months to 60 months. This time frame does not include financing issues.

Rennaker, Joanne (DEQ)

From: Brent Wright <bwright@cityofflint.com>
Sent: Tuesday, June 25, 2013 7:58 AM
To: Ashford, Stephen (DEQ); Busch, Stephen (DEQ); Prysby, Mike (DEQ); Daugherty Johnson; Dave Jansen; Howard Croft; John O'Malia; John O'Brien; Hansen, Jeff; Green, Warren; Michael Glasgow; Samir Matta
Subject: Flint Water Plant Meeting Reminder
Attachments: Flint WTP Mtg Agenda 6-26-13.doc

Gentlemen just a reminder of the scheduled 9 am meeting tomorrow at the Flint Water. A meeting agenda is attached. Have a great day.

Thank You,
Brent Wright

FLINT WTP FACILITY MEETING AGENDA

June 26, 2013 9:00 am

Discussion Topics

I. Introductions

II. Progress Update
- A. Regulatory Needs for Interim & Long Term Operation
- B. Scheduled Plant Run
- C. Timing
- D. Softening/Sludge Disposal

III. Existing WTP Facility Anticipated Improvements
- A. Plant Capacity/Hydraulics
- B. Short Term Goal-Flint River
- C. Long Term Goal-KWA
- D. Project Costs/Budgets
  1. City
     a) Test Run Mode
     b) Flint River
     c) KWA
  2. County
     a) Test Run Mode
     b) Flint River
     c) KWA

IV. Operational Considerations
- A. Job Duties
- B. Work Sharing
- C. Operational/Product/Utility Costs

V. Other Issues

VI. Meeting Schedule

Rennaker, Joanne (DEQ)

From: Wurfel, Brad (DEQ)
Sent: Thursday, April 10, 2014 9:05 AM
To: Busch, Stephen (DEQ)
Subject: RE: flint's application for flint river withdrawals

I called Fonger and relayed what you shared with me. He's got it, I think. Thanks, man.
b

From: Busch, Stephen (DEQ)
Sent: Thursday, April 10, 2014 8:28 AM
To: rfonger1@mlive.com
Cc: Wurfel, Brad (DEQ)
Subject: RE: flint's application for flint river withdrawals

Mr. Fonger,

There is no application for withdrawal from the Flint River. The City has had an established baseline withdrawal capacity prior to water withdrawal legislation becoming effective and has the ability to withdraw water from the River.

The City of Flint has applied and obtained construction permits through our office under the Michigan Safe Drinking Water Act for modifications of its existing Water Treatment Plant facilities.

Let me know if you have any additional questions.

Stephen Busch, P.E.
Lansing and Jackson District Supervisor
Office of Drinking Water and Municipal Assistance
MDEQ
517-643-2314

From: Wurfel, Brad (DEQ)
Sent: Tuesday, April 08, 2014 1:05 PM
To: Busch, Stephen (DEQ)
Subject: Fwd: flint's application for flint river withdrawals

Steve, can you or one of your staff please help the Flint Journal?

Sent from my iPhone

Begin forwarded message:

> **From:** "Fonger, Ronald" <RFONGER1@mlive.com>
> **Date:** April 8, 2014 at 12:13:31 PM EDT
> **To:** "wurfelb@michigan.gov" <wurfelb@michigan.gov>
> **Subject: flint's application for flint river withdrawals**
>
> Hi Brad:
> I met with several Flint officials yesterday about the city's application for Flint River withdrawals, which they submitted last week.
> I'm interested in getting a copy of that application if I can in advance of the permit being acted on.

I'm also interested in knowing the outcome as soon as possible.
What's my best course of action?

Ron Fonger
MLive Media Group
Reporter

mobile 810.347.9963
email rfonger1@mlive.com
address 540 S. Saginaw St. #101, Flint MI 48502

Rennaker, Joanne (DEQ)

From:	Rosenthal, Adam (DEQ)
Sent:	Wednesday, April 16, 2014 2:50 PM
To:	Michael Glasgow
Cc:	Prysby, Mike (DEQ); Busch, Stephen (DEQ)
Subject:	RE: Proposed Water Monitoring - City of Flint
Attachments:	2014 Flint MS startup.doc; 2014 Flint revised MS-SBrev.doc; Flint MS Enclosure.doc

Mike, we have been working on a revised schedule for the City of Flint, which is being sent out today in response to your email indicating the plant startup. Mike Prysby must have been the one in contact with Mr. Croft, not sure what was discussed. Mike is out and will return 4/21/14. Until then our supervisor, Steve Bush, can be contacted at 517-643-2314 for plant operation questions.

see attached schedule.

Adam Rosenthal, EQA
MDEQ – Office of Drinking Water and Municipal Assistance
Lansing District – Constitution Hall 1SW
PO Box 30242
Lansing, MI 48909
517-284-6644
fax: 517-241-3571

From: Michael Glasgow [mailto:mglasgow@cityofflint.com]
Sent: Wednesday, April 16, 2014 12:59 PM
To: Rosenthal, Adam (DEQ)
Subject: Proposed Water Monitoring - City of Flint

Adam,

Good afternoon, I am contacting you in regards to possible changes in our monitoring for our change to full time operation out of the Flint river. I am expecting changes to our Water Quality Monitoring parameters, and possibly our DBP and lead & copper monitoring plan. Also, I am wondering about our MOR required testing. I know you have probably been in contact with Howard Croft, however I have not seen anything except the notes you or Prysby made on the last page of our 2014 monitoring schedule "that things were subject to change". Any information would be greatly appreciated, because it looks as if we will be starting the plant up tomorrow and are being pushed to start distributing water as soon as possible. As the acting F-1, I would like to make sure we are monitoring, reporting and meeting our requirements before I give the O.K to start distributing water.

Thanks,

Mike Glasgow
Laboratory & Water Quality Supervisor
City of Flint Water Plant
(810)787-6537 ext. 3512

2014 Monitoring Schedule

FLINT, CITY OF **WSSN: 02310**

Collect samples early in the monitoring period. This schedule reflects your expected routine monitoring and is subject to change. To receive credit for monitoring, include the **WSSN, Site Code**, and **County** on your request for analysis form. Collect Bacteriological and Automated Partial Chemistry samples close to the shipping time and send overnight delivery. Send all sample results to your Department of Environmental Quality (DEQ) district office unless you use the DEQ laboratory. Test codes, sample units, and costs are listed to help you complete the DEQ laboratory form. Prices are subject to change without notice. The DEQ laboratory is closed on state holidays.

Location: Plant Tap

Collect these samples at the entry point to the distribution system (after treatment, if applicable.)

Sample Type	# Samples/ Frequency	Collect Before	Site Code	Fee	Unit Number	Test Code
Automated Partial Chemistry	This DEQ lab scan includes nitrate, nitrite, fluoride, and sodium whose monitoring frequency requirements differ from one another. Before requesting analyses from a laboratory other than the DEQ laboratory, check with your DEQ district staff for the specific monitoring requirements.					
	1/3 months	**Quarterly**	TP001	$18.00	32	R
Volatile Organic Compounds	1/3 months	**Quarterly**	TP001	$100.00	36VO	CXVO
Complete Metals	1/36 months	**09/30/2014**	TP001	$102.00	36ME	CMET2
Arsenic	1/3 months	**Quarterly**	TP001	$18.00	36ME	CAS
Cyanide	1/3 months	**Quarterly**	TP001	$25.00	36CNa	CCN
SOC – Pesticides	1/3 months	**Quarterly**	TP001	$125.00	36PT	CXPT
SOC – Herbicides	1/3 months	**Quarterly**	TP001	$120.00	36HB	CXHB
SOC – Carbamates	1/3 months	**Quarterly**	TP001	$120.00	36LP	CXLP
Gross Alpha (Radiological)	1/3 months	**Quarterly**	TP001	Not performed at the DEQ Laboratory. A list of certified labs is at www.michigan.gov/DEQ. Select Water, Drinking Water, Community Water Supply, then Certified Labs under Programs and Activities.		
Radium 226 & Radium 228	1/3 months	**Quarterly**	TP001			
Water Quality Parameters	Bi-weekly	**Every 2 Weeks**	TP001	Various	Various	Various
Total Organic Carbon (TOC)	Pair/Monthly	**Monthly**	TP001	$35.00	36TO	CTOC
	Monitor for TOC in the source water before any treatment at the same time as monitoring for TOC in the treated water. These samples (source water and treated water) are referred to as "paired samples." Collect the treated water sample not later than the point of combined filter effluent turbidity monitoring and representative of treated water.					
Expanded SOCs						
Dalapon & Haloacetic Acids	1/12 months	**Between 04/01 and 09/30/2014**	TP001	$130.00	36HA	CXHA
Diquate	1/12 months	**Between 04/01 and 09/30/2014**	TP001	$150.00	36DQ	CXDQ
Endothall	1/12 months	**Between 04/01 and 09/30/2014**	TP001	$150.00	36EN	CXEN
EDB & DBCP	1/12 months	**Between 04/01 and 09/30/2014**	TP001	$70.00	36VO	CXEV

2014 Monitoring Schedule

FLINT, CITY OF **WSSN: 02310**

Collect samples early in the monitoring period. This schedule reflects your expected routine monitoring and is subject to change. To receive credit for monitoring, include the **WSSN, Site Code**, and **County** on your request for analysis form. Collect Bacteriological and Automated Partial Chemistry samples close to the shipping time and send overnight delivery. Send all sample results to your Department of Environmental Quality (DEQ) district office unless you use the DEQ laboratory. Test codes, sample units, and costs are listed to help you complete the DEQ laboratory form. Prices are subject to change without notice. The DEQ laboratory is closed on state holidays.

Location: Distribution System

Sample Type	Collect Samples According to the ...	# Samples/ Frequency	Collect	Site Code	Fee	Unit Number	Test Code
Bacteriological – coliforms	TCR Sampling Site Plan	100/Monthly	**Monthly**	DIST	$16.00	30	BPTC
Chlorine Residual	DBP Monitoring Plan	Measure the residual disinfectant level at the same point and at the same time as the bacteriological sample and report the average to the DEQ.					
Lead Copper for Corrosion Control	Lead and Copper Sampling Pool	100/6 months	**Between 07/01 and 12/31/2014**	DIST	$26.00	36CC	CCUB
Water Quality Parameters	Representative Sites	25/Quarterly	**Quarterly**	DIST	Various	Various	Various
Total Trihalomethanes	DBP Monitoring Plan	8/3 months	**During February, May, August and November 2014**	See DBP Monitoring Plan	$65.00	36VO	CXTM
Haloacetic Acids		8/3 months	**During February, May, August and November 2014**	See DBP Monitoring Plan	$130.00	36HA	CXHA

STATE OF MICHIGAN
DEPARTMENT OF ENVIRONMENTAL QUALITY
LANSING DISTRICT OFFICE

RICK SNYDER
GOVERNOR

DAN WYANT
DIRECTOR

April 16, 2014

Mr. Brent Wright
City Of Flint – D.P.W
Flint Water Plant
4500 North Dort Highway
Flint, Michigan 48505

WSSN: 02310

Dear Mr. Wright:

SUBJECT: Revised Drinking Water Monitoring Schedule – 2014
Monthly Operation Reports
Siting Plans and Record Keeping

Monitoring Schedule:

Enclosed is your revised Drinking Water Monitoring Schedule for calendar year 2014 outlining the minimum requirements for your public water supply. Your schedule has been revised based on the City's intent to change the source of its drinking water from the Detroit Water and Sewerage Department to treatment of the Flint River utilizing the City's Water Treatment Plant. Collect samples early in the monitoring period of the year indicated on the schedule. If you use a private laboratory you are required to report the results to us within the first ten days of the month following the month that you received the results. To receive credit for monitoring, the **"WSSN"** (water supply serial number), the **"Site Code,"** and **"County"** must appear on the sample result. Bottles will NOT be mailed automatically. If you use the Department of Environmental Quality Laboratory, you can order bottles by calling 517-335-8184. Be certain of the United States Environmental Protection Agency sampling and analysis method requirements for hold times.

Please note that both distribution and entry point to the distribution system monitoring will increase upon plant startup.

Monthly Operation Report (MOR) Requirements:

The City shall submit MORs as required under Administrative Rule 1502 (R325.11502). In addition to plant operational data collected and as noted in the attached schedule, the City of Flint will be required to collect Total Organic Compounds (TOC) samples from the source and finish water on a monthly basis. You will also be required to collect Water Quality Parameters (WQPs) at your entry point every 2 weeks. The City must also demonstrate adequate contact time (CT) for disinfection in accordance with Administrative Rule 1505a (R325.11505a).

Disinfection By-Product Sample Siting Plans:

The City of Flint must return to routine standard monitoring of disinfection by-products, and a revised Disinfection & Disinfectants By-Product (DDBP) plan must be submitted, which identifies 4 additional sites, 8 sites in total, for routine quarterly monitoring. These sites must be selected in accordance with the Stage 2 DDBP Rule and supporting documentation must be submitted with the plan for review and approval by this office prior to monitoring.

Lead and Copper Monitoring Requirements and Site Sample Pool

This change in source also increases your distribution system monitoring for WQPs to 25 samples per 6 months and 100 sample locations for Lead & Copper for 2 consecutive 6 month rounds of monitoring. The City will need to expand its current sample site pool in accordance with the requirements of Administrative Rule 710a (R325.10710a). A list of the proposed sample site pool locations, including each site's Tier, sample category, service material, and building plumbing material, shall be submitted to this office for review and approval.

Record Keeping:

The City shall maintain all monitoring records in accordance with all applicable requirements under the Administrative Rules including Rule 720a (R325.10720a), Rule 1506 (R325.11506), and Rule 1507 (R325.11507).

The Michigan Safe Drinking Water Act requires certain reports to be submitted to this office each year. Please remember that cross connection reports and annual pumpage reports are due by March 31, and the **Consumer Confidence Report** is due by July 1.

Also enclosed is the document "2014 Monitoring and Reporting Requirements." This provides additional details about monitoring and reporting requirements. If you have any questions, please contact us by telephone or e-mail using the information below.

Michael F. Prysby, P.E., District Engineer
Lansing District Office
Office of Drinking Water and
Municipal Assistance
517-290-8817

Adam Rosenthal, EQA
Lansing District Office
Office of Drinking Water and
Municipal Assistance
517-284-6644

Enclosure

cc/encl: Mr. Robert Bisnick, City Of Flint
Genesee Co. Health Dept.

2014 Monitoring and Reporting Requirements

Please Monitor Early: Collect samples early in the monitoring period (month, quarter, year) of the year indicated on the schedule. Bacteriological and partial chemistry samples should be collected close to the shipping time and sent overnight delivery to assure sample holding times are not exceeded (30 and 48 hour hold times respectively). We also recommend avoiding mailing bacteriological samples immediately preceding or following a holiday because samples tend to exceed the 30 hour hold time. When this occurs, a repeat sample must be collected as soon as possible upon notification.

If you use a private laboratory please report the results to us within the first ten days of the month following the month that you received the results. A list of certified laboratories is available on request. If samples are not collected as indicated on your monitoring schedule, you will incur a monitoring violation and may also be subject to a fine. For information on the fines policy, visit http://michigan.gov/deq. Click on Water, Drinking Water, Community Water Supply, and Administrative Fines (under Laws and Rules).

To receive credit for monitoring, you must include the **"WSSN"** (water supply serial number), the **"Site Code,"** and the **"County"** when you submit samples for analysis. Site codes are listed on your monitoring schedule.

Special Instructions If You Use The DEQ Laboratory: Bottles will NOT be mailed automatically. To order bottles, call the DEQ Laboratory at 517-335-8184 or download the form EQP 2301 *Requisition for Water Sample Units* from www.michigan.gov/deq. Click on Key Topics, Laboratory Services, Drinking Water, Obtaining The Necessary Sampling Units, and 'test list'. Please note that the DEQ laboratory is closed on most state holidays. The DEQ laboratory prices are subject to change without notice.

Special Instructions For Automated Partial Chemistry, VOC and TTHM Samples: These sample bottles must be cooled and preserved during shipment to the laboratory. If you use the DEQ laboratory, you will receive the ice pack, acid dropper (if necessary) and small cooler when you request the bottles. Samples must be preserved correctly to be used for compliance purposes. To avoid resampling follow instructions contained with the sample bottle. If you would like more information, contact the DEQ lab, at 517-335-8184, or contact this office.

Cyanide: Previously, supplies that chlorinated the water were waived from monitoring for cyanide. The U.S. EPA now requires all supplies to sample the entry point for cyanide.

UCMR3 Monitoring: You may have monitoring requirements in 2014 under the third Unregulated Contaminant Monitoring Rule (UCMR3). The U.S. EPA will contact you directly if your water supply is required to monitor in 2014. A list of laboratories certified to analyze the samples collected for UCMR3 is available at http://water.epa.gov/lawsregs/rulesregs/sdwa/ucmr/ucmr3/upload/lablist.pdf. Contact the U.S. EPA with questions.

Reminder if Lead and Copper Monitoring Due This Year: You must provide individual lead tap results to people who receive water from sites that were sampled, even if lead

was not detected, within 30 days of learning of results. You must also send us a certification that you met all the delivery requirements along with a sample copy of the customer notice within 3 months after the end of the monitoring period. Water supplies that failed to distribute the Consumer Notice of Lead Results must include the following statement in their CCR, "During the year, we failed to provide lead results to persons served at the sites that were tested as required by the Lead and Copper Rule." To download the *Lead and Copper Report and Consumer Notice of Lead Result Certificate* in Microsoft Word or PDF format, visit www.michigan.gov/deq. Click on Water, Drinking Water, Community Water Supply, and Reporting Forms (under Manuals, Forms & Brochures).

Annual Reports: Act 399 requires certain reports to be submitted to this office each year.

- The **Cross Connection Report**, due by March 31, describes the status of your local cross connection control program. Manufactured housing communities are exempt from this requirements until 2016.

  Each year, water supplies must submit a report regardless of whether a formal program has been implemented. If cross connections do not exist in your water system, indicate so on the report. Download the Cross Connection Report form from http://michigan.gov/deq. Click on Water, Drinking Water, Community Water Supply, Reporting Forms (under Manuals, Forms & Brochures). Instructions are included with the form.

- The **Annual Pumpage/Usage Report**, due by March 31, is required of water supplies that do not submit monthly operation reports.

  A summary of water pumpage and water use must be submitted by each water supply that does not submit a monthly operation report. To manage our natural resources, pumpage data are compiled to determine water use demands in Michigan. Download the Annual Pumpage/Usage Report form from http://michigan.gov/deq. Click on Water, Drinking Water, Community Water Supply, Reporting Forms (under Manuals, Forms & Brochures). Please be sure to indicate the appropriate units on the report (e.g. million gallons or gallons).

- The **Consumer Confidence Report**, due by July 1 to your customers, to your local health department and to this office.

  Electronic delivery methods may be used to distribute the CCR to bill-paying customers, provided they are direct. For more information on e-delivery, visit www.michigan.gov/deq. Click on Water, Drinking Water, Community Water Supply, Consumer Confidence Report Rule (under Laws and Rules).

Rennaker, Joanne (DEQ)

From: Michael Glasgow <mglasgow@cityofflint.com>
Sent: Thursday, April 17, 2014 11:05 AM
To: Rosenthal, Adam (DEQ)
Cc: Prysby, Mike (DEQ); Busch, Stephen (DEQ)
Subject: Re: Proposed Water Monitoring - City of Flint

Adam,

Thank you for the quick response. I assumed there would be dramatic changes to our monitoring. I have people above me making plans to distribute water ASAP. I was reluctant before, but after looking at the monitoring schedule and our current staffing, I do not anticipate giving the OK to begin sending water out anytime soon. If water is distributed from this plant in the next couple weeks, it will be against my direction. I need time to adequately train additional staff and to update our monitoring plans before I will feel we are ready. I will reiterate this to management above me, but they seem to have their own agenda.

Thank you,

Mike Glasgow
Laboratory & Water Quality Supervisor
City of Flint Water Plant

On Wed, Apr 16, 2014 at 2:49 PM, Rosenthal, Adam (DEQ) <ROSENTHALA@michigan.gov> wrote:

Mike, we have been working on a revised schedule for the City of Flint, which is being sent out today in response to your email indicating the plant startup. Mike Prysby must have been the one in contact with Mr. Croft, not sure what was discussed. Mike is out and will return 4/21/14. Until then our supervisor, Steve Bush, can be contacted at 517-643-2314 for plant operation questions.

see attached schedule.

Adam Rosenthal, EQA

MDEQ – Office of Drinking Water and Municipal Assistance

Lansing District – Constitution Hall 1SW

PO Box 30242

Lansing, MI 48909

517-284-6644

fax: 517-241-3571

From: Michael Glasgow [mailto:mglasgow@cityofflint.com]
Sent: Wednesday, April 16, 2014 12:59 PM
To: Rosenthal, Adam (DEQ)
Subject: Proposed Water Monitoring - City of Flint

Adam,

Good afternoon, I am contacting you in regards to possible changes in our monitoring for our change to full time operation out of the Flint river. I am expecting changes to our Water Quality Monitoring parameters, and possibly our DBP and lead & copper monitoring plan. Also, I am wondering about our MOR required testing. I know you have probably been in contact with Howard Croft, however I have not seen anything except the notes you or Prysby made on the last page of our 2014 monitoring schedule "that things were subject to change". Any information would be greatly appreciated, because it looks as if we will be starting the plant up tomorrow and are being pushed to start distributing water as soon as possible. As the acting F-1, I would like to make sure we are monitoring, reporting and meeting our requirements before I give the O.K to start distributing water.

Thanks,

Mike Glasgow

Laboratory & Water Quality Supervisor

City of Flint Water Plant

(810)787-6537 ext. 3512

Rennaker, Joanne (DEQ)

From: Prysby, Mike (DEQ)
Sent: Thursday, April 24, 2014 11:03 AM
To: Busch, Stephen (DEQ)
Subject: Flint WTP update

Steve,

Just a quick update on the Flint WTP operation. WTP operators started intermediate chlorination last night around 11pm and a residual of 1.6 ppm (free) is being measured at the bottom of each filter today. Filter effluent turbidities are between 0.03 and 0.04 NTUs and finished water hardness is around 160 ppm (raw water hardness is in the 210 to 220 range). The solids contact units are having bit more carry-over to the filters than desired, but maintaining blanket. WTP staff will investigate different polymers to improve softening performance. Filter bacteriological samples were collected earlier and the results will be available on time for tomorrow's switch-over.

*** Just received notice that the "switch-over ceremony" is now scheduled for 2pm, not 12-noon. The mayor is not available at 12 noon. I will plan to arrive at the WTP around 1:30 to 145ish.

Michael Prysby, P.E.
District Engineer
Office of Drinking Water and Municipal Assistance
517 290-8817

Rennaker, Joanne (DEQ)

From: Crooks, Jennifer <crooks.jennifer@epa.gov>
Sent: Friday, June 20, 2014 4:07 PM
To: Johnson, Mark
Cc: Poy, Thomas; Prysby, Mike (DEQ); Busch, Stephen (DEQ); Shoven, Heather; Murphy, Thomas
Subject: Briefing -- Flint River for drinking water, Michigan
Attachments: Flint River Test Run Phase2 5 July 2013.pdf; GENESEE-2014-05-30.pdf; GENESEE-2014-05-27.pdf; Flint04-2014MOR.pdf

Mark—as we discussed earlier this week, below is a briefing containing the information we discussed regarding the Flint, Michigan water supply. I am out of the office this coming week; if you have questions, please contact Tom Poy, Ground Water and Drinking Water Branch Chief.

Thank you for your time!

Jennifer

Drinking Water in Flint, Michigan

ISSUE: Flint began pumping/treating/distributing Flint River water as their drinking water source on April 25, 2014, and beginning in mid-May, there have been numerous complaints to the Region 5 Ground Water and Drinking Water Branch regarding the drinking water, including rotten egg smell, swamp water smell, people developing rashes. The Region immediately contacted and involved the Drinking Water program at the Michigan Dept of Environmental Quality (MDEQ).

BACKGROUND: Flint has been purchasing finished drinking water from Detroit for decades (source water is Lake Huron). It has been delivered by a large single pipeline from Detroit. In the late 1980's, the State drinking water staff requested that Flint renovate their old surface water treatment plant to meet the State's redundancy requirements, in case the single pipeline from Detroit was unable to transmit finished drinking water. Flint would treat Flint River water periodically throughout the year, to verify that the water treatment plant (WTP) was able to treat Flint River water that met Safe Drinking Water Act (SDWA) standards.

Over the past 15 years or so, Detroit has seen a decrease in its City population, and an increase in poverty/low income residents. Detroit currently has an Emergency Manager due to poor financial situation. (As an aside, last year the City of Highland Park told Detroit it was unable to pay its water/sewer bills, and currently has an Emergency Manager. Highland Park was unable to obtain funding to retrofit its surface water treatment plant, so Detroit is providing water/sewer currently to Highland Park for free.) In order to continue to provide adequately treated water that meets SDWA Health standards, the suburbs have been subsidizing the lower income residents for years. Consequently, communities like Flint have decided to find an alternate source of drinking water.

A regional water authority was formed in 2010, the Karegnondi Water Authority (KWA), which will serve water in mid-Michigan and the Thumb areas. Members of the KWA include Flint, Lapeer; and Genesee, Lapeer and Sanilac Counties. The KWA is currently constructing the Karegnondi pipeline to bring raw water from Lake Huron. It will be completed in about 2 years. Flint has an Emergency Manager now, and I think on paper, it looked like a savings to pump and treat Flint River water for the 2-year interim period prior to connecting to the Karegnondi pipeline, than to continue to pay

Detroit prices for finished drinking water. MDEQ has worked long and hard with the City of Flint and water operators to get the WTP ready to treat Flint River water for the next few years. Complete operation/treatment began April 25, 2014.

In mid-May, Region 5 Ground Water and Drinking Water Branch began receiving calls from Flint citizens regarding the quality of the Flint drinking water. Complaints include rotten egg smell, swamp water smell, people developing rashes. I talked with Richard Benzie, the Community Drinking Water Unit Chief, at MDEQ about any possible chemical releases into the Flint River, and neither he nor Mike Prysby, the Lansing District engineer for Flint, have heard of anything such as this. The normal procedure of chemical releases is that Mike Prysby and Richard would be alerted/notified through the Pollution Emergency Alert System (PEAS), and that hasn't happened.

Mike Prysby has been working quite closely with the Operator-in-Charge at the Flint Water Treatment plant to prepare the WTP and operators to treat the Flint River water. Attached are several analytical results: July 2013 Test Run of Phase 2/5 contaminants conducted on the Flint River, sampled in July 2013; no exceedances are noted; detects of barium and selenium. The April 2014 Monthly Operation Report (MOR) which includes bacteriological analyses, was finalized in mid-May (includes only April 25-30 operation activity) with the following test results (sampled in May 2014), that were provided last week by Steve Busch, the MDEQ Supervising District Engineer: Total Organic Carbon (TOC), Metals, Volatile Organic Carbon (VOC), Synthetic Organic Contaminants (SOC) (all 3 categories), and partial chemistry (which includes nitrates). As the WTP only operated for the last 6 days in April, the MOR results provide limited information. The Bacteriological Portion of the May Operating Period were due 6/10, but the operational monitoring won't be reported until 6/30.

FINDINGS: So, bottom line—yes, the raw water is a different quality and more variable than Lake Huron raw water that Detroit is using. The Flint River is not as high a quality water as Lake Huron, but they are pretreating with ozone, conducting softening to reduce hardness and organic precursors, and are working with chlorine application. And, the Flint River is an interim source of raw water until the Karognondi pipeline is constructed to bring raw Lake Huron water to Flint for treatment.

When you look at the July 2013 Test Run analyses attached, note:
The sample was taken at the Filter Effluent—normally it would be taken at the plant tap, but they were running Flint River water through most of the plant last summer to test treatment, and the filters were the last stop before the clear well/plant tap which were filled with Detroit water they were serving last year. Note: Trihalomethanes (TTHM) are detected, but no exceedances. Detects could be due to: Softening had not been introduced to the treatment process last summer which would reduce the hardness and also remove some of the organic precursor that would add to TTHM levels. Softening is being conducted now in the treatment process. Last summer, chlorine was added in mid-treatment which also could have added to the TTHM level. Now, chlorine is added just before the filters. Also, since it's summer surface water, there will be more run-off, thus more precursor in the raw water. Mike Prysby, the MDEQ District Engineer, believes that today's operation of the plant and quality of drinking water produced is much better than the test runs done over the past year, due to the adjusting of the treatment, such as the softening process and the chlorine application.

Mike received Flint's first Monthly Operation Report (MOR) for the timeframe of April 25-30. Ozone pretreatment is provided to the raw water, and there is ozone destruction at the end of the pretreatment. The Filter Effluent has never been over 0.3 NTU, the ave range is 0.12-0.21 NTU. The chlorine residual at the plant tap is 0.9-1.0 free chlorine. The distribution chlorine residual ranged from 0.7-1.0 of free chlorine, which is acceptable. Bacti samples are pulled every 3-4 hours starting on April 25-30, and all were clear.

CONCLUSION: The analyses show some detects of regulated contaminants, but no exceedances. Thus, we have no report on any regulated contaminant that might be causing rashes, and the complaints we're hearing. I did ask Steve Busch at MDEQ, if there was a possibility of the existence of cyanotoxins from algae on the Flint River. Steve has worked with systems in Southeast Michigan and with Ohio EPA on algae issues, and he didn't think the conditions of the Flint River would support an algae bloom that would cause cyanotoxins to be present.

We would like to know if ATSDR would be interested in looking into this situation, to determine if there are other unregulated contaminants causing complaints of poor water quality.

Mike Prysby: 517-290-8817; prysbym@michigan.gov.
Steve Busch: 517-643-2314; buschs@michigan.gov

Jennifer

Jennifer Kurtz Crooks
Michigan Program Manager/Set-Aside Coordinator
Ground Water and Drinking Water Branch
U.S. EPA, Region 5
77 West Jackson Blvd., WG-15J
Chicago, Illinois 60604
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MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY
DRINKING WATER LABORATORY
USEPA Region V Drinking Water Cert. No. MI00003
P.O. Box 30270
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TEL: (517) 335-8184
FAX: (517) 335-8562

Sample Number
LE83917

Official Laboratory Report

Report To: MICHAEL GLASGOW
4500 N DORT HWY
FLINT MI 48505

System Name/Owner:	CITY OF FLINT	WSSN/Pool ID:	2310
Collection Address:	4500 N DORT HWY,FLINT	Source:	TYPE III
Collected By:	MICHAEL GLASGOW	Site Code:	FILTER EFF
Township/Well#/Section:	//	Collector:	Public Water Supply Operator
County:	Genesee	Date Collected:	07/18/2013 07:30
Sample Point:	FILTER EFFLUENT	Date Received:	07/18/2013 12:23
Water System:	Other	Purpose:	Routine Monitoring

TESTING INFORMATION			REGULATORY INFORMATION			
Analyte Name	Result (mg/L)	Date Tested	RL (mg/L)	MCL/AL (mg/L)	Method	CAS #
Antimony	Not detected	07/19/2013	0.0006	0.006	EPA 200.8	7440-36-0
Arsenic	Not detected	07/19/2013	0.002	0.010	EPA 200.8	7440-38-2
Barium	0.04	07/19/2013	0.01	2	EPA 200.8	7440-39-3
Beryllium	Not detected	07/19/2013	0.0004	0.004	EPA 200.8	7440-41-7
Cadmium	Not detected	07/19/2013	0.0003	0.005	EPA 200.8	7440-43-9
Chloride	72	07/18/2013	4		SM 4500-Cl E	7647-14-5
Chromium	Not detected	07/19/2013	0.01	0.1	EPA 200.8	7440-47-3
Cyanide-Available	Not Detected	07/26/2013	0.02	0.2	OIA-1677	57-12-5
Fluoride	0.13	07/18/2013	0.1	4.0	SM 4500 FC	16984-48-8
Hardness as CaCO3	168	07/18/2013	20		SM 2340 C	HARD-00-C
Iron (automated)	Not detected	07/18/2013	0.1		SM 3500 FeB	7439-89-6
Lead	Not detected	07/19/2013	0.001	0.015	EPA 200.8	7439-92-1
Mercury	Not detected	07/19/2013	0.0001	0.002	EPA 200.8	7439-97-6
Nickel	Not detected	07/19/2013	0.01	0.1	EPA 200.8	7440-02-0
Nitrate as N	0.5	07/18/2013	0.4	10	10-107-04-2-B	14797-55-8
Nitrite as N	Not detected	07/18/2013	0.05	1	10-107-04-2-B	14797-65-0
Selenium	Not Detected	07/19/2013	0.001	0.05	EPA 200.8	7782-49-2
Sodium (automated)	13	07/18/2013	5		SM 3500 NaB	7440-23-5
Sulfate	12	07/18/2013	10		SM 4500 SO4E	14808-79-8
Thallium	Not detected	07/19/2013	0.0002	0.002	EPA 200.8	7440-28-0

Carbamates by HPLC

CAS# : Chemical Abstract Service Registry Number
MCL : Maximum Contaminant Level
AL : Action Level
RL : Reporting Limit

mg/L : milligrams / Liter (ppm)
ppm : parts per million
MPN : Most Probable Number
CFU : Colony Forming Unit

Laboratory Contacts
Drinking Water Unit Mgr: Julia Pieper
Systems Mgmt. Unit Mgr: George Krisztian

MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY
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TEL: (517) 335-8184
FAX: (517) 335-8562

Sample Number
LE83917

TESTING INFORMATION				REGULATORY INFORMATION		
Analyte Name	Result (mg/L)	Date Tested	RL (mg/L)	MCL/AL (mg/L)	Method	CAS #
Carbamates by HPLC						
3 Hydroxycarbofuran	Not Detected	07/23/2013	0.001		EPA 531.2	16655-82-6
Aldicarb	Not Detected	07/23/2013	0.0005		EPA 531.2	116-06-3
Aldicarb sulfone	Not Detected	07/23/2013	0.0005		EPA 531.2	1646-88-4
Aldicarb sulfoxide	Not Detected	07/23/2013	0.0005		EPA 531.2	1646-87-3
Carbaryl	Not Detected	07/23/2013	0.001		EPA 531.2	63-25-2
Carbofuran	Not Detected	07/23/2013	0.0005	0.04	EPA 531.2	1563-66-2
Methiocarb	Not Detected	07/23/2013	0.001		EPA 531.2	2032-65-7
Methomyl	Not Detected	07/23/2013	0.001		EPA 531.2	16752-77-5
Oxamyl	Not Detected	07/23/2013	0.001	0.2	EPA 531.2	23135-22-0
Propoxur	Not Detected	07/23/2013	0.001		EPA 531.2	114-26-1
Chlorinated Acid Herbicides						
2,4,5-T	Not Detected	07/24/2013	0.002		EPA 515.4	93-76-5
2,4,5-TP (silvex)	Not Detected	07/24/2013	0.0003	0.05	EPA 515.4	93-72-1
2,4-D	Not Detected	07/24/2013	0.002	0.07	EPA 515.4	94-75-7
Acifluorfen	Not Detected	07/24/2013	0.004		EPA 515.4	50594-66-6
Bentazon	Not Detected	07/24/2013	0.002		EPA 515.4	25057-89-0
Dicamba	Not Detected	07/24/2013	0.002		EPA 515.4	1918-00-9
Dinoseb	Not Detected	07/24/2013	0.0003	0.007	EPA 515.4	88-85-7
Pentachlorophenol	Not Detected	07/24/2013	0.00006	0.001	EPA 515.4	87-86-5
Picloram	Not Detected	07/24/2013	0.001	0.5	EPA 515.4	1918-02-1
Total DCPA degradates, mono- and di-acid	Not Detected	07/24/2013	0.001		EPA 515.4	1861-32-1
Pesticides Analysis by GC/MS						
4,4'-DDD	Not Detected	07/23/2013	0.001		EPA 525.2	72-54-8
4,4'-DDE	Not Detected	07/23/2013	0.001		EPA 525.2	72-55-9
4,4'-DDT	Not Detected	07/23/2013	0.0005		EPA 525.2	50-29-3
Acetochlor	Not Detected	07/23/2013	0.001		EPA 525.2	34256-82-1
Alachlor	Not Detected	07/23/2013	0.0002	0.002	EPA 525.2	15972-60-8
Aldrin	Not Detected	07/23/2013	0.0004		EPA 525.2	309-00-2
alpha-Chlordane	Not Detected	07/23/2013	0.0002	0.002	EPA 525.2	5103-71-9
Atrazine	0.0005	07/23/2013	0.0002	0.003	EPA 525.2	1912-24-9
Dieldrin	Not Detected	07/23/2013	0.0005		EPA 525.2	60-57-1
Endrin	Not Detected	07/23/2013	0.0001	0.002	EPA 525.2	72-20-8
Endrin aldehyde	Not Detected	07/23/2013	0.001		EPA 525.2	7421-93-4
gamma-Chlordane	Not Detected	07/23/2013	0.0002	0.002	EPA 525.2	5103-74-2
Heptachlor	Not Detected	07/23/2013	0.0002	0.0004	EPA 525.2	76-44-8
Heptachlor epoxide	Not Detected	07/23/2013	0.0001	0.0002	EPA 525.2	1024-57-3
Hexachlorobenzene	Not Detected	07/23/2013	0.0001	0.001	EPA 525.2	118-74-1

CAS# : Chemical Abstract Service Registry Number
MCL : Maximum Contaminant Level
AL : Action Level
RL : Reporting Limit

mg/L : milligrams / Liter (ppm)
ppm : parts per million
MPN : Most Probable Number
CFU : Colony Forming Unit

Laboratory Contacts
Drinking Water Unit Mgr: Julia Pieper
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Sample Number
LE83917

TESTING INFORMATION			REGULATORY INFORMATION			
Analyte Name	Result (mg/L)	Date Tested	RL (mg/L)	MCL/AL (mg/L)	Method	CAS #
Pesticides Analysis by GC/MS						
Hexachlorocyclohexane (alpha-BHC)	Not Detected	07/23/2013	0.001		EPA 525.2	319-84-6
Hexachlorocyclohexane (beta-BHC)	Not Detected	07/23/2013	0.001		EPA 525.2	319-85-7
Hexachlorocyclohexane (delta-BHC)	Not Detected	07/23/2013	0.001		EPA 525.2	319-86-8
Hexachlorocyclopentadiene	Not Detected	07/23/2013	0.0005	0.05	EPA 525.2	77-47-4
Lindane (gamma-BHC)	Not Detected	07/23/2013	0.0001	0.0002	EPA 525.2	58-89-9
Methoxychlor	Not Detected	07/23/2013	0.0001	0.04	EPA 525.2	72-43-5
Metolachlor	Not Detected	07/23/2013	0.001		EPA 525.2	51218-45-2
Metribuzin	Not Detected	07/23/2013	0.001		EPA 525.2	21087-64-9
Molinate	Not Detected	07/23/2013	0.0005		EPA 525.2	2212-67-1
PCB (aroclor 1016)	Not Detected	07/23/2013	0.0001	0.0005	EPA 525.2	12674-11-2
PCB (aroclor 1221)	Not Detected	07/23/2013	0.0001	0.0005	EPA 525.2	11104-28-2
PCB (aroclor 1232)	Not Detected	07/23/2013	0.0001	0.0005	EPA 525.2	11141-16-5
PCB (aroclor 1242)	Not Detected	07/23/2013	0.0001	0.0005	EPA 525.2	53469-21-9
PCB (aroclor 1248)	Not Detected	07/23/2013	0.0001	0.0005	EPA 525.2	12672-29-6
PCB (aroclor 1254)	Not Detected	07/23/2013	0.0001	0.0005	EPA 525.2	11097-69-1
PCB (aroclor 1260)	Not Detected	07/23/2013	0.0001	0.0005	EPA 525.2	11096-82-5
Polybrominated biphenyls	Not Detected	07/23/2013	0.0001		EPA 525.2	59536-65-1
Simazine	Not Detected	07/23/2013	0.0002	0.004	EPA 525.2	122-34-9
Toxaphene	Not Detected	07/23/2013	0.001	0.003	EPA 525.2	8001-35-2
Volatile Organic Compounds						
1,1 Dichloroethane	Not Detected	07/25/2013	0.0005		EPA 524.2	75-34-3
1,1 Dichloroethylene	Not Detected	07/25/2013	0.0005	0.007	EPA 524.2	75-35-4
1,1 Dichloropropene	Not Detected	07/25/2013	0.0005		EPA 524.2	563-58-6
1,1,1 Trichloroethane	Not Detected	07/25/2013	0.0005	0.2	EPA 524.2	71-55-6
1,1,1,2 Tetrachloroethane	Not Detected	07/25/2013	0.0005		EPA 524.2	630-20-6
1,1,2 Trichloroethane	Not Detected	07/25/2013	0.0005	0.005	EPA 524.2	79-00-5
1,1,2,2 Tetrachloroethane	Not Detected	07/25/2013	0.0005		EPA 524.2	79-34-5
1,2 Dichlorobenzene	Not Detected	07/25/2013	0.0005	0.6	EPA 524.2	95-50-1
1,2 Dichloroethane	Not Detected	07/25/2013	0.0005	0.005	EPA 524.2	107-06-2
1,2 Dichloropropane	Not Detected	07/25/2013	0.0005	0.005	EPA 524.2	78-87-5
1,2,3 Trichlorobenzene	Not Detected	07/25/2013	0.0005		EPA 524.2	87-61-6
1,2,3 Trichloropropane	Not Detected	07/25/2013	0.0005		EPA 524.2	96-18-4
1,2,4 Trichlorobenzene	Not Detected	07/25/2013	0.0005	0.07	EPA 524.2	120-82-1
1,2,4 Trimethylbenzene	Not Detected	07/25/2013	0.0005		EPA 524.2	95-63-6
1,3 Dichlorobenzene	Not Detected	07/25/2013	0.0005		EPA 524.2	541-73-1
1,3 Dichloropropane	Not Detected	07/25/2013	0.0005		EPA 524.2	142-28-9
1,3,5 Trimethylbenzene	Not Detected	07/25/2013	0.0005		EPA 524.2	108-67-8
1,4 Dichlorobenzene	Not Detected	07/25/2013	0.0005	0.075	EPA 524.2	106-46-7

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FAX: (517) 335-8562

Sample Number
LE83917

TESTING INFORMATION			REGULATORY INFORMATION			
Analyte Name	Result (mg/L)	Date Tested	RL (mg/L)	MCL/AL (mg/L)	Method	CAS #
Volatile Organic Compounds						
2,2 Dichloropropane	Not Detected	07/25/2013	0.0005		EPA 524.2	594-20-7
Benzene	Not Detected	07/25/2013	0.0005	0.005	EPA 524.2	71-43-2
Bromobenzene	Not Detected	07/25/2013	0.0005		EPA 524.2	108-86-1
Bromochloromethane	Not Detected	07/25/2013	0.0005		EPA 524.2	74-97-5
Bromodichloromethane	0.029	07/25/2013	0.0005	0.080	EPA 524.2	75-27-4
Bromoform	0.0008	07/25/2013	0.0005	0.080	EPA 524.2	75-25-2
Bromomethane	Not Detected	07/25/2013	0.001		EPA 524.2	74-83-9
Carbon tetrachloride	Not Detected	07/25/2013	0.0005	0.005	EPA 524.2	56-23-5
Chlorobenzene	Not Detected	07/25/2013	0.0005	0.1	EPA 524.2	108-90-7
Chlorodibromomethane	0.014	07/25/2013	0.0005	0.080	EPA 524.2	124-48-1
Chloroethane	Not Detected	07/25/2013	0.0005		EPA 524.2	75-00-3
Chloroform	0.030	07/25/2013	0.0005	0.080	EPA 524.2	67-66-3
Chloromethane	Not Detected	07/25/2013	0.0005		EPA 524.2	74-87-3
cis-1,2 Dichloroethylene	Not Detected	07/25/2013	0.0005	0.07	EPA 524.2	156-59-2
cis-1,3 Dichloropropene	Not Detected	07/25/2013	0.0005		EPA 524.2	10061-01-5
Dibromomethane	Not Detected	07/25/2013	0.0005		EPA 524.2	74-95-3
Dichlorodifluoromethane	Not Detected	07/25/2013	0.001		EPA 524.2	75-71-8
Dichloromethane	Not Detected	07/25/2013	0.0006	0.005	EPA 524.2	75-09-2
Ethylbenzene	Not Detected	07/25/2013	0.0005	0.7	EPA 524.2	100-41-4
Fluorotrichloromethane	Not Detected	07/25/2013	0.001		EPA 524.2	75-69-4
Hexachlorobutadiene	Not Detected	07/25/2013	0.0005		EPA 524.2	87-68-3
Isopropylbenzene	Not Detected	07/25/2013	0.0005		EPA 524.2	98-82-8
m & p-Xylene	Not Detected	07/25/2013	0.0005	10	EPA 524.2	XYLMP-00-C
Methyl ethyl ketone	Not Detected	07/25/2013	0.005		EPA 524.2	78-93-3
Methyl isobutyl ketone	Not Detected	07/25/2013	0.005		EPA 524.2	108-10-1
Methyl-tert-butyl ether (MTBE)	Not Detected	07/25/2013	0.001		EPA 524.2	1634-04-4
Naphthalene	Not Detected	07/25/2013	0.0005		EPA 524.2	91-20-3
n-Butylbenzene	Not Detected	07/25/2013	0.0005		EPA 524.2	104-51-8
Nitrobenzene	Not Detected	07/25/2013	0.01		EPA 524.2	98-95-3
n-Propylbenzene	Not Detected	07/25/2013	0.0005		EPA 524.2	103-65-1
o-Chlorotoluene	Not Detected	07/25/2013	0.0005		EPA 524.2	95-49-8
o-Xylene	Not Detected	07/25/2013	0.0005	10	EPA 524.2	95-47-6
p-Chlorotoluene	Not Detected	07/25/2013	0.0005		EPA 524.2	106-43-4
p-Isopropyltoluene	Not Detected	07/25/2013	0.0005		EPA 524.2	99-87-6
sec-Butylbenzene	Not Detected	07/25/2013	0.0005		EPA 524.2	135-98-8
Styrene	Not Detected	07/25/2013	0.0005	0.1	EPA 524.2	100-42-5
tert-Butylbenzene	Not Detected	07/25/2013	0.0005		EPA 524.2	98-06-6
Tetrachloroethylene	Not Detected	07/25/2013	0.0005	0.005	EPA 524.2	127-18-4

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Sample Number
LE83917

TESTING INFORMATION			REGULATORY INFORMATION			
Analyte Name	Result (mg/L)	Date Tested	RL (mg/L)	MCL/AL (mg/L)	Method	CAS #
Volatile Organic Compounds						
Tetrahydrofuran	Not Detected	07/25/2013	0.005		EPA 524.2	109-99-9
Toluene	Not Detected	07/25/2013	0.0005	1	EPA 524.2	108-88-3
Total Trihalomethanes	0.074	07/25/2013	NA	0.080	EPA 524.2	TTHM-00-C
Total Xylenes	Not Detected	07/25/2013	NA	10	EPA 524.2	1330-20-7
trans-1,2 Dichloroethylene	Not Detected	07/25/2013	0.0005	0.1	EPA 524.2	156-60-5
trans-1,3 Dichloropropene	Not Detected	07/25/2013	0.0005		EPA 524.2	10061-02-6
Trichloroethylene	Not Detected	07/25/2013	0.0005	0.005	EPA 524.2	79-01-6
Vinyl chloride	Not Detected	07/25/2013	0.0004	0.002	EPA 524.2	75-01-4

A trip blank was not available for analysis with this sample. This sample contained acetone at an approximate concentrtation of 20 ppb.

The analyses performed by the MDEQ Drinking Water Laboratory were conducted using methods approved by the U.S. Environmental Protection Agency in accordance with the Safe Drinking Water Act, 40 CFR parts 141-143, and other regulatory agencies as appropriate.

Your local health department has detailed information about the quality of drinking water in your area. If you have concerns about the health risks related to the test results of your sample, please contact the Environmental Health Section through the address and telephone number listed below:

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Sample Number
LF19430

Official Laboratory Report

Report To: MICHAEL GLASGOW
4500 N DORT HWY
FLINT MI 48505

System Name/Owner:	CITY OF FLINT -WATER PLANT	WSSN/Pool ID:	2310
Collection Address:	4500 N DORT HWY,FLINT	Source:	TYPE I
Collected By:	MICHAEL GLASGOW	Site Code:	LAB TAP
Township/Well#/Section:	//	Collector:	Public Water Supply Operator
County:	Genesee	Date Collected:	05/22/2014 08:30
Sample Point:	PLANT LAB TAP	Date Received:	05/22/2014 13:19
Water System:	Treated Public Distribution System	Purpose:	Routine Monitoring

TESTING INFORMATION			REGULATORY INFORMATION			
Analyte Name	Result (mg/L)	Date Tested	RL (mg/L)	MCL/AL (mg/L)	Method	CAS #
Antimony	Not detected	05/23/2014	0.0006	0.006	EPA 200.8	7440-36-0
Arsenic	Not detected	05/23/2014	0.002	0.010	EPA 200.8	7440-38-2
Barium	0.03	05/23/2014	0.01	2	EPA 200.8	7440-39-3
Beryllium	Not detected	05/23/2014	0.0004	0.004	EPA 200.8	7440-41-7
Cadmium	Not detected	05/23/2014	0.0003	0.005	EPA 200.8	7440-43-9
Chloride	79	05/22/2014	4		SM 4500-Cl E	7647-14-5
Chromium	Not detected	05/23/2014	0.01	0.1	EPA 200.8	7440-47-3
Cyanide-Available	Not Detected	05/27/2014	0.02	0.2	OIA-1677	57-12-5
Fluoride	0.16	05/22/2014	0.1	4.0	SM 4500 FC	16984-48-8
Hardness as CaCO3	209	05/22/2014	20		SM 2340 C	HARD-00-C
Iron (automated)	Not detected	05/22/2014	0.1		SM 3500 FeB	7439-89-6
Lead	Not detected	05/23/2014	0.001	0.015	EPA 200.8	7439-92-1
Mercury	Not detected	05/23/2014	0.0001	0.002	EPA 200.8	7439-97-6
Nickel	Not detected	05/23/2014	0.01	0.1	EPA 200.8	7440-02-0
Nitrate as N	0.4	05/22/2014	0.4	10	10-107-04-2-B	14797-55-8
Nitrite as N	Not detected	05/22/2014	0.05	1	10-107-04-2-B	14797-65-0
Selenium	Not Detected	05/23/2014	0.001	0.05	EPA 200.8	7782-49-2
Sodium (automated)	15	05/22/2014	5		SM 3500 NaB	7440-23-5
Sulfate	25	05/22/2014	10		SM 4500 SO4E	14808-79-8
Thallium	Not detected	05/23/2014	0.0002	0.002	EPA 200.8	7440-28-0

Carbamates by HPLC

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Sample Number
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TESTING INFORMATION			REGULATORY INFORMATION			
Analyte Name	Result (mg/L)	Date Tested	RL (mg/L)	MCL/AL (mg/L)	Method	CAS #
Carbamates by HPLC						
3 Hydroxycarbofuran	Not Detected	05/27/2014	0.001		EPA 531.2	16655-82-6
Aldicarb	Not Detected	05/27/2014	0.0005		EPA 531.2	116-06-3
Aldicarb sulfone	Not Detected	05/27/2014	0.0005		EPA 531.2	1646-88-4
Aldicarb sulfoxide	Not Detected	05/27/2014	0.0005		EPA 531.2	1646-87-3
Carbaryl	Not Detected	05/27/2014	0.001		EPA 531.2	63-25-2
Carbofuran	Not Detected	05/27/2014	0.0005	0.04	EPA 531.2	1563-66-2
Methiocarb	Not Detected	05/27/2014	0.001		EPA 531.2	2032-65-7
Methomyl	Not Detected	05/27/2014	0.001		EPA 531.2	16752-77-5
Oxamyl	Not Detected	05/27/2014	0.001	0.2	EPA 531.2	23135-22-0
Propoxur	Not Detected	05/27/2014	0.001		EPA 531.2	114-26-1
Chlorinated Acid Herbicides						
2,4,5-T	Not Detected	05/23/2014	0.002		EPA 515.4	93-76-5
2,4,5-TP (silvex)	Not Detected	05/23/2014	0.0003	0.05	EPA 515.4	93-72-1
2,4-D	Not Detected	05/23/2014	0.002	0.07	EPA 515.4	94-75-7
Acifluorfen	Not Detected	05/23/2014	0.004		EPA 515.4	50594-66-6
Bentazon	Not Detected	05/23/2014	0.002		EPA 515.4	25057-89-0
Dicamba	Not Detected	05/23/2014	0.002		EPA 515.4	1918-00-9
Dinoseb	Not Detected	05/23/2014	0.0003	0.007	EPA 515.4	88-85-7
Pentachlorophenol	Not Detected	05/23/2014	0.00006	0.001	EPA 515.4	87-86-5
Picloram	Not Detected	05/23/2014	0.001	0.5	EPA 515.4	1918-02-1
Total DCPA degradates, mono- and di-acid	Not Detected	05/23/2014	0.001		EPA 515.4	1861-32-1
Pesticides Analysis by GC/MS						
4,4'-DDD	Not Detected	05/23/2014	0.001		EPA 525.2	72-54-8
4,4'-DDE	Not Detected	05/23/2014	0.001		EPA 525.2	72-55-9
4,4'-DDT	Not Detected	05/23/2014	0.0005		EPA 525.2	50-29-3
Acetochlor	Not Detected	05/23/2014	0.001		EPA 525.2	34256-82-1
Alachlor	Not Detected	05/23/2014	0.0002	0.002	EPA 525.2	15972-60-8
Aldrin	Not Detected	05/23/2014	0.0004		EPA 525.2	309-00-2
alpha-Chlordane	Not Detected	05/23/2014	0.0002	0.002	EPA 525.2	5103-71-9
Atrazine	Not Detected	05/23/2014	0.0002	0.003	EPA 525.2	1912-24-9
Dieldrin	Not Detected	05/23/2014	0.0005		EPA 525.2	60-57-1
Endrin	Not Detected	05/23/2014	0.0001	0.002	EPA 525.2	72-20-8
Endrin aldehyde	Not Detected	05/23/2014	0.001		EPA 525.2	7421-93-4
gamma-Chlordane	Not Detected	05/23/2014	0.0002	0.002	EPA 525.2	5103-74-2
Heptachlor	Not Detected	05/23/2014	0.0002	0.0004	EPA 525.2	76-44-8
Heptachlor epoxide	Not Detected	05/23/2014	0.0001	0.0002	EPA 525.2	1024-57-3
Hexachlorobenzene	Not Detected	05/23/2014	0.0001	0.001	EPA 525.2	118-74-1

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Sample Number
LF19430

TESTING INFORMATION			REGULATORY INFORMATION			
Analyte Name	Result (mg/L)	Date Tested	RL (mg/L)	MCL/AL (mg/L)	Method	CAS #
Pesticides Analysis by GC/MS						
Hexachlorocyclohexane (alpha-BHC)	Not Detected	05/23/2014	0.001		EPA 525.2	319-84-6
Hexachlorocyclohexane (beta-BHC)	Not Detected	05/23/2014	0.001		EPA 525.2	319-85-7
Hexachlorocyclohexane (delta-BHC)	Not Detected	05/23/2014	0.001		EPA 525.2	319-86-8
Hexachlorocyclopentadiene	Not Detected	05/23/2014	0.0005	0.05	EPA 525.2	77-47-4
Lindane (gamma-BHC)	Not Detected	05/23/2014	0.0001	0.0002	EPA 525.2	58-89-9
Methoxychlor	Not Detected	05/23/2014	0.0001	0.04	EPA 525.2	72-43-5
Metolachlor	Not Detected	05/23/2014	0.001		EPA 525.2	51218-45-2
Metribuzin	Not Detected	05/23/2014	0.001		EPA 525.2	21087-64-9
Molinate	Not Detected	05/23/2014	0.0005		EPA 525.2	2212-67-1
PCB (aroclor 1016)	Not Detected	05/23/2014	0.0001	0.0005	EPA 525.2	12674-11-2
PCB (aroclor 1221)	Not Detected	05/23/2014	0.0001	0.0005	EPA 525.2	11104-28-2
PCB (aroclor 1232)	Not Detected	05/23/2014	0.0001	0.0005	EPA 525.2	11141-16-5
PCB (aroclor 1242)	Not Detected	05/23/2014	0.0001	0.0005	EPA 525.2	53469-21-9
PCB (aroclor 1248)	Not Detected	05/23/2014	0.0001	0.0005	EPA 525.2	12672-29-6
PCB (aroclor 1254)	Not Detected	05/23/2014	0.0001	0.0005	EPA 525.2	11097-69-1
PCB (aroclor 1260)	Not Detected	05/23/2014	0.0001	0.0005	EPA 525.2	11096-82-5
Polybrominated biphenyls	Not Detected	05/23/2014	0.0001		EPA 525.2	59536-65-1
Simazine	Not Detected	05/23/2014	0.0002	0.004	EPA 525.2	122-34-9
Toxaphene	Not Detected	05/23/2014	0.001	0.003	EPA 525.2	8001-35-2
Volatile Organic Compounds						
1,1 Dichloroethane	Not Detected	05/27/2014	0.0005		EPA 524.2	75-34-3
1,1 Dichloroethylene	Not Detected	05/27/2014	0.0005	0.007	EPA 524.2	75-35-4
1,1 Dichloropropene	Not Detected	05/27/2014	0.0005		EPA 524.2	563-58-6
1,1,1 Trichloroethane	Not Detected	05/27/2014	0.0005	0.2	EPA 524.2	71-55-6
1,1,1,2 Tetrachloroethane	Not Detected	05/27/2014	0.0005		EPA 524.2	630-20-6
1,1,2 Trichloroethane	Not Detected	05/27/2014	0.0005	0.005	EPA 524.2	79-00-5
1,1,2,2 Tetrachloroethane	Not Detected	05/27/2014	0.0005		EPA 524.2	79-34-5
1,2 Dichlorobenzene	Not Detected	05/27/2014	0.0005	0.6	EPA 524.2	95-50-1
1,2 Dichloroethane	Not Detected	05/27/2014	0.0005	0.005	EPA 524.2	107-06-2
1,2 Dichloropropane	Not Detected	05/27/2014	0.0005	0.005	EPA 524.2	78-87-5
1,2,3 Trichlorobenzene	Not Detected	05/27/2014	0.0005		EPA 524.2	87-61-6
1,2,3 Trichloropropane	Not Detected	05/27/2014	0.0005		EPA 524.2	96-18-4
1,2,4 Trichlorobenzene	Not Detected	05/27/2014	0.0005	0.07	EPA 524.2	120-82-1
1,2,4 Trimethylbenzene	Not Detected	05/27/2014	0.0005		EPA 524.2	95-63-6
1,3 Dichlorobenzene	Not Detected	05/27/2014	0.0005		EPA 524.2	541-73-1
1,3 Dichloropropane	Not Detected	05/27/2014	0.0005		EPA 524.2	142-28-9
1,3,5 Trimethylbenzene	Not Detected	05/27/2014	0.0005		EPA 524.2	108-67-8
1,4 Dichlorobenzene	Not Detected	05/27/2014	0.0005	0.075	EPA 524.2	106-46-7

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Sample Number
LF19430

TESTING INFORMATION			REGULATORY INFORMATION			
Analyte Name	Result (mg/L)	Date Tested	RL (mg/L)	MCL/AL (mg/L)	Method	CAS #
Volatile Organic Compounds						
2,2 Dichloropropane	Not Detected	05/27/2014	0.0005		EPA 524.2	594-20-7
Benzene	Not Detected	05/27/2014	0.0005	0.005	EPA 524.2	71-43-2
Bromobenzene	Not Detected	05/27/2014	0.0005		EPA 524.2	108-86-1
Bromochloromethane	Not Detected	05/27/2014	0.0005		EPA 524.2	74-97-5
Bromodichloromethane	0.020	05/27/2014	0.0005	0.080	EPA 524.2	75-27-4
Bromoform	0.0010	05/27/2014	0.0005	0.080	EPA 524.2	75-25-2
Bromomethane	Not Detected	05/27/2014	0.001		EPA 524.2	74-83-9
Carbon tetrachloride	Not Detected	05/27/2014	0.0005	0.005	EPA 524.2	56-23-5
Chlorobenzene	Not Detected	05/27/2014	0.0005	0.1	EPA 524.2	108-90-7
Chlorodibromomethane	0.013	05/27/2014	0.0005	0.080	EPA 524.2	124-48-1
Chloroethane	Not Detected	05/27/2014	0.0005		EPA 524.2	75-00-3
Chloroform	0.022	05/27/2014	0.0005	0.080	EPA 524.2	67-66-3
Chloromethane	Not Detected	05/27/2014	0.0005		EPA 524.2	74-87-3
cis-1,2 Dichloroethylene	Not Detected	05/27/2014	0.0005	0.07	EPA 524.2	156-59-2
cis-1,3 Dichloropropene	Not Detected	05/27/2014	0.0005		EPA 524.2	10061-01-5
Dibromomethane	Not Detected	05/27/2014	0.0005		EPA 524.2	74-95-3
Dichlorodifluoromethane	Not Detected	05/27/2014	0.001		EPA 524.2	75-71-8
Dichloromethane	Not Detected	05/27/2014	0.0006	0.005	EPA 524.2	75-09-2
Ethylbenzene	Not Detected	05/27/2014	0.0005	0.7	EPA 524.2	100-41-4
Fluorotrichloromethane	Not Detected	05/27/2014	0.001		EPA 524.2	75-69-4
Hexachlorobutadiene	Not Detected	05/27/2014	0.0005		EPA 524.2	87-68-3
Isopropylbenzene	Not Detected	05/27/2014	0.0005		EPA 524.2	98-82-8
m & p-Xylene	Not Detected	05/27/2014	0.0005	10	EPA 524.2	XYLMP-00-C
Methyl ethyl ketone	Not Detected	05/27/2014	0.005		EPA 524.2	78-93-3
Methyl isobutyl ketone	Not Detected	05/27/2014	0.005		EPA 524.2	108-10-1
Methyl-tert-butyl ether (MTBE)	Not Detected	05/27/2014	0.001		EPA 524.2	1634-04-4
Naphthalene	Not Detected	05/27/2014	0.0005		EPA 524.2	91-20-3
n-Butylbenzene	Not Detected	05/27/2014	0.0005		EPA 524.2	104-51-8
Nitrobenzene	Not Detected	05/27/2014	0.01		EPA 524.2	98-95-3
n-Propylbenzene	Not Detected	05/27/2014	0.0005		EPA 524.2	103-65-1
o-Chlorotoluene	Not Detected	05/27/2014	0.0005		EPA 524.2	95-49-8
o-Xylene	Not Detected	05/27/2014	0.0005	10	EPA 524.2	95-47-6
p-Chlorotoluene	Not Detected	05/27/2014	0.0005		EPA 524.2	106-43-4
p-Isopropyltoluene	Not Detected	05/27/2014	0.0005		EPA 524.2	99-87-6
sec-Butylbenzene	Not Detected	05/27/2014	0.0005		EPA 524.2	135-98-8
Styrene	Not Detected	05/27/2014	0.0005	0.1	EPA 524.2	100-42-5
tert-Butylbenzene	Not Detected	05/27/2014	0.0005		EPA 524.2	98-06-6
Tetrachloroethylene	Not Detected	05/27/2014	0.0005	0.005	EPA 524.2	127-18-4
Tetrahydrofuran	Not Detected	05/27/2014	0.005		EPA 524.2	109-99-9

CAS# : Chemical Abstract Service Registry Number
MCL : Maximum Contaminant Level
AL : Action Level
RL : Reporting Limit

mg/L : milligrams / Liter (ppm)
ppm : parts per million
MPN : Most Probable Number
CFU : Colony Forming Unit

Laboratory Contacts
Drinking Water Unit Mgr: Julia Pieper
Systems Mgmt. Unit Mgr: George Krisztian

MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY
DRINKING WATER LABORATORY
USEPA Region V Drinking Water Cert. No. MI00003
P.O. Box 30270
Lansing, MI 48909
TEL: (517) 335-8184
FAX: (517) 335-8562

Sample Number
LF19430

TESTING INFORMATION			REGULATORY INFORMATION			
Analyte Name	Result (mg/L)	Date Tested	RL (mg/L)	MCL/AL (mg/L)	Method	CAS #
Volatile Organic Compounds						
Toluene	Not Detected	05/27/2014	0.0005	1	EPA 524.2	108-88-3
Total Trihalomethanes	0.056	05/27/2014	NA	0.080	EPA 524.2	TTHM-00-C
Total Xylenes	Not Detected	05/27/2014	NA	10	EPA 524.2	1330-20-7
trans-1,2 Dichloroethylene	Not Detected	05/27/2014	0.0005	0.1	EPA 524.2	156-60-5
trans-1,3 Dichloropropene	Not Detected	05/27/2014	0.0005		EPA 524.2	10061-02-6
Trichloroethylene	Not Detected	05/27/2014	0.0005	0.005	EPA 524.2	79-01-6
Vinyl chloride	Not Detected	05/27/2014	0.0004	0.002	EPA 524.2	75-01-4

The analyses performed by the MDEQ Drinking Water Laboratory were conducted using methods approved by the U.S. Environmental Protection Agency in accordance with the Safe Drinking Water Act, 40 CFR parts 141-143, and other regulatory agencies as appropriate.

Your local health department has detailed information about the quality of drinking water in your area. If you have concerns about the health risks related to the test results of your sample, please contact the Environmental Health Section through the address and telephone number listed below:

Genesee County Health Dept.
630 South Saginaw
Flint, MI 48502-1540
810 257-3603

CAS# : Chemical Abstract Service Registry Number
MCL : Maximum Contaminant Level
AL : Action Level
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mg/L : milligrams / Liter (ppm)
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USEPA Region V Drinking Water Cert. No. MI00003
P.O. Box 30270
Lansing, MI 48909
TEL: (517) 335-8184
FAX: (517) 335-8562

Sample Number
LF19431

Official Laboratory Report

Report To: MICHAEL GLASGOW
4500 N DORT HWY
FLINT MI 48505

System Name/Owner:	CITY OF FLINT - WATER PLANT	WSSN/Pool ID:	2310
Collection Address:	4500 N DORT HWY,FLINT	Source:	TYPE I
Collected By:	MICHAEL GLASGOW	Site Code:	PS4
Township/Well#/Section:	//	Collector:	Public Water Supply Operator
County:	Genesee	Date Collected:	05/22/2014 08:30
Sample Point:	SINK	Date Received:	05/22/2014 13:20
Water System:	Treated Public Distribution System	Purpose:	Routine Monitoring

TESTING INFORMATION			REGULATORY INFORMATION			
Analyte Name	Result (mg/L)	Date Tested	RL (mg/L)	MCL/AL (mg/L)	Method	CAS #
Total Organic Carbon	4.57	05/22/2014	0.5		SM 5310C	TOC-00-C

The analyses performed by the MDEQ Drinking Water Laboratory were conducted using methods approved by the U.S. Environmental Protection Agency in accordance with the Safe Drinking Water Act, 40 CFR parts 141-143, and other regulatory agencies as appropriate.

Your local health department has detailed information about the quality of drinking water in your area. If you have concerns about the health risks related to the test results of your sample, please contact the Environmental Health Section through the address and telephone number listed below:

Genesee County Health Dept.
630 South Saginaw
Flint, MI 48502-1540
810 257-3603

CAS# : Chemical Abstract Service Registry Number
MCL : Maximum Contaminant Level
AL : Action Level
RL : Reporting Limit

mg/L : milligrams / Liter (ppm)
ppm : parts per million
MPN : Most Probable Number
CFU : Colony Forming Unit

Laboratory Contacts
Drinking Water Unit Mgr: Julia Pieper
Systems Mgmt. Unit Mgr: George Krisztian

MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY
DRINKING WATER LABORATORY
USEPA Region V Drinking Water Cert. No. MI00003
P.O. Box 30270
Lansing, MI 48909
TEL: (517) 335-8184
FAX: (517) 335-8562

Sample Number
LF19432

Official Laboratory Report

Report To: MICHAEL GLASGOW
4500 N DORT HWY
FLINT MI 48505

System Name/Owner:	CITY OF FLINT/ WATER PLANT	WSSN/Pool ID:	2310
Collection Address:	4500 N DORT HWY,FLINT	Source:	TYPE I
Collected By:	MICHAEL GLASGOW	Site Code:	RAW
Township/Well#/Section:	//	Collector:	Public Water Supply Operator
County:	Genesee	Date Collected:	05/22/2014 08:30
Sample Point:	SINK	Date Received:	05/22/2014 13:20
Water System:	Treated Public Distribution System	Purpose:	Routine Monitoring

TESTING INFORMATION			REGULATORY INFORMATION			
Analyte Name	Result (mg/L)	Date Tested	RL (mg/L)	MCL/AL (mg/L)	Method	CAS #
Total Organic Carbon	10.3	05/22/2014	0.5		SM 5310C	TOC-00-C

The analyses performed by the MDEQ Drinking Water Laboratory were conducted using methods approved by the U.S. Environmental Protection Agency in accordance with the Safe Drinking Water Act, 40 CFR parts 141-143, and other regulatory agencies as appropriate.

Your local health department has detailed information about the quality of drinking water in your area. If you have concerns about the health risks related to the test results of your sample, please contact the Environmental Health Section through the address and telephone number listed below:

Genesee County Health Dept.
630 South Saginaw
Flint, MI 48502-1540
810 257-3603

CAS# : Chemical Abstract Service Registry Number
MCL : Maximum Contaminant Level
AL : Action Level
RL : Reporting Limit

mg/L : milligrams / Liter (ppm)
ppm : parts per million
MPN : Most Probable Number
CFU : Colony Forming Unit

Laboratory Contacts
Drinking Water Unit Mgr: Julia Pieper
Systems Mgmt. Unit Mgr: George Krisztian

Coagulation Parameters | City of Flint Water Treatment Plant | **WSSN: 2310** | April 2014 |

Date	Million Gallons Treated	Ferric as Fe3+ mg/L	Turbidity, Units																
			Raw			Applied	Confluence Point. No.1 (N) South						Confluence Point. No.2 (S) South						Point of Entry
			Number of Samples	Avg.	Max.	Applied Avg.	Number of Samples	Avg.	Max	No. of 4 Hr. Compliance periods	No. of 4 Hr. Compliance periods >0.3 NTU	No. of Samples >0.3 NTU	Number of Samples	Avg.	Max	No. of 4 Hr. Compliance periods	No. of 4 Hr. Compliance periods >0.3 NTU	No. of Samples >0.3 NTU	Plant Tap NTU
1																			
2																			
3																			
4																			
5																			
6																			
7																			
8																			
9																			
10																			
11																			
12																			
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15																			
16																			
17																			
18																			
19																			
20																			
21																			
22																			
23																			
24																			
25	12.0	11.0	2	10.2	11.8	3.00	6	0.09	0.12	6	0	0	6	0.07	0.09	0	0	0	0.13
26	12.4	10.9	2	11.4	13.4	2.20	6	0.05	0.07	6	0	0	6	0.06	0.11	0	0	0	0.07
27	12.8	11.9	2	11.4	13.7	3.90	6	0.05	0.06	6	0	0	6	0.06	0.11	0	0	0	0.07
28	8.2	12.3	2	14.6	15.6	8.20	4	0.08	0.19	4	0	0	4	0.07	0.10	0	0	0	0.05
29	0	0	2	11.3	13.2	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.07
30	8.1	11.4	2	10.5	11.1	4.60	2	0.22	0.28	2	0	0	2	0.18	0.20	0	0	0	0.25
Avg.	8.9	9.6	2	11.6		4.38	5	0.10	0.14	4.8	0	0	5	0.09	0.12	0	0	0	
Max.	12.8	12.3	2	14.6	15.6	8.20	6	0.22	0.28	6	0	0	6	0.18	0.20	0	0	0	0.25
Min.	0	0	2	10.2		2.20	2	0.05	0.06	2	0	0	2	0.06	0.09	0	0	0	
Total	53.5																		

Fluoridation & Chlorination City of Flint Water Treatment Plant **WSSN: 2310** April 2014 Page 3

Date	Fluoriode Applied as F- mg/L	Fluoride Analysis (mg/L)			Chlorine Application (mg/L)			Chlorine Residual (mg/L)					
					Intermediate Chlorine	Post Chlorine	Total Chlorine	Filtered		3 MG Well		Tap	
		Raw	Tap	Dist.				Free	Total	Free	Total	Free	Total
1													
2													
3													
4													
5													
6													
7													
8													
9													
10													
11													
12													
13													
14													
15													
16													
17													
18													
19													
20													
21													
22													
23													
24													
25	0	0.14	0.59		3.5	0	3.5	1.8	2.1			0.8	1.0
26	0	0.14	0.53		3.5	0	3.5	1.7	1.9			0.9	1.1
27	0	0.13	0.53		3.6	0	3.6	1.7	1.9	1.5	1.8	1.0	1.1
28	0	0.13	0.19		3.7	0	3.7	1.7	1.9	1.4	1.8	0.9	1.0
29	0	0.15	0.58	0.43	3.7	0	3.7	n/a	n/a	n/a	n/a	0.9	1.1
30	0	0.15	0.62		3.5	0	3.5	1.7	2.0	1.5	1.8	1.0	1.1
Avg.	0	0.14	0.51	0.43	3.6	0	3.6	1.7	2.0	1.5	1.8	0.9	1.1
Max.	0	0.15	0.62	0.43	3.7	0	3.7	1.8	2.1	1.5	1.8	1.0	1.1
Min.	0	0.13	0.19	0.43	3.5	0	3.5	1.7	1.9	1.4	1.8	0.8	1.0

Chemical Analyses City of Flint Water Treatment Plant April 2014 Page 4
WSSN: 2310

Date	pH (S.U.)		Total Hardness as CaCO3 (mg/L)		Total Alkalinity as CaCO3 (mg/L)		Non-Carbonate Hardness as CaCO3 (mg/L)		Calcium as Ca2+ (mg/L)		Magnesium as Mg2+ (mg/L)		Chloride as Cl- (mg/L)	
	Raw	Tap	Raw	Tap	Raw	Tap	Raw	Tap	Raw	Tap	Raw	Tap	Raw	Tap
1														
2														
3														
4														
5														
6														
7														
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22														
23														
24														
25		7.39		96		75		21		29.7		5.3		
26	8.31	7.28	255	98	200	73	55	25	77.9	29.7	13.6	5.8	48	24
27	8.34	7.32	249	98	199	70	50	28	75.4	30.5	14.6	5.8	42	32
28	8.39	8.46	247	92	205	60	42	32	82.6	46.5	9.8	8.3	43	68
29	8.46	7.35	230	98	190	70	40	28	76.2	30.5	9.7	5.3		
30	8.41	7.30	248	98	208	73	40	25	72.1	29.7	17.5	5.8	45	17
Avg.	8.38	7.52	246	97	200	70	45	27	76.8	32.8	13.0	6.1	45	35
Max.	8.46	8.46	255	98	208	75	55	32	82.6	46.5	17.5	8.3	48	68
Min.	8.31	7.28	230	92	190	60	40	21	72.1	29.7	9.7	5.3	42	17

Bacteriological & Physical Parameters | City of Flint Water Treatment Plant | **WSSN: 2310** | April 2014 | Page 5

Date	Total Coliform						Standard Plate Count		Wind Direction	Temp. C	Color		Odor	
	Raw (Colilert MPN)		Filter Confluence (N&S)		Plant Tap									
	# Samples	Count	# Samples	# pos	# Samples	# pos	Raw	Tap		Raw	Raw	Tap	Raw	Tap
1														
2														
3														
4														
5														
6														
7														
8														
9														
10														
11														
12														
13														
14														
15														
16														
17														
18														
19														
20														
21														
22														
23														
24														
25	1		12	0	1	0		< 2		11.0				
26	1		12	0	1	0	> 1476	< 2		11.4				
27	1		12	0	1	0	142	< 2		11.1				
28	1		8	0	1	0	532	< 2		11.5				
29	1		0	0	1	0		< 2		12.1				
30	1		4	0	1	0	1246	< 2		13.5				
Avg.							n/a	< 2		11.8				
Max.							> 1476	< 2		13.5				
Min.							142	< 2		11.0				

Distribution System Monitoring City of Flint Water Treatment Plant **WSSN: 2310** April 2014

Date	Free Chlorine Residual at Bacteriological Montioring Stations mg/l										
	1	2	3	4	5	6	7	8	CS	WR	Number of Samples
1											0
2											0
3											0
4											0
5											0
6											0
7											0
8											0
9											0
10											0
11											0
12											0
13											0
14											0
15											0
16											0
17											0
18											0
19											0
20											0
21											0
22											0
23											0
24											0
25											0
26											0
27											0
28											0
29	1.0	0.8	1.0	0.7	0.8	0.8	1.1	0.8	0.7	0.9	10
30											0
31											0

Distribution Sample Summary	
Total # of routine distribution samples analyzed	115
Total # of routine distribution samples required	100

Distribution Disinfectant Residual Summary	
Percent samples with a detectable disinfectant residual	100
Average disinfectant residual this month	0.9

Distribution Bacteriological Summary	
Total # of positive routine distribution samples	0
Percent of routine distribution samples positive	0

Positive Distribution Samples					
Date	Monitoring Station	Date	Repeat Monitorong Stations	Residual	Positive or Negative

Distribution System Monitoring

City of Flint Water Treatment Plant
WSSN: 2310

April 2014

Date	Total Chlorine Residual at Bacteriological Montioring Stations mg/l										
	1	2	3	4	5	6	7	8	CS	WR	Number of Samples
1											0
2											0
3											0
4											0
5											0
6											0
7											0
8											0
9											0
10											0
11											0
12											0
13											0
14											0
15											0
16											0
17											0
18											0
19											0
20											0
21											0
22											0
23											0
24											0
25											0
26											0
27											0
28											0
29	1.0	0.8	1.0	0.7	0.8	0.8	1.1	0.8	0.7	0.9	10
30											0
31											0

Rennaker, Joanne (DEQ)

From: Prysby, Mike (DEQ)
Sent: Friday, March 22, 2013 12:02 PM
To: Shekter Smith, Liane (DEQ); Bloemker, Jon (DEQ); Benzie, Richard (DEQ); Busch, Stephen (DEQ); Donaldson, Kristina (DEQ)
Subject: FW: KWA Rowe Engineering review
Attachments: Rowe Review of Tucker Young Report.pdf

I plan to review Rowe's report along with the TY report and the other documents for additional comments this afternoon. I am forwarding this report for your information and/or review as needed.

Michael Prysby, P.E.
District Engineer
Office of Drinking Water and Municipal Assistance
517 335-6122

From: Daugherty Johnson [mailto:djohnson@cityofflint.com]
Sent: Friday, March 22, 2013 11:53 AM
To: Prysby, Mike (DEQ)
Subject: KWA Rowe Engineering review

Hello Mike. Attached is a copy of the review that Rowe Engineering did of the Tucker Young report that Treasury requested. I believe it was formatted as responses to Tucker Young comments/statements. Give me a call if you have any questions. (810) 577-8906

Thanks
Duffy

ROWE PROFESSIONAL SERVICES COMPANY

Large Firm Resources. Personal Attention.℠

January 7, 2013

Mr. Edward Kurtz, Emergency Financial Manager
City of Flint
1101 S. Saginaw Street
Flint, MI 48502

Subject: Review of December 21, 2012 Presentation – City of Flint Water Supply Assessment

Dear Mr. Kurtz:

As requested, we have reviewed the analysis of water supply alternatives for the City of Flint which was presented to the State Department of Treasury by Tucker, Young, Jackson, and Tull, Inc. (TYJT) on December 21, 2012. Our review is attached and summarizes the primary differences between the TYJT assessment and our previous studies and provides explanations of why we believe there are differences.

We have also reviewed the options for continued DWSD supply included in the TYJT presentation. It is not clear whether these are presented as specific offers on behalf of DWSD or included as examples for analysis, but we have noted some items which we believe should be addressed and considered as these options are compared.

If there are questions, please contact me.

Sincerely,
ROWE Professional Services Company

James E. Redding, P.E.
Vice President / Director of Engineering

Attachment

R:\Projects\04C0105\Docs\Correspondence Out\January 7 Kurtz.docx

Review of TYJT December 21, 2012 Presentation
City of Flint Water Supply Assessment
Prepared by Rowe Professional Services Company

DWSD Supply (Slides 7 through 9)

1. The 8 mgd maximum day supply by DWSD options can result in periods during the summer when most of the water to meet demands will be supplied by the City from the river. To aid in maintaining a consistent water quality, softening of the water from the river should be provided with this option, greatly increasing the City's costs.

2. Upgrades to Flint's WTP and dams will be needed for options requiring blending, since the WTP will be required to provide continuous, reliable service and compliance with recent surface water treatment regulations.

3. The rates for the options analyzed are shown on Slide 9 as "TYJT Estimates". Options and rates shown are different than presented by DWSD previously.

	DWSD 11/29/2012	TYJT Estimates
18 mgd Maximum Day - P&B	$16.24	$16.37
12 mgd Maximum Day - P&B	$16.30	$16.31
8 mgd Maximum Day -P&B		$12.68
12 mgd Maximum Day - Imlay	$14.38	$14.38
8 mgd Maximum Day - Imlay		$11.11

4. Since the rates used in the analyses are shown as estimates, are they actual offers or just presented as "what if" scenarios?

5. We assume that the Imlay options are based on transfer of the 72" main through Lapeer County to Flint. The analyses show a capital cost of $4.7 million; we assume that this is the proposed purchase / lease cost to Flint. This should be clarified along with pertinent details.

6. If the transmission main is transferred to Flint, what are Flint's responsibilities regarding service to the Lapeer County customers? If they remain DWSD customers, then Flint should receive some revenue for the use the main. It does not appear this is included in the TYJT analyses.

7. If the transmission main is transferred to Flint, we assume that the city will be responsible for the maintenance of the 50 year old main. The TYJT analysis did not include this.

8. Do the rates shown include the credit for "reliability" which had been discussed with DWSD?

9. If the point of commerce is changed from Baxter and Potter to Imlay, a new meter pit will be required. The cost of this does not appear to be included in the TYJT cost analyses.

Flint River Supply (Slide 10)

1. If any of the "blending" options are chosen, it will be necessary to upgrade the Flint WTP and dams to provide reliable, continuous service and compliance with recent surface water treatment regulations.

Data Collected (Slide 14)

1. The slide notes that Flint blending is based on DWSD supplying 2/3 and Flint supplying 1/3 of 12 MGD ADD. For the maximum day demand (18 mgd), if DWSD supplies a maximum of 8 mgd, Flint will supply 10 mgd or 56% of the total. However, such a large portion will make it more difficult to blend and achieve consistent water quality. Flint will need to soften water for these options.

Benchmarking Comparisons (Slide 16)

1. The slide subtitles are "KWA O&M Inflation Factor" and "DWSD and Flint Rate Inflation Factor". It seems appropriate to benchmark O&M costs for the KWA, because future costs of service will be dependent on how operating costs are impacted by inflation. For Flint, it does not seem appropriate that "rate inflation" from other utilities be used to determine the impact of inflation on future cost of service. Rates are impacted by inflation, but also by other factors such as debt and customer base. O&M expenses and rates are different and care should be exercised not to mix the two during analyses. The TYJT analyses apply an inflation factor (based on rates from other utilities) to the Flint WTP operating expenses, which does not seem to be consistent.

2. The KWA will supply raw water; SOCWA and YUCA both supply finished water. Regulations impact the O&M for finished water suppliers but should not impact the KWA O&M. The use of data from SOCWA and YUCA does not seem like a comparable comparison with the KWA. Finished water suppliers will have increased costs due to regulatory compliance, which really are not due to "inflation" of the costs of wages, power, chemicals, etc.

3. DWSD has a history of rates to Flint and other suburban wholesale customers. Rates tend to be quite specific to each utility, based on much more than just the costs of operating and maintenance. It appears that DWSD historical rates have not been considered in projecting future DWSD rate increases.

Capital Financing (Slide 17)

1. KWA bonds are planned to be general obligation bonds, backed by member counties.

O&M Inflation Factor (Slide 20)

1. SOCWA and YUCA are finished water suppliers; ever-changing regulatory requirements will impact their operating costs more than a raw water supplier, such as KWA.
2. KWA will be a supplier of raw water. O&M costs should primarily be limited to power and labor, with a little chemical use for zebra mussel control. KWA will not provide treatment of the water.

3. The KWA study assumed power, labor, and chemical costs increase at an annual average of 3%. TYJT indicated this is too low and suggested 5%.

4. Following are examples of historical inflation, which support the 3% as a reasonable assumption for O&M expenses (not rates)
    a. Labor- GCDC-WWS labor costs have increased at an annual average rate of 2.5% since 2003
    b. Electricity Rates in Michigan (per U.S. Energy Information Administration) have increased an average of 3.2% since 1999.
    c. The U.S. Bureau of Labor Statistics indicates that the inflation rate over the last 30 years has been an average of 2.8%.

Finished Water Rate Inflation (Slide 21)

1. TYJT bases their assumptions for rate inflation on a survey of rates from three other water suppliers, but ignored the actual rate history of DWSD. TYJT assumed DWSD rate increases of 4.4% annually (if water is purchased from P&B) and 2.9% annually (if water is purchased from Imlay). Based on the actual charges by DWSD to Flint, DWSD historical rates are as follows:
    a. 10 year increase in DWSD rates to Flint:: 10.5% annually
    b. Average annual increase through 45 year history: 6.7%

2. Note that for the KWA analyses, an inflation factor has just been applied to power, labor, and chemicals. Although higher prices for labor, power, and chemicals impacts utility rates; rates are impacted by many other factors, many of which are not related to inflation. Rate inflation will likely be different than O&M inflation. Other factors impacting rates:
    a. Debt – the amount of debt varies widely between utilities
    b. Number of customers / quantity of water sold – there are many fixed expenses with a utility, that if are distributed amongst more users/more gallons sold will result in lower rates. Conversely, if there are fewer users or less water sold, the rates are higher. Assumptions regarding future water consumption will have a great impact on "rate inflation".

3. Unlike KWA and Flint operating expenses which will increase over time based on inflation, the cost of continued DWSD service should be based on the inflation of DWSD rates, to include the increasing cost of other DWSD expenses such as debt and the impact of reduced customers / demands in addition to increasing O&M expenses.

4. Even though there could be a one-time reduction in DWSD rates through adopting the model contract, limiting peak demands, and or changing the point of commerce; it doesn't seem reasonable to assume that subsequent annual increases will only average 4.4% through the 30 year period of analysis. This is significantly less than historical performance (yet TYJT suggests that inflation for KWA O&M expenses will increase at almost double the rate of historical indicators).

Capital Financing with Revenue Bonds (Slide 24)

1. Note that the KWA bonds will be general obligation bonds backed by the member counties.

2. The 2009 KWA Study assumed 6%, 25 year financing. The interest rate for planning was reduced in the 2012 Study update to 5%, which is still higher than if bonds were sold today.

3. Financial consultants determined the charges for purchasing capacity in the KWA supply based on the estimated project cost plus appropriate financing costs. Based on 60 units of capacity, $538,764,000 will be generated for repayment of debt and project costs using the capacity charges in the KWA capacity agreement.

25 years * 60 units * $355,300 / unit =	$532,950,000
3 years * 60 units * $32,300 / unit =	$ 5,814,000
	$538,764,000

4. For a KWA project cost of $272,421,558, total P&I is $483 million. The difference of $55,500,000 is available for financing expenses (capitalized interest, bond issuance costs, etc.) and additional contingencies.

5. Bond holder reserve is not a requirement for general obligation bonds.

6. TYJT assumed that 3% interest would be earned on the bond holder reserve during the 25 year bond period. Current interest rates are less than 1% and it seems inappropriate to assume such a high rate will be earned on retained funds.

7. Bondholder reserve, if provided, should be applied against the last couple of P&I payments. The TYJT did not apply it. This will reduce their project costs.

KWA Construction (Slides 26 through 29)

TYJT has indicated that the KWA construction cost estimate is too low. The primary differences in cost estimates for the project appear to be the following components:

1. Pump Stations (Slide 27) – The TYJT estimate for the pump stations is more than double that used by the KWA ($54,573,314 vs. $24,618,080). KWA estimates were based on actual construction costs from recent projectd completed by Genesee County within the last eight years.
   a. 32mgd water pump station including two-10 MG ground storage tanks - $13.4 million
   b. 80 mgd wastewater pump station, 50 feet deep wetwell – $8.3 million
   c. 30 mgd wastewater pump station, 50 feet deep wetwell – $9.4 million

   The KWA budgeted amount seems reasonable for two pumping stations as currently planned and to be constructed in rural areas (not southeast Michigan).

2. Redundant Power – There is no need for redundant power; other provisions will provide reliability of supply.

3. Land – Preliminary engineering has continued so earlier budgets established for planning for land acquisition can be greatly reduced. Options have been obtained on all properties which must be

purchased, so purchase prices are known. It will be necessary to obtain easements for only two miles of pipeline construction. All land costs are now estimated at $1.25 million.

4. Engineering, Legal, Administration & Contingencies
   a. The October 2012 KWA estimate provided an allowance of 25% of construction cost to cover engineering, legal, administration, and contingencies (ELAC). This was reduced from the 38% allowance used in the 2009 Study because ongoing planning and design have firmed up many of the details of the project, including:
      i. The intake design has been completed and all regulatory permits obtained.
      ii. The transmission main route has been determined. Meetings with road agencies have firmed up the requirements for construction and restoration within rights-of-way. Environmental review and permitting are in process.

   b. TYJT costs for Intake Crib, Pump Stations, and Transmission Mains (Slide 30) include a 30% allowance for ELAC. These allowances (from Slides 26 through 28) total $72,139,566. In addition, Slide 30 provides the following additional ELAC costs in the project total:

Design Engineering / Pump Stations	$16,939,581
Construction Management	$14,434,410
Administration	$ 349,440
Legal	$ 831,000
Total	$32,554,431

   c. Combining this with the $72,139,566 totals $104,693,997 or 43% of the estimated construction cost. We believe that such a high allowance for ELAC is not appropriate for a project of this magnitude where preliminary engineering and some design have already been completed.

Cost Comparison (Slide 30)

1. The TYJT pump station price is too high based on costs of similar projects; costs used by KWA are based on costs of recent local projects. The KWA estimate is believed to be sufficient for the proposed pumping stations.

2. Redundant power is not required; this does not need to be included in the TYJT estimate.

3. Land for LHPS – actual price is $360,000

4. Design Engineering / PS and Transmission – KWA included engineering in the 25% ELAC allowance included in the $207,752,895 estimated cost of transmission mains; TYJT included engineering in their 30% ELAC allowance included in the $218,811,559 estimated cost. By adding $16,939,581 for design engineering, $14,434,609 for construction administration, $349,440 for administration, and $831,000; it seems that ELAC is being "double-counted". The TYJT 43% allowance for ELAC seems unwarranted for a project with a great deal of preliminary and design engineering completed. The 25% KWA allowance is believed to be sufficient.

5. Easements and land (other than LHPS) should total $1,140,000, based on current options and specific needs for easements.

Other Considerations – Redundancy / Reliability (Slide 33)

1. Unfunded Mandates/ Future Regulations
    a. The proposed KWA supply will deliver raw water; it is not anticipated to be affected by future changes to regulations. Regulations will impact the City of Flint with respect to treatment and/or distribution of finished water. The City will be subject to these requirements with any of the DWSD blending options, just as they will be responsible for them if supplied by KWA. Some compliance costs may actually be less with the higher quality Lake Huron water rather than Flint River water as the source.

2. State Goals
    a. The TYJT presentation indicates that creation of a new raw water supply is contrary to the governor's goals as suggested. However, the development of a new raw water supply provides new opportunities. Communities in Sanilac, St. Clair, and Lapeer counties will have the option to join a regional water supply and replace their small local supplies where limited supplies and high concentrations of arsenic have been a concern. The new water supply also provides great economic development opportunities. The raw water supplied by KWA will make a new commodity, raw water, available to the region. A large, low-cost supply of raw water can be a valuable resource for industries and agri-businesses. The development of a new water supply will also create construction jobs through the short term period of building the new water supply and subsequently over a longer period as new businesses and industries are developed in the area.
    b. The City of Flint and area communities will benefit as permanent jobs are created for operating and maintaining the local treatment facilities.

3. Redundancy
    a. We agree that the KWA and DWSD options are similar with respect to redundancy. Both provide the primary water supply; customers are responsible for their backup supply.

Other Considerations – Cost Slide 34

1. TYJT indicates that the DWSD 8 mgd supply option is the least cost alternative.
    a. The TYJT analysis does not include the cost of needed upgrades to the City's WTP or increased operating costs in their analysis. During summer months, water from the river will need to be softened before blending. More than half of the water supplied will be provided from the river. When the cost of upgrades to the WTP and the increased operating costs (for softening) are added to the TYJT analysis, the KWA option is less than the DWSD 8 mgd option.

2. For any of the DWSD "blending" options, upgrades will need to be made at the WTP to provide for continuous, reliable operation and compliance with new surface water treatment rules. Increased capital and operating costs for treating water from the river should be added to the TYJT costs for comparison with the other options.

3. Water from the river will require greater effort to treat than water from Lake Huron (more chemicals, power, and residuals). The TYJT analysis shows about the same O&M costs for the Flint WTP, regardless of water source. It seems that the WTP O&M costs for the KWA options should be reduced to reflect the savings from treating Lake Huron water.

4. The TYJT presentation noted that the KWA analysis did not include allowances for mechanical and process improvements within the planning period. The KWA will supply raw water. The facilities consist of pipe, pumps, and a tank. There are no treatment facilities which would be susceptible to future regulatory changes. The only improvements that seem likely would be the need to provide additional capacity. Capacity expansion is planned to be financed through capacity charges to new users.

5. The provision for redundant connections between the City's water system and the GCDC system was included in the most recent water supply agreement between the two, in 2011. Although not a KWA cost, the cost of the redundant connections should be considered with all options.

6. The $2.3 million budgeted for land by KWA was intended to cover all land requirements. Since the October update, options have been obtained on all land to be purchased and the locations of easements needed has been finalized. Total land costs are now estimated to be about $1.5 million.

7. The 2004 study included a 47% allowance for engineering, legal, administration, and contingencies (ELAC). The 2009 study reduced the allowance for ELAC to 37% because many of the details since the 2004 conceptual study had been better defined. For the October 2012 update, the allowance for ELAC was reduced to 25% because continued planning and preliminary engineering further addressed details from the earlier concepts.
    a. The detailed design (plans and specifications) and permitting have been completed.
    b. The transmission main route has been finalized. Meetings with road agencies have established requirements for construction and restoration within road rights-of-way. Environmental permitting is in process. The primary remaining unknown is pipe sizing, which is largely dependent on Flint's participation.

    It is our experience that the 25% ELAC allowance is appropriate for a project of this magnitude at this stage in the planning / design stage. The 43% ELAC allowance recommended by TYJT is excessive for a project in the design phase.

8. Flint's WTP as a backup to the KWA will be less difficult to provide for than the current arrangement as a backup to DWSD. We believe there is potential for challenges with chemistry and treatment for the proposed DWSD blending options, too.

9. It doesn't seem that oversizing the KWA capacity is a good solution for the city's water loss problems, if that is what is being suggested.

10. Yes, it would be nice if the KWA system could be constructed to firmly determine its cost and time to complete before making a decision about water supply alternatives. However, a decision is needed regarding Flint's participation so that the sizing and design can be completed, before it can be built.

Project Costs - TYJT Slides 26 through 30

	KWA	TYJT
Intake and Crib		
Construction	$22,076,850	$22,076,850
ELAC	$5,519,213	$5,519,213
Property	$2,300,000	$2,300,000
Pumping Stations		
Construction	$24,618,080	$54,573,314
Land		$75,000
ELAC	$6,154,520	$16,394,494
Transmission Mains		
Construction	$166,202,316	$167,419,530
ELAC	$41,550,579	$50,225,859
Easements		$1,166,170
Engineering		
Design Engineering		$16,939,581
Construction Management		$14,434,609
Administration		$349,440
Legal / Easements / Contracts		$831,000
Power	$4,000,000	$4,000,000
Redundant Power		$1,273,200
Total Construction	$212,897,246	$244,069,694
Total ELAC	$53,224,312	$104,694,196
Total Land / Property / Easements	$2,300,000	$3,541,170
Total Power	$4,000,000	$4,000,000
Total Redundant Power	$0	$1,273,200
Total	$272,421,558	$357,578,260
ELAC as % of Construction	25.0%	42.9%

Option	TYJT Total Cost	TYJT minus additional costs of river treatment	TYJT minus additional costs of river treatment plus redundant Flint-GCDC connections	TYJT minus additional costs of river treatment plus redundant connections less KWA reserve	TYJT minus additional costs of river treatment plus redundant connections less TYJT financing	TYJT plus Flint WTP		Adjusted Total Cost	Ranking
1 Flint WTP Only	$590,441,893							$590,441,893	3
2 DWSD 8 MGD Max Day at Imlay	$621,211,298					$771,289,948		$771,289,948	5
3 KWA 10/31/12 Update	$649,775,166	$534,615,996	$554,555,960					$554,555,960	1
4 DWSD 8 MGD Max Day at P&B	$657,167,877					$807,246,527		$807,246,527	6
5 KWA-1	$707,279,715	$592,120,545	$612,060,509		$572,731,459			$572,731,459	2
6 DWSD 12 MGD Max Day at Imlay	$707,994,386					$858,073,036		$858,073,036	8
7 DWSD 12 MGD Max Day at P&B	$742,168,081					$892,246,731		$892,246,731	9
8 KWA - 2	$766,784,313	$651,625,143	$671,565,107	$654,706,341				$654,706,341	4
9 DWSD 18 MGD Max Day at P&B	$791,202,885						$812,337,848	$812,337,848	7

b

Option for Water Supply	TYJT Projected 30 Year Total Cost	30 Year O&M Reduction for Treating Lake Huron Water	25 Year Bond Cost for Redundant Connections	Eliminate KWA Reserve	Use KWA 25 Year Capital Charge $355,300 / MGD	25 Year Bond Cost for Flint WTP Upgrades	Adjusted 30 Year Total Cost	Rank (Least to Highest Cost)
1 Flint WTP Only	$590,441,893		Included				$590,441,893	3
2 DWSD 8 MGD Max Day at Imlay	$621,211,298		Note 1			$150,078,650	$771,289,948	5
3 KWA 10/31/12 Update	$649,775,166	-$115,159,170	$21,134,963				$555,750,960	1
4 DWSD 8 MGD Max Day at P&B	$657,167,877		Note 1			$150,078,650	$807,246,527	6
5 KWA-1	$707,279,715	-$115,159,170	$21,134,963		-$39,329,050		$573,926,459	2
6 DWSD 12 MGD Max Day at Imlay	$707,994,386		Note 1			$150,078,650	$858,073,036	8
7 DWSD 12 MGD Max Day at P&B	$742,168,081		Note 1			$150,078,650	$892,246,731	9
8 KWA - 2	$766,784,313	-$115,159,170	$21,134,963	-$16,858,766			$655,901,341	4
9 DWSD 18 MGD Max Day at P&B	$791,202,885		$21,134,963				$812,337,848	7

Representative Genesee County Water and Wastewater Projects

Project	Description	All Engineering Fees	Engineer's Estimate	Bid Price	Final Construction Cost	Engineering & Contingency %
Fox Pump Station	30 mgd wastewater pump station & forcemain	$1,829,259		$12,394,273	$12,074,223	
		15.2%				
NEES Project	60" Relief Sewer - included tunneled sections		$54,707,212	$55,985,672	$69,999,429	
					28.0%	
North Water Loop	23 miles 36" and 48" transmission main, pump station, & 20 MG Reservoir	$4,102,610	$29,200,000	$23,570,110	$25,798,529	2.4%
		15.9%			-11.6%	
Henderson Road PS	32 MGD Water Pump Station & Two-10 MG Tanks		$12,046,368	$12,846,077	$13,517,582	
					12.2%	
Pump Station #1	80 MGD wastewater pump station	$1,735,063	$10,269,000	$8,225,400	$8,292,277	-2.4%
		20.9%			19.2%	

Notes:

Engineering Fees include all planning, soils investigation, design, construction inspection & testing, and construction management costs

Engineering Fees % is based on final construction cost

Engineering and Contengency % is based on engineering fees + amount final construction cost exceeds estimate

Final Construction Cost % is based on difference between final construction cost and engineer's estimate

NEES Project Contractor went out of business during project - increasing cost to finish project

Projects constructed within last ten years

Rennaker, Joanne (DEQ)

From: Sygo, Jim (DEQ)
Sent: Wednesday, March 27, 2013 2:53 PM
To: Busch, Stephen (DEQ)
Subject: RE: ODWMA Response - Flint KWA-DWSD Report
Attachments: KWA - DWSD for WRD.DOCX

Thought I would share with you some items that WRD came up with as well. AS you might guess we are in a situations with Emergency Financial Managers so it's entirely possible that they will be making decisions relative to cost. The concern in either situation is that a compliant supply of source water and drinking water can be supplied.

From: Busch, Stephen (DEQ)
Sent: Wednesday, March 27, 2013 1:39 PM
To: Thelen, Mary Beth (DEQ); Wyant, Dan (DEQ); Sygo, Jim (DEQ); Shekter Smith, Liane (DEQ)
Cc: Willard, Veronica (DEQ); Benzie, Richard (DEQ); Prysby, Mike (DEQ); Bloemker, Jon (DEQ); Donaldson, Kristina (DEQ); Creal, William (DEQ)
Subject: ODWMA Response - Flint KWA-DWSD Report
Importance: High

Director Wyant, and Deputy Director Sygo,

Addendums to ODWMA comments provided yesterday regarding the City of Flint water system and comments on the reports from Tucker, Young, Jackson, Tull, Inc. (TYJT) can be found below in red. Additional comments are as follows:

With regards to regulatory authority for DEQ to allow or prevent the breakup of water utilities, and State vs. local decisions about cost effectiveness, it is important to note that when the DEQ permitted the water withdrawal for KWA (permit 2009-001) part of the decision making process (copy attached) included reasonable use and the balance of Economic Development, Social Development, and Environmental Protection. As part of the public participation process general comments were received (pages 6 & 7) regarding impacts on DWSD and rates to remaining customers. The Department's response to those comments stated:

"The DEQ is specifically precluded from using part 327 to "...diminish or create any existing authority of municipalities to require persons to connect to municipal water supply systems as authorized by law" (MCL 324.32726)."

And

"It is appropriately an issue for water service contract negotiations between the regional water system and its customers. To do otherwise invites unwanted intervention of the state into local decision making."

ODWMA cannot on its own assess an actual dollar value to any regional benefit for the City of Flint to remain a full customer of DWSD, but the following should be included in any additional analysis:

- The cost estimates provided in the TYJT report show a cost difference between full KWA and full DWSD participation of $172 million over 30 years.
- The formation of KWA would itself be considered one of the largest regional drinking water authorities in the State in terms of capacity, and as such any regional benefits provided by DWSD may only be marginal in comparison.

Finally, we have additional questions for TYJT regarding the various DWSD supply options and the considerations they made in the operations of the Flint WTP. These considerations will have an impact on the cost estimates for DWSD options.

We look forward to further discussion of these comments during our meetings tomorrow, and please let us know if you have any additional questions for us between now and then.

Stephen Busch, P.E.
Lansing and Jackson District Supervisor
Office of Drinking Water and Municipal Assistance
MDEQ
517-643-2314

From: Busch, Stephen (DEQ)
Sent: Tuesday, March 26, 2013 3:58 PM
To: Wyant, Dan (DEQ); Thelen, Mary Beth (DEQ); Sygo, Jim (DEQ)
Cc: Willard, Veronica (DEQ); Shekter Smith, Liane (DEQ)
Subject: RE: Flint Draft Response

I will provide additional follow up by tomorrow (Wed.) afternoon to my previous email below based on our discussion and the conference call with Andy Dillon earlier today.

Stephen Busch, P.E.
Lansing and Jackson District Supervisor
Office of Drinking Water and Municipal Assistance
MDEQ
517-643-2314

From: Busch, Stephen (DEQ)
Sent: Tuesday, March 26, 2013 12:37 PM
To: Wyant, Dan (DEQ); Thelen, Mary Beth (DEQ); Sygo, Jim (DEQ)
Cc: Willard, Veronica (DEQ); Shekter Smith, Liane (DEQ)
Subject: Flint Draft Response

Director Wyant,

In preparation for our call today with Treasurer Dillon's office, ODWMA has developed the following for consideration. We can provide any additional info you require during the meeting.

ODWMA has reviewed the materials developed by the consultant Tucker, Young, Jackson, Tull, Inc. (TYJT) for Treasury regarding the City of Flint and potential alternatives for public water supply. Based on our reviews, we have developed the following comments to this point in our analysis:

1. The TYJT report does not contain the full scope of the Karegnondi Water Authority (KWA) raw water supply system. TYJT concerns over raw water supply redundancy and reliability are addressed to the satisfaction of ODWMA under the full KWA proposal. Please note some portions of the overall project are being financed independently by the Genesee County Drain Commission.

2. There are significant differences in contract language between KWA and Detroit Water and Sewerage Department (DWSD) with respect to the contracted maximum day demand capacity.
    a. Under a KWA contract, a "maximum day" capacity of 18 million gallons per day (MGD) would fully satisfy current demands of the City of Flint, <u>without</u> the need to supplement raw water capacity using the Flint River. (18 MGD, average over a 30 day period).

   b. Under a DWSD model contract, a "maximum day" capacity, even at 18 MGD, would not satisfy the current demands for the City of Flint. (18 MGD, over any 24 hour period).

3. Restrictions in contracted capacity that would prevent the City of Flint from meeting peak demand requirements present potential limits to economic development within the City of Flint, including possible connection bans and water system extension bans. This information was previously conveyed to the City of Flint by ODWMA staff.

4. All contract options with DWSD that are considered semi-competitive with the KWA contract do not fully supply the City of Flint, and would require the City of Flint to meet a significant, if not majority, of its water demands by treating water from the Flint River. Continuous use of the Flint River at such demand rates would:
   a. Pose an increased microbial risk to public health (Flint River vs. Lake Huron source water)
   b. Pose an increased risk of disinfection by-product (carcinogen) exposure to public health (Flint River vs. Lake Huron source water)
   c. Trigger additional regulatory requirements under the Michigan Safe Drinking Water Act (LT2ESWTR)
   d. Require significant enhancements to treatment at the Flint WTP, beyond those identified in the TYJT report (see item 5 below).
   e. Water Resource Division is evaluating potential impacts to NPDES wastewater discharge permits in downstream segments of the Flint River, as a result of decreased river baseflow caused by Flint WTP use.

5. The TYJT report does not adequately address increased requirements and costs associated with using the Flint River as a significant source for the Flint WTP, which are not necessary under a Lake Huron source water scenario. This includes:
   a. The need to provide softening treatment
   b. Limitations on disposal options for lime softening sludge
   c. Increased ozone capacity, UV disinfection
   d. Additional backup power, more power required for Flint River operation

6. The Flint WTP must operate at some minimum level and within a range of flow rates to maintain treatment effectiveness. Currently that minimum level is 9 MGD. This level may be reduced with additional capital costs to modify the WTP, not addressed in the TYJT report.

7. Allowing Flint WTP to blend water with DWSD sets a new precedent that could pose future consequences with other DWSD customers.

8. Costs impacts to remaining DWSD customers would be similar under the proposed scenarios, only retaining 8 MGD of 30+ MGD total Flint/Genesee Co. demands, based on the following:
   a. Genesee County distribution system demands are pulling out of DWSD regardless of the decisions by Flint WTP
   b. Flint's need to utilize the Flint River as a source

9. ODWMA anticipates cost savings under the KWA proposal will be leveraged to provide additional improvements to the City of Flint water distribution system, improving efficiency and providing additional cost benefits. The KWA water withdrawal permit (2009-001) includes the required implementation of conservation measures that would also drive these distribution system improvements.

10. Major cost discrepancies in TYJT analysis
    a. Engineering, Legal, Administration, Contingency – TYJT appears to have effectively double charged for these costs in their KWA estimates without adequate justification
    b. Pumping facilities – TYJT cost estimate methodology does not appear to address localized market costs and does not distinguish fixed and variable costs in its comparison analysis.

11. Remaining DWSD customers in Lapeer County could potentially see water quality impacts as a result of Flint joining KWA, if they remain with DWSD. However, indications to ODWMA are that these communities are currently in final negotiations with KWA for service, which would make this a non-issue.
    a. City Lapeer
    b. City of Imlay City

Additional response to the TYJT report has also been provided by Rowe Engineering to Flint EFM, Mr. Ed Kurtz. (Copy Attached)

ODWMA has continued to meet on a regular basis with KWA, Genesee County, and the City of Flint regarding these water supply proposals.

ODWMA will continue to provide any additional detailed analysis requested by Treasury or the DEQ Executive Office.

Stephen Busch, P.E.
Lansing and Jackson District Supervisor
Office of Drinking Water and Municipal Assistance
MDEQ
517-643-2314

City of Flint Water Supply Assessment (TYJT; for Treasury)

DEQ-Drinking Water engineers are responsible for this review. WRD offers one comment however. The KWA pump stations are not supplied with a secondary power source. It would appear that we should ask if this meets "10 States" for drinking water facilities. If power is lost to the pump stations, the Flint WTP would have to be used to supply finished water (with Flint River as the raw source, apparently). It would seem that independent secondary power sources should be provided to the KWA pumping stations to more reliably ensure Lake Huron as the source water.

Potential Financial Impacts on the DWSD (Sewerage Fund):

It is difficult to quantify the potential financial impact of lost drinking water customers in Flint on the Sewerage Fund. Flint is supplied currently with DWSD drinking water but provides their own wastewater treatment. However, the following is offered:

- Some common functions in DWSD serve both Water and Sewerage. These include HR, purchasing, IT, legal, and top administration (including the Water Board). Further, under the proposed EMA organizational approach it appears that some services units would serve both water and sewer. It would follow that lost revenue to the Water Fund would have some incremental effect on the Sewerage Fund to make up for fixed costs.
- Lost revenue to the Water Fund would not translate to less outstanding water system debt. Would an increased level of water debt service to revenue result in a lower credit rating of an independent DWSD? The rating applies to DWSD as a whole. A lower rating would potentially increase costs to borrow on the sewerage side; for such items as CSO correction and WWTP improvements.
- Some have suggested that financial impact on residents consider both water rates and sewerage rates, combined. Although this is not what WRD currently does, should this type of assessment be presented in the future then lost revenue on the water side will increase costs to those remaining in DWSD (to cover the fixed costs). This could potentially increase the residential financial costs as a % of MHI for City residents, and thus further lengthen the time needed to completed non-core CSO corrections as described in the new permit.

Effects on NPDES Dischargers:

1) Which NPDES permits would be affected?
Flint WWTP, Flushing WWTP, and Genesee Co-Ragnone WWTP are in the Flint River model/WLA, so all of these and no others are potentially affected (at least in this immediately d/s WLA).

2) Would we expect permit limits would be modified as a result of this proposal (and decreased background flows)?
Since it appears the withdrawal would be near the head of or upstream of the modeled reaches, it would be assumed that all three facilities' limits would become more restrictive, depending on how we approach any load reductions to meet the DO std.

3) What would be the percent reduction in flow coming out of Holloway Reservoir?

A 1988 WRC 'ruling' requires that Holloway Reservoir release 85 cfs minimum in the summer, fall, and winter seasons. 232.4 cfs was used in spring modeling. 10 MGD = 15.5 cfs, so

15.5 cfs / 85 cfs = 18.2% reduction
69.5 cfs would remain

The withdrawal is below Holloway Reservoir, so the flow out of the reservoir itself wouldn't have to change, but the flow at the first WLA facility (Flint WWTP) is reduced. Maybe the Holloway release flow could be increased 10 MGD. Erik believes that the 85 cfs minimum was to protect the fishery.

Rennaker, Joanne (DEQ)

From: Sygo, Jim (DEQ)
Sent: Wednesday, April 17, 2013 2:10 PM
To: Busch, Stephen (DEQ)
Cc: Shekter Smith, Liane (DEQ); Thelen, Mary Beth (DEQ); Shaler, Karen (DEQ); Benzie, Richard (DEQ); Prysby, Mike (DEQ)
Subject: Re: KWA and City of Flint

Thanks Steve , this was very helpful

Sent from my iPhone

On Apr 17, 2013, at 9:51 AM, "Busch, Stephen (DEQ)" <BUSCHS@michigan.gov> wrote:

> Director Wyant, Deputy Director Sygo, and Liane,
>
> A response at this point may be moot as Flint and Genesee Co. already held a press conference yesterday rejecting the DWSD offer.
>
> It is also unclear whether DWSD provided its offer directly to Flint and Genesee Co. by the deadline in Treasurer Dillon's letter. However, Flint and Genesee Co. still took the offer under consideration.
>
> Our office concurs with both Flint and Genesee Co. that the offers provided by DWSD were incomplete.
>
> Of the two scenarios provided by DWSD it appeared that only Scenario 2 was listed as potentially being more cost effective. However, this scenario did not address the following:
>
> 1. The DWSD scenarios are based on 40 MGD of service capacity. However, the KWA project is providing 60 MGD of initial capacity with potential expansion to 75 MGD in the future. Therefore, in order for a more direct comparison the DWSD scenario would need to increase capacity to 60 MGD, which would increase fixed rate commodity costs as well as the capital costs for the Huron Plant that DWSD was planning to allocate to Flint and Genesee Co., presumably by as much as 50%.
>
> 2. DWSD proposals cover a 30 year period to 2042, but fail to recognize that after this period bond payments for the KWA project will be complete and result in a significant reduction in costs for the KWA option.
>
> 3. While DWSD indicates that Flint and Genesee Co. would be given "broadened representation", it remains unclear exactly what this means in terms of actual control in the decision making process.
>
> 4. This scenario continues to rely on a single transmission system and would require the City of Flint to maintain its WTP for emergency purposes and these costs do not appear to be included. In addition, use of the Flint WTP as an emergency backup would leave Genesee Co. without an adequate backup supply to meet their 30 year needs.

Again, without DWSD providing the specific details of these proposals, it is difficult to provide a true comparative analysis, and as such Flint and Genesee Co. appear to be justified in their rejection of these proposals.

Please let me know if you require any further response.

Stephen Busch, P.E.
Lansing and Jackson District Supervisor
Office of Drinking Water and Municipal Assistance
MDEQ
517-643-2314

From: Sygo, Jim (DEQ)
Sent: Tuesday, April 16, 2013 9:59 AM
To: Busch, Stephen (DEQ); Prysby, Mike (DEQ); Benzie, Richard (DEQ)
Cc: Shekter Smith, Liane (DEQ); Shaler, Karen (DEQ); Thelen, Mary Beth (DEQ)
Subject: FW: KWA and City of Flint

Steve, Mike and Richard,

Please take a look at DWSD's last best offer to the City of Flint and provide your collective perspective to the Director through Liane by the end of the week. Copy me in as well. I'll be out of the office but would like to know if you think this is worth considering.

Thank you for your expedited review.

From: Wyant, Dan (DEQ)
Sent: Tuesday, April 16, 2013 6:52 AM
To: Sygo, Jim (DEQ)
Subject: FW: KWA and City of Flint

Jim,

Liane is out of the office today, Can you forward this directly to her staff that worked on this with us.

Dan Wyant, Director
Department of Environmental Quality
517-373-7917

From: Wyant, Dan (DEQ)
Sent: Tuesday, April 16, 2013 6:51 AM
To: Sygo, Jim (DEQ); Creal, William (DEQ); Shekter Smith, Liane (DEQ)
Cc: Anderson, Madhu (DEQ)
Subject: FW: KWA and City of Flint

Bill and Liane,

Can you have your staff's take a quick look at this and let me know today if they think this changes their thoughts and comments to me last week.

Dan Wyant, Director
Department of Environmental Quality
517-373-7917

From: Dillon, Andy (Treasury)
Sent: Monday, April 15, 2013 7:55 PM

To: Wyant, Dan (DEQ); Dennis Muchmore; Roberts, John (GOV)
Cc: Stibitz, Brom (Treasury); Saxton, Thomas (Treasury)
Subject: Fwd: KWA and City of Flint

FYI

Dan, any thoughts re the attached?

We gave dwsd until today to put best offer on table. Flint is to get back to us tmrw. I want to make sure their expected rejection is made in good faith.

Sent from my iPad

Begin forwarded message

> **From:** "Debra Ragland" <dragland@dwsd.org>
> **To:** "ekurtz@cityofflint.com" <ekurtz@cityofflint.com>
> **Cc:** "jwright@co.genesee.mi.us" <jwright@co.genesee.mi.us>, "Dillon, Andy (Treasury)" <DillonA2@michigan.gov>, "James Fausone" <fausone@dwsd.org>, "orrk@detroitmi.gov" <orrk@detroitmi.gov>, "Sue McCormick" <mccormick@dwsd.org>
> **Subject: KWA and City of Flint**
>
> Please see attached on behalf of Sue F. McCormick.
>
> Faxed copy forwarded to Mayor Dayne Walling and Jeff Wright.

Rennaker, Joanne (DEQ)

From: Busch, Stephen (DEQ)
Sent: Tuesday, March 26, 2013 3:58 PM
To: Wyant, Dan (DEQ); Thelen, Mary Beth (DEQ); Sygo, Jim (DEQ)
Cc: Seymour, Veronica (DEQ); Shekter Smith, Liane (DEQ)
Subject: RE: Flint Draft Response

I will provide additional follow up by tomorrow (Wed.) afternoon to my previous email below based on our discussion and the conference call with Andy Dillon earlier today.

Stephen Busch, P.E.
Lansing and Jackson District Supervisor
Office of Drinking Water and Municipal Assistance
MDEQ
517-643-2314

From: Busch, Stephen (DEQ)
Sent: Tuesday, March 26, 2013 12:37 PM
To: Wyant, Dan (DEQ); Thelen, Mary Beth (DEQ); Sygo, Jim (DEQ)
Cc: Willard, Veronica (DEQ); Shekter Smith, Liane (DEQ)
Subject: Flint Draft Response

Director Wyant,

In preparation for our call today with Treasurer Dillon's office, ODWMA has developed the following for consideration. We can provide any additional info you require during the meeting.

ODWMA has reviewed the materials developed by the consultant Tucker, Young, Jackson, Tull, Inc. (TYJT) for Treasury regarding the City of Flint and potential alternatives for public water supply. Based on our reviews, we have developed the following comments to this point in our analysis:

1. The TYJT report does not contain the full scope of the Karegnondi Water Authority (KWA) raw water supply system. TYJT concerns over raw water supply redundancy and reliability are addressed to the satisfaction of ODWMA under the full KWA proposal. Please note some portions of the overall project are being financed independently by the Genesee County Drain Commission.

2. There are significant differences in contract language between KWA and Detroit Water and Sewerage Department (DWSD) with respect to the contracted maximum day demand capacity.
    a. Under a KWA contract, a "maximum day" capacity of 18 million gallons per day (MGD) would fully satisfy current demands of the City of Flint, without the need to supplement raw water capacity using the Flint River. (18 MGD, average over a 30 day period).
    b. Under a DWSD model contract, a "maximum day" capacity, even at 18 MGD, would not satisfy the current demands for the City of Flint. (18 MGD, over any 24 hour period).

3. Restrictions in contracted capacity that would prevent the City of Flint from meeting peak demand requirements present potential limits to economic development within the City of Flint, including possible connection bans and water system extension bans. This information was previously conveyed to the City of Flint by ODWMA staff.

4. All contract options with DWSD that are considered semi-competitive with the KWA contract do not fully supply the City of Flint, and would require the City of Flint to meet a significant, if not majority, of its water demands by treating water from the Flint River. Continuous use of the Flint River at such demand rates would:
    a. Pose an increased microbial risk to public health (Flint River vs. Lake Huron source water)
    b. Pose an increased risk of disinfection by-product (carcinogen) exposure to public health (Flint River vs. Lake Huron source water)
    c. Trigger additional regulatory requirements under the Michigan Safe Drinking Water Act (LT2ESWTR)
    d. Require significant enhancements to treatment at the Flint WTP, beyond those identified in the TYJT report (see item X below).
    e. Water Resource Division is evaluating potential impacts to NPDES wastewater discharge permits in downstream segments of the Flint River.

5. The TYJT report does not adequately address increased requirements and costs associated with using the Flint River as a significant source for the Flint WTP, which are not necessary under a Lake Huron source water scenario. This includes:
    a. The need to provide softening treatment
    b. Limitations on disposal options for lime softening sludge
    c. Increased ozone capacity, UV disinfection
    d. Additional backup power, more power required for Flint River operation

6. The Flint WTP must operate at some minimum level and within a range of flow rates to maintain treatment effectiveness. Currently that minimum level is 9 MGD. This level may be reduced with additional capital costs to modify the WTP, not addressed in the TYJT report.

7. Allowing Flint WTP to blend water with DWSD sets a new precedent that could pose future consequences with other DWSD customers.

8. Costs impacts to remaining DWSD customers would be similar under the proposed scenarios, only retaining 8 MGD of 30+ MGD total Flint/Genesee Co. demands, based on the following:
    a. Genesee County distribution system demands are pulling out of DWSD regardless of the decisions by Flint WTP
    b. Flint's need to utilize the Flint River as a source

9. ODWMA anticipates cost savings under the KWA proposal will be leveraged to provide additional improvements to the City of Flint water distribution system, improving efficiency and providing additional cost benefits.

10. Major cost discrepancies in TYJT analysis
    a. Engineering, Legal, Administration, Contingency – TYJT appears to have effectively double charged for these costs in their KWA estimates without adequate justification
    b. Pumping facilities – TYJT cost estimate methodology does not appear to address localized market costs and does not distinguish fixed and variable costs in its comparison analysis.

11. Remaining DWSD customers in Lapeer County could potentially see water quality impacts as a result of Flint joining KWA.
    a. City Lapeer
    b. City of Imlay City

Additional response to the TYJT report has also been provided by Rowe Engineering to Flint EFM, Mr. Ed Kurtz.

ODWMA has continued to meet on a regular basis with KWA, Genesee County, and the City of Flint regarding these water supply proposals.

ODWMA will continue to provide any additional detailed analysis requested by Treasury or the DEQ Executive Office.

Stephen Busch, P.E.
Lansing and Jackson District Supervisor
Office of Drinking Water and Municipal Assistance
MDEQ
517-643-2314

Rennaker, Joanne (DEQ)

From:	Busch, Stephen (DEQ)
Sent:	Wednesday, March 27, 2013 1:39 PM
To:	Thelen, Mary Beth (DEQ); Wyant, Dan (DEQ); Sygo, Jim (DEQ); Shekter Smith, Liane (DEQ)
Cc:	Seymour, Veronica (DEQ); Benzie, Richard (DEQ); Prysby, Mike (DEQ); Bloemker, Jon (DEQ); Donaldson, Kristina (DEQ); Creal, William (DEQ)
Subject:	ODWMA Response - Flint KWA-DWSD Report
Attachments:	deq-wb-dwehs-wwciu-gcdclqwwpermitresponsepubliccomment_290345_7.pdf; Rowe Review of Tucker Young Report.pdf
Importance:	High

Director Wyant, and Deputy Director Sygo,

Addendums to ODWMA comments provided yesterday regarding the City of Flint water system and comments on the reports from Tucker, Young, Jackson, Tull, Inc. (TYJT) can be found below in red. Additional comments are as follows:

With regards to regulatory authority for DEQ to allow or prevent the breakup of water utilities, and State vs. local decisions about cost effectiveness, it is important to note that when the DEQ permitted the water withdrawal for KWA (permit 2009-001) part of the decision making process (copy attached) included reasonable use and the balance of Economic Development, Social Development, and Environmental Protection. As part of the public participation process general comments were received (pages 6 & 7) regarding impacts on DWSD and rates to remaining customers. The Department's response to those comments stated:

"The DEQ is specifically precluded from using part 327 to "...diminish or create any existing authority of municipalities to require persons to connect to municipal water supply systems as authorized by law" (MCL 324.32726)."

And

"It is appropriately an issue for water service contract negotiations between the regional water system and its customers. To do otherwise invites unwanted intervention of the state into local decision making."

ODWMA cannot on its own assess an actual dollar value to any regional benefit for the City of Flint to remain a full customer of DWSD, but the following should be included in any additional analysis:

- The cost estimates provided in the TYJT report show a cost difference between full KWA and full DWSD participation of $172 million over 30 years.
- The formation of KWA would itself be considered one of the largest regional drinking water authorities in the State in terms of capacity, and as such any regional benefits provided by DWSD may only be marginal in comparison.

Finally, we have additional questions for TYJT regarding the various DWSD supply options and the considerations they made in the operations of the Flint WTP. These considerations will have an impact on the cost estimates for DWSD options.

We look forward to further discussion of these comments during our meetings tomorrow, and please let us know if you have any additional questions for us between now and then.

Stephen Busch, P.E.

Lansing and Jackson District Supervisor
Office of Drinking Water and Municipal Assistance
MDEQ
517-643-2314

From: Busch, Stephen (DEQ)
Sent: Tuesday, March 26, 2013 3:58 PM
To: Wyant, Dan (DEQ); Thelen, Mary Beth (DEQ); Sygo, Jim (DEQ)
Cc: Willard, Veronica (DEQ); Shekter Smith, Liane (DEQ)
Subject: RE: Flint Draft Response

I will provide additional follow up by tomorrow (Wed.) afternoon to my previous email below based on our discussion and the conference call with Andy Dillon earlier today.

Stephen Busch, P.E.
Lansing and Jackson District Supervisor
Office of Drinking Water and Municipal Assistance
MDEQ
517-643-2314

From: Busch, Stephen (DEQ)
Sent: Tuesday, March 26, 2013 12:37 PM
To: Wyant, Dan (DEQ); Thelen, Mary Beth (DEQ); Sygo, Jim (DEQ)
Cc: Willard, Veronica (DEQ); Shekter Smith, Liane (DEQ)
Subject: Flint Draft Response

Director Wyant,

In preparation for our call today with Treasurer Dillon's office, ODWMA has developed the following for consideration. We can provide any additional info you require during the meeting.

ODWMA has reviewed the materials developed by the consultant Tucker, Young, Jackson, Tull, Inc. (TYJT) for Treasury regarding the City of Flint and potential alternatives for public water supply. Based on our reviews, we have developed the following comments to this point in our analysis:

1. The TYJT report does not contain the full scope of the Karegnondi Water Authority (KWA) raw water supply system. TYJT concerns over raw water supply redundancy and reliability are addressed to the satisfaction of ODWMA under the full KWA proposal. Please note some portions of the overall project are being financed independently by the Genesee County Drain Commission.

2. There are significant differences in contract language between KWA and Detroit Water and Sewerage Department (DWSD) with respect to the contracted maximum day demand capacity.
    a. Under a KWA contract, a "maximum day" capacity of 18 million gallons per day (MGD) would fully satisfy current demands of the City of Flint, without the need to supplement raw water capacity using the Flint River. (18 MGD, average over a 30 day period).
    b. Under a DWSD model contract, a "maximum day" capacity, even at 18 MGD, would not satisfy the current demands for the City of Flint. (18 MGD, over any 24 hour period).

3. Restrictions in contracted capacity that would prevent the City of Flint from meeting peak demand requirements present potential limits to economic development within the City of Flint, including possible connection bans and water system extension bans. This information was previously conveyed to the City of Flint by ODWMA staff.

4. All contract options with DWSD that are considered semi-competitive with the KWA contract do not fully supply the City of Flint, and would require the City of Flint to meet a significant, if not majority, of its water demands by treating water from the Flint River. Continuous use of the Flint River at such demand rates would:
    a. Pose an increased microbial risk to public health (Flint River vs. Lake Huron source water)
    b. Pose an increased risk of disinfection by-product (carcinogen) exposure to public health (Flint River vs. Lake Huron source water)
    c. Trigger additional regulatory requirements under the Michigan Safe Drinking Water Act (LT2ESWTR)
    d. Require significant enhancements to treatment at the Flint WTP, beyond those identified in the TYJT report (see item 5 below).
    e. Water Resource Division is evaluating potential impacts to NPDES wastewater discharge permits in downstream segments of the Flint River, as a result of decreased river baseflow caused by Flint WTP use.

5. The TYJT report does not adequately address increased requirements and costs associated with using the Flint River as a significant source for the Flint WTP, which are not necessary under a Lake Huron source water scenario. This includes:
    a. The need to provide softening treatment
    b. Limitations on disposal options for lime softening sludge
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    a. Genesee County distribution system demands are pulling out of DWSD regardless of the decisions by Flint WTP
    b. Flint's need to utilize the Flint River as a source

9. ODWMA anticipates cost savings under the KWA proposal will be leveraged to provide additional improvements to the City of Flint water distribution system, improving efficiency and providing additional cost benefits. The KWA water withdrawal permit (2009-001) includes the required implementation of conservation measures that would also drive these distribution system improvements.

10. Major cost discrepancies in TYJT analysis
    a. Engineering, Legal, Administration, Contingency – TYJT appears to have effectively double charged for these costs in their KWA estimates without adequate justification
    b. Pumping facilities – TYJT cost estimate methodology does not appear to address localized market costs and does not distinguish fixed and variable costs in its comparison analysis.

11. Remaining DWSD customers in Lapeer County could potentially see water quality impacts as a result of Flint joining KWA, if they remain with DWSD. However, indications to ODWMA are that these communities are currently in final negotiations with KWA for service, which would make this a non-issue.
    a. City Lapeer
    b. City of Imlay City

Additional response to the TYJT report has also been provided by Rowe Engineering to Flint EFM, Mr. Ed Kurtz. (Copy Attached)

ODWMA has continued to meet on a regular basis with KWA, Genesee County, and the City of Flint regarding these water supply proposals.

ODWMA will continue to provide any additional detailed analysis requested by Treasury or the DEQ Executive Office.

Stephen Busch, P.E.
Lansing and Jackson District Supervisor
Office of Drinking Water and Municipal Assistance
MDEQ
517-643-2314

GENESEE COUNTY DRAIN COMMISSION
APPLICATION FOR A WATER WITHDRAWAL FROM LAKE HURON

PERMIT DECISION
And
RESPONSE TO PUBLIC COMMENTS

August 28, 2009

Michigan Department of Environmental Quality
Constitution Hall, 525 West Allegan
P.O. Box 30273
Lansing, Michigan 48909-7773

EXECUTIVE SUMMARY

GENESEE COUNTY DRAIN COMMISSION
APPLICATION FOR A WATER WITHDRAWAL FROM LAKE HURON

On February 12, 2009, the Department of Environmental Quality (DEQ) received from the Genesee County Drain Commission (GCDC) a permit application submitted under Section 32723 of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended (NREPA). The permit application included a request that the DEQ begin the required evaluation and public notice under Part 327, Great Lakes Preservation, of NREPA for a proposed water withdrawal from Lake Huron.

Section 32723(4) of Part 327 requires that the DEQ provide for a public comment period of not less than 45 days before a permit application is acted upon. The DEQ invited public comment on the permit application via press release, public notice and website posting. The DEQ issued the press release on the permit application on May 27, 2009, and posted the public notice on the DEQ internet website the following day. A copy of the public notice was transmitted to the GCDC on May 28, 2009 for posting at the entrance to their premises and at the shoreline parcel where a "shore well and pumping station" are to be constructed. The press release and public notice announced the public comment period and requested that comment be submitted to the DEQ by July 15, 2009.

After considering the information submitted relevant to the factors used in determining the acceptability of a permit application and the comments received, the DEQ determined that the proposed GCDC withdrawal is in compliance with the applicable standards and should be issued.

On August 28, 2009, the DEQ rendered a decision in favor of issuing the permit concluding the GCDC proposed withdrawal would not likely cause an adverse resource impact and that all other factors in rendering a permit decision had been met.

This document includes the basis of decision for issuance of a permit to the GCDC for the future withdrawal of 85 MGD from Lake Huron. Responses are provided to comments received on the permit application during the public comment period that including concerns relating to the permit process, the environmental impact of the proposed water withdrawal, the legality of the proposed water use, and the applicability of laws and regulations to the proposed withdrawal.

Many of the early comments were critical of the public notice and comment period duration regarding the permit application. The DEQ is limited in its ability to provide public comment by a Part 327 statutorily required time frame for responding to the permit application. The DEQ recognizes that this is the first application for a permit to withdraw water from a Great Lake that is subject to the standards of Part 327, the Great Lakes Charter process, the standards-of-decision in the Great Lakes-St. Lawrence River Basin Water Resources Compact, and the Great Lakes-St. Lawrence River Basin Sustainable Water Resources Agreement. Therefore, the DEQ reviewed additional comments received after the public comment period for consideration in application and functionality of the administrative process on this and future permit applications.

TABLE OF CONTENTS

I. BACKGROUND - Proposed Withdrawal 1

II. STATUTORY STANDARD 1
Application Submittal 1
Administrative Requirements 1
Conditions Required for Issuance of Permit 2

III. DECISION MAKING PROCESS 3
Consumptive Use Considerations 3
Adverse Resource Impact 3
Applicable Local, State and Federal Laws 4
Reasonable Use 4
Environmentally Sound and Economically Feasible Water Conservation Measures 5
Public and Private Rights, Limitations and Common Law 5

IV. PUBLIC PARTICIPATION PROCESS 6
General Comments 6
Applicability of Laws and Regulations 7
New Withdrawal and Consumptive Use 7
Conservation Measures 8
Reasonableness of Proposed Withdrawal 9
Adverse Impact and Requirements for Ecological Improvement 10
Diversion or Intra-Basin Transfer 10
Inadequate Information 11

V. SUMMARY OF DEQ POSITION 12

I. BACKGROUND

Proposed Withdrawal

The proposed 85 million gallons per day (MGD) water withdrawal is from a Lake Huron water intake. The permit applicant, Genesee County Drain Commission (GCDC), proposes to use the withdrawal water for a community public water supply system, to be owned and operated by a collection of municipalities organized as the Karegnondi Water Authority (KWA). The proposed withdrawal will be via a Lake Huron water intake located approximately 3.5 miles offshore and a shore well and pumping facilities located in the south of section 31 and 32, Worth Township, T.9N, R.17E, Sanilac County, Michigan. The maximum proposed withdrawal of 85 MGD, corresponds to a maximum pumping rate of ~59,000 gallons per minute (gpm).

Public water supply is a use that the DEQ estimates to be 10 percent consumptive. While 90 percent of the water will remain in the Lake Huron watershed, the consumptive use estimate places the loss from the Great Lakes hydrologic system at 8.5 MGD.

II. STATUTORY STANDARD

A person who proposes to develop a new withdrawal of 2 MGD or more from the waters of the state to supply a common distribution system, is required to obtain a water withdrawal permit prior to making the withdrawal (MCL 324.32723[1]).

Application Submittal

A person proposing a withdrawal from the surface waters of the state is required to apply for a permit by submitting an application for the withdrawal to the DEQ containing the following information (MCL 324.32723[2]):

- Capacity of equipment used to make the withdrawal,
- Location of the withdrawal,
- Withdrawal source,
- Amount and rate of withdrawal,
- Intended maximum monthly and annual volumes and rates, if different from the capacity of equipment used to make the withdrawal,
- Relevant information related to seasonal use,
- Description of how the water will be used and location, amount and rate of return flow,
- Any other information the person would like the DEQ to consider.

The application is required to include an evaluation of existing hydrological and hydrogeological conditions and a detailed description of proposed preventative measures where relevant. In addition, the applicant is required to submit an application fee in the amount of $2000.00

Administrative Requirements

MCL 324.32723 requires the department to determine whether a permit application is administratively complete. The DEQ has 30 days to make this determination, unless the applicant is notified of deficiencies in the application requiring additional information. Once an application is determined to be administratively complete, the DEQ is required to provide a public comment period of not less than 45 days and render a decision on the permit application within 120 days from the completeness determination.

The DEQ received the original permit application from the GCDC on February 12, 2009. The information was submitted in accordance with Part 327, and "proposals subject to prior notice and consultation" of The Great Lakes Charter, Principles for the Management of Great Lakes Water Resources (The Charter). On March 4, 2009 the DEQ requested additional information to better fulfill the information requirements of The Charter essential to the administrative

process. Upon receipt of the additional information the DEQ sent a letter to the GCDC dated April 24, 2009 notifying them of the completeness of the application package.

The DEQ invited public comment on the permit application via press release, public notice and website posting. The press release was issued on May 27, 2009, and the posting of the public notice on the DEQ internet website on May 28, 2009. The GCDC was provided a copy of the public notice on May 28, 2009 for posting at the entrance to their premises and at the shoreline parcel where the proposed shore well and pumping station are to be constructed. The press release and public notice announced the 45-day public comment period and requested that comments be submitted to the DEQ by July 15, 2009.

The consumptive use estimate of 8.5 MGD exceeds the 5 MGD threshold established in the Charter for proposed withdrawals requiring Prior Notice and Consultation with the other Great Lakes states and provinces. In the spirit of the companion legislation adopted by the state of Michigan in conjunction with the Great Lakes-St. Lawrence River Basin Water Resources Compact (Compact), and pursuant to the Great Lakes-St. Lawrence River Basin Sustainable Water Resources Agreement (Agreement), the DEQ's Office of the Great Lakes provided notice of the proposed withdrawal on May 26, 2009. The complete application packet was transmitted to the other Great Lakes states, the Canadian provinces of Ontario and Quebec, and the Great Lakes first nation and federally recognized tribes, with a request that comments be provided by July 20, 2009 in order for the DEQ to meet the statutory obligations of Part 327.

Conditions Required for Issuance of a Permit

The DEQ is required to issue a permit for a water withdrawal if all of the following conditions are met (MCL 324.32723[6]):

- All water withdrawn, less any consumptive use, is returned to the source watershed;
- The withdrawal is implemented to insure there is no individual or cumulative adverse resource impact (ARI). Cumulative impacts are to be evaluated based upon available information gathered by the DEQ;
- The withdrawal will be implemented in compliance with all applicable local, state, and federal laws, as well as all legally binding regional interstate and international agreements;
- The proposed use is reasonable;
- The permit applicant certifies compliance with the environmentally sound and economically feasible water conservation measures for the applicable water use sector; and
- The proposed withdrawal does not violate public or private rights and limitations imposed by Michigan water law or other common law duties.

Parallel requirements for approval are spelled out in Section 4.11, Decision Making Standard, of the Compact. Section 4.11(5) of the Compact provides greater specificity on reasonable use conditions and requires the parties to consider efficient use of the water; efficient use of existing water supplies; the balance between economic and social development and environmental protection as they relate to other planned withdrawals and uses sharing the same source; supply potential; the degree and duration of likely adverse impacts and the restoration of hydrologic conditions.

III. DECISION MAKING PROCESS

Consumptive Use Considerations

The consumptive use calculation was based upon a consumptive use coefficient of 10 percent. The DEQ relied primarily upon the United State Geological Survey publication "Consumptive Water-Use Coefficients for the Great Lakes Basin and Climatically Similar Areas," Scientific Investigation Report 2007-5197. There is a relatively narrow range of coefficients for public water supplies in comparison with many of the other types of uses. Further, it is generally conceded the range is 10 to 15 percent as identified in Table 3-1, Consumptive-use coefficient used by Great Lakes jurisdictions, by water use category of the report. Upon review of the aforementioned report, the DEQ ultimately decided that 10 percent was the best estimate of consumptive use. This is the published value for the public water supply sector in Table 3-2, Total water use by category for the Great Lakes Basin, by year, from the Great Lakes Commission annual reports, 1998-2002. Based upon the 10 percent coefficient for consumptive use, the proposed withdrawal is projected to have a maximum consumptive use of 8.5 MGD.

Adverse Resource Impacts

Section 32721(1) of Part 327 prohibits a person from making a "...new or increased large quantity withdrawal from the waters of the state that causes an adverse resource impact." Section 32701(1)(a)(vii) defines an adverse resource impact (ARI) for a surface water body as "decreasing the level of a lake or pond with a surface area of 5 acres or more through a direct withdrawal from the lake or pond in a manner that would impair or destroy the lake or pond or the uses made of the lake or pond, including the ability of the lake or pond to support characteristic fish populations, or such that the ability of the lake or pond to support characteristic fish populations is functionally impaired." For flowing streams and rivers an ARI is defined as decreasing the flow by part of the index flow such that the ability of the stream to support the characteristic fish population is functionally impaired.

Part 327 establishes specific flow reduction as constituting an ARI for some stream types. No specific flow reductions are established for the Great Lakes or their connecting channels. In that case, a comparison of the proposed withdrawal to the water availability from the GL or connecting channel from which the withdrawal originates is one means of assessing the likelihood of an ARI. The proposed withdrawal of 85 MGD corresponds to a daily withdrawal of 1.136×10^7 cubic feet per day (ft^3/day) or 4.148×10^9 cubic feet per year (ft^3/year). The area of Lake Huron and Lake Michigan, which hydraulically act as a single source at the same elevation, possess a combined surface area of 45,300 square miles, or 1.263×10^{12} ft^2. Based upon a consumptive use of 10 percent a withdrawal of 4.148×10^9 cubic feet per year (ft^3/year) would result in a projected loss of water from the Great Lakes Basin of 4.148×10^8 ft^3/year. Assuming no recharge to lakes Michigan and Huron the consumptive use loss is projected to cause a reduction in lake levels of 0.0003284 feet (0.004 inches or 0.01 centimeter). Accordingly, the DEQ concludes the impact of the proposed 85 MGD withdrawal on lake levels and the corresponding impact to the characteristic fish population would not result in an ARI as defined in Part 327.

A comparison of the proposed withdrawal to flows immediately down stream of the proposed intake in the St. Clair River provides another reasonable measure of water availability and the potential for impact. The United States Geological Survey has published average flows for the St. Clair River in excess of 183,000 cubic feet per second, corresponding to a daily flow of ~118,268 MGD. When consideration is given to return flows and consumptive use, the water theoretically lost from Lake Huron of 8.5 MGD corresponds to 0.0072 percent of the total flow.

The DEQ concludes from this comparison that the proposed withdrawal would be insufficient to cause an ARI as defined in Part 327.

Applicable Local, State and Federal Laws

To be approved, the proposed withdrawal must be in compliance with all applicable local, state, and federal laws as well as legally binding interstate and international agreements, including the boundary waters treaty of 1909. Section 32726 governing local ordinances, specifically prohibits a local unit of government from enacting, or enforcing an ordinance that regulates a large quantity withdrawal. The information contained within the permit application indicates the withdrawal would be implemented in compliance with applicable state and federal laws (Part 327) and applicable international agreements. The Boundary Waters Treaty of 1909 was agreed to by the U.S. and Canada to provide a mechanism for the resolution of disputes over waters bordering the two countries and to insure the waters of the Great Lakes remain navigable. Nothing related to the GCDC proposed withdrawal volumes would be in violation of the treaty.

Reasonable Use

Part 327 requires that a proposed use be reasonable. As noted above the specific criteria for consideration the efficient use of the water and the efficient use of existing water supplies; a consideration of the balance between economic development, social development and environmental protect, supply potential; the degree and duration of likely adverse impacts and the restoration of hydrologic conditions. These considerations are consistent with Michigan's test for determining a reasonable use as set forth in Michigan Citizen for Water Conservation V. Nestle Waters of North America, Inc. [Michigan Citizens for Water Conservation v Nestlé Waters N America Inc, 269 Mich App 25; 709 NW2d 174 (2005)]. The considerations are addressed as follows:

Efficient Use of the Water: This requirement is directly tied to the user's commitment to Environmentally Sound and Economically Feasible Water Conservation Measures. (Conservation Measures) In the application the GCDC identified the Conservation Measures applicable to the public water supply sector that they are currently employing. A more comprehensive discussion is provided in the section entitled Conservation Measures on page 6.

Efficient Use of Existing Water Supplies: The language of the Compact specifies efficient use as a consideration when an increased withdrawal is proposed. The Compact language is intended to assure that water from various sources is being efficiently used by a large quantity user before they are granted approval for an increased withdrawal. Since the GCDC proposal is for a new withdrawal, this criterion does not apply.

Balance between Economic Development, Social Development and Environmental Protection: Reasonableness of a water use as it relates to the balance between economic development, social development and environmental protection is an important consideration in the acceptability of a proposed withdrawal.

Creation of a water authority and construction of the pipeline and treatment plants would enhance economic development in a variety of ways. During the 5-year construction period there project would provide an estimated $100 million in skilled trades work, $200 million in manufacturing of pipe and other equipment and 30 million in engineering and design services. Once on line the new pipeline and associated facilities is estimated to create over 50 new jobs necessary to the operation and maintenance treatment facilities, the Great Lakes intake, pipeline, and pump stations. Improving system reliability, as discussed below will also encourage economic development in the affected communities.

From a social standpoint, the proposed withdrawal and related facilities would benefit the area by enhancing the health, safety and security of area residents. The DEQ, Water Bureau (WB)

has identified deficiencies in the GCDC system primarily related to reliability. Significant effort will be placed on improving current system reliability in the design of system components associated with the proposed withdrawal. These efforts will meet with the requirements of the Safe Drinking Water Act. With the construction of new facilities the GCDC would also be improving system reliability for surrounding public water supply systems by offering emergency inter-connects and entering into mutual aid agreements.

Lastly, given the net effect of the withdrawal on the water resources as described above, these economic and social benefits to the area would be obtained without a perceptible impact on the environment.

Supply Potential: Supply potential consideration requires the DEQ look at the impact of the withdrawal on the quantity, quality, reliability, and safe yield of hydrologically interconnected water sources. The proposed withdrawal does not present any known or anticipated threat to the quantity or quality of Lake Huron as a water source. Also, the proposed withdrawal would have no impact on the reliability or the safe yield of the source as it relates to others using Lake Huron or hydrologically connected sources, such as the St. Clair/Detroit river systems.

Degree and Duration of Likely Adverse Impacts: The DEQ concluded the proposed withdrawal would not cause an ARI.

Restoration of Hydrologic Conditions: The water withdrawn by the GCDC, less consumptive use, would all be returned to the source watershed via treated wastewater discharges to the Flint River. The consumptive use losses for inside Great Lakes Basin uses are considered reasonable. Under Part 327 the restoration of hydrologic conditions does not apply to the proposed withdrawal.

Conservation Measures

For permit applications received on or after January 1, 2009, the applicant must self-certify that they are in compliance with Conservation Measures. More specifically they must certify that they are in compliance with the Conservation Measures developed by the applicable water user's sector or developed for the water use associated with that specific withdrawal (MCL 324.32723[6(e)]).

The GCDC has certified that they are in compliance with the accepted practices as developed and submitted to the DEQ for the public water supply sector by the Michigan Section of the American Water Works Association and set a goal of a less than 5 percent system wide water loss. GCDC further certifies to the promotion of educational programs related to lawn sprinkling and other outside uses, and the implementation of programs to promote water re-use and other water conservation measures by commercial and industrial facilities. The GCDC also practices "flat rate water billing," meaning large users do not pay proportionally less as their water use goes up. All water uses served by the GCDC are metered and billing is commensurate with the metered water usage. Lastly, the GCDC employs a local ordinance restricting outdoor water use during periods of peak use.

Public or Private Rights, Limitations and Common Law

The issuance of a permit on the proposed withdrawal must not violate public or private rights or interfere with limitations imposed on the use of the resource by Michigan water law or other common law decisions. Specifically, the DEQ must ascertain if the issuance of the permit would interfere with the principle that certain natural resources, which in this case is Lake Huron, are preserved for public use, and that the state is required to maintain the resource for the public's reasonable use. The issuance of a permit for the proposed withdrawal would not interfere with the public's access to Lake Huron, the public interest in Lake Huron as a natural resource, or maintenance of Lake Huron for drinking and recreational purposes.

VI. PUBLIC PARTICIPATION PROCESS

The DEQ invited public comment on the permit application via press release, public notice and website posting. The press release was issued on May 27, 2009, and the posting of the public notice on the DEQ internet website on May 28, 2009. The web posting included the permit application packet for the proposed withdrawal and the public notice announcement. The press release and public notice announced the public comment period and requested comments be submitted to the DEQ by July 15, 2009.

The Office of the Great Lakes provided notice of the proposed withdrawal on May 26, 2009, to the other Great Lakes states, provinces and federally recognized tribes and first nations. The notice included a request that comments be provided by July 20, 2009.

The remainder of this document summarizes the comments received based on the proposed 85 MGD withdrawal by the GCDC and the DEQ response to the comments on the basis of applicable rule, policy, and procedure in administration of the permit application and review process under Part 327, Great Lakes Preservation, of NREPA.

General Comments

Many of the comments were specific to ongoing negotiations between the GCDC and the City of Detroit relative to the continued provisions for water supply service from the Detroit Water and Sewer Department (DWSD).

It was expressed by some commenters that the GCDC proposal underestimates the reliability of the DWSD public water supply system noting that DWSD possesses sufficient capacity and has an approved proposal to provide the GCDC the desired redundancy. Conversely, it was claimed the request for redundancy was made in 1965 with reciprocal commitment to construct the necessary infrastructure over the past 30 years.

A comment was made that constructing a new intake does not appropriately address deficiencies in either the GCDC or DWSD systems. As an example, there was a reference to ongoing system losses for the GCDC and DWSD of 5 percent versus 20 percent of water pumped.

Multiple comments were received with regards to the impact on water rates for DWSD customers if the KWA member municipalities were to withdraw from the DWSD system. Rate increases for the remaining DWSD customers was estimated at approximately 6 percent. A counter argument was made that the loss of a customer should not affect remaining customer rates as costs are presumably based on "cost of service."

There was a claim that the cost of the intake structure, transmission line, and separate treatment facilities for the KWA would be much greater than provided in the preliminary estimates. Conversely, The GCDC claims that all potential KWA members are aware of the cost estimates. The intake and pipeline costs are estimated at 75 percent of costs, including plans for redundancy while the treatment costs will be 25 percent of costs. GCDC also noted that separate studies on the cost of various water supply alternatives should have no bearing on the permit decision.

Response to Comments: The DEQ does not consider any comments on the relative position of the DWSD and GCDC water supply system to be legally relevant to a decision as to whether or not a permit should be issued to the GCDC for the proposed 85 MGD withdrawal from Lake Huron. Part 327 specifically requires the DEQ to issue a permit if on the basis of the submitted material the proposed water withdrawal meets the decision making criteria. The DEQ is specifically precluded from using part 327 to "...diminish or create any existing authority of municipalities to require persons to connect to municipal water supply systems as authorized by law" (MCL 324.32726).

Any addition or loss of a major customer of a regional public water system has the likelihood of affecting water rates – clearly a major addition or loss affects both the revenues and costs of operation. Water rates and the basis for establishing water rates are not an issue under Part 327. It is appropriately an issue for water service contract negotiations between the regional water system and its customers. To do otherwise invites unwanted intervention of the state into local decision making. There is nothing in Part 327 or any provisions of the Agreement and Compact that would either mandate connection to a regional water system or bind a customer permanently to a regional water system.

Applicability of Law and Regulations

Comments criticized the GCDC's application under Part 327. As a community public water supply the commenter believes the application would have been more appropriately made under the Michigan Safe Drinking Water Act, Act 399, as amended and rules. A submittal of plans and specifications under Act 399 would have provided greater clarity as to the reasonableness of the water use and the applicant's intent relative to applicable Conservation Measures.

Other comments cited the application of requirements in the Compact and expressed the opinion that the GCDC proposal did not meet the applicable standards. Most frequently referenced were the standards identified in *Section 4.11, Decision Making Standard* and *Section 4.12, Applicability* of the Compact. Relative to the former, comments suggested the proposed use is not reasonable based on efficient use of existing water supplies, balance between economic and social development, environmental protection, use of same source by multiple users, and the probable degree of adverse impacts. Relative to the latter requirements, it was implied that the Compact provides the Originating Party (i.e. Michigan) with the power to apply a much more stringent standard.

Response to Comments: Part 327 and the companion amendments to Act 399 do not provide any restrictions as to who may apply for a permit to make a large quantity water withdrawal nor specify how one must go about obtaining a permit. GCDC stated that they submitted their request for approval through Part 327 in large part to obtain the appropriate authorization of the withdrawal before investing a significant amount of money in developing plans and specification for the water works systems. Conformity with the Decision Making Standard of the Compact is, in part, the basis for the DEQ's decision on the permit application.

New Withdrawal and Consumptive Use

A number of comments focused on the fact that approval of the GCDC proposal would not result in a decrease in Detroit's ability to pump water and solicit new customers to maintain their current rate of use. As a result commenters concluded that the GCDC proposal should be treated as a new withdrawal. A corollary to this criticism was the observation that the total water withdrawal from the Great Lakes Basin would increase and that approval of the proposal would encourage other users to pursue similar use of Great Lakes waters. Some comments questioned the water use projections by the GCDC for the years 2014 to 2039. GCDC projected water use to increase by 42 percent. There was also concern that projected demand was 78.7 MGD, yet the request is for 85 MGD. There were requests that the proposed new withdrawal should be considered unacceptable unless the Detroit withdrawal was reduced by a corresponding amount.

Concern was also expressed over an increase in consumptive use. The fact that there would be an increase in use would result in additional consumptive use loss from the Great Lakes Basin. Numerous comments, particularly from other states questioned the use of 10 percent as the consumptive use coefficient indicating it should be higher. USGS publications cite consumptive use on public water supply systems in the range of 10 to 15 percent.

Response to Comments: Comments on the increased use must be addressed within the context of public water supply system operation, in particular when the increase in use is based upon population projections over a period of years. GCDC conducted a study to obtain the projected use of 78.7 MGD by 2039 based upon population and water use trends for the area currently served by the GCDC system. The GCDC explains that the request for 85 MGD provides a slight buffer over that which would be needed to account for water use in KWA member water treatment plants for such things as filter backwash. Additional buffer is provided to account for system losses. The GCDC as previously noted has set a goal of 5 percent for system losses. The DEQ determined the 85 MGD request is appropriate relative to the projected use, system operation and system water losses.

The DEQ has projected an increase in consumptive use of 8.5 MGD because the GCDC proposal is a new withdrawal. The GCDC proposed withdrawal does not affect the baseline capacity of the DWSD system or DWSD's future use of their existing baseline capacity. In the short term, the combined use of water for both the DWSD and GCDC systems will not significantly increase, because GCDC presently receives their water from DWSD. The proposed withdrawal was evaluated by the DEQ on the basis of DWSD maintaining their existing baseline capacity and evaluating the impact of a new 85 MGD withdrawal by GCDC from Lake Huron.

The consumptive use coefficient of 10 percent was obtained from *Table 3-2. Total water use by category for the Great Lakes Basin, by year, from the Great Lakes Commission annual reports, 1998-2002* in the USGS publication Consumptive Water-Use Coefficients for the Great Lakes Basin and Climatically Similar Areas, Scientific Investigations Report 2007-5197. Consumptive use coefficients for public supply over the years cited (1998-2002) were 10 and 11 percent, with 10 percent cited as the consumptive use over the entire period in question. The DEQ deemed this reference to be the most reasonable estimate of consumptive use.

Conservation Measures

There were multiple criticisms of the GCDC's commitment to water conservation. Specifically, that the GCDC identified no measures aimed at water use reduction noting that water conservation on new systems should be aggressive. Comments cited the published water conservation measures applicable to the public water supply sector noting that the GCDC has not made a commitment to each and every conservation measure. Specifically, their description of conservation measures did not include measures that promote water use conservation and the reduction of system leaks. Lastly, none of GCDC proposed wholesale or municipal customers provided information on compliance with Conservation Measures.

Commenters also expressed concern that the conservation measures identified by the GCDC were not consistent with the requirements of the Agreement and/or Compact. Plans for water use reduction or conservation were characterized as inadequate as nothing was mentioned relative to targeting system leaks and the promotion of efficient water use, in particular those leaks mentioned for the Detroit system. It was expressed that no new withdrawals should be approved until Detroit's leak problems are addressed. Some indicate there should be no approval of the withdrawal without a "water master plan" including impacts of current conservation and efficient use measures that have reduced total use and consumption. Commenters questioned whether there would be a continuation of conservation efforts made to date or whether there efforts would be improved upon. It was noted that a projected increase in population does not necessarily correspond to a projected increase in use, if one assumes more efficient use and conservation. Some commented that additional documentation is needed on water conservation measures including clear goals, targets and means of assessment.

Response to Comments: After January 1, 2009 permit applicant's are required to "self-certify" that they are in compliance with conservation measures developed by the applicable water

user's sector or developed for the water use associated with that specific withdrawal. The GCDC certified to the promotion of educational programs related to lawn sprinkling and other outside water uses, implementation of programs to promote water re-use and promotion of other water conservation measures by commercial and industrial facilities, and has set a goal of a less than 5 percent for system wide water losses. The GCDC practices "flat rate water billing," meters all water uses and bills commensurate with the metered water usage. The GCDC employs a local ordinance restriction on outdoor water use during periods of peak use.

The DEQ acknowledges the GCDC has not certified as to employing each and every water conservation measure identified for the public water supply sector, and notes there is not a requirement in Part 327 that they do so. The DEQ does commit to working with public water supplies to further water conservation efforts and will do so with the GCDC. Relative to the GCDC customers, the GCDC is making application on behalf of member communities of the KWA. All KWA members would participate in the implementation of the identified conservation measures. References to fixing deficiencies in the DWSD system are not germane to the GCDC permit application.

Reasonableness of Proposed Withdrawal

A number of comments were received relative to the reasonableness of the proposed withdrawal noting that any proposal must be considered on the basis of its purpose, suitability of use to location, the extent and amount of harm, benefits, necessity and manner of use, and other factors. The Agreement and Compact also require consideration of the economic and social value relative to potential environmental impacts and other factors. Generally, comments on the reasonableness of the proposed withdrawal focused on:

- The environmental harm that might be caused by the return of treated wastewater, and
- The necessity and amount of the withdrawal given the availability of Detroit system.

Specifically, on the issue of return flow there is a concern that points of discharge and downstream segments would be incapable of absorbing the projected 42 percent increase in discharge (based on future growth projection) without adverse impact. Commenter's claim numerous combined sewer overflows have occurred and requested verification that discharges are operating in compliance with existing laws.

Regarding the availability of the Detroit system, many comments made reference to the fact that the efficient use of existing systems is a required demonstration of reasonableness. There were claims the GCDC application should be rejected since the GCDC failed to rule out the option of using the existing DWSD system. Comments indicated that DWSW currently has the capacity to meet the needs of the GCDC and its customer municipalities, is already providing service to the proposed service area, and alleges to having made a commitment to providing reliability.

A few comments related to the economic and social value criteria of the Agreement and Compact, which requires consideration of the balance between economic development and social development and environmental protection on planned withdrawals from the same source

Response to Comments: There are four wastewater discharges by the City of Flushing, City of Flint, Genesee County's "Ragnone Plant" and the City of Lapeer. The four wastewater treatment plants are in the process of reducing infiltration and inflow from their collection systems. The National Pollutant Discharge Elimination System (NPDES) permits for the Flint and Genesee Ragnone plants discharges require treatment facility and collection system capacity analyses. The City of Lapeer proposes to rehabilitate their plant to increase the treatment capacity and accommodate an increase in population and service area. All are operating and are in compliance with the parameters stipulated by their respective NPDES permits. If the GCDC service area demands increase in the future, or if the service area expands, the DEQ will use the standard NPDES permit review/reissuance cycle (5-years) to

evaluate any impacts from increases in wastewater flow. That process will include public participation.

The efficient use of existing systems is an applicable consideration when a proposal for an increased withdrawal and consumptive use is before the DEQ for approval. That is to say, an existing system must demonstrate that it is not wasteful of its water before is request for an increase in use can be approved. Because this is a new withdrawal the requirement for efficient use of existing systems, specifically the efficient use of a system owned and operated by another party (DWSD), is not germane to the permit decision.

As a consideration on the reasonableness of a water use, social and economic development considerations must be balanced against environmental impact of the proposed withdrawal. The GCDC outlined the potential benefits including enhanced public safety, security and health that would be provided to area communities served by the proposed withdrawal. Many of the social benefits would arise as a direct outcome of the new intake, pipeline, shore well and treatment facilities correcting existing system deficiencies identified by the DEQ. The GCDC projects the proposed construction of facilities would provide a direct infusion of money, jobs and manufacturing opportunities to the area. The DEQ determined there would likely be no ARI to the commonly shared water source as the withdrawal is not of sufficient magnitude to perceptibly lower the levels of Lake Michigan and Lake Huron. Accordingly, the DEQ concludes the GCDC proposal meets the reasonableness criteria relative to social development, economic development, and environmental impact.

Adverse Impact and Requirements for Ecological Improvement

Comments pointed out that the Great Lakes states and provinces have agreed to protect, conserve, restore and improve the Great Lakes resources. Some additional analysis recommended that the DEQ ascertain if there might be a cumulative ARI and questioned why the DEQ has not required the submittal of proposed restorative measures as part of the application packet. Comment pointed out that the application packet included no information as to whether Detroit will reduce its water use, whether GCDC will remain a DWSD customer for backup, and whether DWSD will seek additional customers. Commenters indicated that if there is no net reduction in use cumulative impacts need to be addressed. Some believe what was referred to as a diversion could have a significant impact on the levels of the Great Lakes and set precedent for other large scale diversions. Eleven comments focused solely on the impact the withdrawal would have on lake levels.

Response to Comments: The DEQ has determined there would be no ARI caused by the impact of the proposed withdrawal, and no perceptible impact on the levels of the Great Lakes or connecting channels. Given the likely near term affect of the proposed withdrawal on the volume of the DWSD withdrawal, there is no identifiable issue of cumulative impacts. Part 327, ~~which is~~ the guiding legislation in the issuance of the permit, requires "preventative measures" be submitted as part of a permit application only when necessary to preclude an otherwise prohibited environmental impact. As a proposed new withdrawal, the DEQ evaluated the GCDC withdrawal without assuming there would necessarily be any change to DWSD capacity to withdraw~~al~~ water from the Great Lakes.

Diversion or Intra-Basin Transfer

A number of comments assumed that the proposed withdrawal constitutes a diversion, or intra-basin transfer, precluding DEQ approval under Part 327, the Agreement and Compact. Comments indicated the need for the GCDC to better identify the current and proposed service area. This was especially true in dealing with service to Shiawassee County as portions of the county are in both the Lake Michigan and Lake Huron watersheds. There was also concern that some of the service area and return flow might be to the St. Clair/Detroit River watershed, or discharged to the Lake Erie watershed resulting in an intra-basin transfer. There was concern

that approval of the withdrawal would set a dangerous precedent for the review of diversion and intra-basin transfers in the future.

Response to Comments: In accordance with Part 327, the Agreement and Compact, the DEQ has determined the proposed withdrawal would not constitute a diversion or intra-basin transfer. Portions of Shiawassee County lie in both the Lake Michigan and Lake Huron watersheds. However, Section 4.12.9 of the Compact states that Lake Michigan and Lake Huron are to be considered a single hydrologic unit and watershed. And therefore the transfer of water between Lake Michigan and Lake Huron watersheds is not considered a diversion under the Compact. None of the proposed service area lies within the watershed of the connecting channel or Lake Erie. Connecting channels are those waters and associated watershed that lie between any two of the Great Lakes. Section 4.12.7 of the Compact treats connecting channels as though they are part of both the Great Lake watersheds above and below the connecting channel.

In summary, within the applicable definitions of Part 327, the Agreement, and Compact the proposed withdrawal would not constitute a diversion or intra-basin transfer. It is a proposal potentially subject to Prior Notice and Consultation under the Charter because it is proposed as an in basin use with the only loss of Great Lakes waters due to the associated consumptive use.

Inadequate Information

A number of comments criticized the adequacy of the submitted information. Some suggested more information was needed on the movement of ground water and surface water to determine if the proposal will result in an intra-basin transfer or cause an adverse impact to the quantity and quality of Great Lakes basin waters. There were claims the proposal did not meet the requirements, spirit or intent of Agreement or Compact. The presumed inadequacy of information led to concern over consumptive use, service area information and water loss. There was also concern over inconsistencies in the information such as references to the new capacity of 85 MGD, a maximum capacity of 110 MGD and a firm capacity of 88 MGD. There were questions as to the relationship between the various cited capacities.

Others acknowledged the effort made to demonstrate consistency with the Agreement and/or Compact while noting information deficiencies. In a few instances commenter's requested information concurrent with a request for extension of the public comment period.

Response to Comments: A permit applicant under Part 327 is required to submit information including pumping capacity; location of withdrawal; withdrawal source; amount and rate of withdrawal; the maximum monthly and annual volumes and rates; relevant information related to seasonal use; a description of how the water will be used; the location, amount and rate of return flow; and an evaluation of existing hydrological and hydrogeological conditions. Other information may be provided at the discretion of the applicant with a description of preventative measures required where relevant.

Due to the magnitude of the withdrawal and its qualifying as a proposal potentially subject to Prior Notice and Consultation under the Charter, the DEQ requested the submittal of additional information. Extensive information was provided to meet information requirements in accordance with the Charter, the Agreement and Compact. The DEQ deemed the information sufficient and notified the GCDC of such on April 24, 2009.

Regarding the request for an extension of the public comment period, Part 327 contains a statutory limit on the time the DEQ may give to the consideration of a permit application. Once the applicant is notified of the completeness of application the DEQ has 120 days in which to render a decision. Given the time constraints and the adequacy of the application packet, the DEQ denied requests to grant an extension to the public comment period.

V. Summary of DEQ Position

The DEQ has determined the application for the GCDC proposed withdrawal of water from Lake Huron was submitted in accordance with the permit requirements of Part 327. Further, the proposed withdrawal is deemed not likely to cause an ARI and, as proposed, meets the intent of the Great Lakes Charter and the decision making standards of the Agreement and Compact. The DEQ based this determination on a review of the information and data pertinent to the factors used in making a decision on a permit application which included a thoughtful consideration of the comments received from the public, the other Great Lakes states, the Canadian provinces of Ontario and Quebec, and federally recognized tribes and first nations on the permit application, as made available for public review.

The authorized withdrawal capacity is 85 million gallons per day (maximum withdrawal in any single day). The DEQ will assure that capacity is not exceeded in the issuance of the required Michigan Safe Drinking Water Act construction permits (1976 P.A. 399, as amended). In addition, the DEQ will require as a condition of this Part 327 authorization that the participating members of the Karegnondi Water Authority be committed to a water conservation/water use efficiency program consistent with the water sector guidelines accepted by the state under Part 327, and posted on the DEQ website.

ROWE PROFESSIONAL SERVICES COMPANY

*Large Firm Resources. Personal Attention.*sm

January 7, 2013

Mr. Edward Kurtz, Emergency Financial Manager
City of Flint
1101 S. Saginaw Street
Flint, MI 48502

Subject: Review of December 21, 2012 Presentation – City of Flint Water Supply Assessment

Dear Mr. Kurtz:

As requested, we have reviewed the analysis of water supply alternatives for the City of Flint which was presented to the State Department of Treasury by Tucker, Young, Jackson, and Tull, Inc. (TYJT) on December 21, 2012. Our review is attached and summarizes the primary differences between the TYJT assessment and our previous studies and provides explanations of why we believe there are differences.

We have also reviewed the options for continued DWSD supply included in the TYJT presentation. It is not clear whether these are presented as specific offers on behalf of DWSD or included as examples for analysis, but we have noted some items which we believe should be addressed and considered as these options are compared.

If there are questions, please contact me.

Sincerely,
ROWE Professional Services Company

James E. Redding, P.E.
Vice President / Director of Engineering

Attachment

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Review of TYJT December 21, 2012 Presentation
City of Flint Water Supply Assessment
Prepared by Rowe Professional Services Company

DWSD Supply (Slides 7 through 9)

1. The 8 mgd maximum day supply by DWSD options can result in periods during the summer when most of the water to meet demands will be supplied by the City from the river. To aid in maintaining a consistent water quality, softening of the water from the river should be provided with this option, greatly increasing the City's costs.

2. Upgrades to Flint's WTP and dams will be needed for options requiring blending, since the WTP will be required to provide continuous, reliable service and compliance with recent surface water treatment regulations.

3. The rates for the options analyzed are shown on Slide 9 as "TYJT Estimates". Options and rates shown are different than presented by DWSD previously.

	DWSD 11/29/2012	TYJT Estimates
18 mgd Maximum Day - P&B	$16.24	$16.37
12 mgd Maximum Day - P&B	$16.30	$16.31
8 mgd Maximum Day -P&B		$12.68
12 mgd Maximum Day - Imlay	$14.38	$14.38
8 mgd Maximum Day - Imlay		$11.11

4. Since the rates used in the analyses are shown as estimates, are they actual offers or just presented as "what if" scenarios?

5. We assume that the Imlay options are based on transfer of the 72" main through Lapeer County to Flint. The analyses show a capital cost of $4.7 million; we assume that this is the proposed purchase / lease cost to Flint. This should be clarified along with pertinent details.

6. If the transmission main is transferred to Flint, what are Flint's responsibilities regarding service to the Lapeer County customers? If they remain DWSD customers, then Flint should receive some revenue for the use the main. It does not appear this is included in the TYJT analyses.

7. If the transmission main is transferred to Flint, we assume that the city will be responsible for the maintenance of the 50 year old main. The TYJT analysis did not include this.

8. Do the rates shown include the credit for "reliability" which had been discussed with DWSD?

9. If the point of commerce is changed from Baxter and Potter to Imlay, a new meter pit will be required. The cost of this does not appear to be included in the TYJT cost analyses.

Flint River Supply (Slide 10)

1. If any of the "blending" options are chosen, it will be necessary to upgrade the Flint WTP and dams to provide reliable, continuous service and compliance with recent surface water treatment regulations.

Data Collected (Slide 14)

1. The slide notes that Flint blending is based on DWSD supplying 2/3 and Flint supplying 1/3 of 12 MGD ADD. For the maximum day demand (18 mgd), if DWSD supplies a maximum of 8 mgd, Flint will supply 10 mgd or 56% of the total. However, such a large portion will make it more difficult to blend and achieve consistent water quality. Flint will need to soften water for these options.

Benchmarking Comparisons (Slide 16)

1. The slide subtitles are "KWA O&M Inflation Factor" and "DWSD and Flint Rate Inflation Factor". It seems appropriate to benchmark O&M costs for the KWA, because future costs of service will be dependent on how operating costs are impacted by inflation. For Flint, it does not seem appropriate that "rate inflation" from other utilities be used to determine the impact of inflation on future cost of service. Rates are impacted by inflation, but also by other factors such as debt and customer base. O&M expenses and rates are different and care should be exercised not to mix the two during analyses. The TYJT analyses apply an inflation factor (based on rates from other utilities) to the Flint WTP operating expenses, which does not seem to be consistent.

2. The KWA will supply raw water; SOCWA and YUCA both supply finished water. Regulations impact the O&M for finished water suppliers but should not impact the KWA O&M. The use of data from SOCWA and YUCA does not seem like a comparable comparison with the KWA. Finished water suppliers will have increased costs due to regulatory compliance, which really are not due to "inflation" of the costs of wages, power, chemicals, etc.

3. DWSD has a history of rates to Flint and other suburban wholesale customers. Rates tend to be quite specific to each utility, based on much more than just the costs of operating and maintenance. It appears that DWSD historical rates have not been considered in projecting future DWSD rate increases.

Capital Financing (Slide 17)

1. KWA bonds are planned to be general obligation bonds, backed by member counties.

O&M Inflation Factor (Slide 20)

1. SOCWA and YUCA are finished water suppliers; ever-changing regulatory requirements will impact their operating costs more than a raw water supplier, such as KWA.
2. KWA will be a supplier of raw water. O&M costs should primarily be limited to power and labor, with a little chemical use for zebra mussel control. KWA will not provide treatment of the water.

3. The KWA study assumed power, labor, and chemical costs increase at an annual average of 3%. TYJT indicated this is too low and suggested 5%.

4. Following are examples of historical inflation, which support the 3% as a reasonable assumption for O&M expenses (not rates)
    a. Labor- GCDC-WWS labor costs have increased at an annual average rate of 2.5% since 2003
    b. Electricity Rates in Michigan (per U.S. Energy Information Administration) have increased an average of 3.2% since 1999.
    c. The U.S. Bureau of Labor Statistics indicates that the inflation rate over the last 30 years has been an average of 2.8%.

Finished Water Rate Inflation (Slide 21)

1. TYJT bases their assumptions for rate inflation on a survey of rates from three other water suppliers, but ignored the actual rate history of DWSD. TYJT assumed DWSD rate increases of 4.4% annually (if water is purchased from P&B) and 2.9% annually (if water is purchased from Imlay). Based on the actual charges by DWSD to Flint, DWSD historical rates are as follows:
    a. 10 year increase in DWSD rates to Flint:: 10.5% annually
    b. Average annual increase through 45 year history: 6.7%

2. Note that for the KWA analyses, an inflation factor has just been applied to power, labor, and chemicals. Although higher prices for labor, power, and chemicals impacts utility rates; rates are impacted by many other factors, many of which are not related to inflation. Rate inflation will likely be different than O&M inflation. Other factors impacting rates:
    a. Debt – the amount of debt varies widely between utilities
    b. Number of customers / quantity of water sold – there are many fixed expenses with a utility, that if are distributed amongst more users/more gallons sold will result in lower rates. Conversely, if there are fewer users or less water sold, the rates are higher. Assumptions regarding future water consumption will have a great impact on "rate inflation".

3. Unlike KWA and Flint operating expenses which will increase over time based on inflation, the cost of continued DWSD service should be based on the inflation of DWSD rates, to include the increasing cost of other DWSD expenses such as debt and the impact of reduced customers / demands in addition to increasing O&M expenses.

4. Even though there could be a one-time reduction in DWSD rates through adopting the model contract, limiting peak demands, and or changing the point of commerce; it doesn't seem reasonable to assume that subsequent annual increases will only average 4.4% through the 30 year period of analysis. This is significantly less than historical performance (yet TYJT suggests that inflation for KWA O&M expenses will increase at almost double the rate of historical indicators).

Capital Financing with Revenue Bonds (Slide 24)

1. Note that the KWA bonds will be general obligation bonds backed by the member counties.

2. The 2009 KWA Study assumed 6%, 25 year financing. The interest rate for planning was reduced in the 2012 Study update to 5%, which is still higher than if bonds were sold today.

3. Financial consultants determined the charges for purchasing capacity in the KWA supply based on the estimated project cost plus appropriate financing costs. Based on 60 units of capacity, $538,764,000 will be generated for repayment of debt and project costs using the capacity charges in the KWA capacity agreement.

25 years * 60 units * $355,300 / unit =	$532,950,000
3 years * 60 units * $32,300 / unit =	$ 5,814,000
	$538,764,000

4. For a KWA project cost of $272,421,558, total P&I is $483 million. The difference of $55,500,000 is available for financing expenses (capitalized interest, bond issuance costs, etc.) and additional contingencies.

5. Bond holder reserve is not a requirement for general obligation bonds.

6. TYJT assumed that 3% interest would be earned on the bond holder reserve during the 25 year bond period. Current interest rates are less than 1% and it seems inappropriate to assume such a high rate will be earned on retained funds.

7. Bondholder reserve, if provided, should be applied against the last couple of P&I payments. The TYJT did not apply it. This will reduce their project costs.

KWA Construction (Slides 26 through 29)

TYJT has indicated that the KWA construction cost estimate is too low. The primary differences in cost estimates for the project appear to be the following components:

1. Pump Stations (Slide 27) – The TYJT estimate for the pump stations is more than double that used by the KWA ($54,573,314 vs. $24,618,080). KWA estimates were based on actual construction costs from recent projectd completed by Genesee County within the last eight years.
   a. 32mgd water pump station including two-10 MG ground storage tanks - $13.4 million
   b. 80 mgd wastewater pump station, 50 feet deep wetwell – $8.3 million
   c. 30 mgd wastewater pump station, 50 feet deep wetwell – $9.4 million

   The KWA budgeted amount seems reasonable for two pumping stations as currently planned and to be constructed in rural areas (not southeast Michigan).

2. Redundant Power – There is no need for redundant power; other provisions will provide reliability of supply.

3. Land – Preliminary engineering has continued so earlier budgets established for planning for land acquisition can be greatly reduced. Options have been obtained on all properties which must be

purchased, so purchase prices are known. It will be necessary to obtain easements for only two miles of pipeline construction. All land costs are now estimated at $1.25 million.

4. Engineering, Legal, Administration & Contingencies
   a. The October 2012 KWA estimate provided an allowance of 25% of construction cost to cover engineering, legal, administration, and contingencies (ELAC). This was reduced from the 38% allowance used in the 2009 Study because ongoing planning and design have firmed up many of the details of the project, including:
      i. The intake design has been completed and all regulatory permits obtained.
      ii. The transmission main route has been determined. Meetings with road agencies have firmed up the requirements for construction and restoration within rights-of-way. Environmental review and permitting are in process.

   b. TYJT costs for Intake Crib, Pump Stations, and Transmission Mains (Slide 30) include a 30% allowance for ELAC. These allowances (from Slides 26 through 28) total $72,139,566. In addition, Slide 30 provides the following additional ELAC costs in the project total:

Design Engineering / Pump Stations	$16,939,581
Construction Management	$14,434,410
Administration	$ 349,440
Legal	$ 831,000
Total	$32,554,431

   c. Combining this with the $72,139,566 totals $104,693,997 or 43% of the estimated construction cost. We believe that such a high allowance for ELAC is not appropriate for a project of this magnitude where preliminary engineering and some design have already been completed.

Cost Comparison (Slide 30)

1. The TYJT pump station price is too high based on costs of similar projects; costs used by KWA are based on costs of recent local projects. The KWA estimate is believed to be sufficient for the proposed pumping stations.

2. Redundant power is not required; this does not need to be included in the TYJT estimate.

3. Land for LHPS – actual price is $360,000

4. Design Engineering / PS and Transmission – KWA included engineering in the 25% ELAC allowance included in the $207,752,895 estimated cost of transmission mains; TYJT included engineering in their 30% ELAC allowance included in the $218,811,559 estimated cost. By adding $16,939,581 for design engineering, $14,434,609 for construction administration, $349,440 for administration, and $831,000; it seems that ELAC is being "double-counted". The TYJT 43% allowance for ELAC seems unwarranted for a project with a great deal of preliminary and design engineering completed. The 25% KWA allowance is believed to be sufficient.

5. Easements and land (other than LHPS) should total $1,140,000, based on current options and specific needs for easements.

Other Considerations – Redundancy / Reliability (Slide 33)

1. Unfunded Mandates/ Future Regulations
    a. The proposed KWA supply will deliver raw water; it is not anticipated to be affected by future changes to regulations. Regulations will impact the City of Flint with respect to treatment and/or distribution of finished water. The City will be subject to these requirements with any of the DWSD blending options, just as they will be responsible for them if supplied by KWA. Some compliance costs may actually be less with the higher quality Lake Huron water rather than Flint River water as the source.

2. State Goals
    a. The TYJT presentation indicates that creation of a new raw water supply is contrary to the governor's goals as suggested. However, the development of a new raw water supply provides new opportunities. Communities in Sanilac, St. Clair, and Lapeer counties will have the option to join a regional water supply and replace their small local supplies where limited supplies and high concentrations of arsenic have been a concern. The new water supply also provides great economic development opportunities. The raw water supplied by KWA will make a new commodity, raw water, available to the region. A large, low-cost supply of raw water can be a valuable resource for industries and agri-businesses. The development of a new water supply will also create construction jobs through the short term period of building the new water supply and subsequently over a longer period as new businesses and industries are developed in the area.
    b. The City of Flint and area communities will benefit as permanent jobs are created for operating and maintaining the local treatment facilities.

3. Redundancy
    a. We agree that the KWA and DWSD options are similar with respect to redundancy. Both provide the primary water supply; customers are responsible for their backup supply.

Other Considerations – Cost Slide 34

1. TYJT indicates that the DWSD 8 mgd supply option is the least cost alternative.
    a. The TYJT analysis does not include the cost of needed upgrades to the City's WTP or increased operating costs in their analysis. During summer months, water from the river will need to be softened before blending. More than half of the water supplied will be provided from the river. When the cost of upgrades to the WTP and the increased operating costs (for softening) are added to the TYJT analysis, the KWA option is less than the DWSD 8 mgd option.

2. For any of the DWSD "blending" options, upgrades will need to be made at the WTP to provide for continuous, reliable operation and compliance with new surface water treatment rules. Increased capital and operating costs for treating water from the river should be added to the TYJT costs for comparison with the other options.

3. Water from the river will require greater effort to treat than water from Lake Huron (more chemicals, power, and residuals). The TYJT analysis shows about the same O&M costs for the Flint WTP, regardless of water source. It seems that the WTP O&M costs for the KWA options should be reduced to reflect the savings from treating Lake Huron water.

4. The TYJT presentation noted that the KWA analysis did not include allowances for mechanical and process improvements within the planning period. The KWA will supply raw water. The facilities consist of pipe, pumps, and a tank. There are no treatment facilities which would be susceptible to future regulatory changes. The only improvements that seem likely would be the need to provide additional capacity. Capacity expansion is planned to be financed through capacity charges to new users.

5. The provision for redundant connections between the City's water system and the GCDC system was included in the most recent water supply agreement between the two, in 2011. Although not a KWA cost, the cost of the redundant connections should be considered with all options.

6. The $2.3 million budgeted for land by KWA was intended to cover all land requirements. Since the October update, options have been obtained on all land to be purchased and the locations of easements needed has been finalized. Total land costs are now estimated to be about $1.5 million.

7. The 2004 study included a 47% allowance for engineering, legal, administration, and contingencies (ELAC). The 2009 study reduced the allowance for ELAC to 37% because many of the details since the 2004 conceptual study had been better defined. For the October 2012 update, the allowance for ELAC was reduced to 25% because continued planning and preliminary engineering further addressed details from the earlier concepts.
    a. The detailed design (plans and specifications) and permitting have been completed.
    b. The transmission main route has been finalized. Meetings with road agencies have established requirements for construction and restoration within road rights-of-way. Environmental permitting is in process. The primary remaining unknown is pipe sizing, which is largely dependent on Flint's participation.

    It is our experience that the 25% ELAC allowance is appropriate for a project of this magnitude at this stage in the planning / design stage. The 43% ELAC allowance recommended by TYJT is excessive for a project in the design phase.

8. Flint's WTP as a backup to the KWA will be less difficult to provide for than the current arrangement as a backup to DWSD. We believe there is potential for challenges with chemistry and treatment for the proposed DWSD blending options, too.

9. It doesn't seem that oversizing the KWA capacity is a good solution for the city's water loss problems, if that is what is being suggested.

10. Yes, it would be nice if the KWA system could be constructed to firmly determine its cost and time to complete before making a decision about water supply alternatives. However, a decision is needed regarding Flint's participation so that the sizing and design can be completed, before it can be built.

Project Costs - TYJT Slides 26 through 30

	KWA	TYJT
Intake and Crib		
Construction	$22,076,850	$22,076,850
ELAC	$5,519,213	$5,519,213
Property	$2,300,000	$2,300,000
Pumping Stations		
Construction	$24,618,080	$54,573,314
Land		$75,000
ELAC	$6,154,520	$16,394,494
Transmission Mains		
Construction	$166,202,316	$167,419,530
ELAC	$41,550,579	$50,225,859
Easements		$1,166,170
Engineering		
Design Engineering		$16,939,581
Construction Management		$14,434,609
Administration		$349,440
Legal / Easements / Contracts		$831,000
Power	$4,000,000	$4,000,000
Redundant Power		$1,273,200
Total Construction	$212,897,246	$244,069,694
Total ELAC	$53,224,312	$104,694,196
Total Land / Property / Easements	$2,300,000	$3,541,170
Total Power	$4,000,000	$4,000,000
Total Redundant Power	$0	$1,273,200
Total	$272,421,558	$357,578,260
ELAC as % of Construction	25.0%	42.9%

Option	TYJT Total Cost	TYJT minus additional costs of river treatment	TYJT minus additional costs of river treatment plus redundant Flint-GCDC connections	TYJT minus additional costs of river treatment plus redundant connections less KWA reserve	TYJT minus additional costs of river treatment plus redundant connections less TYJT financing	TYJT plus Flint WTP		Adjusted Total Cost	Ranking
1 Flint WTP Only	$590,441,893							$590,441,893	3
2 DWSD 8 MGD Max Day at Imlay	$621,211,298					$771,289,948		$771,289,948	5
3 KWA 10/31/12 Update	$649,775,166	$534,615,996	$554,555,960					$554,555,960	1
4 DWSD 8 MGD Max Day at P&B	$657,167,877					$807,246,527		$807,246,527	6
5 KWA-1	$707,279,715	$592,120,545	$612,060,509		$572,731,459			$572,731,459	2
6 DWSD 12 MGD Max Day at Imlay	$707,994,386					$858,073,036		$858,073,036	8
7 DWSD 12 MGD Max Day at P&B	$742,168,081					$892,246,731		$892,246,731	9
8 KWA - 2	$766,784,313	$651,625,143	$671,565,107	$654,706,341				$654,706,341	4
9 DWSD 18 MGD Max Day at P&B	$791,202,885						$812,337,848	$812,337,848	7

Option for Water Supply	TYJT Projected 30 Year Total Cost	30 Year O&M Reduction for Treating Lake Huron Water	25 Year Bond Cost for Redundant Connections	Eliminate KWA Reserve	Use KWA 25 Year Capital Charge $355,300 / MGD	25 Year Bond Cost for Flint WTP Upgrades	Adjusted 30 Year Total Cost	Rank (Least to Highest Cost)
1 Flint WTP Only	$590,441,893		Included				$590,441,893	3
2 DWSD 8 MGD Max Day at Imlay	$621,211,298		Note 1			$150,078,650	$771,289,948	5
3 KWA 10/31/12 Update	$649,775,166	-$115,159,170	$21,134,963				$555,750,960	1
4 DWSD 8 MGD Max Day at P&B	$657,167,877		Note 1			$150,078,650	$807,246,527	6
5 KWA-1	$707,279,715	-$115,159,170	$21,134,963		-$39,329,050		$573,926,459	2
6 DWSD 12 MGD Max Day at Imlay	$707,994,386		Note 1			$150,078,650	$858,073,036	8
7 DWSD 12 MGD Max Day at P&B	$742,168,081		Note 1			$150,078,650	$892,246,731	9
8 KWA - 2	$766,784,313	-$115,159,170	$21,134,963	-$16,858,766			$655,901,341	4
9 DWSD 18 MGD Max Day at P&B	$791,202,885		$21,134,963				$812,337,848	7

Representative Genesee County Water and Wastewater Projects

Project	Description	All Engineering Fees	Engineer's Estimate	Bid Price	Final Construction Cost	Engineering & Contingency %
Fox Pump Station	30 mgd wastewater pump station & forcemain	$1,829,259		$12,394,273	$12,074,223	
		15.2%				
NEES Project	60" Relief Sewer - included tunneled sections		$54,707,212	$55,985,672	$69,999,429	
					28.0%	
North Water Loop	23 miles 36" and 48" transmission main, pump station, & 20 MG Reservoir	$4,102,610	$29,200,000	$23,570,110	$25,798,529	2.4%
		15.9%			-11.6%	
Henderson Road PS	32 MGD Water Pump Station & Two-10 MG Tanks		$12,046,368	$12,846,077	$13,517,582	
					12.2%	
Pump Station #1	80 MGD wastewater pump station	$1,735,063	$10,269,000	$8,225,400	$8,292,277	-2.4%
		20.9%			-19.2%	

Notes:

Engineering Fees include all planning, soils investigation, design, construction inspection & testing, and construction management costs

Engineering Fees % is based on final construction cost

Engineering and Contengency % is based on engineering fees + amount final construction cost exceeds estimate

Final Construction Cost % is based on difference between final construction cost and engineer's estimate

NEES Project Contractor went out of business during project - increasing cost to finish project

Projects constructed within last ten years

Rennaker, Joanne (DEQ)

From: Busch, Stephen (DEQ)
Sent: Monday, July 08, 2013 11:20 AM
To: Wurfel, Brad (DEQ); Copen, Leigh (DEQ); Shekter Smith, Liane (DEQ); Bloemker, Jon (DEQ); Seymour, Veronica (DEQ)
Cc: Prysby, Mike (DEQ); Benzie, Richard (DEQ)
Subject: Media Inquiry - Flint WTP Engineering

I received a call this morning (July 8) from Dominic Adams, Flint Journal/Mlive. I called him back with Mike Prysby, District Engineer sitting in on the call.

Mr. Adams had obtained information that the City of Flint was contracting some engineering work for the Flint WTP, and the work was in part to potentially use the Flint River as a primary drinking water source.

I informed Mr. Adams that the City of Flint receives treated water from DWSD and has been since the 1960's, but has had the WTP available for reliability should the single transmission line system from DWSD fail. In an emergency the Flint WTP is already approved to use the Flint River for source water and is designed to meet all drinking water standards and public health requirements.

I also informed Mr. Adams that the engineering work in question would be to primarily enhance treatment capabilities beyond minimum requirements for the purpose of softening to provide customers with water quality consistent with what they already receive from DWSD. Some equipment for softening is already in place, but under emergency operation would not normally be used due to the time required for startup and fine tuning.

Mr. Adams asked whether the DEQ has approved or signed off on the proposed engineering work and on allowing the City of Flint to use the River as its source water. I explained that the ODWMA has not received a construction permit application for such work at this time, and that one would be required. I also indicated to Mr. Adams, that regardless of the source water, the City of Flint would be required to meet all applicable Drinking Water Standards and public health requirements and again that the WTP is already approved as a redundant supply to use the Flint River as a source water meeting all drinking water standards and that the WTP undergoes test runs on a quarterly basis to maintain the WTP.

Mr. Adams asked for more specifics regarding the treatment process and I explained that the removal of hardness for aesthetic water quality at this WTP is called lime softening.

Mr. Adams also inquired about the City being able to use the Flint River after the contract with DWSD terminates, and I indicated that may be one option, but they could also continue to purchase treated water from DWSD.

In Mr. Adams voicemail he mentioned a variance to use the Flint River, and I reiterated that there is no "Variance", but that the WTP has been constructed and approved to treat water from the Flint River to appropriate standards as needed.

Let me know if you have any questions.

Stephen Busch, P.E.
Lansing and Jackson District Supervisor
Office of Drinking Water and Municipal Assistance
MDEQ
517-643-2314

Rennaker, Joanne (DEQ)

From: Busch, Stephen (DEQ)
Sent: Wednesday, October 21, 2015 10:45 AM
To: Rennaker, Joanne (DEQ)
Subject: FOIA 6857-15
Attachments: RE: Flint - Dept of Treasury; RE: Flint River Intake Location; FW: Flint Scenarios; FW: Flint River as a Source; Flint Water Plant Meeting Reminder; RE: flint's application for flint river withdrawals; RE: Proposed Water Monitoring - City of Flint; Re: Proposed Water Monitoring - City of Flint; Flint WTP update; Briefing -- Flint River for drinking water, Michigan; FW: KWA Rowe Engineering review; RE: ODWMA Response - Flint KWA-DWSD Report; Re: KWA and City of Flint; RE: Flint Draft Response; ODWMA Response - Flint KWA-DWSD Report; Media Inquiry - Flint WTP Engineering; Media Contact FW: questions about Flint River; Flint River - Genesee County Park & Rec Attorney Call; RE: Media Contacts: City of Flint WTP; Media Contact - Flint WTP

JoAnne,

I have gone through my email and found the following records related to this FOIA request. I spent 1.5 hours to retrieve these records. I am still reviewing for any printed materials.

Stephen Busch, P.E.
MDEQ Lansing District Coordinator
Office of Drinking Water and Municipal Assistance
Lansing and Jackson District Supervisor
517-643-2314
buschs@michigan.gov

Rennaker, Joanne (DEQ)

From: Busch, Stephen (DEQ)
Sent: Wednesday, April 02, 2014 12:57 PM
To: Benzie, Richard (DEQ); Prysby, Mike (DEQ)
Cc: Philip, Kris (DEQ); Fisher, Brant (DEQ)
Subject: Flint River - Genesee County Park & Rec Attorney Call

FYI.

I received a call this morning from Helen Mills, an attorney from Fahey Schultz Burzych Rhodes Law Firm representing the Genesee County Parks and Recreation Commission this morning.

She had some questions following the recent article in the Flint Journal and had mistakenly jumped to the conclusion that the construction permit applications to our office from the City of Flint included a withdrawal permit for the Flint River.

I explained to her that the City already has the ability to withdraw water from the River since the WTP was originally constructed in the 1960's, and that a baseline capacity of 90 MGD was established for the City of Flint (along with all existing community water supply withdrawals) when water withdrawal legislation went into effect a few years ago. I referred her to Brant Fisher for more specific questions regarding the water withdrawal legislation and establishment of baseline capacities.

I explained that the City has kept the WTP as an emergency backup system but now has indicated they plan to use the Flint River and WTP on a continuous basis until the KWA pipeline is available to provide an alternate source water for the WTP. The construction permit applications in question are for modifications to the WTP to address differences in short term emergency operation vs. long term continuous operation.

She also asked about the permit process which I explained is covered under Section 4 of Act 399 and Part 13 of the Administrative Rules, that the application contains basic information and is enclosed with engineering plans and specifications sealed by a PE licensed in the state. I informed her that review of preliminary plans is common for more complex projects such as this to help save time, effort, and money by addressing design issues upfront. She asked about the status and I indicated that we received permit applications on Monday and that staff are currently reviewing the plans and specifications.

She may call back with more questions.

The Genesee Co. Park & Rec has facilities along the Flint River and is concerned about impacts from the City utilizing the River. The Halloway Dam/Reservoir is controlled by the City, but its operation also carries some requirements to maintain certain levels within the waterway.

Stephen Busch, P.E.
Lansing and Jackson District Supervisor
Office of Drinking Water and Municipal Assistance
MDEQ
517-643-2314

Rennaker, Joanne (DEQ)

From: Busch, Stephen (DEQ)
Sent: Monday, April 21, 2014 10:22 AM
To: Wurfel, Brad (DEQ); Feuerstein, Heather (DEQ); Shekter Smith, Liane (DEQ); Benzie, Richard (DEQ); Seymour, Veronica (DEQ)
Cc: Prysby, Mike (DEQ)
Subject: RE: Media Contacts: City of Flint WTP

Dominic Adams, Flint Journal/Mlive called this morning with some follow up after last week.

He asked about when work would be completed.
- I indicated he would need to ask the City to see when their contractors would be done

Will the DEQ be back out prior to re-inspect?
- I indicated we would, once the City notifies us, but we have not been contacted yet.

What work needs to be done?
- Primarily the completion of reconstructing some disinfection equipment.
  (While they are completing other work to soften the water using lime, this is not for public health protection, not a DEQ requirement for treatment)

When you inspected was the work done wrong and you asked for changes or just not done?
- Just not completed yet.

Should residents be concerned about this disinfection as part of treating the water?
- No. Flint water will be disinfected similar to how Detroit disinfects its water.

Does the DEQ need to complete sampling of the water before allowing Flint to start?
- The City of Flint has been provided with all of their monitoring requirements. The City maintains its own lab at the treatment plant to monitor water during operation. More complex monitoring which the City is not certified for analysis will be collected by the City and sent to either the state lab or a private lab for analysis according to the required schedule we have provided them.

Aside from the disinfection is there other work the City must get done to start the water treatment plant.?
- Startup of the treatment process will take several days to complete and the City has already begun this process.

I indicated that I'm sure the City of Flint will inform the media when it has started to provide residents with water from its water treatment plant.

Stephen Busch, P.E.
Lansing and Jackson District Supervisor
Office of Drinking Water and Municipal Assistance
MDEQ
517-643-2314

From: Busch, Stephen (DEQ)
Sent: Friday, April 18, 2014 5:32 PM
To: Wurfel, Brad (DEQ); Feuerstein, Heather (DEQ); Shekter Smith, Liane (DEQ); 'Richard Benzie P.E. (BENZIER@michigan.gov)'; Willard, Veronica (DEQ)
Cc: prysbym@michigan.gov
Subject: Media Contacts: City of Flint WTP

I was contacted today by the following reporters:

- Stephanie Parkinson, NBC news 25 Flint
- Kevin Wilson, ABC news 12 Flint
- Dominic Adams, Flint Journal/MLive

I provided a statement to each late this afternoon that:

DEQ staff were in the City of Flint today (4/18) to check on construction progess of work being completed at the Flint water treatment plant. The construction work nearing completion but is not yet complete. The WTP has initialized some of its treatment systems, and this process will take several days to complete. As such the WTP is not yet serving water to residents.

Stephanie Parkinson had a few followup questions.

- Will the work be completed by Monday? I indicated the City would be best able to answer questions regarding the construction schedule, Monday does not appear likely but they did think construction would be completed by next week.
- Has the DEQ completed testing of the City water? The City maintains a lab that conducts most operational testing, and then the City is required to submit their results to the DEQ.
- What equipment is still under construction? Disinfection equipment is the main focus of the remaining work.

Stephen Busch, P.E.
Lansing and Jackson District Supervisor
Office of Drinking Water and Municipal Assistance
MDEQ
517-643-2314

Rennaker, Joanne (DEQ)

From: Busch, Stephen (DEQ)
Sent: Thursday, June 12, 2014 1:16 PM
To: Wurfel, Brad (DEQ); Feuerstein, Heather (DEQ); Shekter Smith, Liane (DEQ); Benzie, Richard (DEQ); Seymour, Veronica (DEQ)
Cc: Prysby, Mike (DEQ); McClellan, Michael (DEQ)
Subject: Media Contact - Flint WTP

I just spoke with Ron Fongers of the Flint Journal.

He said he was at a press conference this morning held by the Flint Emergency Manager in which the EM brought in Flint Water System staff to report on the first full month of operation at the City's Water Treatment Plant. Ron indicated the City stated they were in 100% compliance with the treatment standards.

Ron asked me to confirm that this statement was accurate. I stated that the City has been meeting all applicable standards for water quality and treatment operations.

Ron asked about the City using lime treatment to soften the water. I explained that when the City was a customer of DWSD, the source of their water was from the Great Lakes which have natural levels of hardness that normally don't require softening to meet customer expectations. However, the City's current source of the Flint River has higher levels of hardness and the City is using lime softening to lower the hardness level. I also indicated that this treatment is for aesthetic purposes and goes beyond minimum treatment requirements for public health protection.

Ron indicated the City was receiving an increase in complaints from customers and asked whether we had seen a significant increase in complaint calls. I indicated we have received a couple of complaints specific to Flint, but that this is not a significant increase as we receive complaints from customers sporadically for all the water systems we regulate.

Ron asked if we were in contact with the City regarding their operations. I stated that we have been in consultation with the City regarding the operation of all of their water facilities, treatment (including softening) and distribution.

Ron asked about what monitoring we have reviewed mentioning bacteria and turbidity. I indicated in addition the City has monitored for metals, organics including disinfection byproducts, and other inorganics such as nitrate along with microbial contaminants and applicable operational requirements like turbidity and disinfection.

Stephen Busch, P.E.
Lansing and Jackson District Supervisor
Office of Drinking Water and Municipal Assistance
MDEQ
517-643-2314

Prysby, Mike (DEQ)

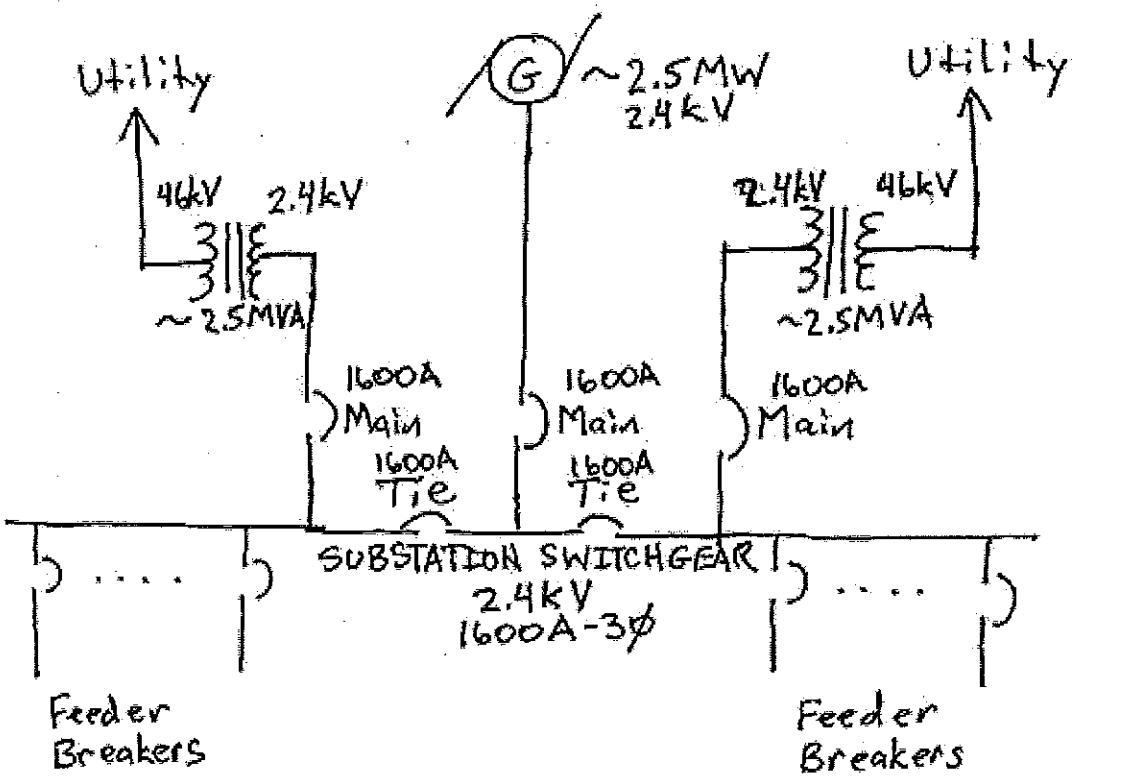
From: Green, Warren <jwgreen@lan-inc.com>
Sent: Wednesday, October 23, 2013 3:41 PM
To: Prysby, Mike (DEQ)
Cc: 'Brent Wright'
Subject: City of Flint

Mike

As you know, the Flint Water Plant (FWP) currently uses 2400V as primary power throughout the facility. All of the power feeders in the plant site are 5kV rated and it appears the existing switchgear is also rated at 5kV. Most of the major electrical improvements installed during Phase I were dual voltage (2400/4160) equipment in anticipation of the plant power being changed to 4160V in the future. However, this voltage conversion is not needed for the phase of work.

The current sub-station has two 2.5 MVA transformers running in parallel for a total capacity 5 MVA. These old transformers are not equipped with cooling fans. Based on the evaluation performed during the Phase II study, which was completed in 2003, the full connected load to these transformers is estimated to be 6.97 MVA while the estimated power load at 36-mgd is 4.22 MVA. Based on these estimates there is sufficient power for the plant with both sub-station transformers in service. Even though the transformers are owned by Consumers Energy, it could take weeks to replace one of these main transformers in the event of a unit failure, which will result in reduced treatment and pumping capacity. The sub-station switchgear was installed in 1960 and is antiquated and difficult to maintain.

Since the 2003 study, Flint's maximum day water demand has decreased to approximately 20-mgd, which has correspondingly reduced the estimated power load. At this time it is believed that two 2.0 to 2.5 MW transformers will be required to power the FWP to meet maximum day demand and one transformer will meet average day demand under emergency conditions. We are proposing to construct a new substation with two – 2.0 to 2.5 MW pad mounted transformers, along with substation switch gear, interconnected with one 2.0 to 2.5 MW intermittent duty diesel generator as shown below. This arrangement will allow the generator to backup either transformer to cover maximum day demands should one of the transformers or transformer feeds drop off line and to provide sufficient generation capacity to meet average day demands.



Flint WTP - Preliminary One-Line Diagram

Would you please review and provide any comments that you may have.

Thanks Warren

J. Warren Green, PE
Director of Engineering

Lockwood, Andrews & Newnam, Inc.
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www.lan-inc.com • JWGreen@lan-inc.com

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Flint WTP Improvements
Phase II
Segments I-III
MDEQ Comments
February 27, 2014

Segment 1 - Cut –in Piping

The detail shows air-release manholes with corp. stops? How will the air release operation be executed? Means to drain the manhole?

Segment 1 – WTP Rehab

1. Raw Water Piping – Maintain back-up supply from Gen Co. during interim operation at C.S. #2. Sheet C5-102

   54X42 cross (Sheet C5-501 & C5-101) only 6-inches – Support?

   Air-release manhole – same as Cut-in piping

   Current yard piping diagram?

2. Mid-Point CL2 - Basis of design needed

   - Application rate (both mid-pt & post for CT)
   - CL2 gas max dosage LBs/Day
   - Scale – type, capacity
   - Rotometer (lbs/day)
   - Vacc reg, injector, educator (size)
   - Scrubber capacity
   - Room air-exchange rate
   - Pipe penetrations – Sheet C-103 – linkseal – gas resistant?
   - Floor drains
   - Door sweep
   - Safety features – obs window, fan, lights, switches, panic bar
   - Scrubber piping – lower intake
   - Check valve/anti-siphon at influent channel

3. High Service Pump

   Will mechanical ball valve operate like a check valve in event of unexpected pump shut-down?

   TDH of current pump and proposed pump?
   Conformance of proposed pump TDH with system head curve?

4. LOX/LN Storage

   LOX & LN piping clarification – Sheet D2-102 & D2-601
   BOD for storage
   Ozone was designed at 4.0 mg/l max dose @ 36 MGD (Sec. 3.5 WTP BOD)

   Ozone max dose at 18.0 MGD is 650 Lbs/day

   How many GPD does this equate to?

5. Electrical improvements

   Are operation of the pumps being split with the MCC or are multiple MCCs being provided?

Flint WTP Improvements
Phase II
Segments I-III
MDEQ Comments
March 19 , 2014

Segment 1 - Cut –in Piping

The detail shows air-release manholes with corp. stops? How will the air release operation be executed? Means to drain the manhole?

Written response needed.....

Segment 1 – WTP Rehab

1. **Raw Water Piping – Maintain back-up supply from Gen Co. during interim operation at C.S. #2. Sheet C5-102**

   54X42 cross (Sheet C5-501 & C5-101) only 6-inches – Support?

   Air-release manhole – same as Cut-in piping

   Current yard piping diagram?

Written response needed on the first 3 items. Yard piping diagram will be a work in progress.

2. **Mid-Point CL2 - Basis of design provided**

   - **Scale – use existing or proposed? If poposed - type, capacity**
   - **Scrubber?**
   - **Room air-exchange rate ?**
   - **Pipe penetrations – discuss protective seal**
   - **Floor drains – discuss**
   - **Door sweep - discuss**
   - **Scrubber piping – lower intake**

- **Check valve/anti-siphon at influent channel - include in final**

3. **High Service Pump**

   Will mechanical ball valve operate like a check valve in event of unexpected pump shut-down?

   TDH of current pump and proposed pump?
   Conformance of proposed pump TDH with system head curve?

   Written response needed.....

4. **LOX/LN Storage**

   Piping configuration clarified
   The LN calculation (71 ppd) is not clear. Is there a % concentration or transfer efficiency?

5. **Electrical improvements**

   Are operation of the pumps being split with the MCC or are multiple MCCs being provided?

   Written response needed.....

Flint WTP Improvements
Bray Road Lime Sludge Lagoon
MDEQ Comments
March 21, 2014

1. The placement of the proposed liner and berm fails to establish physical separation between the lime sludge collection area and concrete fill area. For complete separation of these areas, the berm needs to be constructed down to native soil.

   As proposed, this appears to constitute the first step towards a "cap-in-place" of the existing materials. If waste is left in place within the berm, the city will be required to construct the berm to meet Part 115 cap requirements. In addition, long term groundwater monitoring, financial assurance, closure and post closure plans will be required.

2. Please provide a residuals management plan for the lime sludge collection area. In additional to removal of new lime sludge produced, the plan must also include the gradual removal of existing lime sludge.

3. The working depth of the lime sludge collection area does not appear to meet 10-States Standard's minimum depth of 5 feet. The available volume appears to be 60,000 cubic yards based on 2.6 feet of working depth. Please confirm this. What is the surface area of the lagoon? Please provide a basis of design that includes the amount of lime sludge produced at average day demand and the available days of storage at this production rate. These parameters will need to be used towards developing the residuals management plan. Finally, an acceptable residuals management plan is needed for us to consider a deviation from the 10-State Standards guidelines.

4. An effluent sampling point needs to be provided for decant water.

Prysby, Mike (DEQ)

From: Matta, Samir <SFMatta@lan-inc.com>
Sent: Tuesday, March 25, 2014 11:17 AM
To: Prysby, Mike (DEQ)
Cc: Busch, Stephen (DEQ); Arduin, Jim (DEQ)
Subject: RE: Bray Road Lagoon Improvements - MDEQ Comments
Attachments: Bray Road Basis of Design.pdf

Hi Mike,

I thought we shared the basis of design information with you but it seems I did not so here it is.

The City would like to have a sit down meeting tomorrow or Thursday afternoon either at your place or City Hall. Are you guys available?

Please let me know.

Thanks.

Samir F. Matta
Senior Project Manager

Lockwood, Andrews & Newnam, Inc.
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www.lan-inc.com • sfmatta@lan-inc.com

From: Prysby, Mike (DEQ) [mailto:PRYSBYM@michigan.gov]
Sent: Friday, March 21, 2014 2:33 PM
To: Matta, Samir
Cc: Busch, Stephen (DEQ); Arduin, Jim (DEQ)
Subject: Bray Road Lagoon Improvements - MDEQ Comments

Samir,

Attached are MDEQ's comments regarding the proposed work at the Bray Road site to allow re-use of the site for the disposal of WTP lime sludge. Please contact me at your earliest convenience if you have questions regarding our comments or wish to schedule a meeting.

Michael Prysby, P.E.
District Engineer
Office of Drinking Water and Municipal Assistance
517 290-8817

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BASIS OF DESIGN
BRAY ROAD LIME SLUDGE DECANT WATER TREATMENT SYSTEM
CITY OF FLINT

1. GENERAL DATA

The City of Flint (City) proposes to use the existing lime sludge storage lagoon facility at Bray Road for the next 2.5 years on a continuous basis while the Karegnondi Water Authority (KWA) water system is being constructed. After which, the facility will only be used should the Flint WTP have to treat Flint River water on an emergency basis. In order to maximize storage volume of the facility, the City proposes to construct a decant tower structure, pump station and forcemain to transport the decanted water from the lagoon to a nearby sanitary sewer for final disposal. A CO_2 feed system is also proposed to neutralize the high pH decant waste stream prior to pumping to the sanitary sewer.

The existing lime sludge storage lagoon facility at Bray Road does not have multiple cells; therefore, the sludge will be continuously wetted and will only consolidate to approximately 25% solids. The lime sludge and decant waste stream flows are summarized in the table below:

Lime Sludge Quantities Summary

	WTP Flow [MGD]	Sludge Produced (3% Solids) [gpd]	Sludge Stored (25% Solids) [cy/day]	Decant Waste to Sewer [gpd]	Decant Waste to Sewer [gpm]
Average Day	10	92,000	55	80,700	56
Current Max Day	18	165,000	98	145,200	100
Prop. Max Day	24	220,000	131	193,600	135

2. CO_2 FEED SYSTEM

a. Process Description

A gaseous carbon dioxide feed system will be installed on the Bray Road site near the decant pump station. The system will include a liquid storage tank, vaporizer, vapor heater, pressure regulator, pH control panel and a gas diffuser. Liquid CO_2 will be stored in a 6-ton tank and regulated through a vaporizer. The gaseous CO_2 will be sent through diffuser piping and released into the decant tower through two (2) 7" diameter disk ceramic diffusers. A pH probe will be located in the decant tower to monitor pH downstream of the CO_2 injection point. The pH probe will transmit the pH reading to the pH control panel, which will regulate the CO_2 feed rate for set point control of the pH in the decant water waste stream.

b. Design Criteria

- Max CO_2 feed – 200 mg/L
- Max decant flow rate – 140 gpm

- CO_2 feed system capacity @ Max Day (140 gpm)

$$\frac{140gpm}{694.4\frac{gpm}{MGD}} * 200ppm\ CO_2 * \frac{8.34lb}{gal} = 336\ lb/day$$

- CO_2 feed system capacity @ Average Day (60 gpm)

$$\frac{60gpm}{694.4\frac{gpm}{MGD}} * 200ppm\ CO_2 * \frac{8.34lb}{gal} = 144\ lb/day$$

- CO_2 storage for minimum 30 days at Average Day per 10 States Standards

$$144\frac{lb}{day} * 30\ days = 4{,}320\ lbs = 2.16\ tons$$

c. Equipment

- One (1) 6 ton capacity Liquid Carbon Dioxide storage tank system complete with refrigeration unit (6 ton is minimum for CO_2 delivery by tanker truck)
- One (1) 12 kW electric vaporizer
- One (1) vapor heater
- One (1) First stage CO_2 pressure regulator
- One (1) Carbon Dioxide pH control panel
- One (1) Carbon Dioxide gas diffuser assembly
- One (1) pH Transducer
- Two (2) 7″ Diameter Ceramic Disk-type diffusers

3. DECANT TOWER

a. Process Description

The decant tower is a 6'x6' precast manhole with three (3) 12″W x 36″H staggered openings that will provide 9' of total operating depth for decanting. Each opening has an interior wall-mounted inverted slide gate with a manual operator and an external stoplog channel to allow maintenance on the slide gate when necessary. An under-flow baffle wall will be installed to promote CO_2 transfer into the decant waste stream and prevent short circuiting. A pH probe will be installed just below the invert of the 8″ gravity pipe to the decant pump station.

b. Design Criteria

- Average day flow rate = 60 gpm
- Peak day flow rate = 140 gpm

- Minimum detention time = 20 min

$$Min\ Detention\ Volume\ Required = 20\ min * 140 gpm * \frac{0.1337 ft^3}{gal} = 374.3\ ft^3$$

- Minimum liquid level above diffuser = 10′ per manufacturer

c. Equipment

- One (1) 6′x6′x25′ precast manhole
  - Top of structure elevation = 744.00′
  - Top of baffle wall elevation = 742.00′
  - Maximum lagoon operating level elevation = 739.60′
  - Slide gate 1 invert elevation= 736.60′
  - Slide gate 2 invert elevation = 733.60′
  - Slide gate 3 invert elevation = 730.60′
  - 8″ gravity line invert elevation = 730.33′
  - Lagoon bottom elevation = 730.00′
  - Bottom of baffle wall elevation = 722.00′
  - Diffuser centerline elevation = 720.25′
  - Bottom of decant tower elevation = 719.00′

- Detention Time:

$$@\ \text{Max Day}\ \frac{\left[(730.33-719.00)*6*6*\frac{7.48\ gal}{CF}\right]}{140\ gpm} = 21.8\ min$$

$$@\ \text{Average Day}\ \frac{\left[(730.33-719.00)*6*6*\frac{7.48\ gal}{CF}\right]}{60\ gpm} = 50.8\ min$$

- Minimum Operating Depth Over Diffusers: 730.33′ - 720.25′ = 10.08′
- Three (3) 12″W x36″H inverted slide gates, 304SS
- Three (3) 20″W Stoplogs and channels, 304SS
- One (1) 6′W x 20′H Baffle Wall, FRP
- 8″ Diameter Gravity line to Decant P.S., DIP or PVC

4. DECANT PUMP STATION DESIGN AND FORCEMAIN

a. Process Description

The decant pump station will be a 6′ diameter precast concrete manhole. It will be fed through an 8″ gravity line from the decant tower. Two (2) 140-gpm submersible solids handling pumps will be installed with quick discharge connections and guide rails for lifting and lowering the pumps for maintenance. The pumps will be controlled by a float switch assembly consisting of four (4) switches: pumps off; pump 1 on; pump 2 on; high water alarm. The pump

discharge piping will connect to a 4" diameter forcemain that will transport the waste stream to a nearby sanitary sewer.

b. Design Criteria

- Max Day flow rate, Qmax = 140 gpm
- Average Day flow rate, Qave = 60 gpm
- Maximum pump starts per hour = 10

$$Cycle\ time\ (\Theta) = \frac{60\ min}{10\ cycles} = 6\ min$$

$$Minimum\ sump\ volume = \frac{Q_{pump} * \Theta}{4} = \frac{140 * 6}{4} = 210\ gal$$

- Minimum forcemain velocity of 2 ft/s

c. Equipment

- One (1) 6'*Diameter* x 18'H precast manhole
  - Top of structure elevation = 744.00'
  - High Water Alarm elevation = 731.25'
  - Gravity line invert elevation = 730.25'
  - Pump 2 On elevation = 729.75'
  - Pump 1 On elevation = 728.75'
  - Pumps Off elevation = 727.50'
  - Bottom of pump station elevation = 726.00'

$$Wetwell\ volume = \frac{\pi D^2}{4} = \frac{\pi 6^2}{4} = 28.27\ \frac{ft^3}{ft} * 7.48 \frac{gal}{ft^3} = 211.5 \frac{gal}{ft}$$

$$Pump\ Run\ Time = \frac{(728.75' - 727.50') * 211.5 \frac{gal}{ft}}{(140\ gpm - 60\ gpm)} = 3.3\ min$$

$$Fill\ Time = \frac{(728.75' - 727.50') * 211.5 \frac{gal}{ft}}{(60\ gpm)} = 4.4\ min$$

- Two (2) 140-gpm pumps
- One (1) 4-float switch assembly
- 4" Diameter Forcemain, DIP or PVC
  - Forcemain Velocity @ Qmax = $\frac{\frac{140\ gal}{min} * \frac{1\ min}{60\ s} * \frac{1\ CF}{7.48\ gal}}{\pi(\frac{2}{12})^2} = 3.6\ fps$

Flint WTP Improvements
Phase II
Segments I-III
MDEQ Comments
April 3, 2014

Phase II – Segment 1 - Watermain Cut-in Plans

- **Mid-Pt Chlorination - update plans to depict the additional anti-siphon/ball valve as described in your response to our March 19, 2014 comments. Most likely to be added to Sheet C-508.**

- **Include a full-sized mid-point chlorination system schematic with the updated plans.**

- **It appears that make-up water and chlorine gas are not combined at the chlorine feeder (panel w. rotometer, vacc. monitor, auto. feed control valve, etc.) for production of liquid chlorine. Instead, this appears to take place at the ejector/check valve assembly on the plant supply line. Please confirm. If gas under vacuum is conveyed to the ejector at the plant supply line, the gas piping must be Schedule 80 seamless steel tubing. Please confirm. This can be included on the chlorination system schematic.**

Please provide 2 full-sized sets of Watermain Cut-in Plans that include the requested information and revisions.

Phase II - Segment 1 - WTP Rehabilitation Plans

- **LOX/LN Storage & Piping – update plans to depict revised sheets D2-102 and D2-601. The revisions were made to clarify the gas piping configuration.**

- **The existing LOX storage tank will provide approximately 16 days storage at max design rate at 12.0 MGD until the second tank is installed. The Act 399 permit will be issued with a condition that the MDEQ is provided a copy of the contract between the city and the LOX supplier that specifies the maximum delivery time. The LOX system shall be operated such that a minimum of 5 days**

storage is maintained in the LOX tank at all times.

- Mid – Point Chlorination (Chlorine room) - revise sheets C5-105 and C5-508 to show deletion of the chlorine gas scrubber system.

- Revise the ventilation intake duct detail (Sheet C5-508) to as described in your response.

- Add panic hardware to chlorinator room door (east and west exits).

- The existing door between P.S. 4 and the chlorine gas storage room should be closed off such that the chlorine gas storage room and chlorinator room are only assessable from the outside. Although an improved door sweep is proposed, door sweeps are not failsafe in a catastrophic gas release and such an event could jeopardize the entire P.S. #4.

- Raw Water Piping – the proposed 54X42 cross provides minimal vertical separation (approximately 6-inches). A pair concrete cradles installed on each side of the 54-inch concrete main will mitigate the force of the 42-inch main installed above at the crossing. A condition will be added to the Act 399 permit to field adjust the 42-inch main installation to maximize the vertical separation at the crossing.

Please provide 2 full-sized sets of WTP Rehabilitation Plans that include the requested information and revisions.

Phase II – Segment 2 - Bray Road Sludge Lagoon

Provide 2 full-sized sets of construction plans for proposed work at the Bray Road sludge lagoon. Separation between the concrete disposal area the lime sludge disposal area by metal sheet piling, as discussed in our meeting, needs to be depicted.

Prepare final Bray Road Lime Sludge Management Plan. The plan also needs to include establishment of a level working surface in the west portion of the lagoon and removal of the island.

The Act 399 permit will also include a condition requiring the sheet piling to be driven deep enough into native soil to maintain its structural integrity for removal of waste material on the exterior portion of the lagoon.

Act 399 Permit Applications:

WTP Rehabilitation:

Part 6 (Facilities Description) needs to discuss the provisions for the stand-by generator. The description needs to be added in the Phase II – Segment III – Electrical Improvements (@WTP) – (i.e. transfer switch, universal generator connection)

Bray Road (Flint WTP Phase II, Segment II – Lime Residual Disposal)

Please revise Part 6 (Facilities Description) since a berm-liner system will not be used to separate the lime sludge area from the concrete debris area. Eliminate "Berm/liner" from the statement: "Berm/liner or Sheet Piling improvements to separate concrete debris from lime sludge."

Prysby, Mike (DEQ)

From: Michael Glasgow <mglasgow@cityofflint.com>
Sent: Thursday, June 19, 2014 4:10 PM
To: Prysby, Mike (DEQ)
Subject: Polymer Information
Attachments: PW340.doc; PW340 MSDS.doc

Mike,
Good afternoon. Here is some info on the polymers we are using in treatment. We purchase these through Chemco Products Incorporated. We are using a dosage between 3-5 mg/L of the PW-340. The other polymer we are using is P-142 PWG, which we use a dosage rate around 0.1 mg/L. I cannot find the info of P-142 polymer in my files. I will have Chemco send it to me and I will pass it on as soon as I get it.

Mike Glasgow
City of Flint Water Plant

PW-340
POTABLE WATER COAGULANT

DESCRIPTION

PW-340 is a liquid polyaluminum chloride coagulant intended for use as a clarification aid in the treatment of drinking water. This product is very effective for color and turbidity removal and provides settling improvement in lime softening pretreatment systems. Unlike other metal salt coagulants, PW-340 is low in acidity and has minimal effect on the pH of the finished water. PW-340 is certified by NSF for use in potable water up to 180 mg/l (ppm).

TYPICAL PROPERTIES

Appearance:	Clear, colorless liquid
Odor:	Odorless
Specific Gravity:	1.34 (11.2 lbs/gal)
pH (neat):	4.0 - 5.0
Solubility in Water:	Complete
Freezing Point:	19°F; -28°C

APPLICATION

For water clarification, the typical effective PW-340 dose is in the 0.1 to 10 ppm range; however, the optimum dose should be determined with jar testing and finished water turbidity/color analysis. As a lime softening aid, PW-340 is effective in the 1 to 20 ppm range: settling tests should be run to establish the best treatment level. PW-340 should be added neat (undiluted) to an area of high agitation. Improved results may be produced by following the PW-340 treatment with a low (0.025 - 1.0 ppm) dose of potable-grade anionic or cationic polymer.

STORAGE AND HANDLING

PW-340 is mildly corrosive; therefore it should be stored in its original container or in a stainless steel, plastic or fiberglass vessel. Store product at room temperature. Do not mix PW-340 with other chemicals and do not dilute product with water (loss of activity may occur). If product becomes frozen, thaw and mix thoroughly prior to use.
For further information, refer to the Material Safety Data Sheet.

PACKAGING

PW-340 is available in 55 gallon (628 lbs. net) plastic drums, FOB Howell, MI.

Please contact our office or your Chemco Sales Representative for product samples, technical assistance, or additional information.

CHEMCO
PRODUCTS INCORPORATED

MATERIAL SAFETY DATA SHEET

CHEMCO Products Incorporated
1349 Grand Oaks Drive
Howell, MI 48843

Phone: (517) 546-7800
FAX : (517) 546-5163

CHEMTREC 24 HOUR EMERGENCY NUMBER: 1-800-424-9300

Product.....> **PW-340**

Section 1: Material Identification

Chemical Family..... aluminum salt solution
DOT Shipping name..... Compound, Water Clarifying
Hazard Class..... Not Regulated
Date Revised..... May 9, 1997

Section 2: Ingredient and Hazards

Hazardous Classification: irritant

Ingredients	Percent	Limits(TLV)
polyaluminum chloride (CAS 1327-41-9)	50	2 mg/m^3 as Al

Section 3: Physical Data

Boiling Point..... 220°F
Specific Gravity..... 1.34
Vapor Pressure..... <20 mm Hg 68°F
Evaporation Rate..... <1 (ACETATE=1)
Vapor Density..... 1.0 (WATER=1)
Measured pH (neat).... 3.5
Water Solubility..... complete
Appearance..... clear to hazy colorless liquid
Odor..... odorless

Abbreviation: n/a = not applicable

MATERIAL SAFETY DATA SHEET

Product.....> **PW-340**

Section 4: Fire and Explosion Data

Flash Point,F,SETA....	not combustible
Flammable Limits.....	LEL: n/a UEL: n/a
Auto Ignition Temp....	n/a
Extinguishing Media...	acceptable media are water, carbon dioxide, dry or foam.
Special Procedures....	use SCBA with full face shield
Unusual Fire Hazards..	none

Section 5: Health Hazard Data

* ROUTES OF EXPOSURE * Primary route: Dermal

Eye Contact.....	low pH material may cause severe irritation or corneal injury if not promptly removed.
Skin Contact.....	may cause mild irritation.
Inhalation.....	excessive exposure may irritate upper respiratory tract.
Oral.....	Single dose LD_{50} has not been determined.

* EMERGENCY FIRST AID *

Eyes.....	Immediately flush with water for 15 minutes, seek medical attention.
Skin.....	flush with water for 15 minutes, remove contaminated clothing. Seek medical attention if irritation develops.
Inhalation.....	move to fresh air.
Ingestion.....	DO NOT induce vomiting, may cause burns of the mouth and throat. Give large amounts of water or milk. Get immediate medical attention.

Section 6: Reactivity Data

Stability.....	stable
Incompatibility.....	alkalies
Decomposition Products.	(thermal) above 500°F, HCl gas is produced.
Hazardous Polymerization	will not occur

Abbreviation: n/a = not applicable

MATERIAL SAFETY DATA SHEET

Product.....> **PW-340**

Section 7: Environmental Protection Procedures

Spill..... Dike and reclaim as much spilled material as possible. Cover spill residue with absorbent material and shovel into closable containers. Do not flush away to sewers or any natural waterways.

Waste Disposal..... dispose of following proper federal, state and local regulations.

Section 8: Control Measures/Special Protection

Respiratory Protection.. use with adequate ventilation.
Ventilation Recommended. provide local exhaust.
Protective Gloves..... chemical or solvent resistant material.
Eye Protection..... chemical goggles or face shield.
Other Equipment..... safety/eye wash nearby.
Work/Hygienic Practices: wash thoroughly after handling.

Section 9: Additional Information

NSF potable water limit = 180 mg/L maximum

HMIS Rating Code: HMIS			
		0 =	minimal
		1 =	slight
Health.....	1	2 =	moderate
Flammability.....	0	3 =	serious
Reactivity.....	0	4 =	severe
Personal Protection...	B	B =	safety glasses and chemical-resistant gloves

The information provided relates to the specific material designated and may not be valid for such material used in combination with other materials outside the scope of intended usage. No representation, warranty or guarantee is made and it remains the user's responsibility to confirm by other investigation as to safe material application. We do not accept liability for loss or damage that may occur from the use of this information.

2310

CITY of FLINT WATER TREATMENT PLANT MONTHLY OPERATION REPORT

SUPPLY NAME: CITY of FLINT WATER PLANT
WSSN: 2310

Michael Glasgow	**June 2014**
Operator-in-Charge	Month/Year
F-1R, F-2	**F-1**
Certification of Operator-in-Charge	Water Plant Classification
Michael Glasgow	**Genesee**
Signature of Operator-in-Charge	County

DEQ RESOURCE MANAGEMENT DIVISION
JUL 28 2014
LANSING DISTRICT

Treatment Rate and Filter Data

Maximum Treatment Rate:	25	Million Gallons per Day
Rated Plant Capacity:	36	Million Gallons per Day
Average Filter Run:	74	Hours
Average Head Loss:	*	Feet *(filter head loss meters not operational)
Average Filtration Rate:	2.5	Gallons Per Square Feet per Minute
Maximum Filtration Rate:	3.5	Gallons Per Square Feet per Minute
Average Wash Water Use:	3.6%	Percent of Treated Water

Chemical Data

Chlorine on hand:	24000	lb.	Est. supply:	20	days
Primary Coagulant (Ferric Chloride) on hand:	63450	lb.	Est. supply:	10	days
Lime (CaO) on hand:	169	tons	Est. supply:	18	days
Fluoride on Hand:	9064	lb.	Est. supply:	16	days
Cost of All Chemicals per Million Gallons:	*	dollars			
Total Power Cost per Million Gallons:	*	dollars			

Remarks	Confluence Point # 1 (N)	Confluence Point # 2 (S)
Number of filter confluence samples > 0.3 NTU:	0	0
Number of filter confluence samples collected:	180	180
Percent of filter confluence samples > 0.3 NTU:	0.00%	0.00%
Number of filter confluence samples > 1 NTU	0	0

Did any individual filter exceed:

1.0 NTU in two consecutive measurements taken 15 minutes apart? **NO**
If yes, attach specific filter(s) information and indicate required follow-up status.

0.5 NTU in two consecutive measurements taken 15 minutes apart after 4 hours of operation? **NO**
If yes, attach specific filter(s) information and indicate required follow-up status.

1.0 NTU in two consecutive measurements taken 15 minutes apart for 3 consecutive months? **NO**
If yes, attach specific filter(s) information and indicate required follow-up status.

2.0 NTU in two consecutive measurements taken 15 minutes apart for 2 consecutive months? **NO**
If yes, attach specific filter(s) information and indicate required follow-up status.

Was continuous (every 15 minutes) filter monitoring equipment off-line during the month? **NO**
If yes, indicate date(s), duration, and individual filter grab sampling frequency on a separate sheet.

Did POE disinfectant residual fall below 0.2 ppm during the month? **NO**
If yes, indicate date(s) and duration on a separate sheet.

Was minimum C*T credit achieved for the entire month? **YES**
If no, indicate on a separate sheet the date(s) not achieved.

Was continuous POE chlorine residual monitoring equipment off-line during the month? **NO**
If yes, indicate date(s) and duration on a separate sheet.

COMPLETED

Coagulation Parameters & Softening Chemical Application City of Flint Water Treatment Plant **WSSN: 2310** June 2014

Date	Million Gallons Treated	Ferric as Fe3+ mg/L	Lime Dosage (mg/L)	PW-340 Catioinc Polymer Dosage (mg/L)	P-142PWG Anionic Polymer Dosage (mg/L)	Turbidity, Units				
						Raw			Plate Settler	Applied
						Number of Samples	Avg.	Max.	Effluent Avg.	Applied Avg.
1	20.2	16.9	46.8	2.2	0.06	6	2.70	4.10	0.38	4.51
2	21.7	14.5	45.8	2.2	0.06	6	2.70	5.90	0.52	3.37
3	20.8	14.4	39.5	1.9	0.05	6	6.70	9.20	0.58	3.50
4	20.6	14.7	55.4	2.0	0.05	6	11.3	30.2	0.48	3.33
5	23.1	14.9	63.7	1.8	0.04	6	6.00	6.70	0.74	4.15
6	23.3	16.2	42.4	1.9	0.05	6	5.30	5.90	0.51	4.52
7	21.1	15.2	0.0	0.0	0.00	6	4.30	5.60	0.38	0.95
8	20.0	15.6	0.0	0.0	0.00	6	2.80	3.90	0.37	0.75
9	20.1	14.7	0.0	0.0	0.00	6	2.60	5.30	0.32	0.56
10	18.5	16.6	120.7	1.9	0.05	6	4.30	5.50	0.32	7.62
11	21.4	18.5	136.0	1.9	0.05	6	3.30	5.20	0.27	2.61
12	24.2	18.1	122.2	1.8	0.05	6	4.70	5.60	0.28	7.06
13	23.4	15.8	113.9	1.8	0.05	6	3.90	4.20	0.41	7.51
14	22.7	14.9	109.3	1.8	0.05	6	4.40	5.00	0.45	4.09
15	24.4	15.1	140.7	1.8	0.05	6	4.60	5.70	0.41	2.34
16	24.3	15.2	137.1	1.8	0.05	6	5.10	7.10	0.37	1.63
17	21.8	17.0	155.0	2.0	0.05	6	4.30	5.50	0.27	2.55
18	20.8	19.2	168.0	2.2	0.05	6	4.90	7.20	0.26	2.15
19	20.5	18.4	152.9	2.1	0.05	6	2.70	4.30	0.24	1.23
20	23.0	18.7	144.3	2.2	0.05	6	6.60	39.4	0.29	1.14
21	22.4	18.0	147.6	2.2	0.06	6	3.40	12.0	0.31	1.20
22	21.4	18.3	122.5	2.2	0.06	6	5.10	26.2	0.29	1.82
23	21.2	18.2	147.6	2.2	0.06	6	3.10	6.70	0.27	1.02
24	21.0	19.4	161.8	2.3	0.06	6	3.60	8.20	0.27	1.55
25	21.5	19.7	175.1	2.4	0.06	6	3.60	10.6	0.24	2.93
26	21.6	18.9	143.9	2.4	0.06	6	2.40	3.60	0.26	2.67
27	16.1	19.0	149.8	2.4	0.06	6	1.90	2.70	0.29	1.91
28	18.3	19.1	137.8	2.2	0.06	6	5.80	12.2	0.33	2.56
29	20.4	19.6	115.1	1.8	0.05	6	8.20	19.5	0.44	1.87
30	21.0	19.2	116.8	1.8	0.05	6	6.20	10.5	0.51	2.74
Avg.	21.4	17.1	107.1	1.8	0.05	6	4.55			2.86
Max.	24.4	19.7	175.1	2.4	0.06	6	11.3	39.4	0.74	7.62
Min.	16.1	14.4	0.0	0.0	0.00	6	1.90			0.56
Total	640.5									

Filter turbiditiy

City of Flint Water Treatment Plant
WSSN: 2310

June 2014

Date	Turbidity, Units												
	Confluence Point. No.1 (N) North						Confluence Point. No.2 (S) South						Point of Entry
	Number of Samples	Avg.	Max	No. of 4 Hr. Compliance periods	No. of 4 Hr. Compliance periods >0.3 NTU	No. of Samples >0.3 NTU	Number of Samples	Avg.	Max	No. of 4 Hr. Compliance periods	No. of 4 Hr. Compliance periods >0.3 NTU	No. of Samples >0.3 NTU	Plant Tap NTU
1	6	0.09	0.12	6	0	0	6	0.09	0.11	6	0	0	0.07
2	6	0.11	0.16	6	0	0	6	0.10	0.14	6	0	0	0.09
3	6	0.14	0.23	6	0	0	6	0.12	0.19	6	0	0	0.11
4	6	0.14	0.19	6	0	0	6	0.09	0.11	6	0	0	0.10
5	6	0.18	0.24	6	0	0	6	0.15	0.22	6	0	0	0.15
6	6	0.13	0.15	6	0	0	6	0.12	0.16	6	0	0	0.12
7	6	0.14	0.18	6	0	0	6	0.12	0.14	6	0	0	0.12
8	6	0.12	0.20	6	0	0	6	0.15	0.20	6	0	0	0.12
9	6	0.15	0.25	6	0	0	6	0.14	0.22	6	0	0	0.11
10	6	0.21	0.26	6	0	0	6	0.14	0.23	6	0	0	0.14
11	6	0.11	0.16	6	0	0	6	0.12	0.23	6	0	0	0.16
12	6	0.11	0.13	6	0	0	6	0.10	0.13	6	0	0	0.09
13	6	0.09	0.12	6	0	0	6	0.09	0.11	6	0	0	0.08
14	6	0.11	0.13	6	0	0	6	0.09	0.12	6	0	0	0.10
15	6	0.11	0.18	6	0	0	6	0.10	0.15	6	0	0	0.10
16	6	0.11	0.14	6	0	0	6	0.09	0.10	6	0	0	0.09
17	6	0.09	0.13	6	0	0	6	0.07	0.13	6	0	0	0.07
18	6	0.09	0.13	6	0	0	6	0.08	0.20	6	0	0	0.08
19	6	0.08	0.14	6	0	0	6	0.09	0.17	6	0	0	0.08
20	6	0.08	0.10	6	0	0	6	0.07	0.09	6	0	0	0.16
21	6	0.07	0.08	6	0	0	6	0.08	0.20	6	0	0	0.08
22	6	0.08	0.11	6	0	0	6	0.09	0.12	6	0	0	0.08
23	6	0.08	0.10	6	0	0	6	0.08	0.11	6	0	0	0.07
24	6	0.09	0.14	6	0	0	6	0.10	0.26	6	0	0	0.13
25	6	0.07	0.14	6	0	0	6	0.08	0.19	6	0	0	0.09
26	6	0.08	0.10	6	0	0	6	0.08	0.10	6	0	0	0.09
27	6	0.09	0.11	6	0	0	6	0.08	0.10	6	0	0	0.09
28	6	0.08	0.10	6	0	0	6	0.09	0.10	6	0	0	0.10
29	6	0.10	0.14	6	0	0	6	0.09	0.12	6	0	0	0.11
30	6	0.10	0.11	6	0	0	6	0.09	0.14	6	0	0	0.15
Avg.	6	0.11	0.15	6	0	0	6	0.10	0.15	6	0	0	
Max.	6	0.21	0.26	6	0	0	6	0.15	0.26	6	0	0	0.16
Min.	6	0.07	0.08	6	0	0	6	0.07	0.09	6	0	0	

Fluoridation & Chlorination City of Flint Water Treatment Plant **WSSN: 2310** June 2014

Date	Fluoriode Applied as F- mg/L	Fluoride Analysis (mg/L)			Chlorine Application (mg/L)			Chlorine Residual (mg/L)					
					Intermediate Chlorine	Post Chlorine	Total Chlorine	Filtered		3 MG Well		Tap	
		Raw	Tap	Dist.				Free	Total	Free	Total	Free	Total
1	0.00	0.15	0.17		4.8	1.5	6.3	1.3	1.6	1.5	2.0	1.2	1.7
2	0.00	0.16	0.17		4.7	1.7	6.4	1.1	1.5	1.6	2.0	1.3	1.5
3	0.00	0.16	0.16		5.4	1.8	7.2	1.0	1.5	1.5	2.0	1.3	1.7
4	0.50	0.18	0.20		5.3	2.0	7.3	1.4	1.8	1.8	2.1	1.7	2.0
5	0.50	0.14	0.45	0.25	4.5	2.0	6.5	0.9	1.2	1.6	1.9	1.3	1.7
6	0.00	0.15	0.16		4.7	2.4	7.1	0.7	1.0	1.6	1.9	1.4	1.7
7	0.00	0.14	0.18		5.5	2.8	8.3	0.7	1.0	1.6	2.0	1.3	1.6
8	0.00	0.17	0.19		5.2	2.7	7.9	0.7	0.9	1.5	1.9	1.3	1.7
9	0.00	0.17	0.18		5.1	2.7	7.8	0.5	0.9	1.7	2.1	1.3	1.8
10	0.00	0.16	0.18		4.8	2.5	7.3	0.3	0.6	1.4	1.8	1.2	1.6
11	0.00	0.17	0.14		4.8	3.1	7.9	0.9	1.2	1.7	2.2	1.6	1.9
12	0.00	0.14	0.13	0.18	4.2	2.9	7.1	0.8	1.2	2.0	2.4	1.9	2.3
13	0.00	0.16	0.14		4.4	3.4	7.8	0.6	0.8	2.4	2.8	2.1	2.4
14	0.00	0.16	0.14		4.2	3.5	7.7	0.7	1.0	2.4	2.8	2.0	2.4
15	0.00	0.16	0.13		4.1	3.5	7.6	0.4	0.8	2.3	2.9	1.7	2.0
16	0.00	0.16	0.13		4.2	3.5	7.7	0.8	1.0	2.6	3.1	2.1	2.5
17	0.00	0.15	0.13		4.6	3.1	7.7	1.1	1.5	2.5	2.9	2.2	2.5
18	0.00	0.16	0.13		5.0	2.6	7.6	1.3	1.5	2.5	3.0	2.0	2.5
19	0.00	0.14	0.13	0.18	5.0	2.9	7.9	1.4	1.6	2.7	3.1	2.1	2.4
20	0.00	0.16	0.13		5.0	3.1	8.1	1.3	1.5	2.3	2.8	1.7	2.1
21	0.00	0.16	0.13		5.0	4.0	9.0	1.1	1.4	2.3	2.8	2.0	2.2
22	0.00	0.17	0.13		4.9	4.0	8.9	0.8	1.0	2.4	3.0	2.1	2.4
23	0.00	0.16	0.13		4.7	2.6	7.3	1.4	1.7	2.5	2.8	2.2	2.7
24	0.00	0.16	0.13		4.8	2.9	7.7	1.3	1.5	2.5	2.9	2.7	3.0
25	0.00	0.16	0.13		4.7	2.9	7.6	1.2	1.5	2.5	2.9	2.0	2.4
26	0.00	0.17	0.12	0.15	3.9	3.0	6.9	1.0	1.4	2.2	2.6	2.5	3.0
27	0.00	0.16	0.13		4.9	2.7	7.6	1.2	1.5	2.9	3.2	2.1	2.5
28	0.00	0.16	0.14		4.6	3.0	7.6	1.5	1.8	2.3	3.0	2.4	3.0
29	0.00	0.15	0.14		3.8	3.5	7.3	0.8	1.2	2.3	2.8	1.9	2.3
30	0.00	0.15	0.13		4.1	3.2	7.3	0.6	0.9	2.5	3.3	1.8	2.1
Avg.	0.03	0.16	0.16	0.19	4.7	2.9	7.5	1.0	1.3	2.1	2.6	1.8	2.2
Max.	0.50	0.18	0.45	0.25	5.5	4.0	9.0	1.5	1.8	2.9	3.3	2.7	3.0
Min.	0.00	0.14	0.12	0.15	3.8	1.5	6.3	0.3	0.6	1.4	1.8	1.2	1.5

Chemical Analyses City of Flint Water Treatment Plant June 2014 Page 5

WSSN: 2310

Date	pH (S.U.)		Total Hardness as CaCO3 (mg/L)		Total Alkalinity as CaCO3 (mg/L)		Non-Carbonate Hardness as CaCO3 (mg/L)		Calcium as Ca2+ (mg/L)		Magnesium as Mg2+ (mg/L)		Chloride as Cl- (mg/L)	
	Raw	Tap	Raw	Tap	Raw	Tap	Raw	Tap	Raw	Tap	Raw	Tap	Raw	Tap
1	8.28	7.81	270	234	216	132	54	102	85.8	84.2	13.6	5.8	41	87
2	8.02	7.58	262	236	218	132	44	104	84.2	82.6	12.6	7.3	40	83
3	8.17	7.39	278	248	218	140	60	108	93.0	77.8	6.3	13.1	43	75
4	8.25	7.49	276	238	220	144	56	94	80.2	79.4	18.5	9.2	41	79
5	8.26	7.49	274	236	220	148	54	88	89.0	79.4	12.6	9.2	44	80
6	8.16	7.52	262	234	216	146	46	88	85.0	77.0	12.2	10.2	43	93
7	8.21	7.27	268	260	226	172	42	88	87.4	85.0	12.2	11.7	42	80
8	8.26	7.36	260	262	222	170	38	92	81.0	82.6	13.6	12.2	43	80
9	8.17	7.36	268	266	220	164	48	102	93.0	85.8	8.3	10.2	44	79
10	8.18	7.21	270	260	226	172	44	88	96.2	94.6	4.9	5.8	45	78
11	8.10	7.38	266	192	220	100	46	92	83.4	64.1	14.1	7.8	43	86
12	8.11	7.44	268	192	222	100	46	92	84.2	64.1	14.1	7.8	42	80
13	8.01	7.56	264	218	218	110	46	108	85.8	70.5	12.2	10.2	42	81
14	7.94	7.65	272	210	216	114	56	96	90.6	68.1	11.2	9.7	40	78
15	8.27	7.57	268	188	226	100	42	88	85.8	67.3	13.1	4.9	43	79
16	8.34	7.75	266	186	220	94	46	92	84.2	64.9	13.1	5.8	44	80
17	8.12	7.66	262	190	222	92	40	98	90.6	68.9	7.3	4.4	43	80
18	8.24	7.24	268	184	230	94	38	90	87.4	66.5	12.2	3.4	40	81
19	8.13	7.61	272	182	228	88	44	94	91.4	62.5	8.3	6.3	42	81
20	8.01	7.33	264	180	222	88	42	92	89.0	60.9	10.2	8.7	42	83
21	7.98	7.35	252	182	226	82	26	100	86.6	64.1	9.0	5.3	43	84
22	8.00	7.45	264	180	224	84	40	96	87.4	59.3	11.2	7.8	42	81
23	7.98	7.00	260	168	224	74	36	94	89.8	53.7	8.7	8.3	46	88
24	7.92	7.60	274	194	222	82	52	112	89.0	60.9	10.7	10.2	45	87
25	7.98	7.68	276	168	228	70	48	98	91.4	58.5	11.7	5.3	43	90
26	7.88	7.72	280	186	226	80	54	106	86.6	65.7	15.6	5.3	46	90
27	7.92	7.12	254	176	224	66	30	110	89.8	67.3	7.3	1.9	39	92
28	7.97	7.64	272	176	230	74	42	102	85.0	64.1	14.6	3.9	43	85
29	8.26	7.49	276	178	232	76	44	102	87.4	55.3	12.2	9.7	40	90
30	7.94	7.70	268	156	230	66	38	90	92.2	56.9	9.2	3.4	44	91
Avg.	8.10	7.48	268	205	223	108	45	97	87.7	69.7	11.4	7.5	43	83
Max.	8.34	7.81	280	266	232	172	60	112	96.2	94.6	18.5	13.1	46	93
Min.	7.88	7.00	252	156	216	66	26	88	80.2	53.7	4.9	1.94	39	75

Bacteriological & Physical Parameters | City of Flint Water Treatment Plant | **WSSN: 2310** | June 2014 | Page 6

Date	Total Coliform						Standard Plate Count (Simplate MPN)		Wind Direction	Temp. C	Color		Odor	
	Raw (Colilert MPN)		Filter Confluence (N&S)		Plant Tap									
	# Samples	Count	# Samples	# pos	# Samples	# pos	Raw	Tap		Raw	Raw	Tap	Raw	Tap
1	1	320	12	1	1	0	3020	<2		21.7				
2	1	62	12	0	1	0	7840	<2		20.5				
3	1	1710	12	0	1	0	4180	<2		22.4				
4	1	3232	12	0	1	0	5980	<2		22.1				
5	1	3232	12	0	1	0	1368	<2		21.5				
6	1	4286	12	2	1	0	1540	<2		22.2				
7	1	4374	12	0	1	0	11100	<2		22.5				
8	1	3328	12	0	1	0	7840	<2		21.7				
9	1	1768	12	0	1	0	9400	<2		21.5				
10	1	6152	12	0	1	0	11100	<2		23.9				
11	1	12262	12	0	1	0	3660	<2		23.4				
12	1	8704	12	0	1	0	12460	<2		22.9				
13	1	4978	12	0	1	0	1720	<2		22.3				
14	1	4092	12	0	1	0	1240	<2		20.9				
15	1	3912	12	0	1	0	1660	<2		21.7				
16	1	3440	12	0	1	0	1940	<2		22.7				
17	1	2748	12	0	1	0	1600	<2		23.3				
18	1	2338	12	0	1	0	2080	<2		23.3				
19	1	1542	12	0	1	0	7840	<2		22.8				
20	1	1678	12	0	1	0	1180	<2		22.4				
21	1	1672	12	0	1	0	960	<2		21.8				
22	1	7308	12	0	1	0	7440	<2		22.0				
23	1	4028	12	0	1	0	3900	<2		21.6				
24	1	1234	12	0	1	0	3780	<2		22.5				
25	1	2100	12	0	1	0	2240	<2		22.5				
26	1	2396	12	0	1	0	5140	<2		22.0				
27	1	1968	12	0	1	0	2000	<2		22.9				
28	1	1976	12	0	1	0	11100	<2		22.9				
29	1	2802	12	0	1	0	6780	<2		25.8				
30	1	9572	12	0	1	0	2560	<2		24.8				
Avg.										22.5				
Max.							12460	0		25.8				
Min.										20.5				

Distribution System Monitoring City of Flint Water Treatment Plant **WSSN: 2310** June 2014

Date	Free Chlorine Residual at Bacteriological Montioring Stations mg/l										
	1	2	3	4	5	6	7	8	CS	WR	Number of Samples
1											0
2									0.5	0.0	2
3									0.2	0.0	2
4	0.5	0.9	0.5	0.5	0.2	0.5	0.4	0.9	0.2	0.0	10
5	0.4	0.2	0.5	0.4	0.1	0.6	0.3	0.9	0.1	0.0	10
6									0.1	0.0	2
7											0
8											0
9									0.1	0.0	2
10	0.6	1.1	0.4	0.6	0.2	0.6	0.3	0.7	0.3	0.0	10
11									0.0	0.0	2
12	1.2	1.8	0.9	1.3	0.6	0.9	0.5	1.8	1.4	0.0	10
13									0.1	0.0	2
14											0
15											0
16									1.2	0.0	2
17	1.3	1.5	1.0	0.5	0.7	1.5	0.9	2.0	0.2	0.3	10
18	1.4	1.1	1.2	1.1	0.3	1.2	0.9	1.4	0.6	0.1	10
19									0.2	0.1	2
20											0
21											0
22											0
23											0
24											0
25	1.3	1.3	1.1	1.0	0.3	0.8	1.0	1.5	0.9	0.4	10
26	1.1	1.4	0.9	0.0	0.0	1.4	0.8	2.1	0.9	0.6	10
27									0.7	1.1	2
28											0
29											0
30									0.6	1.3	2

Distribution Sample Summary	
Total # of routine distribution samples analyzed	100
Total # of routine distribution samples required	100

Distribution Disinfectant Free Residual Summary	
Percent samples with a detectable disinfectant residual	86%
Average disinfectant residual this month	0.7

Distribution Bacteriological Summary	
Total # of positive routine distribution samples	2
Percent of routine distribution samples positive	2%

Positive Distribution Samples					
Date	Monitoring Station	Date	Repeat Monitorong Stations	Residual	Positive or Negative
6/10/2014	WEST SIDE	6/11/2014	WS UPSTREAM	.10/.30	ABSENT
		6/11/2014	WS DOWNSTREAM	.10/.30	ABSENT
		6/11/2014	WEST SIDE	0/.10	ABSENT
6/11/2014	CEDAR STREET	6/12/2014	CS UPSTREAM	0.2/0.4	ABSENT
		6/12/2014	CS DOWNSTREAM	0.2/0.3	ABSENT
		6/12/2014	CEDAR STREET	1.4/1.8	ABSENT

Distribution System Monitoring City of Flint Water Treatment Plant **WSSN: 2310** June 2014

Date	Total Chlorine Residual at Bacteriological Montioring Stations mg/l										
	1	2	3	4	5	6	7	8	CS	WR	Number of Samples
1											0
2									0.8	0.2	2
3									0.3	0.2	2
4	1.0	1.3	0.8	0.9	0.3	1.0	0.6	1.1	0.3	0.2	10
5	0.8	0.6	0.8	0.6	0.3	0.8	0.6	1.1	0.3	0.2	10
6									0.3	0.2	2
7											0
8											0
9									0.2	0.2	2
10	1.0	1.6	0.7	1.1	0.6	1.2	0.7	1.2	0.5	0.2	10
11									0.2	0.1	2
12	1.7	2.5	1.3	1.7	0.9	1.2	0.9	2.3	1.8	0.1	10
13									0.3	0.2	2
14											0
15											0
16									1.6	0.2	2
17	1.9	1.9	1.3	0.7	1.0	2.0	1.3	2.9	0.3	0.5	10
18	2.0	1.5	1.8	1.5	0.6	1.6	1.4	2.1	0.9	0.3	10
19									0.3	0.3	2
20											0
21											0
22											0
23											0
24											0
25	1.8	1.9	1.6	1.4	0.5	1.1	1.4	2.0	1.1	0.7	10
26	1.5	1.9	1.3	0.1	0.1	1.8	1.1	2.5	1.1	0.8	10
27									1.0	1.5	2
28											0
29											0
30									0.9	1.3	2

Distribution Disinfectant Total Residual Summary	
Percent samples with a detectable disinfectant residual	100%
Average disinfectant residual this month	1.0

2310

MONTHLY OPERATION REPORT OF WATER TREATMENT PLANT

SUPPLY NAME: CITY of FLINT WATER PLANT
WSSN: 2310

Michael Glasgow	May 2014
Operator-in-Charge	Month/Year
F-1R, F-2	F-1
Certification of Operator-in-Charge	Water Plant Classification
Michael Glasgow	Genesee
Signature of Operator-in-Charge	County

Treatment Rate and Filter Data

Maximum Treatment Rate:	26.9	Million Gallons per Day
Rated Plant Capacity:	36	Million Gallons per Day
Average Filter Run:	101	Hours
Average Head Loss:	*	Feet
Average Filtration Rate:	2.6	Gallons Per Square Feet per Minute
Maximum Filtration Rate:	3.8	Gallons Per Square Feet per Minute
Average Wash Water Use:	2	Percent of Treated Water

Chemical Data

Chlorine on hand:	22000	lb.	Est. supply:	20 days
Primary Coagulant (Ferric Chloride) on hand:	83765	lb.	Est. supply:	14 days
Cost of All Chemicals per Million Gallons:	*	dollars		
Total Power Cost per Million Gallons:	*	dollars		

Remarks

Number of filter confluence samples > 0.3 NTU:	8
Number of filter confluence samples collected:	350
Percent of filter confluence samples > 0.3 NTU:	0.86%
Number of filter confluence samples > 1 NTU	0

Did any individual filter exceed:

1.0 NTU in two consecutive measurements taken 15 minutes apart? **NO**
If yes, attach specific filter(s) information and indicate required follow-up status.

0.5 NTU in two consecutive measurements taken 15 minutes apart after 4 hours of operation? **NO**
If yes, attach specific filter(s) information and indicate required follow-up status.

1.0 NTU in two consecutive measurements taken 15 minutes apart for 3 consecutive months? **NO**
If yes, attach specific filter(s) information and indicate required follow-up status.

2.0 NTU in two consecutive measurements taken 15 minutes apart for 2 consecutive months? **NO**
If yes, attach specific filter(s) information and indicate required follow-up status.

Was continuous (every 15 minutes) filter monitoring equipment off-line during the month? **NO**
If yes, indicate date(s), duration, and individual filter grab sampling frequency on a separate sheet.

Did POE disinfectant residual fall below 0.2 ppm during the month? **NO**
If yes, indicate date(s) and duration on a separate sheet.

Was minimum C*T credit achieved for the entire month? **YES**
If no, indicate on a separate sheet the date(s) not achieved.

Was continuous POE chlorine residual monitoring equipment off-line during the month? **YES***
If yes, indicate date(s) and duration on a separate sheet.

# of CFE 5 samples per 4HR Compl. period?

Very High!!

CAN one get tubs off plants?

Can get

start up issues Main Bath 5-2015 Got softened only one sink

Coagulation Parameters

City of Flint Water Treatment Plant
WSSN: 2310

May 2014

Date	Million Gallons Treated	Ferric as Fe3+ mg/L	Turbidity, Units																Point of Entry
			Raw			Applied	Confluence Point. No.1 (N) North						Confluence Point. No.2 (S) South						
			Number of Samples	Avg.	Max.	Applied Avg.	Number of Samples	Avg.	Max	No. of 4 Hr. Compliance periods	No. of 4 Hr. Compliance periods >0.3 NTU	No. of Samples >0.3 NTU	Number of Samples	Avg.	Max	No. of 4 Hr. Compliance periods	No. of 4 Hr. Compliance periods >0.3 NTU	No. of Samples >0.3 NTU	Plant Tap NTU
1	15.1	10.9	6	9.60	12.7	5.04	6	0.10	0.19	6	0	0	6	0.07	0.08	6	0	0	0.09
2	14.7	11.3	6	10.1	10.7	7.12	6	0.06	0.07	6	0	0	6	0.07	0.10	6	0	0	0.09
3	21.4	12.3	6	11.2	12.6	7.40	6	0.15	0.18	6	0	0	6	0.11	0.15	6	0	0	0.11
4	21.4	11.8	6	26.2	31.2	8.65	6	0.11	0.13	6	0	0	6	0.10	0.11	6	0	0	0.12
5	21.6	12.3	6	12.6	14.5	5.80	6	0.16	0.23	6	0	0	6	0.14	0.18	6	0	0	0.12
6	22.3	12.1	6	15.0	20.3	4.53	6	0.21	0.27	6	0	0	6	0.18	0.21	6	0	0	0.19
7	21.9	12.1	6	15.5	14.8	5.23	6	0.13	0.16	6	0	0	6	0.12	0.17	6	0	0	0.11
8	22.7	11.7	6	12.6	15.5	4.74	6	0.16	0.25	6	0	0	6	0.11	0.13	6	0	0	0.16
9	22.2	12.0	6	9.30	9.60	4.33	6	0.12	0.15	6	0	0	6	0.11	0.16	6	0	0	0.14
10	21.8	12.2	6	13.2	15.3	5.60	6	0.11	0.18	6	0	0	6	0.09	0.10	6	0	0	0.09
11	19.1	13.8	6	12.6	14.1	6.43	6	0.19	0.29	6	0	0	6	0.08	0.09	6	0	0	0.09
12	8.5	15.3	2	12.0	13.9	8.46	1	0.09	0.09	1	0	0	1	0.07	0.07	1	0	0	0.08
13	0.0	12.9	2	11.3	14.1	n/a	0	n/a	n/a	0	n/a	n/a	0	n/a	n/a	0	n/a	n/a	0.10
14	22.2	12.3	6	30.8	71.7	11.8	6	0.24	0.37	6	1	1	6	0.23	0.31	6	1	1	0.16
15	16.6	20.6	6	45.2	63.0	5.68	6	0.21	0.28	6	0	0	6	0.24	0.28	6	0	0	0.22
16	20.2	18.7	6	28.2	37.3	5.21	6	0.21	0.38	6	1	1	6	0.22	0.45	6	1	1	0.22
17	21.0	20.0	6	14.3	19.3	4.90	6	0.12	0.22	6	0	0	6	0.09	0.08	6	0	0	0.11
18	20.8	18.3	6	9.50	10.7	6.03	6	0.14	0.28	6	0	0	6	0.08	0.09	6	0	0	0.09
19	22.0	18.2	6	9.20	11.3	4.59	6	0.12	0.17	6	0	0	6	0.07	0.10	6	0	0	0.09
20	22.1	18.0	6	7.20	8.40	4.63	6	0.11	0.11	6	0	0	6	0.09	0.11	6	0	0	0.09
21	21.0	19.4	6	7.80	8.90	6.27	6	0.11	0.18	6	0	0	6	0.08	0.08	6	0	0	0.09
22	21.0	18.6	6	9.40	11.3	6.50	6	0.11	0.16	6	0	0	6	0.07	0.09	6	0	0	0.08
23	21.0	18.9	6	9.10	10.4	6.24	6	0.11	0.13	6	0	0	6	0.08	0.09	6	0	0	0.08
24	20.8	17.9	6	7.10	8.30	5.38	6	0.12	0.18	8	0	0	6	0.08	0.09	6	0	0	0.09
25	21.0	18.3	6	6.00	7.30	5.62	6	0.14	0.22	6	0	0	6	0.18	0.25	6	0	0	0.10
26	22.0	18.0	6	5.20	5.60	3.23	6	0.12	0.14	6	0	0	6	0.10	0.13	6	0	0	0.11
27	20.6	19.4	6	5.70	7.30	2.78	6	0.13	0.18	6	0	0	6	0.12	0.14	6	0	0	0.10
28	20.1	20.0	6	4.20	5.30	3.52	6	0.11	0.13	6	0	0	6	0.08	0.08	6	0	0	0.08
29	19.7	20.0	6	5.20	10.3	3.72	6	0.09	0.12	6	0	0	6	0.07	0.08	6	0	0	0.06
30	19.3	16.1	6	3.50	5.30	3.54	6	0.11	0.16	6	0	0	6	0.07	0.07	6	0	0	0.06
31	18.0	17.6	6	3.50	4.40	2.23	6	0.09	0.12	6	0	0	6	0.08	0.09	6	0	0	0.08
Avg.	19.4	15.8	6	12.3		5.51	6	0.13	0.19	6	0	0	6	0.11	0.14	6	0	0	
Max.	22.7	20.6	6	45.2	71.7	11.8	6	0.24	0.38	6	1	1	6	0.24	0.45	6	1	1	0.22
Min.	0.0	10.9	2	3.50		2.23	0	0.06	0.07	0	0	0	0	0.07	0.07	0	0	0	
Total	602.1																		

Access would be better

for loading & backwash 2.6 gpm/ft²

= 1.77 gpm/ft²

Inactive

and do ↑

would like one filter for backup

? is

USING WATER FROM DORT WHEN WAS ON DWSD WATER

Fluoridation & Chlorination — City of Flint Water Treatment Plant — WSSN: 2310 — May 2014 — Page 3

Date	Fluoride Applied as F- mg/L	Fluoride Analysis (mg/L)			Chlorine Application (mg/L)			Chlorine Residual (mg/L)					
					Intermediate Chlorine	Post Chlorine	Total Chlorine	Filtered		3 MG Well		Tap	
		Raw	Tap	Dist.				Free	Total	Free	Total	Free	Total
1	0	0.14	0.19		3.4	0.0	3.4	1.4	1.6	1.4	1.6	1.2	1.5
2	0	0.15	0.34		4.0	0.0	4.0	1.2	1.3	1.6	2.0	1.3	1.6
3	0	0.14	0.18		4.0	0.0	4.0	1.8	2.2	1.7	2.0	1.5	1.7
4	0	0.15	0.24		4.4	0.0	4.4	2.2	2.6	1.5	1.7	1.8	2.2
5	0	0.14	0.13		4.7	0.0	4.7	1.9	2.2	1.8	2.1	1.2	1.4
6	0	0.14	0.13		4.9	0.0	4.9	1.9	2.3	1.7	1.9	1.2	1.5
7	0	0.15	0.14		4.9	0.0	4.9	1.8	2.2	2.0	2.3	1.9	2.2
8	0	0.15	0.14	0.17	4.7	0.0	4.7	1.8	2.3	1.8	2.2	1.7	2.1
9	0	0.15	0.13		5.1	0.0	5.1	1.5	1.9	1.7	2.0	1.5	1.9
10	0	0.15	0.14		5.2	0.0	5.2	2.0	2.5	1.7	2.1	1.5	2.0
11	0	0.16	0.14		5.6	0.0	5.6	2.1	2.6	2.0	2.6	1.7	2.1
12	0	0.15	0.13		6.9	0.0	6.9	1.8	2.4	1.7	2.2	1.4	2.0
13	0	0.15	0.25		5.0	0.0	5.0	n/a	n/a	1.7	2.0	1.5	1.8
14	0	0.15	0.13	0.23	4.9	0.0	4.9	1.9	2.3	1.5	1.9	1.5	1.8
15	0	0.14	0.14		6.2	0.0	6.2	2.0	2.4	2.0	2.5	2.2	2.6
16	0	0.14	0.13		5.3	0.0	5.3	1.9	2.3	1.6	2.0	1.4	1.7
17	0	0.15	0.14		5.1	0.6	5.7	1.7	2.1	1.6	1.9	1.6	2.0
18	0	0.16	0.15		5.1	0.6	5.7	1.5	1.9	1.6	1.9	1.4	1.7
19	0	0.15	0.14		4.7	0.2	4.9	1.6	1.8	1.9	2.3	1.5	1.7
20	0	0.15	0.15		5.0	0.5	5.5	1.9	2.3	2.1	2.6	1.6	1.9
21	0	0.15	0.16		4.9	0.4	5.3	1.8	2.3	2.0	2.4	1.8	2.3
22	0	0.15	0.14		5.0	0.2	5.2	1.7	2.1	2.1	2.5	1.5	1.8
23	0	0.14	0.13		4.9	0.4	5.3	1.5	1.8	1.8	2.3	1.6	2.1
24	0	0.15	0.15		5.0	0.9	5.9	1.5	2.0	1.5	2.0	1.3	1.7
25	0	0.15	0.14		5.0	1.0	6.0	1.4	1.8	1.6	2.0	1.5	1.9
26	0	0.15	0.16		5.0	0.9	5.9	1.5	1.8	1.7	2.3	1.7	2.0
27	0	0.16	0.17		5.3	0.9	6.2	1.5	1.7	1.8	2.2	1.5	1.7
28	0	0.15	0.16	0.19	5.7	1.0	6.7	1.6	2.0	1.9	2.3	1.6	2.0
29	0	0.16	0.16		5.1	0.8	5.9	1.5	1.8	1.8	2.1	1.2	1.4
30	0	0.16	0.17		5.1	1.1	6.2	1.4	1.7	1.6	1.8	1.4	1.7
31	0	0.15	0.16		5.4	1.4	6.8	1.4	1.7	1.6	2.0	1.2	1.6
Avg.	0	0.15	0.16	0.20	5.0	0.4	5.4	1.7	2.1	1.7	2.1	1.5	1.9
Max.	0	0.16	0.34	0.23	6.9	1.4	6.9	2.2	2.6	2.1	2.6	2.2	2.6
Min.	0	0.14	0.13	0.17	3.4	0.0	3.4	1.2	1.3	1.4	1.6	1.2	1.4

INSTALL FLO-LOCKS
STARTED 3rd/4th JOINTS
FACILITIES LOCKS — SHUT-DOWN
MAINT STAFF — PLASTIC WELDED
NEEDS TO BE REPAIRED 03
ANTICIPATE END OF MAY OR SOON
TO REPLACE LOCKS OR CHANGE OUT PIPING

8X IN DAY during
OR
2X PER SHIFT
1/4 HRS

Seems like softening post-carb dropped off around 6th/7th

Split treatment due to flow out of City

Use softening

15.16 mgd

4.5 Mgd

Softening

Chemical Analyses — City of Flint Water Treatment Plant — WSSN: 2310 — May 2014 — Page 4

Date	pH (S.U.)		Total Hardness as CaCO3 (mg/L)		Total Alkalinity as CaCO3 (mg/L)		Non-Carbonate Hardness as CaCO3 (mg/L)		Calcium as Ca2+ (mg/L)		Magnesium as Mg2+ (mg/L)		Chloride as Cl- (mg/L)	
	Raw	Tap	Raw	Tap	Raw	Tap	Raw	Tap	Raw	Tap	Raw	Tap	Raw	Tap
1	8.44	7.71	246	146	196	66	50	80	56.7	48.1	20.9	7.8	43.0	67.0
2	8.27	7.07	250	162	196	80	54	82	83.4	48.1	10.2	10.2	44.0	41.0
3	8.26	7.47	250	132	200	60	50	72	82.6	42.5	10.7	6.3	40.0	60.0
4	8.39	7.50	256	120	196	70	60	50	86.6	60.9	6.3	6.3	47.0	60.0
5	8.39	7.41	232	152	204	76	28	76	78.6	54.6	8.7	3.9	45.0	75.0
6	8.25	7.21	240	160	202	90	38	70	80.2	54.5	9.7	7.3	53.0	71.0
7	8.24	7.24	266	210	212	130	54	80	71.3	66.5	21.4	10.7	51.0	76.0
8	8.33	7.13	272	218	210	128	62	90	66.6	84.2	10.7	2.4	n/a	n/a
9	8.29	7.22	264	224	210	130	54	94	86.6	75.4	11.7	8.7	50.0	80.0
10	8.38	7.36	260	216	214	122	46	94	81.8	73.7	13.6	7.8	48.0	80.0
11	8.35	7.46	286	230	216	126	70	104	84.0	73.7	20.4	11.2	46.0	82.0
12	8.33	7.43	266	218	208	120	58	98	99.4	72.1	4.4	9.2	45.0	76.0
13	8.28	7.24	278	202	216	114	62	88	85.8	59.3	15.6	13.1	48.0	66.0
14	8.23	7.30	264	220	208	138	56	82	68.9	68.1	22.4	12.2	45.0	72.0
15	8.06	7.42	242	206	184	122	58	84	66.5	65.7	16.5	10.2	43.0	73.0
16	8.05	7.12	234	214	196	118	38	96	81.0	69.7	7.8	9.7	41.0	90.0
17	8.16	7.21	246	208	200	98	46	108	85.8	65.7	7.8	10.2	41.0	85.0
18	8.29	7.27	280	212	206	116	74	96	77.0	64.9	14.6	12.2	47.0	80.0
19	8.24	7.27	266	214	214	120	52	94	85.8	69.7	12.6	9.7	43.0	78.0
20	8.22	7.44	254	220	212	124	42	96	85.8	70.5	9.7	10.7	43.0	80.0
21	8.23	7.42	246	226	208	118	38	108	77.8	74.5	12.6	9.7	45.0	85.0
22	8.33	7.50	244	216	208	118	36	98	79.4	72.1	11.2	8.7	42.0	85.0
23	8.22	7.49	248	222	208	114	40	108	82.6	72.9	10.2	9.7	48.0	87.0
24	8.24	7.52	258	228	208	118	50	110	78.6	72.9	15.1	11.2	42.0	80.0
25	8.30	7.49	240	228	208	124	32	104	8.6	75.4	9.7	11.2	42.0	82.0
26	8.28	7.30	248	220	208	120	40	100	84.2	81.0	9.2	4.4	41.0	80.0
27	8.21	7.55	242	226	208	126	34	100	78.6	77.0	11.2	8.3	41.0	84.0
28	8.28	7.46	242	240	208	126	34	114	82.6	80.2	8.8	9.7	43.0	87.0
29	8.23	7.46	254	224	210	114	44	110	83.4	78.6	11.2	6.8	42.0	88.0
30	8.33	7.49	256	230	216	132	40	98	83.4	79.4	11.7	7.8	42.0	88.0
31	8.32	7.41	248	242	212	130	36	112	77.8	74.5	13.1	13.6	40.0	78.0
Avg.	8.27	7.37	254	206	207	113	48	93	78.3	68.6	12.3	9.1	44.4	77.2
Max.	8.44	7.71	286	242	216	138	74	114	99.4	84.2	22.4	13.6	53	90
Min.	8.05	7.07	232	120	184	60	28	50	8.6	42.5	4.4	2.4	40	41

Where?

Softening?

Want to adjust CMB

Appears to be Battery cast-Fail and pH → B<ARB

D.-Pp. 6x NON-CARB & Alk =

HNaCl − Alk = N. CARB Hardness

Bacteriological & Physical Parameters | City of Flint Water Treatment Plant WSSN: 2310 | May 2014 | Page 5

Date	Total Coliform						Standard Plate Count		Wind Direction	Temp. C	Color		Odor	
	Raw (Colilert MPN)		Filter Confluence (N&S)		Plant Tap									
	# Samples	Count	# Samples	# pos	# Samples	# pos	Raw	Tap		Raw	Raw	Tap	Raw	Tap
1	1	1166	12	0	1	0	14760	<2		12.6				
2	1	864	12	0	1	0	800	<2		13.2				
3	1	930	12	0	1	0	1300	<2		12.0				
4	1	974	12	0	1	0	>14760	<2		13.6				
5	1	882	12	0	1	0	>14760	<2		12.5				
6	1	618	12	0	1	0	12460	<2		14.9				
7	1	728	12	0	1	0	>14760	<2		14.3				
8	1	426	12	0	1	0	9400	<2		13.4				
9	1	342	12	0	1	0	>14760	<2		16.6				
10	1	610	12	0	1	0	>14760	2		17.6				
11	1	220	12	0	1	0	>14760	2		18.1				
12	1	218	12	0	1	0	>14760	<2		18.3				
13	1	126	12	0	1	0	11100	<2		19.5				
14	1	2910	12	0	1	0	>14760	<2		19.6				
15	1	16328	12	0	1	0	14760	<2		17.4				
16	1	12588	12	0	1	0	6960	<2		13.2				
17	1	3720	12	1	1	0	3320	2		14.3				
18	1	1618	12	0	1	0	7840	<2		16.7				
19	1	4494	12	0	1	0	16.1	<2		16.1				
20	1	1616	12	0	1	0	860	<2		17.2				
21	1	4764	12	0	1	0	14760	<2		18.2				
22	1	2934	12	0	1	0	7440	<2		19.0				
23	1	960	12	0	1	0	7840	<2		18.0				
24	1	682	12	0	1	0	3780	<2		18.3				
25	1	398	12	0	1	0	14760	2		18.7				
26	1	482	12	0	1	0	>14760	<2		21.4				
27	1	2034	12	0	1	0	1600	<2		20.6				
28	1	2028	12	0	1	0	7440	<2		21.1				
29	1	918	12	0	1	0	5740	<2		20.6				
30	1	852	12	0	1	0	2160	<2		22.3				
31	1	1166	12	0	1	0	3320	<2		22.7				
Avg.										17.2				
Max.							> 14760	2		22.7				
Min.										12.0				

Biofilm Act

- Turn-over @ Reservoirs
- Mixing
- TTHM formation – stagnation?

Distribution System Monitoring | City of Flint Water Treatment Plant WSSN: 2310 | May 2014 |

Date	Free Chlorine Residual at Bacteriological Montioring Stations mg/l										
	1	2	3	4	5	6	7	8	CS	WR	Number of Samples
1									0.6	0.8	2
2									0.6	0.8	2
3											0
4											0
5									0.7	0.6	2
6									1.1	1.4	2
7	1.0	1.3	0.9	1.0	0.9	0.9	0.9	1.3	0.4	0.6	10
8	1.1	1.3	1.0	1.4	0.9	1.1	0.9	1.4	0.8	0.6	10
9									0.7	0.6	2
10											0
11											0
12									0.3	0.4	2
13									0.3	0.4	2
14	1.0	0.7	1.0	1.0	0.7	0.7	0.9	0.7	0.3	0.4	10
15	0.6	0.5	0.5	0.3	0.2	0.3	0.2	0.4	0.2		9
16									0.3		1
17											0
18											0
19									0.4	0.3	2
20									0.3	0.3	2
21	0.3	1.2	0.7	0.8	0.5	1.0	0.7	1.2	0.3	0.3	10
22	0.8	0.9	0.7	0.4					0.3	0.2	6
23									0.3	0.2	2
24											0
25											0
26									0.3	0.4	2
27									0.2	0.0	2
28	0.7	0.9	0.6	0.1	0.6	0.6	0.5	1.0	0.2	0.1	10
29	0.7	1.1	0.6	0.9	0.3	0.9	0.9	1.1	0.3	0.1	10
30											0
31											0

Correlation of low FCR in WR with high HPC?

5/05 – give us the result

Distribution Sample Summary	
Total # of routine distribution samples analyzed	100
Total # of routine distribution samples required	100

Distribution Disinfectant Free Residual Summary	
Percent samples with a detectable disinfectant residual	99
Average disinfectant residual this month	0.7

Distribution Bacteriological Summary	
Total # of positive routine distribution samples	0
Percent of routine distribution samples positive	0

Positive Distribution Samples					
Date	Monitoring Station	Date	Repeat Monitorong Stations	Residual	Positive or Negative

until flushing

Cl2 on WR Filling to Reservoir 1 mg/L Cl2 ft

helps

F: 4 – 6 T

Adding Portable Cl2 @ WR

@ Calcium Hypo that used being used @ the WTP int.

Dosages? MOR Residuals?

Distribution System Monitoring | City of Flint Water Treatment Plant **WSSN: 2310** | May 2014 | Page 7

Date	Total Chlorine Residual at Bacteriological Montioring Stations mg/l										
	1	2	3	4	5	6	7	8	CS	WR	Number of Sample
1									0.7	1.0	2
2									0.7	0.8	2
3											0
4											0
5									1.0	0.8	2
6									1.9	0.9	2
7	1.5	1.7	1.4	1.4	1.1	1.1	1.1	1.7	0.6	0.9	10
8	1.6	1.9	1.2	1.7	1.3	1.7	1.3	1.7	0.9	1.1	10
9									0.9	0.8	2
10											0
11											0
12									0.4	0.6	2
13									0.4	0.7	2
14	1.3	1.0	1.4	1.3	1.0	1.1	1.2	0.9	0.4	0.7	10
15	0.8	0.7	1.0	0.6	0.5	0.7	0.7	0.7	0.3		9
16									0.4		1
17											0
18											0
19									0.5	0.5	2
20									0.4	0.5	2
21	0.4	1.9	1.2	1.3	1.0	1.5	1.1	1.6	0.4	0.4	10
22	1.2	1.5	1.0	1.7					0.5	0.3	6
23									0.4	0.3	2
24											0
25											0
26											0
27									0.4	0.2	2
28	1.1	1.2	1.0	0.3	0.8	1.1	0.9	1.4	0.3	0.2	10
29	1.1	1.5	1.1	1.1	0.5	1.1	1.1	1.2	0.5	0.3	10
30											0
31											0

Distribution Disinfectant Total Residual Summary	
Percent samples with a detectable disinfectant residual	100
Average disinfectant residual this month	1.0

Cover Page Notes:

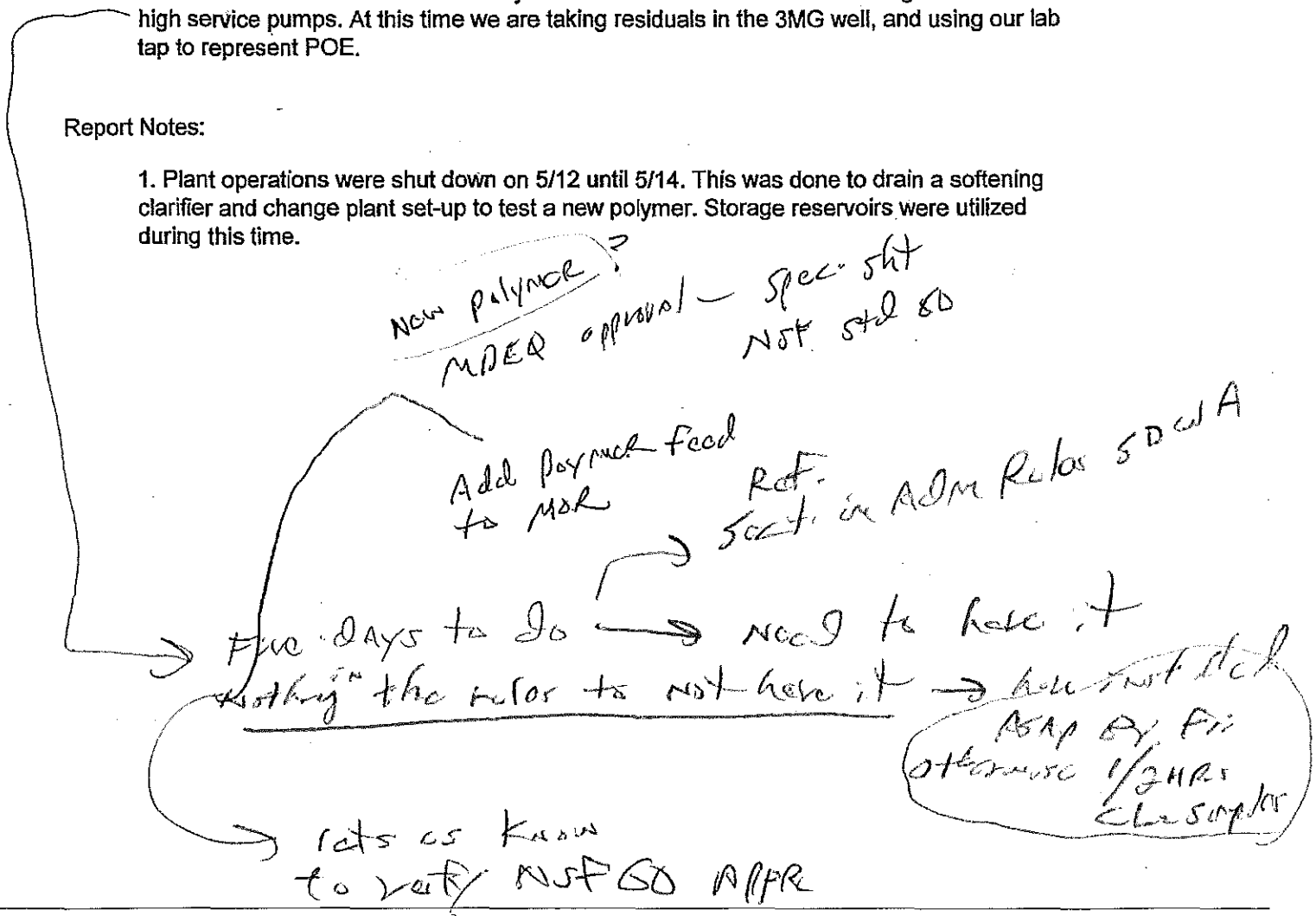
1. Filter head loss meters are not operational on our SCADA. They will be operational after our SCADA upgrades are complete. The SCADA upgrades are out for bid at the moment.

2. No cost analysis done for chemicals or power. An accurate chemical cost could not be determined due to polymer usage. We were given significant quantities (4-5 days) of polymer to use as a trial on two different occasions. No power cost was determined because I am trying to gain access to the correct monthly power cost.

3. POE continuous chlorine residual monitoring equipment has not been installed. We plan to move the continuous chlorine analyzer from the 3MG Well to the discharge side of the high service pumps. At this time we are taking residuals in the 3MG well, and using our lab tap to represent POE.

Report Notes:

1. Plant operations were shut down on 5/12 until 5/14. This was done to drain a softening clarifier and change plant set-up to test a new polymer. Storage reservoirs were utilized during this time.



23 IC

MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY

PERMIT APPLICATION FOR WATER SUPPLY SYSTEMS

(CONSTRUCTION - ALTERATION - ADDITION OR IMPROVEMENT) AS DESCRIBED HEREIN

Required under the Authority of 1976 PA 399, as amended

This application becomes an Act 399 Permit only when signed and issued by authorized Michigan Department of Environmental Quality (DEQ) Staff. See instructions below for completion of this application.

1. **Municipality or Organization, Address and WSSN** that will own or control the water facilities to be constructed. This permit is to be issued to: City of Flint 4500 North Dort Highway Flint, MI 48505 **WSSN:** 02310	Permit Stamp Area (DEQ use only) MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY PERMIT NO. W 140026 APR 09 2014 EXAMINED AND APPROVED FOR COMPLIANCE WITH ACT 399, P.A. 1976	
2. **Owner's Contact Person** (provide name for questions): Contact: Brent Wright Title: Plant Supervisor Phone: 810-787-6537		
3. **Project Name** (Provide phase number if project is segmented): Flint WTP Phase II, Segment II - Lime Residual Disposal	4. **Project Location** (City, Village, Township): City of Flint	5. **County** (location of project): Genesee County

ISSUED UNDER THE AUTHORITY OF THE DIRECTOR OF THE DEPARTMENT OF ENVIRONMENT QUALITY

cc:

Issued by: _____

Reviewed by: Patrick Cook for MFP for Mike Prysby

☐ **If this box is marked see attached special conditions.**

Instructions: Complete items 1 through 5 above and 6 through 21 on the following pages of this application. Print or type all information except for signatures. Mail completed application, plans and specifications, and any attachments to the DEQ District Office having jurisdiction in the area of the proposed construction.

Please Note:

a. This **PERMIT** only authorizes the construction, alteration, addition or improvement of the water system described herein and is issued solely under the authority of 1976 PA 399, as amended.
b. The issuance of this **PERMIT** does not authorize violation of any federal, state or local laws or regulations, nor does it obviate the necessity of obtaining such permits, including any other DEQ permits, or approvals from other units of government as may be required by law.
c. This **PERMIT** expires two (2) years after the date of issuance in accordance with R 325.11306, 1976 PA 399, administrative rules, unless construction has been initiated prior to expiration.
d. Noncompliance with the conditions of this permit and the requirements of the Act constitutes a violation of the Act.
e. Applicant must give notice to public utilities in accordance with 1974 PA 53, (MISS DIG), being Section 460.701 to 460.718 of the Michigan Compiled Laws, and comply with each of the requirements of that Act.
f. All earth changing activities must be conducted in accordance with the requirements of the Soil Erosion and Sedimentation Control Act, Part 91, 1994 PA 451, as amended.
g. All construction activity impacting wetlands must be conducted in accordance with the Wetland Protection Act, Part 303, 1994 PA 451, as amended.
h. Intentionally providing false information in this application constitutes fraud which is punishable by fine and/or imprisonment.
i. Where applicable for water withdrawals, the issuance of this permit indicates compliance with the requirements of Part 327 of Act 451, Great Lakes Preservation Act.

MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY

Permit Application for Water Systems (Continued)

6. **Facilities Description** – In the space below provide a detailed description of the proposed project. Applications without adequate facilities descriptions **will be returned**. SEE EXAMPLES BELOW. Use additional sheets if needed.

Improvements to the City of Flint Lime Sludge Lagoons at Bray Road to allow lime sludge from the the Flint WTP to be stored during the interim period when the plant will be treating Flint River water. The lagoons will not be needed for continuous use when the plant switches to treatment of raw water from the KWA Lake Huron Water Supply:

PHASE II, SEGMENT II - LIME RESIDUAL DISPOSAL (@BRAY ROAD):
* Plugging and abandonment of 8" inlet piping; construction of 306 LF of new 10" inlet piping; installation of bulkhead on existing outlet structure to prevent discharge to surface water.
* Clay Berm barrier improvements to separate concrete debris pile from lime sludge.
* Construction of new decant tower structure, 8" gravity sewer, and decant pump station (duplex submersible) with CO2 feed system for pH adjustment. Vortex impeller pumps (2) shall each be rated at 140 gpm at 22' TDH; CO2 feed consists of 6 ton storage tank, 15 pph pH controlled feed system, SS gas piping, and diffusers installed in the decant tower.
* Construction of approx. 3,800 LF of 6" HDPE decant forcemain and connection to existing City santiary sewer system.

EXAMPLES – EXAMPLES – EXAMPLES – EXAMPLES – EXAMPLES – EXAMPLES	
Water Mains	500 feet of 8-inch water main in First Street from Main Street north to State Street. **OR** 250 feet of 12-inch water main in Clark Road from an existing 8-inch main in Third Avenue north to a hydrant.
Booster Stations	A booster station located at the southwest corner of Third Avenue and Main Street, and equipped with two, 15 Hp pumps each rated 150 gpm @ 200 feet TDH. Station includes backup power and all other equipment as required for proper operation.
Elevated Storage Tank	A 300,000 gallon elevated storage tank located in City Park. The proposed tank shall be spherical, all welded construction and supported on a single pedestal. The tank shall be 150 feet in height, 40 feet in diameter with a normal operating range of 130 – 145 feet. The interior coating system shall be ANSI/NSF Standard 61 approved or equivalent. The tank will be equipped with a cathodic protection system, and includes a tank level control system with telemetry.
Chemical Feed	A positive displacement chemical feed pump, rated at 24 gpd @ 110 psi to apply a chlorine solution for Well No. 1. Chlorine is 12.5% NaOCL, ANSI/NSF Standard 60 approved and will be applied at a rate of 1.0 mg/l of actual chlorine.
Water Supply Well	Well No. 3, a 200 foot deep well with 170 feet of 8-inch casing and 30 feet of 8-inch, 10 slot screen. The well will be equipped with a 20 Hp submersible pump and motor rated 200 gpm @ 225 feet TDH, set at 160 feet below land surface.
Treatment Facilities	A 5 million gpd water treatment plant located at the north end of Second Avenue. The facility will include 6 low service pumps, 2 rapid mix basins, 4 flocculation/sedimentation basins, 8 dual media filters, 3 million gallon water storage reservoir and 6 high service pumps. Also included are chemical feed pumps and related appurtenances for the addition of alum, fluoride, phosphate and chlorine.

MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY

Permit Application for Water Systems (Continued)

General Project Information – Complete all boxes below.

7. Design engineer's name, engineering firm, address, phone number, and email address:	8. Indicate who will provide project construction inspection:
Jeremy N. Nakashima, PE Lockwood, Andrews & Newnam, Inc. 1 Oakbrook Terrace, Suite 207 Oakbrook Terrace, IL 60181 630-495-4123 / jnnakashima@lan-inc.com	☒Organization listed in Box 1. ☒Engineering firm listed in Box 7. ☐Other - name, address, and phone number listed below.

9. Is a basis of design attached?
☒YES ☐NO

If no, briefly explain why a basis of design is not needed. Submitted previously under separate cover.

10. Are sealed and signed engineering plans attached?
☒YES ☐NO

If no, briefly explain why engineering plans are not needed. Plans and specs submitted previously under separate cover.

11. Are sealed and signed construction specifications attached?
☒YES ☐NO

If specifications are not attached, they need to be on file at DEQ.

12. Were Recommended Standards for Water Works, Suggested Practice for Water Works, AWWA guidelines, and the requirements of Act 399 and its administrative rules followed?
☒YES ☐NO

If no, explain which deviations were made and why.

13. Are all coatings, chemical additives and construction materials ANSI/NSF or other adequate 3rd party approved?
☒YES ☐NO

If no, describe what coatings, additives or materials did not meet the applicable standard and why.

14. Are all water system facilities being installed in the public right-of-way or a dedicated utility easement? (For projects not located in the public right-of-way, utility easements must be shown on the plans.)
☐YES ☒NO

If no, explain how access will be obtained. Most work will be on City owned property, except forcemain.

15. Is the project construction activity within a wetland (as defined by Section 324.30301(d)) of Part 303, 1994 PA 451?
☐YES ☒NO

If yes, a wetland permit must be obtained.

16. Is the project construction activity within a 100-year floodplain (as defined by R 323.1311(e)) of Part 31, 1994 PA 451, administrative rules?
☐YES ☒NO

If yes, a flood plain permit must be obtained.

17. Is the project construction activity within 500 feet of a lake, reservoir, or stream?
☒YES ☐NO

If yes, a Soil and Erosion Control Permit must be obtained or indicate if the owner listed in box 2 of this application is an Authorized Public Agency (Section 10 of Part 91, 1994 PA 451) ☐ Owner is APA.

MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY

Permit Application for Water Systems (Continued)

18. Will the proposed construction activity be part of a project involving the disturbance of five (5) or more acres of land?
☐YES ☒NO
If yes, is this activity regulated by the National Pollutant Discharge Elimination System storm water regulations?
☐YES: NPDES Authorization to discharge storm water from construction activities must be obtained.

☐NO: Describe why activity is not regulated:
Please call 517-241-8993 with questions regarding the applicability of the storm water regulations.

19. Is the project in or adjacent to a site of suspected or known soil or groundwater contamination?
☐YES ☒NO

If yes, attach a copy of a plan acceptable to the DEQ for handling contaminated soils and/or groundwater disturbed during construction. Contact the local DEQ district office for listings of Michigan sites of environmental contamination.

20. IF YOU ARE A CUSTOMER/WHOLESALE/BULK PURCHASER, COMPLETE THE FOLLOWING

1) Name and WSSN of source water supply system (seller) _____

2) Does the water service contract require water producer/seller to review and approve customer/wholesale/bulk purchaser water system construction plans?
☐YES ☐NO

If yes to #2, the producer/seller approval letter must be attached when submitted to DEQ.

21. **Owner's Certification** The owner of the proposed facilities or the owner's authorized representative shall complete the owner's certification. It is anticipated that the owner will either be a governmental agency (city, village, township, county, etc.) or a private owner (individual, company, association, etc.) of a Type I public water supply.

OWNER'S CERTIFICATION

I, BRENT F. WRIGHT (print) (name), acting as the WATER PLANT SUPERVISOR (print) (title/position) for

CITY OF FLINT (print) (entity owning proposed facilities) certify that this project has been reviewed and approved as detailed by the Plans and Specifications submitted under this application, and is in compliance with the requirements of 1976 PA 399, as amended, and its administrative rules.

Signature* 3-31-2014 Date (810) 787-6537 Phone

*Original signature only, no photocopies will be accepted.

MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY

Permit Application for Water Systems (Continued)

PROJECT BASIS OF DESIGN – FOR WATER MAIN PROJECTS

PROJECT NAME: _____

For this PROJECT the following information must be provided per Act 399 unless waived by the Department. For projects other than water main installation, or if additional space is needed, attach separate sheet(s) with detailed Basis of Design calculations.

A. A general map of the initial and ultimate service areas
☐ Included on engineering plans ☐ Attached separately

B. Number of service connections served by this permit application _____

C. Total number of service connections ultimately served by entire project _____

D. Residential Equivalent Units (REUs) served by this permit application _____

E. Total Residential Equivalent Units (REUs) ultimately served by entire project _____

F. Water flow rates for proposed project based on REUs listed in "D' and "E" above

1. Initial design average day flow (mgd) _____
2. Initial design maximum day flow (mgd) _____
3. Total design average day flow (mgd) _____
4. Total design maximum day flow (mgd) _____
5. Required fire flows: (1) _____ gpm for _____ hours

G. Actual flows and pressures of existing system at the connection point(s) (2)

_____ gpm at _____ psi
_____ gpm at _____ psi
_____ gpm at _____ psi
_____ gpm at _____ psi

H. Estimated minimum flows and pressures within the proposed water main system (3) _____ gpm at _____ psi

(1) Every water system must decide what levels of fire fighting flows they wish to provide. Fire flow should be appropriate for the area (residential, commercial, industrial) being served by the project. Typical fire flow rates can be obtained from the water supply, local fire dept., ISO or AWWA. The water system must then be designed to be able to provide the required fire flows while maintaining at least 20 psi in all portions of the distribution system.

(2) Flows and pressures at the connection points must be given to determine if the existing water main(s) are able to deliver water to the new service area. These numbers can be obtained from a properly modeled and calibrated distribution system hydraulic analysis or hydrant flow tests performed in the field. If more than one connection is proposed, list as needed.

(3) List what the estimated minimum flows can be expected in the proposed water mains based on estimated water demands, head losses, elevation changes and other factors that may affect flows, such as dead end mains.

Flint WTP Improvements – Phase II, Segments I, II, and III
Responses to MDEQ Review Comments dated 4-3-2014

The MDEQ review comments dated 4-3-14 have been addressed as noted in the responses below. Revised drawings have also been prepared in conjunction with these responses and have been included in the attached revised drawing sets for Phase II, Segments I, II, and III.

DEQ
RESOURCE MANAGEMENT DIVISION
APR 08 2014
LANSING DISTRICT

Phase II – Segment 1 - Watermain Cut-in Plans

- **Mid-Pt Chlorination - update plans to depict the additional anti-siphon/ball valve as described in your response to our March 19, 2014 comments. Most likely to be added to Sheet C-508.**

  Response: The anti-siphon/ball valve is shown on revised Sheet C-104, dated 4-7-14.

- **Include a full-sized mid-point chlorination system schematic with the updated plans.**

  Response: The mid-point chlorination system schematic has been included in the Phase II, Segment I – Initial Watermain Cut-in drawings as Sheet C-509, dated 4-7-14.

- **It appears that make-up water and chlorine gas are not combined at the chlorine feeder (panel w. rotometer, vacc. monitor, auto. feed control valve, etc.) for production of liquid chlorine. Instead, this appears to take place at the ejector/check valve assembly on the plant supply line. Please confirm. If gas under vacuum is conveyed to the ejector at the plant supply line, the gas piping must be Schedule 80 seamless steel tubing. Please confirm. This can be included on the chlorination system schematic.**

  Response: The above description of the midpoint chlorination system is essentially correct. As shown on Sheet C-509, the mid-point chlorination system is a vacuum system. The vacuum regulators are mounted directly to the chlorine storage cylinders. Vacuum lines run from the regulators to the chlorinator control panels where feed rate is controlled. Vacuum lines are then connected from the control panel to ejectors, where water supply flowing through the ejectors creates the vacuum required to pull gas from the storage tanks. While the ejectors are not located in the control panel, it is common to have the ejectors remotely mounted from the control panels. A review of the 10 State Standards requirement for Schedule 80 seamless steel tubing appears to be for pressure gas feed systems, and not vacuum gas feed systems as proposed for Flint. As such, the recommended vacuum line material for a 500

ppd system is 5/8" O.D. flexible polyethylene plastic tubing (see attached information from Hydro Instruments).

Please provide 2 full-sized sets of Watermain Cut-in Plans that include the requested information and revisions.

Phase II - Segment 1 - WTP Rehabilitation Plans

- **LOX/LN Storage & Piping – update plans to depict revised sheets D2-102 and D2-601. The revisions were made to clarify the gas piping configuration.**

  Response: Revised drawings D2-101, D2-102, D2-301, D2-502, and D2-601 have been included in the updated plan set.

- **The existing LOX storage tank will provide approximately 16 days storage at max design rate at 12.0 MGD until the second tank is installed. The Act 399 permit will be issued with a condition that the MDEQ is provided a copy of the contract between the city and the LOX supplier that specifies the maximum delivery time. The LOX system shall be operated such that a minimum of 5 days storage is maintained in the LOX tank at all times.**

  Response: The City will provide MDEQ a copy of the contract between the City and their LOX supplier under separate cover. LOX can be supplied within 24 hours of when a purchase order is issued.

- **Mid – Point Chlorination (Chlorine room) - revise sheets C5-105 and C5-508 to show deletion of the chlorine gas scrubber system.**

  Response: Sheets C5-105, C5-508, and EP6-101, which are all specific to the chlorine scrubber work only, have been deleted in their entirety from the updated plan set.

- **Revise the ventilation intake duct detail (Sheet C5-508) to as described in your response.**

  Response: This intake duct detail is no longer applicable as it is for the chlorine scrubber system, which has been deleted. As noted in the previous MDEQ review comment responses, the City will extend the existing ventilation intake ductwork in the existing Chlorine Storage Room to finished floor level. This work has been added to the Phase II, Segment I – Initial Watermain Cut-in plan set, see Note 7 of revised drawing Sheet C-103.

- **Add panic hardware to chlorinator room door (east and west exits).**

  Response: The City will perform this work. This work has been added to the Phase II, Segment I – Initial Watermain Cut-in plan set, see Note 8 of revised drawing Sheet C-103.

- **The existing door between P.S. 4 and the chlorine gas storage room should be closed off such that the chlorine gas storage room and chlorinator room are only assessable from the outside. Although an improved door sweep is proposed, door sweeps are not failsafe in a catastrophic gas release and such an event could jeopardize the entire P.S. #4.**

  Response: The City will perform this work. This work has been added to the Phase II, Segment I – Initial Watermain Cut-in plan set, see notes on revised drawing Sheet C-103.

- **Raw Water Piping – the proposed 54X42 cross provides minimal vertical separation (approximately 6-inches). A pair concrete cradles installed on each side of the 54-inch concrete main will mitigate the force of the 42-inch main installed above at the crossing. A condition will be added to the Act 399 permit to field adjust the 42-inch main installation to maximize the vertical separation at the crossing.**

  Response: The Contractor is required to field verify the elevation of the existing 54" pipeline. The City or the City's representative onsite observing construction will coordinate with the Contractor to ensure that the clearance between the 42" and 54" pipelines is increased to the maximum extent practical.

Please provide 2 full-sized sets of WTP Rehabilitation Plans that include the requested information and revisions.

Phase II – Segment 2 - Bray Road Sludge Lagoon

Provide 2 full-sized sets of construction plans for proposed work at the Bray Road sludge lagoon. Separation between the concrete disposal area the lime sludge disposal area by metal sheet piling, as discussed in our meeting, needs to be depicted.

Response: 2 full sized sets of construction plans of proposed work at the Bray Road Sludge Lagoon are included for your review and file. The separation barrier between the concrete disposal area and the lime sludge disposal area will be accomplished by

establishing a clay barrier that extends to the bottom of the original lagoon bottom as shown in the detail on sheet C-501. The separation barrier will be constructed within the lime sludge lagoon away from the concrete disposal area as to provide complete separation as discussed.

Prepare final Bray Road Lime Sludge Management Plan. The plan also needs to include establishment of a level working surface in the west portion of the lagoon and removal of the island.

Response: A final version of the Bray Road Lime Sludge Management Plan is being included with this final submittal. A level working surface of 738.5' has been designated within the sludge lagoon after the pump station is operational. All debris or vegetation growth within the 742' elevation within the sludge lagoon is intended to be removed and cleared by the contractor.

The Act 399 permit will also include a condition requiring the sheet piling to be driven deep enough into native soil to maintain its structural integrity for removal of waste material on the exterior portion of the lagoon.

Response: Sheet piling is no longer being used as the separation barrier based on further discussion with the contractor and availability. A clay berm will be constructed for the full depth within the lime sludge lagoon using the original bottom of the sludge lagoon as a base using the proposed alignment proposed for the sheet piling.

Act 399 Permit Applications:

WTP Rehabilitation:

Part 6 (Facilities Description) needs to discuss the provisions for the stand-by generator. The description needs to be added in the Phase II – Segment III – Electrical Improvements (@WTP) – (i.e. transfer switch, universal generator connection)

Response: See attached revised Part 6 of the Act 399 Permit Application forms.

Bray Road (Flint WTP Phase II, Segment II – Lime Residual Disposal)

Please revise Part 6 (Facilities Description) since a berm-liner system will not be used to separate the lime sludge area from the concrete debris area. Eliminate "Berm/liner" from the statement: "Berm/liner or Sheet Piling improvements to separate concrete debris from lime sludge."

Response: See attached revised Part 6 of the Act 399 Permit Application forms.

000978

Lockwood, Andrews & Newnam, Inc.

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Date: 4-8-14

Project Number: 130-10701-001

Company: MDEQ

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Project: City of Flint Water Treatment Plant Improvements.

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- ☐ As Requested
- ☒ For Your Use
- ☒ For Review and Comment
- ☐ For Your Signature

Quantity	Description
2	22x34 Plans - Phase II, Segment 1 – Rehabilitation
2	22x34 Plans - Phase II, Segment 1 – Initial Watermain Cut-In
2	22x34 Plans - Phase II, Segment II – Lime Residual Disposal
2	Final Bray Road Lime sludge management Plan
1	Updated page 2 for permit applications
1	LAN Team Response to MDEQ Review comments

Remarks

These plans are being submitted for permit issuance as discussed.

DEQ
RESOURCE MANAGEMENT DIVISION
APR 08 2014
LANSING DISTRICT

Distribution

1- Daugherty Johnson
2- Brent Wright
3- File

Prepared By

Samir Matta, PE

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If enclosures are not as noted, kindly notify us at once.

Flint WTP Improvements
Phase II
Segments I-III
MDEQ Comments
April 3, 2014

Phase II – Segment 1 - Watermain Cut-in Plans

- Mid-Pt Chlorination - update plans to depict the additional anti-siphon/ball valve as described in your response to our March 19, 2014 comments. Most likely to be added to Sheet C-508.

- Include a full-sized mid-point chlorination system schematic with the updated plans.

- It appears that make-up water and chlorine gas are not combined at the chlorine feeder (panel w. rotometer, vacc. monitor, auto. feed control valve, etc.) for production of liquid chlorine. Instead, this appears to take place at the ejector/check valve assembly on the plant supply line. Please confirm. If gas under vacuum is conveyed to the ejector at the plant supply line, the gas piping must be Schedule 80 seamless steel tubing. Please confirm. This can be included on the chlorination system schematic.

Please provide 2 full-sized sets of Watermain Cut-in Plans that include the requested information and revisions.

Phase II - Segment 1 - WTP Rehabilitation Plans

- LOX/LN Storage & Piping – update plans to depict revised sheets D2-102 and D2-601. The revisions were made to clarify the gas piping configuration.

- The existing LOX storage tank will provide approximately 16 days storage at max design rate at 12.0 MGD until the second tank is installed. The Act 399 permit will be issued with a condition that the MDEQ is provided a copy of the contract between the city and the LOX supplier that specifies the maximum delivery time. The LOX system shall be operated such that a minimum of 5 days

Act 399 Permit Applications:

WTP Rehabilitation:

Part 6 (Facilities Description) needs to discuss the provisions for the stand-by generator. The description needs to be added in the Phase II – Segment III – Electrical Improvements (@WTP) – (i.e. transfer switch, universal generator connection)

Bray Road (Flint WTP Phase II, Segment II – Lime Residual Disposal)

Please revise Part 6 (Facilities Description) since a berm-liner system will not be used to separate the lime sludge area from the concrete debris area. Eliminate "Berm/liner" from the statement: "Berm/liner or Sheet Piling improvements to separate concrete debris from lime sludge."

storage is maintained in the LOX tank at all times.

- Mid – Point Chlorination (Chlorine room) - revise sheets C5-105 and C5-508 to show deletion of the chlorine gas scrubber system.

- Revise the ventilation intake duct detail (Sheet C5-508) to as described in your response.

- Add panic hardware to chlorinator room door (east and west exits).

- The existing door between P.S. 4 and the chlorine gas storage room should be closed off such that the chlorine gas storage room and chlorinator room are only assessable from the outside. Although an improved door sweep is proposed, door sweeps are not failsafe in a catastrophic gas release and such an event could jeopardize the entire P.S. #4.

- Raw Water Piping – the proposed 54X42 cross provides minimal vertical separation (approximately 6-inches). A pair concrete cradles installed on each side of the 54-inch concrete main will mitigate the force of the 42-inch main installed above at the crossing. A condition will be added to the Act 399 permit to field adjust the 42-inch main installation to maximize the vertical separation at the crossing.

Please provide 2 full-sized sets of WTP Rehabilitation Plans that include the requested information and revisions.

Phase II – Segment 2 - Bray Road Sludge Lagoon

Provide 2 full-sized sets of construction plans for proposed work at the Bray Road sludge lagoon. Separation between the concrete disposal area the lime sludge disposal area by metal sheet piling, as discussed in our meeting, needs to be depicted.

Prepare final Bray Road Lime Sludge Management Plan. The plan also needs to include establishment of a level working surface in the west portion of the lagoon and removal of the island.

The Act 399 permit will also include a condition requiring the sheet piling to be driven deep enough into native soil to maintain its structural integrity for removal of waste material on the exterior portion of the lagoon.

Flint WTP Improvements
Phase II
Segments I-III
MDEQ Comments
March 19 , 2014

Segment 1 - Cut –in Piping

The detail shows air-release manholes with corp. stops? How will the air release operation be executed? Means to drain the manhole?

Written response needed.....

Segment 1 – WTP Rehab

1. Raw Water Piping – Maintain back-up supply from Gen Co. during interim operation at C.S. #2. Sheet C5-102

   54X42 cross (Sheet C5-501 & C5-101) only 6-inches – Support?

   Air-release manhole – same as Cut-in piping

   Current yard piping diagram?

Written response needed on the first 3 items. Yard piping diagram will be a work in progress.

2. Mid-Point CL2 - Basis of design provided

   - Scale – use existing or proposed? If poposed - type, capacity
   - Scrubber?
   - Room air-exchange rate ?
   - Pipe penetrations – discuss protective seal
   - Floor drains – discuss
   - Door sweep - discuss
   - Scrubber piping – lower intake

FIN 516 6793

- Check valve/anti-siphon at influent channel - include in final

3. High Service Pump

   Will mechanical ball valve operate like a check valve in event of unexpected pump shut-down?

   TDH of current pump and proposed pump?
   Conformance of proposed pump TDH with system head curve?

   Written response needed.....

4. LOX/LN Storage

   Piping configuration clarified
   The LN calculation (71 ppd) is not clear. Is there a % concentration or transfer efficiency?

5. Electrical improvements

   Are operation of the pumps being split with the MCC or are multiple MCCs being provided?

   Written response needed.....

Flint WTP Improvements
Phase II
Segments I-III
MDEQ Comments
February 27, 2014

2 FKNS
– ACCESS
– MONUMENT A.R. INC
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TO ACCESS A.R.
during Filling

Segment 1 - Cut –in Piping

✓ **The detail shows air-release manholes with corp. stops? How will the air release operation be executed? Means to drain the manhole?**

↳ Pump em down

Segment 1 – WTP Rehab

✓ **1. Raw Water Piping – Maintain back-up supply from Gen Co. during interim operation at C.S. #2. Sheet C5-102**

Not 60" of just prior to

✓ **54X42 cross (Sheet C5-501 & C5-101) only 6-inches – Support?**

↳ Field adjust the steel WM – MAY MISS the Available

✓ **Air-release manhole – same as Cut-in piping**

↳ Same design

Current yard piping diagram? – Work in Progress

SAME Op. Concept

2. Mid-Point CL2 - Basis of design needed

- Application rate (both mid-pt & post for CT)
- CL2 gas max dosage LBs/Day
- Scale – type, capacity ✓ 4 NEW SCALETRON IND.
- Rotometer (lbs/day)
- Vacc reg, injector, educator (size)
- Scrubber capacity – Not being installed
- Room air-exchange rate 1/3.3 MIN
- Pipe penetrations – Sheet C-103 – linkseal – gas resistant? – will inspect & seal
- Floor drains – to be plugged
- Door sweep – NEW better sealing sweeps to be provided?
- Safety features – obs window, fan, lights, switches, panic bar
- Scrubber piping – lower intake ⇒ will extend to Floor w. 90° bend
- Check valve/anti-siphon at influent channel – yes

hydraulic check valve will close on system failure/shut-down

3. **High Service Pump**

   Will mechanical ball valve operate like a check valve in event of unexpected pump shut-down?

   TDH of current pump and proposed pump? 185 will match w. smaller pump
   Conformance of proposed pump TDH with system head curve?

4. **LOX/LN Storage**

   LOX & LN piping clarification – Sheet D2-102 & D2-601
   BOD for storage
   Ozone was designed at 4.0 mg/l max dose @ 36 MGD (Sec. 3.5 WTP BOD)

   Ozone max dose at 18.0 MGD is 650 Lbs/day

   How many GPD does this equate to?

5. **Electrical improvements**

   Are operation of the pumps being split with the MCC or are multiple MCCs being provided?

One switchgear – dual feed
Two breakers – redundancy

Flint WTP Improvements – Phase II, Segments I, II and III

Responses to MDEQ Review Comments dated 3/19/2014

Segment I – Initial Watermain Cut-in

1. Detail 2, Sheet C-504, "Air Release & Access Manhole," shows a 2" corp stop for air release. These are intended to be manual air release valves for exhausting air upon initial filling of the pipeline or after maintenance has been performed and refilling the pipeline. The manhole structure will be checked periodically and pumped out with a portable sump pump as part of the normal plant maintenance program.

Segment 1 – Rehabilitation

1. Raw Water Piping
   a. Maintain back up supply from Genesee County during interim operation at C.S. #2. Installation of the 42" raw water piping has been delayed until the KWA project is closer to being ready to supply water to the City. This will allow the City to maintain the backup supply from Genesee County during interim operation.
   b. The crossing of the new 42" steel pipe over the existing 54" concrete pipe is shown in plan on drawing sheet C5-101, with Detail 5, Sheet C5-501 showing how the 42-inch line will be supported. As shown on Detail 5, Sheet C5-501, the new 42-inch line will have concrete pipe cradles constructed on either side of the existing 54" pipe, maintaining a minimum clearance of 12" on either side of the 54" pipe. Pipe loads from the 42" line will then be transferred to the pipe cradles and into the soil, and not the 54" pipe. The 6" clearance between the two pipes will be backfilled with CLSM material as it will be impossible to compact typical granular bedding material under the 42" pipe.
   c. Detail 2, Sheet C5-505, "Air Release & Access Manhole," shows a 2" corp stop for air release. These are intended to be manual air release valves for exhausting air upon initial filling of the pipeline or after maintenance has been performed and refilling the pipeline. The manhole structure will be checked periodically and pumped out with a portable sump pump as part of the normal plant maintenance program.
   d. See attached color coded yard piping diagram.

2. Midpoint Chlorination
   a. Four (4) new scales will be provided for monitoring chlorine usage from ton containers. Scales shall be as manufactured by Scaletron Industries Ltd. with a load range of 0 to 4000 lbs.
   b. The City has not been able to determine that the chlorine scrubber is a requirement of any applicable code. At this time, the City will not be installing the chlorine scrubber shown on the design drawings and will rely on the existing ventilation system to exhaust air from the Chlorine Storage Room.
   c. The existing ventilation in the Chlorine Storage Room was tested to have a capacity of 18.3 air changes per hour, or 0.305 air changes per minute. Therefore, one room volume air

change would take approximately 3.3 minutes with the current ventilation system. See attached test results. Due to the size of the existing Chlorine Storage Room, a ventilation system of 1 air change per minute is not practical. While the existing ventilation system capacity is less than 1 air change per minute, it appears to be in compliance with 10 State Standards as lesser rates may be considered in cases where 1 air change per minute is not appropriate due to the size of the room.

d. WTP staff will identify and inspect all proposed and existing piping and conduit wall penetrations in the Chlorine Storage Room and seal as necessary to prevent gas leakage into other parts of Pump Station No. 4.
e. Existing floor drains in the Chlorine Storage Room were for condensate from the old chlorine evaporator system. These drains will no longer be used and will be plugged by WTP staff.
f. WTP staff will attach new door sweeps with better seals at existing doors as required.
g. WTP staff will extend existing ventilation intake ductwork to finished floor level with 90-degree bends.
h. Per Addendum No. 1, an Anti-siphon / Back Pressure Valve and additional ball valve shall be added just prior to the trough wall penetration. The anti-siphon / back pressure valve shall be PVC and designed for use with chlorine systems. The valve shall be a LMI #35856, Walchem E90422, or engineer approved equivalent. The valve shall be installed between the two ball valves to allow for isolation during servicing. The valve shall be located above the high water level in the trough. The Contractor shall install a 1" drain line from the relief port to the finished floor elevation of the pipe gallery.

3. High Service Pump
   a. The new 16" pump control ball valve for HSP #1 replaces the existing pump control ball valve in kind and will operate in the same manner as the existing valve. The valve will act like a check valve upon emergency shutdown of the pump through the use of a hydraulic cylinder actuator that will automatically close the valve. The cylinder actuator uses hydraulic water system pressure to supply the energy required to close the valve.
   b. The existing HSP #1 is rated for 25 MGD at 185' TDH. The proposed replacement HSP #1 is rated for 15 MGD at 185' TDH, matching the head condition of the existing pump.
   c. Results from the City's hydraulic model were used to develop system curves for max day and average day, which were used to confirm pump selection. The proposed HSP #1 will operate on a VFD which can be adjusted during operation to meet various duty points depending on demand.

4. LOX/LIN Storage
   a. Nitrogen usage is calculated based on 2.5 % of the oxygen usage:

      2,833 ppd O_2 x 0.025 = 71 ppd N_2

5. Electrical Improvements
   a. The operation of the pumps is contained within a single switchgear at Pump Station No. 4. However, there will be a dual feed coming into the main plant switchgear that will supply redundant power to the plant, including Pump Station No. 4. There will also be two breakers

at the main plant switchgear that feed two different breakers at Pump Station No. 4. Therefore, any one point of failure will not take the system down.

DEQ
RESOURCE MANAGEMENT DIVISION
APR 08 2014
LANSING DISTRICT

Lockwood, Andrews & Newnam, Inc.
A LEO A DALY COMPANY

Proposed Bray Road Lime Sludge Management Plan

1. Introduction

The City of Flint plans to utilize their existing WTP to provide water on a continuous basis. The city plans to treat water from the Flint River until construction of the proposed KWA supply system is complete and the WTP can then be used to treat water from Lake Huron. Until then, The City of Flint will be utilizing the Bray Road Disposal site to pump lime sludge for interim storage with decant water being pumped into the City of Flint sanitary sewer system. The Flint River and consequently the Bray Road facility will be utilized during the KWA Supply System era for emergencies or to supplement water supply demands beyond current max day provided by KWA.

2. Proposed Lime Sludge Management Plan

LAN has been working with the City to evaluate, design and implement a lime residuals disposal plan to handle softening sludge for the interim period and long term operation of using the Flint River as a water source. The most feasible option is the use of Bray Road lagoon which was constructed in 1958. The site has been used intermittently since then during select test runs by the City. However, a concern by the MDEQ about unauthorized discharges into the neighboring stream and disposal of street sweeping, concrete and asphalt chunks has made this site off limits for the time being. Our team is working with City staff to develop a preliminary work plan and schedule that will address the concerns of the MDEQ and allow the use of the site for continued discharges of lime sludge in the interim basis and in the long run when emergencies and supplemental water supply require the use of lime softening at the water treatment plant.

EXISTING SYSTEM

The most common sludge dewatering method is use of lagoons to settle the lime sludge and decant the water. The lime sludge from the water treatment clarifiers is transferred by pipe to a dewatering lagoon, e.g. at the Bray road site. The pipe network for the discharge line into the Bray Road site consists of an 8 " pipe with multiple discharge feeders with valves that distributes the flow of the lime sludge into the dewatering lagoon. This facility has one large dewatering lagoon and one small lagoon for decant water. The two are separated by a dike and a concrete structure with an adjustable stop log system that controls the flows between the two lagoons. The large dewatering lagoon is capable of decanting the water on top of the sludge (supernatant) to the adjacent small lagoon for discharge to the nearby Cornwell Drain via an outlet tower. See Figure 1 - Existing Site Layout. Figure 2 – Decant Lagoon Blow Up.

The site was constructed in the late 1950s and was used on a permanent basis until the City entered into a contract to obtain treated water from the City of Detroit, at which time; the site was used occasionally for test runs as a redundant system. During this period, the City of Flint did not control fully site activities and some unauthorized discharges of illegal debris got placed within the site that has compromised the use of the site. As a result, The MDEQ has, on multiple occasions, requested that the City secure the site and insures that these activities are suspended while addressing the illegal disposal of street sweeping, concrete and asphalt debris within the site. See Figure 3.

PROPOSED SYSTEM

The proposed upgrades associated with the Softening Residuals Disposal have been categorized into Phase II – Segment II and are to be completed as soon as practical so that the WTP can be utilized to treat water from the Flint River in the spring of 2014. However, the use of the Bray Road lagoon for other disposal activities will require that this issue be addressed independently to certain extent as to isolate the problem areas while working with MDEQ to permit its use for lime sludge disposal.

In order to analyze the issues, define the possibility of using the site and address MDEQ concerns, the LAN Team has performed additional survey, geotechnical and environmental testing at the site in order to assess the condition of the lime sludge in the basin and to verify the capacity of the lagoon system. Based on the preliminary findings of this evaluation, proposed improvements will be designed to accommodate the use of the facility in the interim basis (during the use of the Flint river) while addressing some of the MDEQ concerns about the site and any unauthorized discharges into the nearby stream. Permitting for site use will be incorporated as part of the overall design improvements at the WTP and submitted to the MDEQ for their pre-permit review and comments. A final package will be submitted to the MDEQ at the 100% design stage for permit issuance and approval of work plan.

The intended Work plan encompasses the following action items:

1. Evaluate the existing conditions in comparison to the original site design and its intended functionality in order to evaluate required design changes. Figures 1 & 2 highlight the original design and select key elements while Figure 3 shows the changes that may affect proper operation of the system.
2. Site survey of the project site has been completed. Collected data confirms the plan that the site has the required capacity to handle the continuous full time operation of the plant during the next 30 to 36 months until the KWA system is constructed and connection is made at which time, lime softening will not be required. Figure 4 highlights the current

site features and proposed elevation for the required volume and anticipated 2 feet free board.

3. In order to address MDEQ concerns about discharges to the Cornwell Drain, the outlet tower will be capped to terminate any discharges to the stream while lime softening is in use at the WTP.
4. A separation barrier will be constructed to isolate the disposal area from the lime sludge discharge bay as shown in Figure 4.
5. A decant structure and submersible pump station will be constructed in the SE corner of the upper lagoon bay to treat and dispose of flows into the City's sanitary system. This system will be fully operational while the plant is treating river water and lime softening is required. A new storm treatment outlet structure may be reestablished with the approval of MDEQ after the KWA connection is online and lime softening is no longer in use.
6. In order to assess the potential impact of the disposal site on the ground water, two new monitoring wells were installed along the west side of the site in order to analyze the characteristics of the flow entering the site while using the existing monitoring wells to check whether these characteristics have worsened or not. Based on the results of the well data collected, it does not seem that the debris area is a cause for contamination to the site; However, The City will have to develop a more definitive environmental work plan to further evaluate and insure that the debris will not cause any detrimental effect on the groundwater system.

PROPOSED MANAGEMENT PLAN

Drying and selling lime sludge for agricultural lime is a desirable solution to the disposal problem, since the money made by the sale offsets the disposal cost paid by the water treatment plant: if the lime sludge were not sold as a product, no value for the material could be recovered. However, The City of Flint has not had the time to research this option and find a suitable consumer(s) for such a transaction. But this option will be pursued and the plan will be modified for approval by the MDEQ when such option becomes viable.

Lime sludge could be disposed of in municipal solid waste (MSW) landfills. However, it is Safe to assume that MSW landfills would prefer stockpiled lime sludge to be somewhat dry, because landfills need to minimize the amount of leachate they generate. Furthermore, if lime sludge were sent to a MSW landfill, the producer of the sludge may have to pay for the costs of drying, loading, and transporting the sludge, plus tipping fees.

Since the sludge may need to be retained in the lagoon for an average 10 -12 months before it is excavated from the dewatering lagoon with a backhoe and isolated to be dried in the sun during the summer in a month or two depending on air temperature, sun exposure, and humidity. Therefore The City of Flint is proposing the following approach to their lime sludge management plan:

1. The City is committed to removing all new lime sludge to be generated during the operation of the plant using Flint River water in addition to 10% of the lime sludge already in place at the site.
2. The equivalent of 10% of existing lime sludge and all future accumulations will be disposed of site either at the landfill or using approved land application sites.
3. Existing lime sludge on site will be manipulated and stored in two semi isolated bays along the north side of the lagoon in order to allow the City to start removing it from site for disposal at the landfill until land application sites are determined and approved by MDEQ.
4. The four available orifices, on site, will be utilized to discharge lime sludge into the lagoon system based on a quarterly or semi-annual rotating schedule as to allow for proper distribution of the lime sludge within the lagoon.
5. No flows will be permitted into the decant lagoon until the pump station is fully operational. However, the plan is to maintain the level working surface within the sludge lagoon at 738.5' while the pump station and decant system is operational.

3. Implementation Schedule

The majority of the work associated with the operation of the WTP will need to be accomplished and completed by April 15, 2014 so the plant can be operational by April 17, 2014. All work associated with the Bray road site may not be complete but the following activities will be completed in order to allow for the successful operation of the Plant with MDEQ approval. The activities to be completed immediately are as follows:

1. Suitable Barrier of clay berm will be constructed to isolate the disposal area from the dewatering lagoon and will be completed as agreed to with MDEQ.
2. Outlet Tower will be bulk headed out of the decant lagoon as to insure no outflow to the stream nearby (Cornwell Drain).
3. New orifice will be installed near the SE corner of the site to replace the two damaged that will be abandoned.
4. Stop logs will be in place to isolate the dewatering lagoon from the decant lagoon until the pump station is operational.
5. Existing lime sludge will be manipulated along the edges as to excavate and store dry lime sludge in the upper two semi isolated bays for regular removal and disposal at the landfill until land application options are available for permitted use.

The City is committed to provide the appropriate improvements for the proper use of the site as a lime sludge disposal facility while addressing the issues associated with the unauthorized disposal areas so the site can be closed suitably and allow it to function as initially intended.

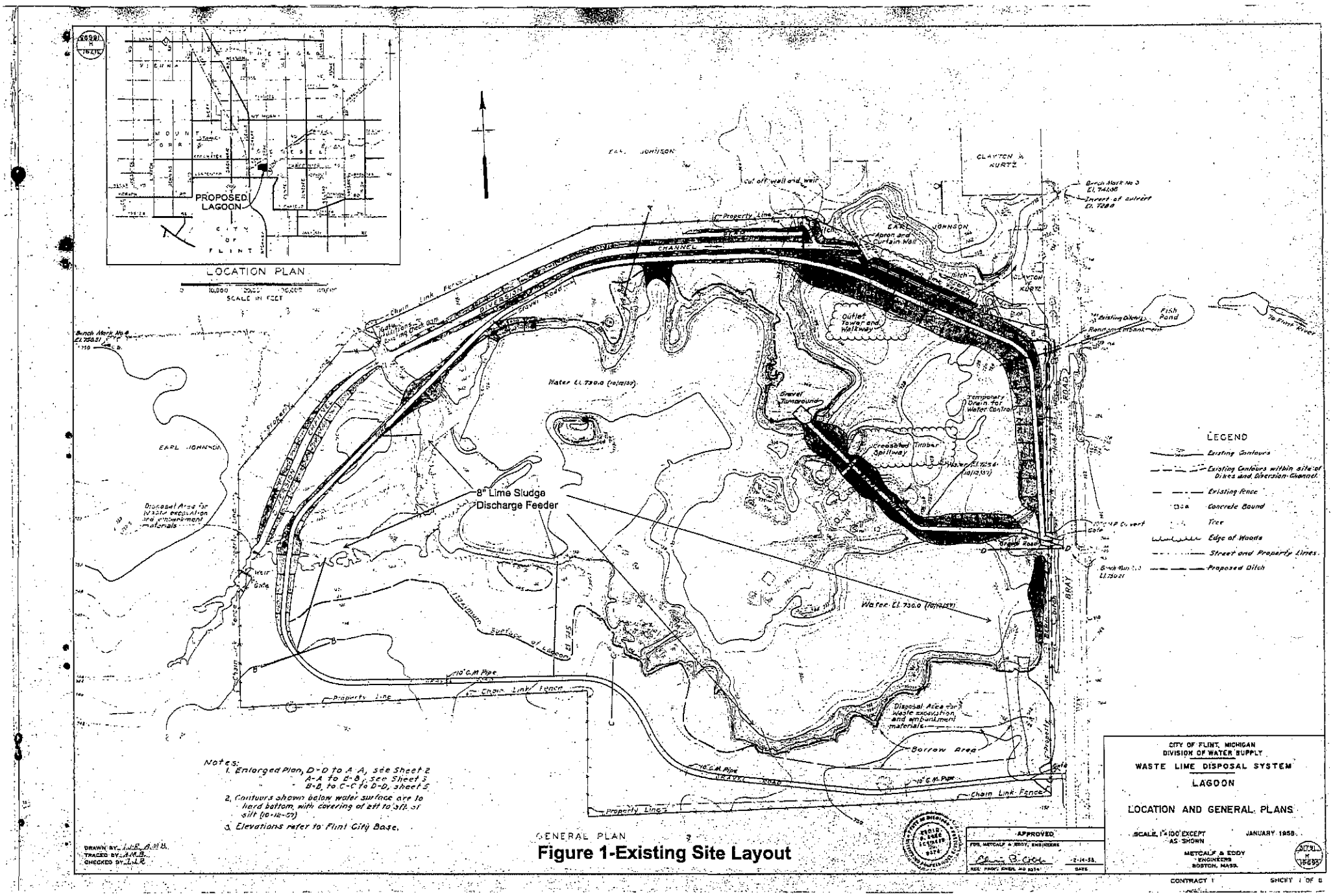


Figure 1-Existing Site Layout

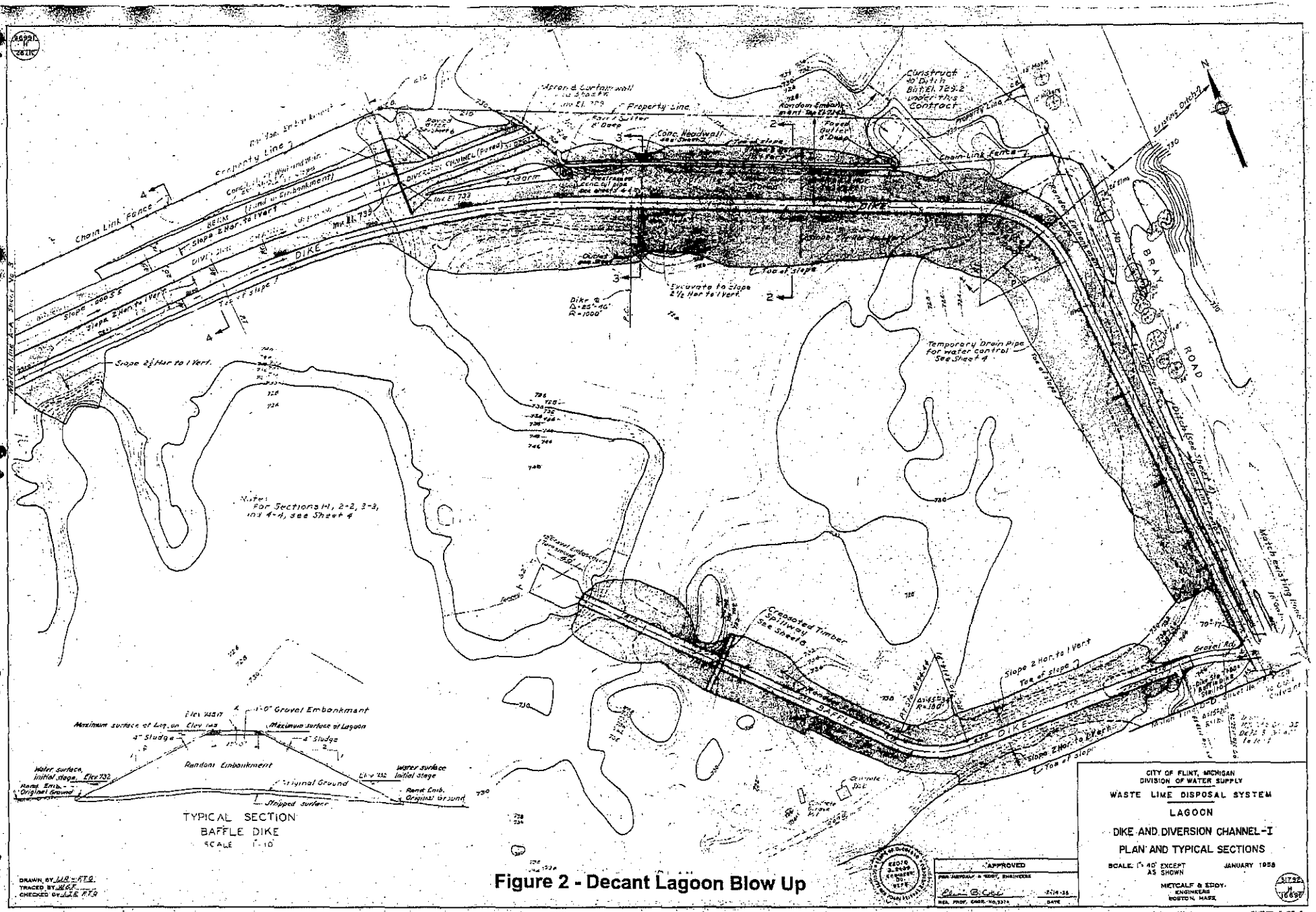


Figure 2 - Decant Lagoon Blow Up

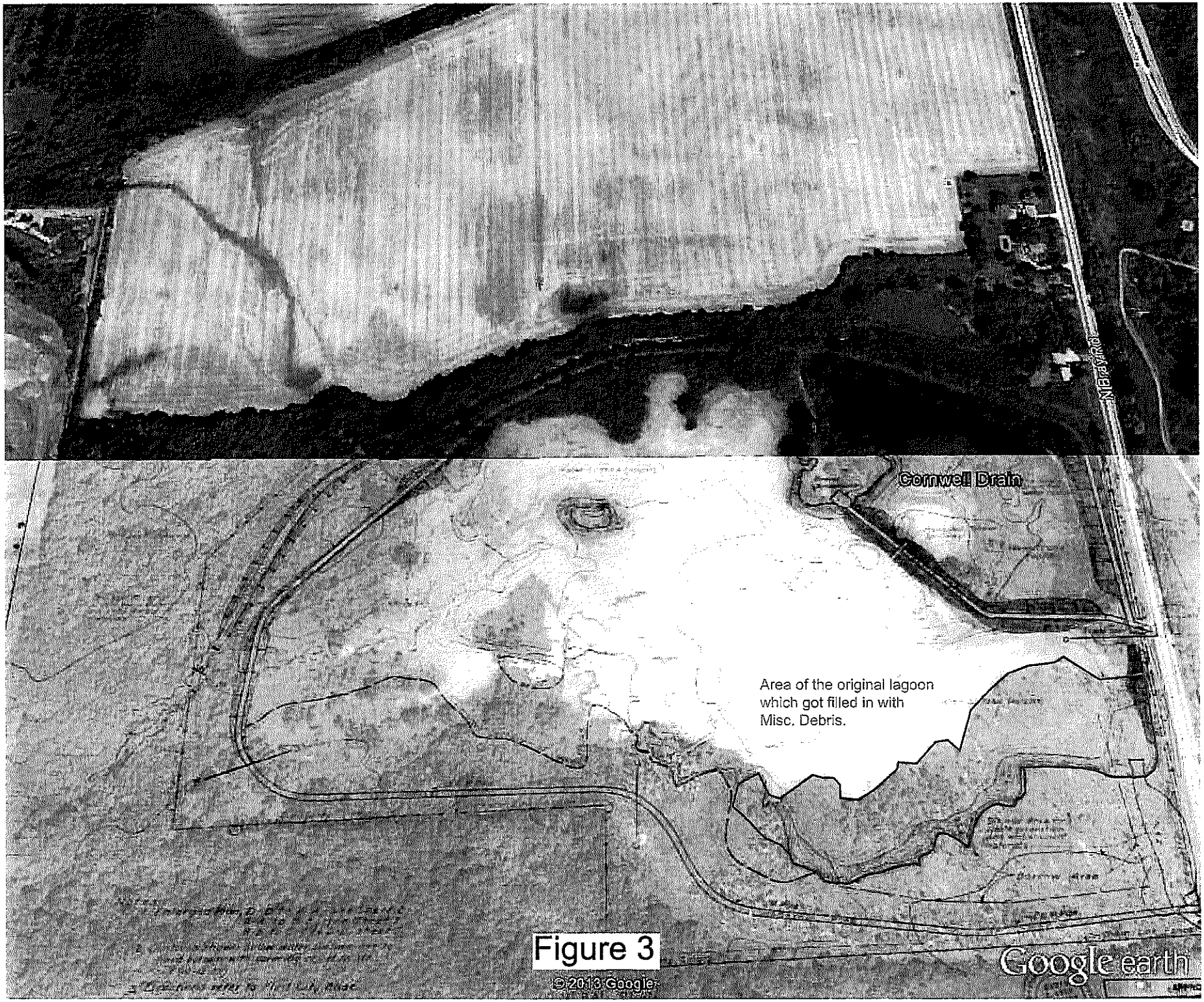
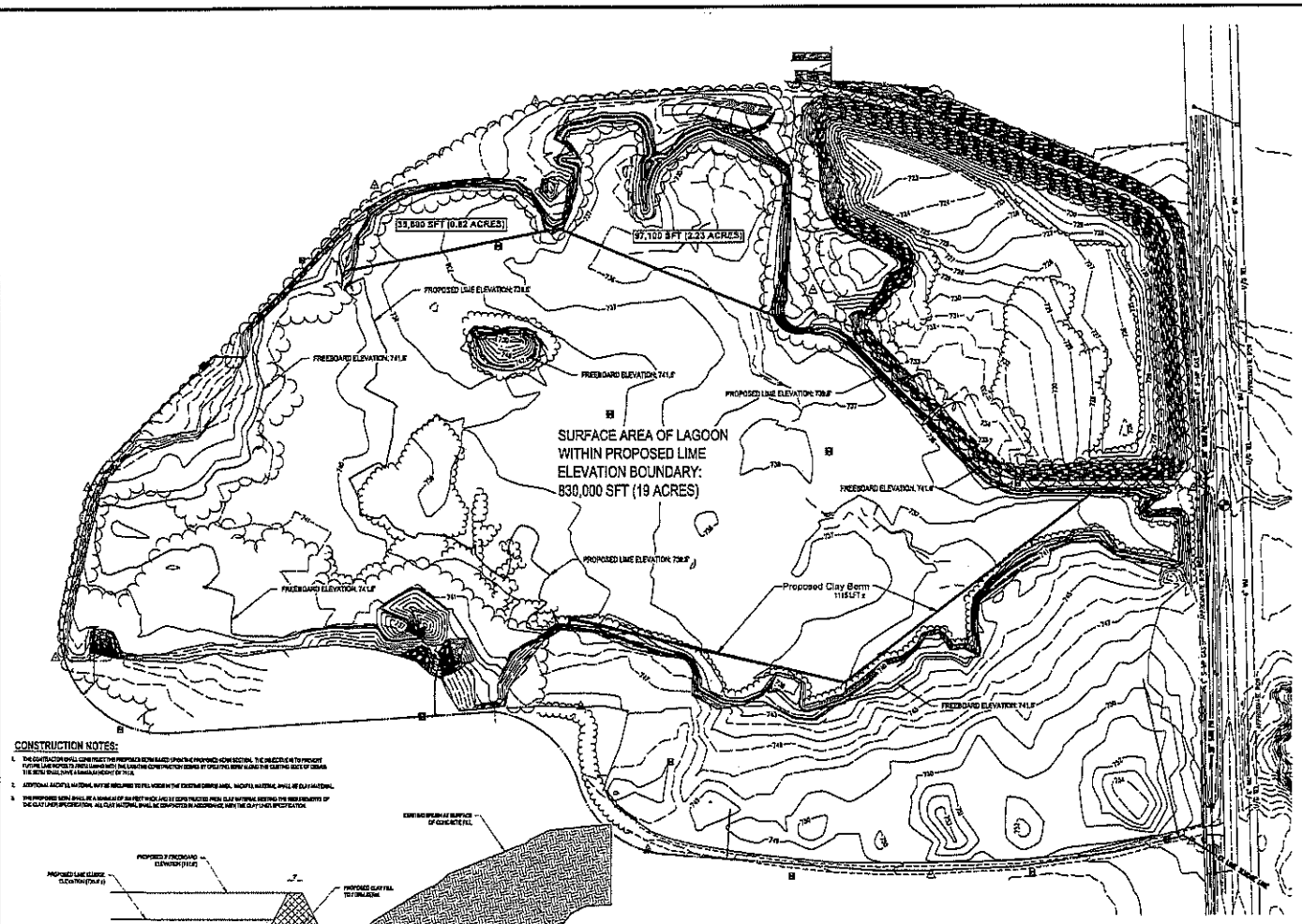
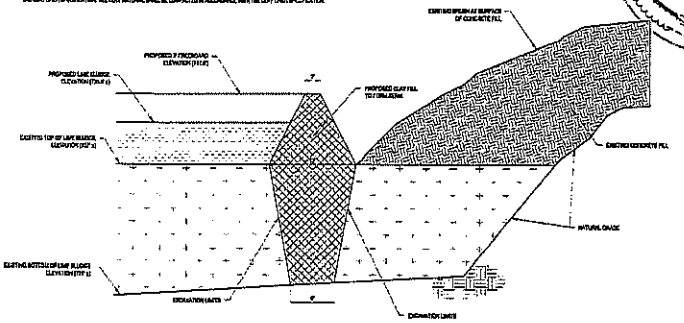

Cornwell Drain
Area of the original lagoon which got filled in with Misc. Debris.
Google earth
© 2013 Google

Figure 3



CONSTRUCTION NOTES:

1. THE CONSTRUCTION WILL CONSTRUCT THE PROPOSED BERM BASED UPON THE PROVIDED ROWE SECTION. THE OBJECTIVE IS TO PREVENT FUTURE LIME SLURRY FLOWS (WITH LIMING MUD) ONTO EXISTING CONSTRUCTION DURING BY CREATING BERM ALONG THE EXISTING EDGE OF DRAIN. THE BERM SHALL HAVE A MINIMUM WIDTH OF 7'-0".
2. ADDITIONAL BACKFILL MATERIAL MAY BE REQUIRED TO FILL VOIDS IN THE EXISTING DIKING AREA. BACKFILL MATERIAL SHALL BE CLAY MATERIAL.
3. THE PROPOSED BERM SHALL BE A MINIMUM OF 2'-0" THICK AND BE CONSTRUCTED FROM CLAY MATERIAL MEETING THE REQUIREMENTS OF THE CLAY LINER SPECIFICATION. ALL CLAY MATERIAL SHALL BE COMPACTED IN ACCORDANCE WITH THE CLAY LINER SPECIFICATION.



1 PROPOSED BERM SECTION
SCALE: N.T.S.

Figure 4

Flint WTP
Phase II, Segment II
Lime Residual Disposal
Flint MI, 48505

Lockwood, Andrews & Newnam, Inc.
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KEY PLAN

REVISIONS

NO.	DESCRIPTION	DATE

FILE LOG

Manager	DAH
Designer	MAH
Drafter	KPS
Checker	DAH
Client	

Project No. 130-10701-001
Date: February 28, 2014

© LAN A DAILY Company 2014

Project Name: P:\LAN\FLINT\PROJECTFILES\PROJECTS\130-10701-001\V1-0-PRODUCTION\V1-01-DRAWINGS\
File R:\Projects\130701\Dwg\Construction Drawings\Dwg Conceptdwg Plotted: 3/25/2014 2:49 PM By Kevin Sova

966000

Prysby, Mike (DEQ)

From:	Matta, Samir <SFMatta@lan-inc.com>
Sent:	Wednesday, March 26, 2014 2:22 PM
To:	Prysby, Mike (DEQ); Busch, Stephen (DEQ); Arduin, Jim (DEQ)
Cc:	Daugherty Johnson; Brent Wright (bwright@cityofflint.com)
Subject:	Bray Road Alternative Separation Concepts.
Attachments:	Piling Concept 3-24-14 (2).pdf - Adobe Acrobat.pdf; MC-3500 Chamber from ADS StormTech System.pdf

Hi All,

As requested, the following two concepts are being discussed with the City and ultimately with the contractor to see which one is more in line with the project budget and can be accomplished in a timely matter. The attached concept shows sheet piling being proposed which will be terminated at the designated height needed to achieve a 2' freeboard along the alignment highlighted in RED.

The other concept which we discussed on the phone will entail using a light weight storm chamber (see attachment) fastened to a 4x8 plywood sheeting, attached together, with a geotextile fabric along the back side to follow the same alignment as the sheet piling option. It will be placed directly on the existing lime sludge in front of the disposal area for separation.

Please review, let me know if you have any questions and we can further discuss on Monday.

Thanks.

Samir F. Matta, PE
Senior Project Manager

Lockwood, Andrews & Newnam, Inc.
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Flint WTP Improvements
Bray Road Lime Sludge Lagoon
MDEQ Comments
March 21, 2014

1. The placement of the proposed liner and berm fails to establish physical separation between the lime sludge collection area and concrete fill area. For complete separation of these areas, the berm needs to be constructed down to native soil.

   As proposed, this appears to constitute the first step towards a "cap-in-place" of the existing materials. If waste is left in place within the berm, the city will be required to construct the berm to meet Part 115 cap requirements. In addition, long term groundwater monitoring, financial assurance, closure and post closure plans will be required.

2. Please provide a residuals management plan for the lime sludge collection area. In additional to removal of new lime sludge produced, the plan must also include the gradual removal of existing lime sludge.

3. The working depth of the lime sludge collection area does not appear to meet 10-States Standard's minimum depth of 5 feet. The available volume appears to be 60,000 cubic yards based on 2.6 feet of working depth. Please confirm this. What is the surface area of the lagoon? Please provide a basis of design that includes the amount of lime sludge produced at average day demand and the available days of storage at this production rate. These parameters will need to be used towards developing the residuals management plan. Finally, an acceptable residuals management plan is needed for us to consider a deviation from the 10-State Standards guidelines.

4. An effluent sampling point needs to be provided for decant water.

Total Hardness 272 mg/L use 300 mg/l as $CaCO_3$ 9/13/13 LAN Report

Goal; 100 mg/L as $CaCO_3$

200 mg/L removed

10 stalls -7 Acres/1 MGAL/160 MG removed

Size;

-7A * 10 MGD * 200 mg/L removed / 100 = 14A

Based on 5 Ft depth

we have 2.6 Ft depth — 19 A

SA = 830,000 Ft^2 = 19A

Rem 150 mg/l

-7A * 10 MGD * 150/200 =

LAN Report

@ 14 MGD

@ 12% solids → 73,924 gpd = 366 yd^3/DAY

@ 25% → 183 yd^3/DAY

25% @ 10 mgd → 131 yd^3/DAY

12 mgd → 157 yd^3/DAY

60000 yd^3 / 131 yd^3/DAY = 458 DAYS @ 10 MGD = 1.25 yrs

382 DAY @ 12 MGD = 1 yr

3 Months = 50,000 yd^3 wo. Dirt 3/6

@ 10 MGD

455 yd^3

@ 10 mgd 60,000 yd^3 / 55 yd^3/DAY = 1091 DAYS = 3.0 yrs

@ 12 mgd 60,000 yd^3 / 66 yd^3/DAY = 909 DAYS = 2.5 yrs

BASIS OF DESIGN
BRAY ROAD LIME SLUDGE DECANT WATER TREATMENT SYSTEM
CITY OF FLINT

1. GENERAL DATA

The City of Flint (City) proposes to use the existing lime sludge storage lagoon facility at Bray Road for the next 2.5 years on a continuous basis while the Karegnondi Water Authority (KWA) water system is being constructed. After which, the facility will only be used should the Flint WTP have to treat Flint River water on an emergency basis. In order to maximize storage volume of the facility, the City proposes to construct a decant tower structure, pump station and forcemain to transport the decanted water from the lagoon to a nearby sanitary sewer for final disposal. A CO_2 feed system is also proposed to neutralize the high pH decant waste stream prior to pumping to the sanitary sewer.

The existing lime sludge storage lagoon facility at Bray Road does not have multiple cells; therefore, the sludge will be continuously wetted and will only consolidate to approximately 25% solids. The lime sludge and decant waste stream flows are summarized in the table below:

Lime Sludge Quantities Summary

	WTP Flow [MGD]	Sludge Produced (3% Solids) [gpd]	Sludge Stored (25% Solids) [cy/day]	Decant Waste to Sewer [gpd]	Decant Waste to Sewer [gpm]
Average Day	10 @ 10 MGD	92,000	55 @ 66 yd³/DAY	80,700	56
Current Max Day	18	165,000	98	145,200	100
Prop. Max Day	24	220,000	131	193,600	135

2. CO_2 FEED SYSTEM

a. Process Description

A gaseous carbon dioxide feed system will be installed on the Bray Road site near the decant pump station. The system will include a liquid storage tank, vaporizer, vapor heater, pressure regulator, pH control panel and a gas diffuser. Liquid CO_2 will be stored in a 6-ton tank and regulated through a vaporizer. The gaseous CO_2 will be sent through diffuser piping and released into the decant tower through two (2) 7" diameter disk ceramic diffusers. A pH probe will be located in the decant tower to monitor pH downstream of the CO_2 injection point. The pH probe will transmit the pH reading to the pH control panel, which will regulate the CO_2 feed rate for set point control of the pH in the decant water waste stream.

b. Design Criteria

- Max CO_2 feed – 200 mg/L
- Max decant flow rate – 140 gpm

9

- CO_2 feed system capacity @ Max Day (140 gpm)

$$\frac{140 gpm}{694.4 \frac{gpm}{MGD}} * 200 ppm\ CO_2 * \frac{8.34 lb}{gal} = 336\ lb/day$$

- CO_2 feed system capacity @ Average Day (60 gpm)

$$\frac{60 gpm}{694.4 \frac{gpm}{MGD}} * 200 ppm\ CO_2 * \frac{8.34 lb}{gal} = 144\ lb/day$$

- CO_2 storage for minimum 30 days at Average Day per 10 States Standards

$$144 \frac{lb}{day} * 30\ days = 4{,}320\ lbs = 2.16\ tons$$

c. Equipment

- One (1) 6 ton capacity Liquid Carbon Dioxide storage tank system complete with refrigeration unit (6 ton is minimum for CO_2 delivery by tanker truck)
- One (1) 12 kW electric vaporizer
- One (1) vapor heater
- One (1) First stage CO_2 pressure regulator
- One (1) Carbon Dioxide pH control panel
- One (1) Carbon Dioxide gas diffuser assembly
- One (1) pH Transducer
- Two (2) 7" Diameter Ceramic Disk-type diffusers

3. DECANT TOWER

a. Process Description

The decant tower is a 6'x6' precast manhole with three (3) 12"W x 36"H staggered openings that will provide 9' of total operating depth for decanting. Each opening has an interior wall-mounted inverted slide gate with a manual operator and an external stoplog channel to allow maintenance on the slide gate when necessary. An under-flow baffle wall will be installed to promote CO_2 transfer into the decant waste stream and prevent short circuiting. A pH probe will be installed just below the invert of the 8" gravity pipe to the decant pump station.

b. Design Criteria

- Average day flow rate = 60 gpm
- Peak day flow rate = 140 gpm

- Minimum detention time = 20 min

$$Min\ Detention\ Volume\ Required = 20\ min * 140 gpm * \frac{0.1337 ft^3}{gal} = 374.3\ ft^3$$

- Minimum liquid level above diffuser = 10' per manufacturer

c. Equipment

- One (1) 6'x6'x25' precast manhole
  - Top of structure elevation = 744.00'
  - Top of baffle wall elevation = 742.00'
  - Maximum lagoon operating level elevation = 739.60'
  - Slide gate 1 invert elevation= 736.60'
  - Slide gate 2 invert elevation = 733.60'
  - Slide gate 3 invert elevation = 730.60'
  - 8" gravity line invert elevation = 730.33'
  - Lagoon bottom elevation = 730.00'
  - Bottom of baffle wall elevation = 722.00'
  - Diffuser centerline elevation = 720.25'
  - Bottom of decant tower elevation = 719.00'

- Detention Time:

@ Max Day $\frac{\left[(730.33-719.00)*6*6*\frac{7.48\ gal}{CF}\right]}{140\ gpm} = 21.8\ min$

@ Average Day $\frac{\left[(730.33-719.00)*6*6*\frac{7.48\ gal}{CF}\right]}{60\ gpm} = 50.8\ min$

- Minimum Operating Depth Over Diffusers: 730.33' - 720.25' = 10.08'
- Three (3) 12"W x36"H inverted slide gates, 304SS
- Three (3) 20"W Stoplogs and channels, 304SS
- One (1) 6'W x 20'H Baffle Wall, FRP
- 8" Diameter Gravity line to Decant P.S., DIP or PVC

4. DECANT PUMP STATION DESIGN AND FORCEMAIN

a. Process Description

The decant pump station will be a 6' diameter precast concrete manhole. It will be fed through an 8" gravity line from the decant tower. Two (2) 140-gpm submersible solids handling pumps will be installed with quick discharge connections and guide rails for lifting and lowering the pumps for maintenance. The pumps will be controlled by a float switch assembly consisting of four (4) switches: pumps off; pump 1 on; pump 2 on; high water alarm. The pump

discharge piping will connect to a 4" diameter forcemain that will transport the waste stream to a nearby sanitary sewer.

b. Design Criteria

- Max Day flow rate, Qmax = 140 gpm
- Average Day flow rate, Qave = 60 gpm
- Maximum pump starts per hour = 10

$$Cycle\ time\ (\theta) = \frac{60\ min}{10\ cycles} = 6\ min$$

$$Minimum\ sump\ volume = \frac{Q_{pump} * \theta}{4} = \frac{140 * 6}{4} = 210\ gal$$

- Minimum forcemain velocity of 2 ft/s

c. Equipment

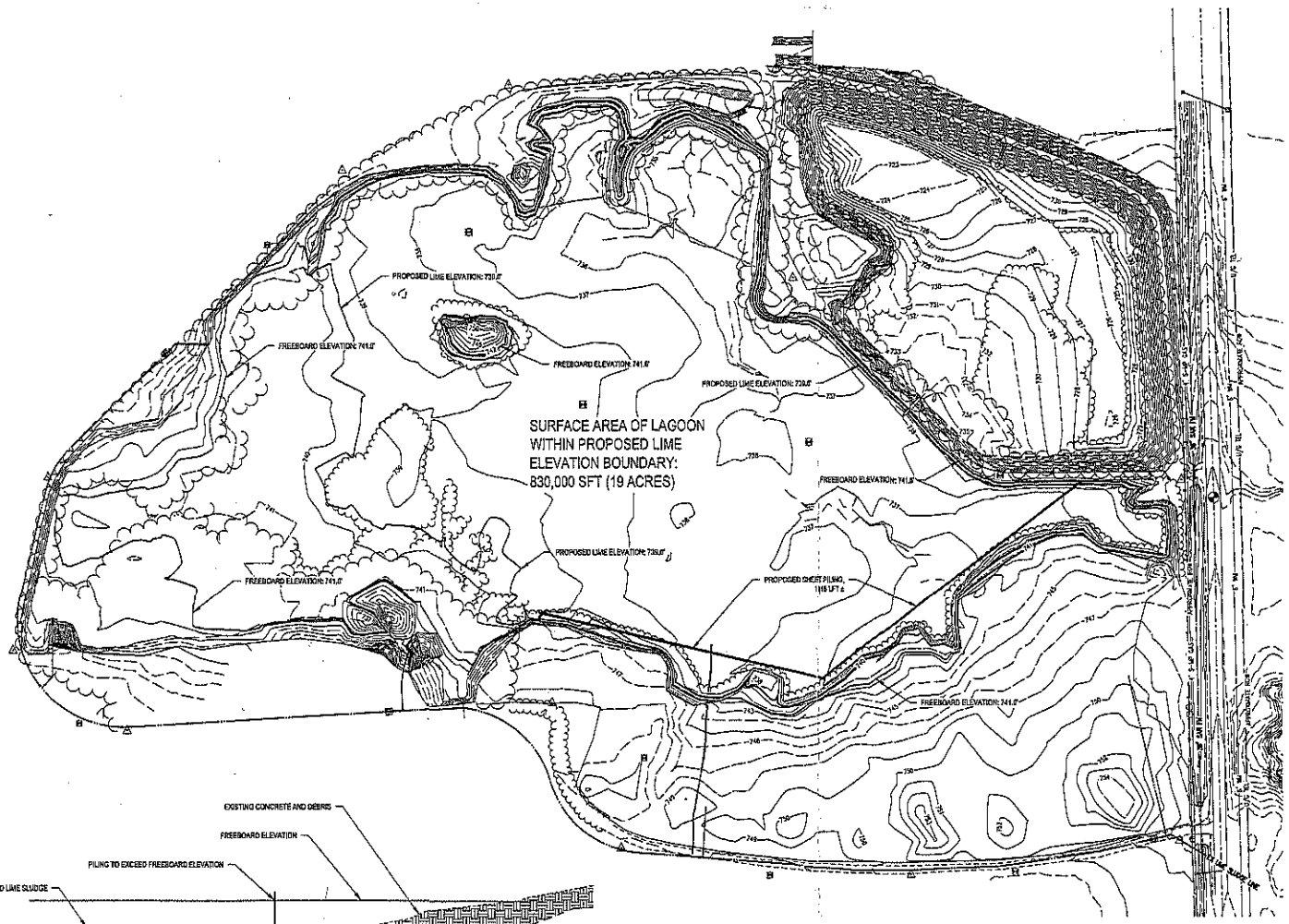
- One (1) 6'*Diameter* x 18'H precast manhole
  - Top of structure elevation = 744.00'
  - High Water Alarm elevation = 731.25'
  - Gravity line invert elevation = 730.25'
  - Pump 2 On elevation = 729.75'
  - Pump 1 On elevation = 728.75'
  - Pumps Off elevation = 727.50'
  - Bottom of pump station elevation = 726.00'

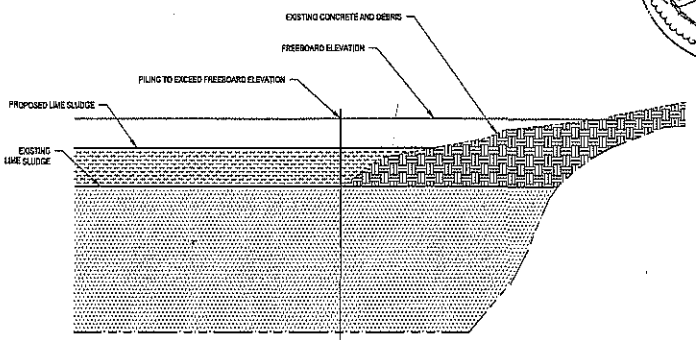
$$Wetwell\ volume = \frac{\pi D^2}{4} = \frac{\pi 6^2}{4} = 28.27\ \frac{ft^3}{ft} * 7.48 \frac{gal}{ft^3} = 211.5 \frac{gal}{ft}$$

$$Pump\ Run\ Time = \frac{(728.75' - 727.50') * 211.5 \frac{gal}{ft}}{(140\ gpm - 60\ gpm)} = 3.3\ min$$

$$Fill\ Time = \frac{(728.75' - 727.50') * 211.5 \frac{gal}{ft}}{(60\ gpm)} = 4.4\ min$$

- Two (2) 140-gpm pumps
- One (1) 4-float switch assembly
- 4" Diameter Forcemain, DIP or PVC
  - Forcemain Velocity @ Qmax = $\frac{\frac{140\ gal}{min} * \frac{1\ min}{60\ s} * \frac{1\ CF}{7.48\ gal}}{\pi(\frac{2}{12})^2} = 3.6\ fps$





Flint WTP
Phase II, Segment II
Lime Residual Disposal
Flint MI, 48505

Lockwood, Andrews & Newnam, Inc.
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KEY PLAN

REVISIONS

NO.	DESCRIPTION	DATE

FILE LOG

Manager	MAB
Design	MHL
Draw	MJR
Check	MAB

STAMP

Project No. 130-10701-001
Date: February 28, 2014

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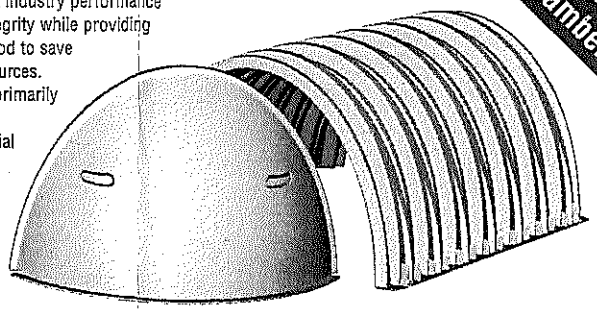
Project Name: P:\LADPW\LADCOUNTY\PROJECTWISE\DOCUMENTS\PROJECTS\130-10701-001\4-0-PRODUCTION\4-01-DRAWINGS\...
File Name: \Projects\130011\Veg\Construction Drawings\Dry Road Lime Lagoon Drawings\Plng Concept.dwg Plotted: 3/25/2014 2:49 PM By Kevin Jones

StormTech MC-3500 Chamber

MC-3500 Chamber

Designed to meet the most stringent industry performance standards for superior structural integrity while providing designers with a cost-effective method to save valuable land and protect water resources. The StormTech system is designed primarily to be used under parking lots thus maximizing land usage for commercial and municipal applications.



StormTech MC-3500 Chamber (not to scale)

Nominal Chamber Specifications

Size (L x W x H)	90" (2286 mm) x 77" (1956 mm) x 45" (1143 mm)
Chamber Storage	109.9 ft³ (3.11 m³)
Min. Installed Storage*	176.9 ft³ (5.06 m³)
Weight	134 lbs (60.8 kg)

* This assumes a minimum of 12" (305 mm) of stone above, 9" (229 mm) of stone below chambers, 9" (229 mm) of stone between chambers/end caps and 40% stone porosity.

StormTech MC-3500 End Cap (not to scale)

Nominal End Cap Specifications

Size (L x W x H)	26.5" (673 mm) x 71" (1803 mm) x 45.1" (1145 mm)
End Cap Storage	15.6 ft³ (0.44 m³)
Min. Installed Storage*	46.9 ft³ (1.33 m³)
Weight	43 lbs (19.5 kg)

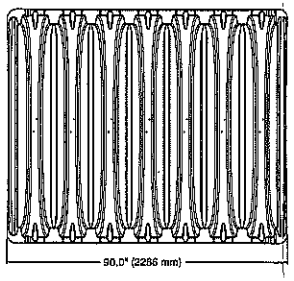
*This assumes a minimum of 12" (305 mm) of stone above, 9" (229 mm) of stone below, 6" (152 mm) of stone perimeter, 9" (229 mm) of stone between chambers/end caps and 40% stone porosity.

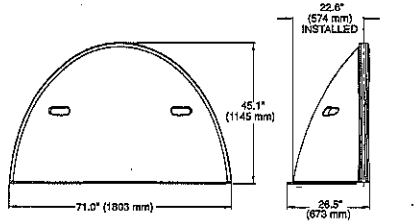
Shipping

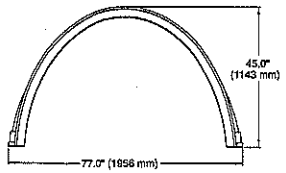
15 chambers/pallet

16 end caps/pallet

7 pallets/truck







231C

PERMIT APPLICATION FOR WATER SUPPLY SYSTEMS

(CONSTRUCTION - ALTERATION - ADDITION OR IMPROVEMENT) AS DESCRIBED HEREIN

Required under the Authority of 1976 PA 399, as amended

This application becomes an Act 399 Permit only when signed and issued by authorized Michigan Department of Environmental Quality (DEQ) Staff. See instructions below for completion of this application.

1. **Municipality or Organization, Address and WSSN** that will own or control the water facilities to be constructed. This permit is to be issued to: City of Flint 4500 North Dort Highway Flint, MI 48505 **WSSN**: 02310	Permit Stamp Area (DEQ use only) MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY PERMIT NO. W 140025 APR 09 2014 EXAMINED AND APPROVED FOR COMPLIANCE WITH ACT 399, P.A. 1976
2. **Owner's Contact Person** (provide name for questions): Contact: Brent Wright Title: Plant Supervisor Phone: 810-787-6537	

3. **Project Name** (Provide phase number if project is segmented):	4. **Project Location** (City, Village, Township):	5. **County** (location of project):
1) Flint WTP Phase II, Sement I - Initial Watermain Cut-In / Rehabilitation; 2) Flint WTP Phase II, Segment II - Lime Residual Disposal; 3) Flint WTP Phase II, Segment III - Electrical Improvements	City of Flint	Genesee County

ISSUED UNDER THE AUTHORITY OF THE DIRECTOR OF THE DEPARTMENT OF ENVIRONMENT QUALITY

cc:

Issued by: _____

Reviewed by: Robert Cook for MPP for Mike Prysby

☐ **If this box is marked see attached special conditions.**

Instructions: Complete items 1 through 5 above and 6 through 21 on the following pages of this application. Print or type all information except for signatures. Mail completed application, plans and specifications, and any attachments to the DEQ District Office having jurisdiction in the area of the proposed construction.

Please Note:

a. This **PERMIT** only authorizes the construction, alteration, addition or improvement of the water system described herein and is issued solely under the authority of 1976 PA 399, as amended.
b. The issuance of this **PERMIT** does not authorize violation of any federal, state or local laws or regulations, nor does it obviate the necessity of obtaining such permits, including any other DEQ permits, or approvals from other units of government as may be required by law.
c. This **PERMIT** expires two (2) years after the date of issuance in accordance with R 325.11306, 1976 PA 399, administrative rules, unless construction has been initiated prior to expiration.
d. Noncompliance with the conditions of this permit and the requirements of the Act constitutes a violation of the Act.
e. Applicant must give notice to public utilities in accordance with 1974 PA 53, (MISS DIG), being Section 460.701 to 460.718 of the Michigan Compiled Laws, and comply with each of the requirements of that Act.
f. All earth changing activities must be conducted in accordance with the requirements of the Soil Erosion and Sedimentation Control Act, Part 91, 1994 PA 451, as amended.
g. All construction activity impacting wetlands must be conducted in accordance with the Wetland Protection Act, Part 303, 1994 PA 451, as amended.
h. Intentionally providing false information in this application constitutes fraud which is punishable by fine and/or imprisonment.
i. Where applicable for water withdrawals, the issuance of this permit indicates compliance with the requirements of Part 327 of Act 451, Great Lakes Preservation Act.

MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY

Permit Application for Water Systems (Continued)

6. **Facilities Description** – In the space below provide a detailed description of the proposed project. Applications without adequate facilities descriptions **will be returned**. SEE EXAMPLES BELOW. Use additional sheets if needed.

Improvements to the City of Flint WTP to enable treatment of Flint River water on an interim basis until the KWA Lake Huron Water Supply is available for connection and use by the City of Flint:

PHASE II, SEGMENT I - INITIAL WATERMAIN CUT-IN / REHABILITATION (@WTP):
* Replace existing 25 MGD HSP #1 at Pump Station No. 4 with a new 700 HP, vertically mounted, split-case centrifugal pump rated for 15 MGD at 185' TDH. New pump suction and discharge piping, valves and supports will also be provided.
* Construction of new ozone system LOX/LIN storage facility to provide system redundancy and a minimum of 30 days chemical storage. A new concrete containment structure will be constructed adjacent to the existing LOX/LIN storage facility. The new LOX and LIN tanks will have nominal capacities of 9000 gal. and 525 gal., respectively.
* Installation of Midpoint Chlorination. A 3"x6" dual walled chlorine solution line, approx. 665 LF, will be installed from the existing chlorine room at Pump Station No. 4 to a diffuser in the filter influent channel at Plant 2. The chlorine gas feed system shall consist of four 500 ppd feed systems (total 2000 ppd) to be installed by City personnel. Each 500 ppd system consists of a ton cylinder mounted vacuum regulator, control panel, ejector, and misc. piping, tubing & valves.
* Approx. 850 LF 42" raw watermain connection from existing 48" and 36" mains that feed the plant to convey KWA raw water to the Ozone Building. Work includes a 54x48 cross to make the initial connection at the Ozone Building, buried yard butterfly valves, access and air release manholes, and cathodic protection test stations.

PHASE II, SEGMENT III - ELECTRICAL IMPROVEMENTS (@WTP):
* Plant substation improvements, including two new 2500 kW transformers and switchgear. The substation switchgear has been fabricated with two utility main breakers, one generator breaker and two tie breakers. So provisions are in place for a future permanent generator. If a temporary generator is needed in the event of an outage to both independent utility services, provisions are in place to temporary cable a large portable generator through a manhole, duct bank and cable tray system to the generator breaker in the substation switchgear
* Plant 2 electrical improvements, including two new 500 kW transformers and switchgear.
* Pump Station No. 4 improvements, including new switchgear and VFD for HSP #1.

EXAMPLES – EXAMPLES – EXAMPLES – EXAMPLES – EXAMPLES – EXAMPLES	
Water Mains	500 feet of 8-inch water main in First Street from Main Street north to State Street. **OR** 250 feet of 12-inch water main in Clark Road from an existing 8-inch main in Third Avenue north to a hydrant.
Booster Stations	A booster station located at the southwest corner of Third Avenue and Main Street, and equipped with two, 15 Hp pumps each rated 150 gpm @ 200 feet TDH. Station includes backup power and all other equipment as required for proper operation.
Elevated Storage Tank	A 300,000 gallon elevated storage tank located in City Park. The proposed tank shall be spherical, all welded construction and supported on a single pedestal. The tank shall be 150 feet in height, 40 feet in diameter with a normal operating range of 130 – 145 feet. The interior coating system shall be ANSI/NSF Standard 61 approved or equivalent. The tank will be equipped with a cathodic protection system, and includes a tank level control system with telemetry.
Chemical Feed	A positive displacement chemical feed pump, rated at 24 gpd @ 110 psi to apply a chlorine solution for Well No. 1. Chlorine is 12.5% NaOCL, ANSI/NSF Standard 60 approved and will be applied at a rate of 1.0 mg/l of actual chlorine.
Water Supply Well	Well No. 3, a 200 foot deep well with 170 feet of 8-inch casing and 30 feet of 8-inch, 10 slot screen. The well will be equipped with a 20 Hp submersible pump and motor rated 200 gpm @ 225 feet TDH, set at 160 feet below land surface.
Treatment Facilities	A 5 million gpd water treatment plant located at the north end of Second Avenue. The facility will include 6 low service pumps, 2 rapid mix basins, 4 flocculation/sedimentation basins, 8 dual media filters, 3 million gallon water storage reservoir and 6 high service pumps. Also included are chemical feed pumps and related appurtenances for the addition of alum, fluoride, phosphate and chlorine.

General Project Information – Complete all boxes below.

7. Design engineer's name, engineering firm, address, phone number, and email address:	8. Indicate who will provide project construction inspection:
Jeremy N. Nakashima, PE Lockwood, Andrews & Newnam, Inc. 1 Oakbrook Terrace, Suite 207 Oakbrook Terrace, IL 60181 630-495-4123 / jnnakashima@lan-inc.com	☒Organization listed in Box 1. ☒Engineering firm listed in Box 7. ☐Other - name, address, and phone number listed below.

9. Is a basis of design attached?
☒YES ☐NO

If no, briefly explain why a basis of design is not needed. Submitted previously under separate cover.

10. Are sealed and signed engineering plans attached?
☒YES ☐NO

If no, briefly explain why engineering plans are not needed. Plans and specs submitted previously under separate cover.

11. Are sealed and signed construction specifications attached?
☒YES ☐NO

If specifications are not attached, they need to be on file at DEQ.

12. Were Recommended Standards for Water Works, Suggested Practice for Water Works, AWWA guidelines, and the requirements of Act 399 and its administrative rules followed?
☒YES ☐NO

If no, explain which deviations were made and why.

13. Are all coatings, chemical additives and construction materials ANSI/NSF or other adequate 3rd party approved?
☒YES ☐NO

If no, describe what coatings, additives or materials did not meet the applicable standard and why.

14. Are all water system facilities being installed in the public right-of-way or a dedicated utility easement? (For projects not located in the public right-of-way, utility easements must be shown on the plans.)
☐YES ☒NO

If no, explain how access will be obtained. Most work will be on City owned property, except forcemain.

15. Is the project construction activity within a wetland (as defined by Section 324.30301(d)) of Part 303, 1994 PA 451?
☐YES ☒NO

If yes, a wetland permit must be obtained.

16. Is the project construction activity within a 100-year floodplain (as defined by R 323.1311(e)) of Part 31, 1994 PA 451, administrative rules?
☐YES ☒NO

If yes, a flood plain permit must be obtained.

17. Is the project construction activity within 500 feet of a lake, reservoir, or stream?
☒YES ☐NO

If yes, a Soil and Erosion Control Permit must be obtained or indicate if the owner listed in box 2 of this application is an Authorized Public Agency (Section 10 of Part 91, 1994 PA 451) ☐ Owner is APA.

MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY

Permit Application for Water Systems (Continued)

18. Will the proposed construction activity be part of a project involving the disturbance of five (5) or more acres of land?
☐YES ☒NO
If yes, is this activity regulated by the National Pollutant Discharge Elimination System storm water regulations?
☐YES: NPDES Authorization to discharge storm water from construction activities must be obtained.

☐NO: Describe why activity is not regulated:
Please call 517-241-8993 with questions regarding the applicability of the storm water regulations.

19. Is the project in or adjacent to a site of suspected or known soil or groundwater contamination?
☐YES ☒NO

If yes, attach a copy of a plan acceptable to the DEQ for handling contaminated soils and/or groundwater disturbed during construction. Contact the local DEQ district office for listings of Michigan sites of environmental contamination.

20. IF YOU ARE A CUSTOMER/WHOLESALE/BULK PURCHASER, COMPLETE THE FOLLOWING

1) Name and WSSN of source water supply system (seller) _____

2) Does the water service contract require water producer/seller to review and approve customer/wholesale/bulk purchaser water system construction plans?
☐YES ☐NO

If yes to #2, the producer/seller approval letter must be attached when submitted to DEQ.

21. **Owner's Certification** The owner of the proposed facilities or the owner's authorized representative shall complete the owner's certification. It is anticipated that the owner will either be a governmental agency (city, village, township, county, etc.) or a private owner (individual, company, association, etc.) of a Type I public water supply.

OWNER'S CERTIFICATION

I, BRENT F. WRIGHT (print) (name), acting as the WATER PLANT SUPERVISOR (print) (title/position) for

CITY OF FLINT (print) (entity owning proposed facilities) certify that this project has been reviewed and approved as detailed by the Plans and Specifications submitted under this application, and is in compliance with the requirements of 1976 PA 399, as amended, and its administrative rules.

Signature* 3-31-2014 Date (810)787-6537 Phone

*Original signature only, no photocopies will be accepted.

PROJECT BASIS OF DESIGN – FOR WATER MAIN PROJECTS

PROJECT NAME: _____

For this PROJECT the following information must be provided per Act 399 unless waived by the Department. For projects other than water main installation, or if additional space is needed, attach separate sheet(s) with detailed Basis of Design calculations.

A. A general map of the initial and ultimate service areas
☐ Included on engineering plans ☐ Attached separately

B. Number of service connections served by this permit application _____

C. Total number of service connections ultimately served by entire project _____

D. Residential Equivalent Units (REUs) served by this permit application _____

E. Total Residential Equivalent Units (REUs) ultimately served by entire project _____

F. Water flow rates for proposed project based on REUs listed in "D' and "E" above

1. Initial design average day flow (mgd) _____
2. Initial design maximum day flow (mgd) _____
3. Total design average day flow (mgd) _____
4. Total design maximum day flow (mgd) _____
5. Required fire flows: (1) _____ gpm for _____ hours

G. Actual flows and pressures of existing system at the connection point(s) (2)
_____ gpm at _____ psi
_____ gpm at _____ psi
_____ gpm at _____ psi
_____ gpm at _____ psi

H. Estimated minimum flows and pressures within the proposed water main system (3) _____ gpm at _____ psi

(1) Every water system must decide what levels of fire fighting flows they wish to provide. Fire flow should be appropriate for the area (residential, commercial, industrial) being served by the project. Typical fire flow rates can be obtained from the water supply, local fire dept., ISO or AWWA. The water system must then be designed to be able to provide the required fire flows while maintaining at least 20 psi in all portions of the distribution system.

(2) Flows and pressures at the connection points must be given to determine if the existing water main(s) are able to deliver water to the new service area. These numbers can be obtained from a properly modeled and calibrated distribution system hydraulic analysis or hydrant flow tests performed in the field. If more than one connection is proposed, list as needed.

(3) List what the estimated minimum flows can be expected in the proposed water mains based on estimated water demands, head losses, elevation changes and other factors that may affect flows, such as dead end mains.

001010

Lockwood, Andrews & Newnam, Inc.

TRANSMITTAL

Filing Data Code 1-07

PLANNING

ENGINEERING

PROGRAM MANAGEMENT

☐ UPS ☐ FEDEX ☐ DELIVERY SERVICE ☒ HAND DELIVER ☐ OVERNIGHT ☐ REGULAR MAIL ☐ PICK-UP ☐ OTHER Extranet(To PM)

Est. 1935

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MIAMI, FL
MILPITAS, CA
PHOENIX, AZ
SACRAMENTO, CA
SAN ANTONIO, TX
SAN MARCOS, TX
WACO, TX

To: Mr. Steve Busch, PE

Date: 4-8-14

Project Number: 130-10701-001

Company: MDEQ

Routing:

Address: 525 WEST ALLEGAN STREET
Lansing, MI 48933

Project: City of Flint Water Treatment Plant Improvements.

We Are Sending You:		These Are Transmitted:	
☐ Shop Drawings	☐ Reports	☐ As Requested	
☐ Original Drawings	☐ Submittal Data	☒ For Your Use	
☒ Prints	☐ Proposal	☒ For Review and Comment	
☐ Specifications	☐ As Noted	☐ For Your Signature	

Quantity	Description
2	22x34 Plans - Phase II, Segment 1 – Rehabilitation
2	22x34 Plans - Phase II, Segment 1 – Initial Watermain Cut-In
2	22x34 Plans - Phase II, Segment II – Lime Residual Disposal
2	Final Bray Road Lime sludge management Plan
1	Updated page 2 for permit applications
1	LAN Team Response to MDEQ Review comments

Remarks

These plans are being submitted for permit issuance as discussed.

DEQ
RESOURCE MANAGEMENT DIVISION
APR 08 2014
LANSING DISTRICT

Distribution

1- Daugherty Johnson
2- Brent Wright
3- File

Prepared By

Samir Matta, PE

1311 SOUTH LINDEN ROAD
SUITE B
FLINT, MI 48532
TEL 810.820.2682
FAX 810.820.2703
www.lan-inc.com

Flint WTP Improvements – Phase II, Segments I, II, and III
Responses to MDEQ Review Comments dated 4-3-2014

The MDEQ review comments dated 4-3-14 have been addressed as noted in the responses below. Revised drawings have also been prepared in conjunction with these responses and have been included in the attached revised drawing sets for Phase II, Segments I, II, and III.

DEQ
RESOURCE MANAGEMENT DIVISION
APR 08 2014
LANSING DISTRICT

Phase II – Segment 1 - Watermain Cut-in Plans

- **Mid-Pt Chlorination - update plans to depict the additional anti-siphon/ball valve as described in your response to our March 19, 2014 comments. Most likely to be added to Sheet C-508.**

  Response: The anti-siphon/ball valve is shown on revised Sheet C-104, dated 4-7-14.

- **Include a full-sized mid-point chlorination system schematic with the updated plans.**

  Response: The mid-point chlorination system schematic has been included in the Phase II, Segment I – Initial Watermain Cut-in drawings as Sheet C-509, dated 4-7-14.

- **It appears that make-up water and chlorine gas are not combined at the chlorine feeder (panel w. rotometer, vacc. monitor, auto. feed control valve, etc.) for production of liquid chlorine. Instead, this appears to take place at the ejector/check valve assembly on the plant supply line. Please confirm. If gas under vacuum is conveyed to the ejector at the plant supply line, the gas piping must be Schedule 80 seamless steel tubing. Please confirm. This can be included on the chlorination system schematic.**

  Response: The above description of the midpoint chlorination system is essentially correct. As shown on Sheet C-509, the mid-point chlorination system is a vacuum system. The vacuum regulators are mounted directly to the chlorine storage cylinders. Vacuum lines run from the regulators to the chlorinator control panels where feed rate is controlled. Vacuum lines are then connected from the control panel to ejectors, where water supply flowing through the ejectors creates the vacuum required to pull gas from the storage tanks. While the ejectors are not located in the control panel, it is common to have the ejectors remotely mounted from the control panels. A review of the 10 State Standards requirement for Schedule 80 seamless steel tubing appears to be for pressure gas feed systems, and not vacuum gas feed systems as proposed for Flint. As such, the recommended vacuum line material for a 500

ppd system is 5/8" O.D. flexible polyethylene plastic tubing (see attached information from Hydro Instruments).

Please provide 2 full-sized sets of Watermain Cut-in Plans that include the requested information and revisions.

Phase II - Segment 1 - WTP Rehabilitation Plans

- **LOX/LN Storage & Piping – update plans to depict revised sheets D2-102 and D2-601. The revisions were made to clarify the gas piping configuration.**

  Response: Revised drawings D2-101, D2-102, D2-301, D2-502, and D2-601 have been included in the updated plan set.

- **The existing LOX storage tank will provide approximately 16 days storage at max design rate at 12.0 MGD until the second tank is installed. The Act 399 permit will be issued with a condition that the MDEQ is provided a copy of the contract between the city and the LOX supplier that specifies the maximum delivery time. The LOX system shall be operated such that a minimum of 5 days storage is maintained in the LOX tank at all times.**

  Response: The City will provide MDEQ a copy of the contract between the City and their LOX supplier under separate cover. LOX can be supplied within 24 hours of when a purchase order is issued.

- **Mid – Point Chlorination (Chlorine room) - revise sheets C5-105 and C5-508 to show deletion of the chlorine gas scrubber system.**

  Response: Sheets C5-105, C5-508, and EP6-101, which are all specific to the chlorine scrubber work only, have been deleted in their entirety from the updated plan set.

- **Revise the ventilation intake duct detail (Sheet C5-508) to as described in your response.**

  Response: This intake duct detail is no longer applicable as it is for the chlorine scrubber system, which has been deleted. As noted in the previous MDEQ review comment responses, the City will extend the existing ventilation intake ductwork in the existing Chlorine Storage Room to finished floor level. This work has been added to the Phase II, Segment I – Initial Watermain Cut-in plan set, see Note 7 of revised drawing Sheet C-103.

- **Add panic hardware to chlorinator room door (east and west exits).**

  Response: The City will perform this work. This work has been added to the Phase II, Segment I – Initial Watermain Cut-in plan set, see Note 8 of revised drawing Sheet C-103.

- **The existing door between P.S. 4 and the chlorine gas storage room should be closed off such that the chlorine gas storage room and chlorinator room are only assessable from the outside. Although an improved door sweep is proposed, door sweeps are not failsafe in a catastrophic gas release and such an event could jeopardize the entire P.S. #4.**

  Response: The City will perform this work. This work has been added to the Phase II, Segment I – Initial Watermain Cut-in plan set, see notes on revised drawing Sheet C-103.

- **Raw Water Piping – the proposed 54X42 cross provides minimal vertical separation (approximately 6-inches). A pair concrete cradles installed on each side of the 54-inch concrete main will mitigate the force of the 42-inch main installed above at the crossing. A condition will be added to the Act 399 permit to field adjust the 42-inch main installation to maximize the vertical separation at the crossing.**

  Response: The Contractor is required to field verify the elevation of the existing 54" pipeline. The City or the City's representative onsite observing construction will coordinate with the Contractor to ensure that the clearance between the 42" and 54" pipelines is increased to the maximum extent practical.

Please provide 2 full-sized sets of WTP Rehabilitation Plans that include the requested information and revisions.

Phase II – Segment 2 - Bray Road Sludge Lagoon

Provide 2 full-sized sets of construction plans for proposed work at the Bray Road sludge lagoon. Separation between the concrete disposal area the lime sludge disposal area by metal sheet piling, as discussed in our meeting, needs to be depicted.

Response: 2 full sized sets of construction plans of proposed work at the Bray Road Sludge Lagoon are included for your review and file. The separation barrier between the concrete disposal area and the lime sludge disposal area will be accomplished by

establishing a clay barrier that extends to the bottom of the original lagoon bottom as shown in the detail on sheet C-501. The separation barrier will be constructed within the lime sludge lagoon away from the concrete disposal area as to provide complete separation as discussed.

Prepare final Bray Road Lime Sludge Management Plan. The plan also needs to include establishment of a level working surface in the west portion of the lagoon and removal of the island.

Response: A final version of the Bray Road Lime Sludge Management Plan is being included with this final submittal. A level working surface of 738.5' has been designated within the sludge lagoon after the pump station is operational. All debris or vegetation growth within the 742' elevation within the sludge lagoon is intended to be removed and cleared by the contractor.

The Act 399 permit will also include a condition requiring the sheet piling to be driven deep enough into native soil to maintain its structural integrity for removal of waste material on the exterior portion of the lagoon.

Response: Sheet piling is no longer being used as the separation barrier based on further discussion with the contractor and availability. A clay berm will be constructed for the full depth within the lime sludge lagoon using the original bottom of the sludge lagoon as a base using the proposed alignment proposed for the sheet piling.

Act 399 Permit Applications:

WTP Rehabilitation:

Part 6 (Facilities Description) needs to discuss the provisions for the stand-by generator. The description needs to be added in the Phase II – Segment III – Electrical Improvements (@WTP) – (i.e. transfer switch, universal generator connection)

Response: See attached revised Part 6 of the Act 399 Permit Application forms.

Bray Road (Flint WTP Phase II, Segment II – Lime Residual Disposal)

Please revise Part 6 (Facilities Description) since a berm-liner system will not be used to separate the lime sludge area from the concrete debris area. Eliminate "Berm/liner" from the statement: "Berm/liner or Sheet Piling improvements to separate concrete debris from lime sludge."

Response: See attached revised Part 6 of the Act 399 Permit Application forms.

MDEQ Comments & LAN's Responses

Flint WTP Improvements
Phase II
Segments I-III
MDEQ Comments
April 3, 2014

Phase II – Segment 1 - Watermain Cut-in Plans

- Mid-Pt Chlorination - update plans to depict the additional anti-siphon/ball valve as described in your response to our March 19, 2014 comments. Most likely to be added to Sheet C-508.

- Include a full-sized mid-point chlorination system schematic with the updated plans.

- It appears that make-up water and chlorine gas are not combined at the chlorine feeder (panel w. rotometer, vacc. monitor, auto. feed control valve, etc.) for production of liquid chlorine. Instead, this appears to take place at the ejector/check valve assembly on the plant supply line. Please confirm. If gas under vacuum is conveyed to the ejector at the plant supply line, the gas piping must be Schedule 80 seamless steel tubing. Please confirm. This can be included on the chlorination system schematic.

Please provide 2 full-sized sets of Watermain Cut-in Plans that include the requested information and revisions.

Phase II - Segment 1 - WTP Rehabilitation Plans

- LOX/LN Storage & Piping – update plans to depict revised sheets D2-102 and D2-601. The revisions were made to clarify the gas piping configuration.

- The existing LOX storage tank will provide approximately 16 days storage at max design rate at 12.0 MGD until the second tank is installed. The Act 399 permit will be issued with a condition that the MDEQ is provided a copy of the contract between the city and the LOX supplier that specifies the maximum delivery time. The LOX system shall be operated such that a minimum of 5 days

Act 399 Permit Applications:

WTP Rehabilitation:

Part 6 (Facilities Description) needs to discuss the provisions for the stand-by generator. The description needs to be added in the Phase II – Segment III – Electrical Improvements (@WTP) – (i.e. transfer switch, universal generator connection)

Bray Road (Flint WTP Phase II, Segment II – Lime Residual Disposal)

Please revise Part 6 (Facilities Description) since a berm-liner system will not be used to separate the lime sludge area from the concrete debris area. Eliminate "Berm/liner" from the statement: "Berm/liner or Sheet Piling improvements to separate concrete debris from lime sludge."

storage is maintained in the LOX tank at all times.

- Mid – Point Chlorination (Chlorine room) - revise sheets C5-105 and C5-508 to show deletion of the chlorine gas scrubber system.

- Revise the ventilation intake duct detail (Sheet C5-508) to as described in your response.

- Add panic hardware to chlorinator room door (east and west exits).

- The existing door between P.S. 4 and the chlorine gas storage room should be closed off such that the chlorine gas storage room and chlorinator room are only assessable from the outside. Although an improved door sweep is proposed, door sweeps are not failsafe in a catastrophic gas release and such an event could jeopardize the entire P.S. #4.

- Raw Water Piping – the proposed 54X42 cross provides minimal vertical separation (approximately 6-inches). A pair concrete cradles installed on each side of the 54-inch concrete main will mitigate the force of the 42-inch main installed above at the crossing. A condition will be added to the Act 399 permit to field adjust the 42-inch main installation to maximize the vertical separation at the crossing.

Please provide 2 full-sized sets of WTP Rehabilitation Plans that include the requested information and revisions.

Phase II – Segment 2 - Bray Road Sludge Lagoon

Provide 2 full-sized sets of construction plans for proposed work at the Bray Road sludge lagoon. Separation between the concrete disposal area the lime sludge disposal area by metal sheet piling, as discussed in our meeting, needs to be depicted.

Prepare final Bray Road Lime Sludge Management Plan. The plan also needs to include establishment of a level working surface in the west portion of the lagoon and removal of the island.

The Act 399 permit will also include a condition requiring the sheet piling to be driven deep enough into native soil to maintain its structural integrity for removal of waste material on the exterior portion of the lagoon.

Flint WTP Improvements
Phase II
Segments I-III
MDEQ Comments
March 19 , 2014

Segment 1 - Cut –in Piping

The detail shows air-release manholes with corp. stops? How will the air release operation be executed? Means to drain the manhole?

Written response needed.....

Segment 1 – WTP Rehab

1. Raw Water Piping – Maintain back-up supply from Gen Co. during interim operation at C.S. #2. Sheet C5-102

   54X42 cross (Sheet C5-501 & C5-101) only 6-inches – Support?

   Air-release manhole – same as Cut-in piping

   Current yard piping diagram?

Written response needed on the first 3 items. Yard piping diagram will be a work in progress.

2. Mid-Point CL2 - Basis of design provided

   - Scale – use existing or proposed? If poposed - type, capacity
   - Scrubber?
   - Room air-exchange rate ?
   - Pipe penetrations – discuss protective seal
   - Floor drains – discuss
   - Door sweep - discuss
   - Scrubber piping – lower intake

FIN SIC 6793

- **Check valve/anti-siphon at influent channel - include in final**

3. **High Service Pump**

   Will mechanical ball valve operate like a check valve in event of unexpected pump shut-down?

   TDH of current pump and proposed pump?
   Conformance of proposed pump TDH with system head curve?

   Written response needed.....

4. **LOX/LN Storage**

   Piping configuration clarified
   The LN calculation (71 ppd) is not clear. Is there a % concentration or transfer efficiency?

5. **Electrical improvements**

   Are operation of the pumps being split with the MCC or are multiple MCCs being provided?

   Written response needed.....

Flint WTP Improvements
Phase II
Segments I-III
MDEQ Comments
February 27, 2014

2 IFKNr
– ACCESS
– MONNITE a.R. Inlc to connect to corp to access air during filling

Segment 1 - Cut –in Piping

✓ **The detail shows air-release manholes with corp. stops? How will the air release operation be executed? Means to drain the manhole?**

↳ Comp em down

Segment 1 – WTP Rehab

1. **Raw Water Piping – Maintain back-up supply from Gen Co. during interim operation at C.S. #2. Sheet C5-102** ✓ Not 60.07 ↑ gpm ≈ 7.11 ↓ 48 Pressure ↓ Available

2. **54X42 cross (Sheet C5-501 & C5-101) only 6-inches – Support?** ✓ ↳ Field adjust the steel WM – MAY MISS the vert sch.

3. **Air-release manhole – same as Cut-in piping** ✓ ↳ same design same op. concept

Current yard piping diagram? – Work in Progress

4. **Mid-Point CL2 - Basis of design needed**

- **Application rate (both mid-pt & post for CT)**
- **CL2 gas max dosage LBs/Day**
- **Scale – type, capacity** ✓ & NEW SCALETRON IND.
- **Rotometer (lbs/day)**
- **Vacc reg, injector, educator (size)**
- **Scrubber capacity** – Not being installed
- **Room air-exchange rate** 1/3.3 MIN
- **Pipe penetrations – Sheet C-103 – linkseal – gas resistant?** – will inspect & seal
- **Floor drains** – to be plugged
- **Door sweep** – NEW better sealing sweeps to be provided
- **Safety features – obs window, fan, lights, switches, panic bar**
- **Scrubber piping – lower intake** ⇒ will extend to floor w. 90° bend
- **Check valve/anti-siphon at influent channel** – yes

hydraulic ck/valve will close on system failure/shut-down

3. **High Service Pump**

   Will mechanical ball valve operate like a check valve in event of unexpected pump shut-down?

   1,185 will match w. smaller pump

   TDH of current pump and proposed pump?
   Conformance of proposed pump TDH with system head curve?

4. **LOX/LN Storage**

   LOX & LN piping clarification – Sheet D2-102 & D2-601
   BOD for storage
   Ozone was designed at 4.0 mg/l max dose @ 36 MGD (Sec. 3.5 WTP BOD)

   Ozone max dose at 18.0 MGD is 650 Lbs/day

   How many GPD does this equate to?

5. **Electrical improvements**

   Are operation of the pumps being split with the MCC or are multiple MCCs being provided?

One switchgear – dual feed
& Two breakers – redundancy

Flint WTP Improvements – Phase II, Segments I, II and III

Responses to MDEQ Review Comments dated 3/19/2014

Segment I – Initial Watermain Cut-in

1. Detail 2, Sheet C-504, "Air Release & Access Manhole," shows a 2" corp stop for air release. These are intended to be manual air release valves for exhausting air upon initial filling of the pipeline or after maintenance has been performed and refilling the pipeline. The manhole structure will be checked periodically and pumped out with a portable sump pump as part of the normal plant maintenance program.

Segment 1 – Rehabilitation

1. Raw Water Piping
   a. Maintain back up supply from Genesee County during interim operation at C.S. #2. Installation of the 42" raw water piping has been delayed until the KWA project is closer to being ready to supply water to the City. This will allow the City to maintain the backup supply from Genesee County during interim operation.
   b. The crossing of the new 42" steel pipe over the existing 54" concrete pipe is shown in plan on drawing sheet C5-101, with Detail 5, Sheet C5-501 showing how the 42-inch line will be supported. As shown on Detail 5, Sheet C5-501, the new 42-inch line will have concrete pipe cradles constructed on either side of the existing 54" pipe, maintaining a minimum clearance of 12" on either side of the 54" pipe. Pipe loads from the 42" line will then be transferred to the pipe cradles and into the soil, and not the 54" pipe. The 6" clearance between the two pipes will be backfilled with CLSM material as it will be impossible to compact typical granular bedding material under the 42" pipe.
   c. Detail 2, Sheet C5-505, "Air Release & Access Manhole," shows a 2" corp stop for air release. These are intended to be manual air release valves for exhausting air upon initial filling of the pipeline or after maintenance has been performed and refilling the pipeline. The manhole structure will be checked periodically and pumped out with a portable sump pump as part of the normal plant maintenance program.
   d. See attached color coded yard piping diagram.

2. Midpoint Chlorination
   a. Four (4) new scales will be provided for monitoring chlorine usage from ton containers. Scales shall be as manufactured by Scaletron Industries Ltd. with a load range of 0 to 4000 lbs.
   b. The City has not been able to determine that the chlorine scrubber is a requirement of any applicable code. At this time, the City will not be installing the chlorine scrubber shown on the design drawings and will rely on the existing ventilation system to exhaust air from the Chlorine Storage Room.
   c. The existing ventilation in the Chlorine Storage Room was tested to have a capacity of 18.3 air changes per hour, or 0.305 air changes per minute. Therefore, one room volume air

change would take approximately 3.3 minutes with the current ventilation system. See attached test results. Due to the size of the existing Chlorine Storage Room, a ventilation system of 1 air change per minute is not practical. While the existing ventilation system capacity is less than 1 air change per minute, it appears to be in compliance with 10 State Standards as lesser rates may be considered in cases where 1 air change per minute is not appropriate due to the size of the room.

d. WTP staff will identify and inspect all proposed and existing piping and conduit wall penetrations in the Chlorine Storage Room and seal as necessary to prevent gas leakage into other parts of Pump Station No. 4.
e. Existing floor drains in the Chlorine Storage Room were for condensate from the old chlorine evaporator system. These drains will no longer be used and will be plugged by WTP staff.
f. WTP staff will attach new door sweeps with better seals at existing doors as required.
g. WTP staff will extend existing ventilation intake ductwork to finished floor level with 90-degree bends.
h. Per Addendum No. 1, an Anti-siphon / Back Pressure Valve and additional ball valve shall be added just prior to the trough wall penetration. The anti-siphon / back pressure valve shall be PVC and designed for use with chlorine systems. The valve shall be a LMI #35856, Walchem E90422, or engineer approved equivalent. The valve shall be installed between the two ball valves to allow for isolation during servicing. The valve shall be located above the high water level in the trough. The Contractor shall install a 1" drain line from the relief port to the finished floor elevation of the pipe gallery.

Door sweeps not fail SAFC

window to Read Cl2 & surge

3. High Service Pump
   a. The new 16" pump control ball valve for HSP #1 replaces the existing pump control ball valve in kind and will operate in the same manner as the existing valve. The valve will act like a check valve upon emergency shutdown of the pump through the use of a hydraulic cylinder actuator that will automatically close the valve. The cylinder actuator uses hydraulic water system pressure to supply the energy required to close the valve.
   b. The existing HSP #1 is rated for 25 MGD at 185' TDH. The proposed replacement HSP #1 is rated for 15 MGD at 185' TDH, matching the head condition of the existing pump.
   c. Results from the City's hydraulic model were used to develop system curves for max day and average day, which were used to confirm pump selection. The proposed HSP #1 will operate on a VFD which can be adjusted during operation to meet various duty points depending on demand.

4. LOX/LIN Storage
   a. Nitrogen usage is calculated based on 2.5 % of the oxygen usage:

      2,833 ppd O_2 x 0.025 = 71 ppd N_2

5. Electrical Improvements
   a. The operation of the pumps is contained within a single switchgear at Pump Station No. 4. However, there will be a dual feed coming into the main plant switchgear that will supply redundant power to the plant, including Pump Station No. 4. There will also be two breakers

at the main plant switchgear that feed two different breakers at Pump Station No. 4. Therefore, any one point of failure will not take the system down.

Lockwood, Andrews & Newnam, Inc.
A LEO A DALY COMPANY

Proposed Scope of Upgrades to Flint WTP

Phase II - Segments I & II

1. Introduction

The City of Flint plans to utilize their existing WTP to provide water on a continuous basis. The city plans to treat water from the Flint River until construction of the proposed KWA supply is complete and the WTP can then be used to treat water from Lake Huron. The following proposed improvements are needed to place the WTP into service next spring. These improvements will remain in service once the KWA is in service.

2. Scope of Work

The proposed upgrades have been categorized into Phase II – Segment I and are to be completed as soon as practical so that the WTP can be utilized to treat water from the river in the spring of 2014. Engineering services will include final design, plans, contract documents, bidding assistance. Since time is of importance, specifications and schematic drawings will also be provided for pre-procurement of long lead item equipment and are outlined within each section below. Contract administration and construction phase services are not included within the initial scope of services.

- Design Progress Meetings: Meet with City staff to provide project status updates and to discuss specific design issues and details in order to facilitate timely design decisions. Meetings will include design team personnel from each discipline as required, City operations staff and administrative staff. Five (5) design progress meetings are included.
- Prepare and update opinion of probable construction cost at for each project bidding document submittal (40%, 80% and Final Draft). Prepare final opinion of probable construction cost prior to bidding.
- Quality Assurance/Quality Control: A Quality Control Plan (QCP) will be developed and implemented specifically for this project. At each project submittal stage, the document deliverables will be checked and reviewed by experienced personnel to ensure that the design meets applicable standards and normal engineering practice.
- Deliverables:
  40% Bidding Documents (Drawings and Technical Specification Outline)
  80% Bidding Documents (Drawings and Technical Specifications)
  Final Draft Bidding Documents (Drawings and Technical Specifications)
  Final Bidding Documents (One printed and one electronic set of Drawings and Technical Specifications
- Bidding Phase
  Conduct pre-bid meeting.
  Respond to contractor inquiries.
  Prepare construction document addenda, as necessary.

Review bids and supporting bid documentation. Prepare bid report summarizing bids, contractor references, and contractor qualifications; make recommendation for contract award.

- Construction Phase
  Review and respond to contractor submittals (First two reviews are included in level of effort, subsequent review cost will be paid for by contractor)
  Respond to contractor's request for information
  Prepare monthly payment documents
  Negotiate and prepare change orders for client review and approval
  Attend monthly project meetings
  Provide periodic onsite technical observer (have included two weeks per month in level of effort)
  Develop record documents (provide one hard and one electronic copy to owner)

Specific Work Tasks:

Item 1 – Chemical Systems / Ozone

The Michigan Department of Environmental Quality (MDEQ) requires 30 days of redundant storage of the chemical used in this treatment process. To bring the rehabilitated plant into regulatory compliance with the chemical storage requirements for primary use, additional storage facilities will need to be constructed for liquid oxygen and nitrogen.

One liquid oxygen and one liquid nitrogen storage tanks and unloading stations identical to the existing units will be installed north of the existing facilities. Details are listed as follows:

- Liquid Oxygen
  Capacity – 9000 gallons
  Diameter – 10 ft (maximum)

  Liquid Nitrogen
  Capacity – 540 gallons
  Diameter –5.5 ft (maximum)

Pre-procurement documents for the liquid oxygen and nitrogen tanks will be provided.

Item 2 – Electrical

The City of Flint Water Treatment Plant (WTP) represents a combination of administrative, process, and maintenance facilities which all require electrical power. At the completion of Phase I of the water treatment plant rehabilitation projects, much of the electrical distribution equipment such as motor control centers (MCCs), power/lighting panels, transformers, and electrical power feeders will have been upgraded. There is, however, significant additional work required to address remaining electrical equipment that has reached a point of obsolescence.

Switchgear in the sub-station was installed around 1960. It is antiquated and difficult to maintain. Very little work has been done to the station since its original installation. The plant has two 46 kV primary feeds into the sub-station. Replacement of the distribution switchgear with current technology

equipment would allow a higher degree of load protection, be serviceable by numerous sources, and have replacement parts availability. When the switchgear is replaced, the plant will have to stay in operation. Brief interruptions of power of selected plant processes could be accommodated during cut over to new equipment.

Proposed Substation Upgrade

- Coordinate upgrades to Consumers 46kV primary feeders to provide a single overhead 46KV primary service
- Replace the two Consumers 2.5kVA substation transformers and overhead structure with two 2.0 to 2.5 kVA 46KV pad-mounted transformers.
- Replace the City's substation switchgear in the substation building.

Pre-procurement documents for the pad mounted transformers and switchgear will be provided.

Pump Station No.4 contains the largest electrical loads in the plant. Four low service pumps and five high service pumps represent a combined total of approximately 4000 horsepower. Additional loads from HVAC, lighting, controls, and chemical feed are about 60 kVA. This represents a total load of 531 amps @ 2400 volts. The existing switchgear in Pump Station No.4 is antiquated and difficult to maintain. Current technology equipment will allow a higher degree of load protection.

Proposed Pump Station No. 4 Improvements

- Replace 2400V switchgear
- Provide one 15 MGD medium voltage VFD

Pre-procurement documents for the medium voltage VFD and switchgear will be provided.

As a base load facility capable of producing water at any time the Flint WTP must have the ability to deal with power outages. In order to meet these electrical need in the event of a loss of power to the plant site or the loss of one of the substation transformers a new standby diesel generator is proposed to be located adjacent to the new substation.

Proposed Standby Power Improvements

- One 2.0 to 2.5 mVA generators and fuel tank. – Provisions, But no actual generator

Pre-procurement documents for the generator set will be provided.

There are four 2400V to 480V transformers in Plant 2 that are antiquated and difficult to maintain. Replacement parts are no longer available and reliability is questionable.

Proposed Plant 2 Improvements

- Replace two 300kVA 2.4KV transformer/switchgear.
- Replace two 100kVA 2.4KV transformer/switchgear.

Pre-procurement documents for the transformers and switchgear will be provided.

Item 3 – Mid-Point Chlorination

Mid-point chlorination facilities are proposed to increase reliability of the disinfection process and improve Ct. For this initial stage the existing chlorine equipment in Pump Station No. 4 will be used and a new chlorine solution line will be installed from Pump Station No. 4 to the filter influent channel in Plant 2. A chlorine scrubber system will be installed in Pump Station No.4 to protect against a leaking chlorine ton container.

Proposed Chlorine Improvements

- New chlorine solution line to filter gallery.
- Chlorine system improvements.
- Dry scrubber system.

Item 4 – Low and High Service Pump Station No. 4

As a result of decreased demands, pumps at Pump Station No. 4 are "over-sized" and do not efficiently operate. Some of the pumps experience vibrations in the shafts and steady bearings. The existing pump station will be rehabilitated to replace "over-sized" pumps and obsolete equipment and provide needed maintenance.

Proposed Pump Station No. 4 Improvements

- Install one new High Service Pump (15 MGD @190 feet TH, vertically mounted pumps with 800 HP 2400/4160 V inverter duty motors, with 20 feet of shaft and steady bearings)
- Replacement of existing piping, valves, supports, and bearings
- New intermediate platforms, ladders, & stairs
- New ventilation (for exhausting heat from VFD's)
- Demolition of existing equipment to accommodate new equipment

Pre-procurement documents for the pump, motor, control valves and isolation valves will be provided.

Item 5 – Raw Water Piping Connection

The proposed KWA raw water pipeline will connect to the existing 72" PCCP finished water supply line near Center and Pierson Roads. (East of this connection, the 72" PCCP will be utilized by GCDC-WWS for distribution of finished water in the GCDC-WWS service area.) Raw water from Lake Huron will be conveyed to the WTP site via the 72" PCCP pipeline. On the WTP site, the 72" pipeline will be tapped for a 42" pipe and for a 36" pipe to convey raw water for treatment. Connections to the existing pipe will be made at this time to avoid future plant shutdowns for connections.

Proposed Pump Station No. 4 Improvements

- 48-inch pipe connections
- 36-inch pipe connection
- 54-inch pipe connection

Pre-procurement documents for the valves and connection fittings will be provided.

Phase II – Segment II:

The proposed upgrade for item 6 has been categorized as Phase II – Segment II and is to be completed with the same urgency as the rest of the work so that the WTP can be utilized to treat water from the river in the spring of 2014. However, the use of the Bray Road lagoon for other disposal activities will require that this issue be addressed independently to certain extent as to isolate the problem areas while working with MDEQ to permit its use for lime sludge disposal.

Item 6 – Softening Residuals Disposal

Develop, evaluate, design and implement a lime residuals disposal plan to handle softening sludge for the interim period of operation using the Flint River as a water source. These options may include the use of Bray Road lagoon, construction of temporary dewatering and loading facilities, and other temporary storage options.

The use of Bray Road Lagoon will require additional survey, geotechnical and environmental testing at the site in order to assess the condition of the lime sludge in the basin and to verify the capacity of the lagoon system. Based on the findings of this evaluation, proposed improvements will be designed to accommodate the use of the facility in the interim basis while addressing some of the MDEQ concerns about the site and any unauthorized discharges into the nearby stream. Permitting for site use will be incorporated as part of the overall design improvements at the WTP and submitted to the MDEQ at the 80% design stage for their pre-permit review and comments. A final package will be submitted to the MDEQ at the 100% design stage for permit issuance and approval of work plan.

Pre-procurement documents for specific equipment may be provided as needed.

3. Schedule

The work included in this work authorization is anticipated to be performed in accordance with the following schedule, based on the Notice-To-Proceed (NTP) date of November 1, 2013. For the purposes of this proposal, we anticipate a 3 month design phase and 1 month bid phase. Schedule revisions may be necessary as information becomes available and work priorities change.

Project Milestone	Date
Project Kickoff Meeting	November 6, 2013
Equipment Procurement Documents	December 6, 2013
Submit 40% Bidding Documents	December 18, 2013
Submit 80% Bidding Documents	January 10, 2014
Submit Final Draft Bidding Documents	January 31, 2013
Submit Final Bidding Documents	February 7, 2014
Bid Advertising	February 10, 2014
Pre-Bid Meeting	February 17, 2014
Bid Opening	TBD by City
Recommendation of Contract	TBD by City
Contract Award issued by City	TBD by City

4. Compensation

The Reimbursable Compensation method with a maximum not-to-exceed limit will be used for this contract. Labor rates shall be based on personnel classifications according to the existing rate sheet. Reimbursable expenses shall be invoiced at the actual cost times a factor of 1.0 for processing and handling. The estimated maximum not-to-exceed fee for this project is $962,800 which includes a $15,000 allowance for surveying and $15,000 allowance for geotechnical services.

Description	Fee
Design and Bidding Assistance	$ 752,800
Surveying Allowance	$ 15,000
Geotechnical Allowance	$ 15,000
Construction Phase Services	$ 180,000
Total Maximum Not to Exceed Fee	**$ 962,800**

Any other work beyond the Scope of Services herein will require a subsequent Work Authorization with prior approval from the City.

May 21, 2013

TO: Brent Wright, Supervisor
Water Plant

FROM: Derrick F. Jones,
Purchasing Manager

SUBJECT: SEALED BIDS

Attached are the sealed bids that were received for the annual supply of LOX-l.iquid Oxygen for your review. These copies are yours to keep. The proposals were opened on May 14, 2013 under proposals #14-513.

Your review and recommendation are needed as soon as possible. Attach a staff resolution form when you send back your recommendation and make sure that your requisition has been updated and pre-encumbered with the correct price. If your recommendation is under $10,000.00, you do not need to include a staff resolution form.

Please note: if your project is being funded by any grants issued by the federal government, you must go to www.sam.gov to ensure that the selected vendor has not been debarred.

Attachment

AIR LIQUIDE

Mr. Brent Wright

City of Flint, Water Treatment Plant

4500 N. Dort Highway

Flint, MI 48505

Mr. Wright,

Air Liquide Industrial U.S. LP appreciates your business and the opportunity to provide the City of Flint with a reliable and economic supply of bulk liquid oxygen. Air Liquide strives for quick and reasonable turn-around time for your oxygen deliveries when your order is placed with the National Scheduling Center. Air Liquide's typical standard delivery time frame is within 24 to 48 hours upon order.

Thank you and please call me directly at 708-579-7977.

Sincerely,

Amy Waszczak

National Municipal Business Coordinator

Air Liquide Industrial U.S. LP

REQUIREMENTS / TABULATION

Treatment Chemical Specifications

Flint Water Plant

- Product to meet or exceed AWWA Standard B510-00 Column H of Table 1 and ANSI/NSF 60, see attached table.
- Delivery to be by pressurized vessel tanker truck, not to exceed 20 ton deliverable product and conforming to all applicable local, state and federal regulations.
- Trailer must have proper DOT markings, including the nomenclature "Guaranteed by VENDOR to meet the requirements of AWWA B510 Standard for".
- Weight Certificate from certified weigher, supplied by selected vendor for each delivery. Certified liquid meter tickets may be acceptable substitute.
- Purity Standards with certification for every load. Affadavit of certified analysis. 02 Purity must be 99.5%
- Copy to owner of selected vendor's QC/QA program.
- Water Plant Staff training for the initial load to bulk storage.
- The vendor shall contact the Water Plant Supervisor 24 hours prior to delivery to confirm. 810-787-6537.

LOX-LIQUID OXYGEN 99.5%
FOR USE IN STATE MANDATED PLANT TEST RUNS

CONTACT PHONE#: 810.785.7877

FURNISH AS REQUESTED FOR THE PERIOD 7/1/13 - 6/30/14.
APPROXIMATE QUANTITIES, NOT GUARANTEED

FOR MORE INFORMATION CONTACT:
BRENT WRIGHT @810.787.6537 EXT# 3510

LIQUID OXYGEN TO BE USED IN OZONE PROCESS.

$0.381 /cu ft. *

Only the specifier has the responsibility and judgment for determining whether a proposed substitution is an "or equal or exceeding" specification. Mfg., model #, and supporting documentation of specifications for alternates must be provided.

* Amendment Number 2 to the existing Bulk Product Agreement is made a part of Air Liquides bid for bulk liquid oxygen.

THIS PAGE MUST BE COMPLETED AND INCLUDED WITH SUBMITTAL:
The undersigned herby certifies, on behalf of the respondent named in this Certification (the "Respondent"), that the information provided in this offer submitted to the City of Flint is accurate and complete, and that I am duly authorized to submit same. I hereby certify that the Respondent has reviewed all documents and requirements included in this offer and accept its terms and conditions.

Cash Discounts will be computed from the date of receipt of invoice. Prices firm unless stated otherwise by bidder. Delivery can be made in ( ) days ARO (after receipt of order).

Payment Terms: 30 Delivery Dest.: F.O.B. Fed. ID #: 90 0186946
(All Freight Terms are considered F.O.B., Prepaid unless otherwise noted by seller)

COMPANY NAME (Respondent): Air Liquide Industrial US LP
(Printed)
ADDRESS : 5220 East Avenue
CITY/STATE/ZIP : Countryside IL 60525
PHONE : 708-579-7977 FAX: 708 579 7933
EMAIL : amy.waszczak@airliquide.com
PRINT NAME and Title : Amy Waszczak, Municipal Business Coordinator
(Authorized Representative)
SIGNED : Amy Waszczak DATE: 5/13/2013
(Authorized Representative)

Please submit original documents plus one copy.

New vendors are required to complete and submit an IRS W-9 Form and Vendor ACH Form with the City of Flint. Link is available at www.cityofflint.com/finance/purchasing.

Bid results may be viewed next business day online at www.cityofflint.com/finance/purchasing

Technical Bulletin
Vacuum Tubing & Piping

Vacuum Tubing / Piping Sizing Guide for Chlorine & Sulfur Dioxide

Gas Feed Rate	100 ft.	200 ft.	300 ft.	500 ft.	1000 ft.	1500 ft.
50 PPD / 1 kg/h	3/8"	3/8"	1/2"	1/2"	1/2"	5/8"
100 PPD / 2 kg/h	3/8"	1/2"	5/8"	5/8"	3/4"	3/4"
250 PPD / 5 kg/h	1/2"	5/8"	3/4"	3/4"	1"	1"
500 PPD / 10 kg/h	5/8"	3/4"	1"	1"	1-1/2"	1-1/2"
1000 PPD / 20 kg/h	1"	1"	1-1/2"	1-1/2"	1-1/2"	1-1/2"
2000 PPD / 40 kg/h	1"	1-1/2"	1-1/2"	2"	2"	2"
4000 PPD / 80 kg/h	1-1/2"	1-1/2"	2"	2"	2"	3"
6000 PPD / 120 kg/h	1-1/2"	2"	2"	2"	3"	3"

NOTES:

1. In the above table:
   a. 3/8", 1/2" and 5/8" refer to the OD (outer diameter) of flexible polyethylene plastic tubing.
   b. 3/4", 1", 1-1/2", 2" and 3" refer to Schedule 80 PVC rigid piping.

2. The above recommendations are based on calculations limiting friction loss to 0.5" Hg or less.

Hydro Instruments | 600 Emlen Way, Telford, PA 18969 | Phone: 215.799.0980 | Fax: 215.799.0984 | Email: sales@hydroinstruments.com | Web Address: www.hydroinstruments.com

Specifications subject to change without notice. 2011 Hydro Instruments

WTP - Rehab
phase 2 - Seq 2

Cl_2 BAD

GAS Cl_2 cutshts

LOX, LN CA/Cs

City of Flint
Water Treatment Plant Improvements
Midpoint Chlorination System Basis of Design

Basis of Design for Midpoint Chlorination:

Q, Design Max Day = 18 MGD
Cl_2 Dosage, Max = 5.5 mg/L [per City of Flint plant staff] — assume 3.0 mg/L demand leaves 2.5 mg/L Avail → Meets 10-states of 4.4.1.2 of 2.0 mg/L Min
Cl_2 Usage, Max = 18 x 5.5 x 8.34 = 826 ppd Cl_2
Provide minimum 1,000 ppd gas chlorination system. → Prov. Adequate Stand-By — 4.4.1.3

Proposed Gas Chlorination System:

1. Four (4) 500 ppd Cl_2 vacuum gas feed systems with chlorine solution piping manifold for total installed capacity of 2,000 ppd Cl_2.
2. Each 500 ppd Cl_2 vacuum gas feed system shall consist of the following:
    a. One (1) 500 ppd vacuum regulator (direct mounted to chlorine ton containers or remote mounted). Each unit shall include an actuator for emergency closure of the chlorine container valve. Vacuum regulators shall be Hydro Instruments Series 700 with integral drip leg and heater.
    b. One (1) wall mounted control panel with the following equipment:
        i. One (1) automatic valve for feed rate control, Hydro Instruments Omni-Valve Model OV-110.
        ii. One (1) 500 ppd rotameter, Hydro Instruments Model RM-701.
        iii. One (1) vacuum monitor, Hydro Instruments Model VM-150.
        iv. One (1) 500 ppd differential pressure regulator, Hydro Instruments Model DP-500.
        v. PVC bypass piping.
    c. One (1) 500 ppd ejector nozzle/check valve assembly, Hydro Instruments Model EJ-5000
3. One (1) existing chlorine gas leak detector as manufactured by MSA.
4. Four (4) existing ton container load cells.

Note: All new equipment shall be as manufactured by Hydro Instruments of Telford, PA. Catalog cutsheets for all new equipment are attached.

Description of Operation:

Each 500 ppd Cl_2 gas feed system will operate based on signals from the plant PLC. Based on operator set dosage, the PLC will send a signal to open the water supply solenoid valve(s) that will allow supply water to flow through the ejector(s) to create the vacuum necessary for gas flow from the ton container(s). If the set point is less than 500 ppd, only one solenoid valve will open. If the set point is greater than 500 ppd, two solenoid valves will open, and the other two 500 ppd systems will remain as standby units. Initially, the dosage will be controlled by the operator manually adjusting the setpoint at the PLC. However, the system has the capability of automatically controlling the feed rate through a flow pacing signal or through a chlorine residual analyzer compound feedback loop. → Auto proportioning 4.4.1.5

Each 500 ppd system will be fed from a single one ton chlorine container with its own load cell to monitor chlorine usage. The PLC will monitor each load cell and will signal an alarm when the container is empty; the PLC will automatically close the solenoid valve for the 500 ppd system with the empty container and will start one of the standby units so that the empty ton container can be changed out.

auto switch yes

mets 4.4.1.4

Estimated Chlorine Feed Rates - lbs./day

Examination of previous chlorine demand tests and past plant operation data using Flint River water, shows a chlorine demand around 3.0 mg/L on average. The chart below shows the pounds per day of chlorine that will need to be applied for different flows and different chlorine dosages that may be encountered.

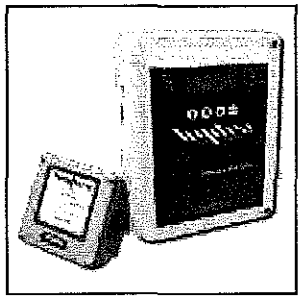
Flow (MG)	Chlorine dosage (mg/L)						
	3	4	4.5	5	5.5	6	6.5
12	300.2	400.3	450.4	500.4	550.4	600.5	650.5
18	450.4	600.5	675.5	750.6	825.7	900.7	975.8
24	600.5	800.6	900.7	1000.8	1100.9	1201.0	1301.0

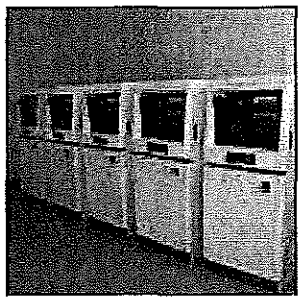
In order to produce a 1.5 mg/L chlorine residual in finished water to meet Ct requirements, the dosage will most likely be between 4.5 & 5.5 mg/L. The demand may increase if ozone production decreases, or if the source water contains large amounts of turbidity during spring runoff, or heavy rains.

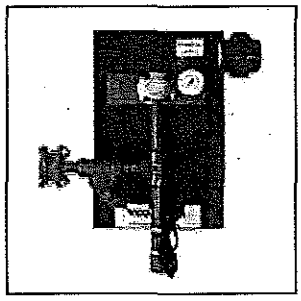
hydro INSTRUMENTS™

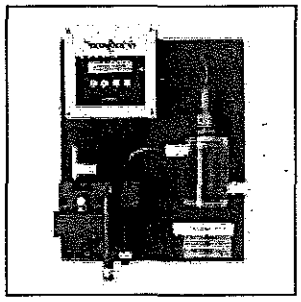
Highest Quality

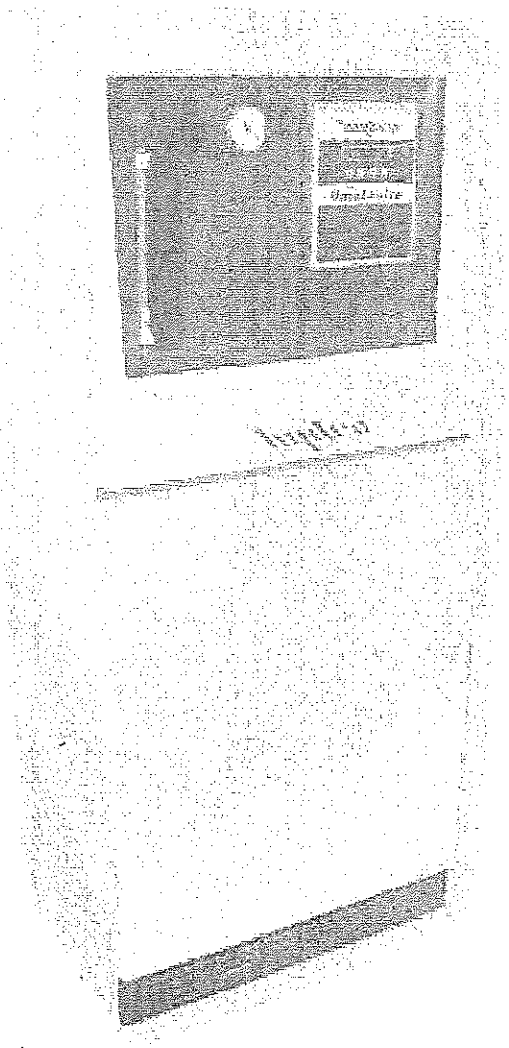
Gas Chlorination Systems

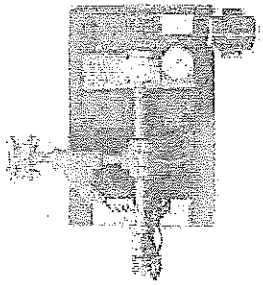


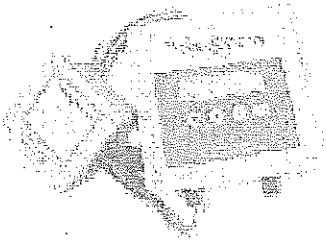


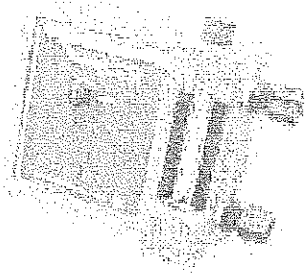












Application: Gas chlorination systems are used for water disinfection and other purposes in a variety of applications. Compared to other disinfection methods, chlorine offers the advantage of a stable and long lasting residual that can remain in the water protecting it from recontamination after treatment. Among chlorination methods, chlorine gas is the most economical and the equipment is also the most reliable and easy to operate. Some of the most common applications for large scale gas chlorination systems are surface water treatment plants, waste water treatment plants, and cooling towers for power plants, oil refineries, etc...Gas chlorination systems are also used in a variety of industrial, mining, and agricultural applications.

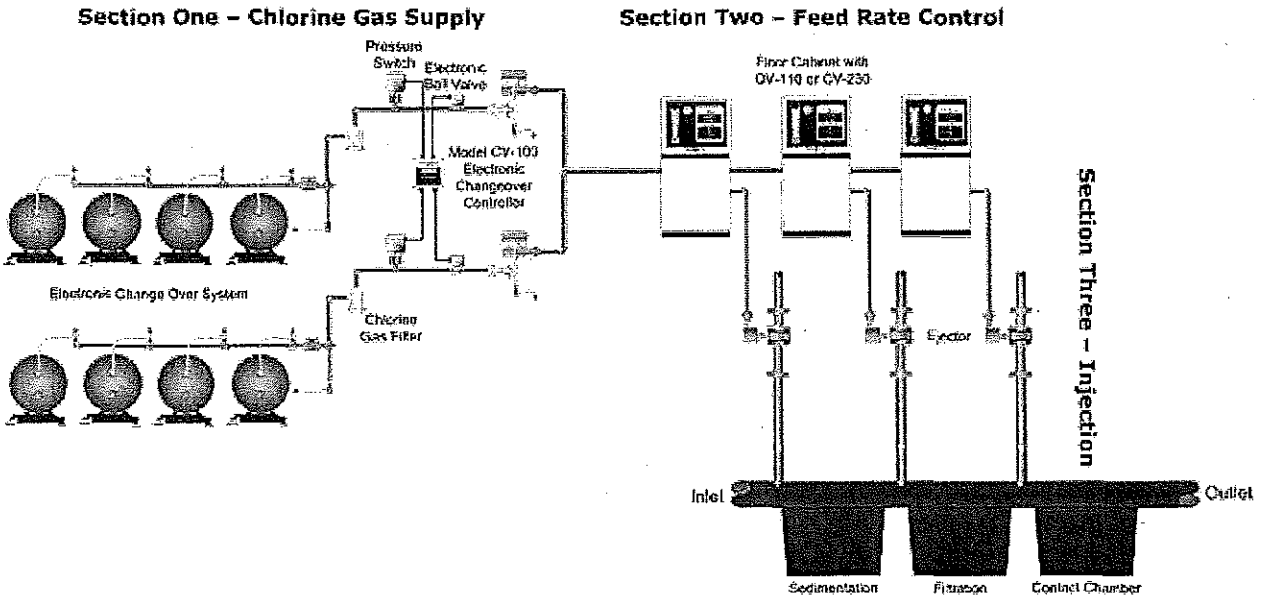
Purpose: Regardless of the application, the gas chlorination system will be required to inject chlorine gas into the process water at one or more locations (with the goal of achieving a desired level of residual chlorine to the process water). Different applications have different requirements for the residual chlorine concentration depending on the water quality and the application. Chlorine residual is quantified in units of parts per million (PPM or mg/L). In order to maintain a constant residual in the water, as the process water flow rate increases and decreases the chlorine feed rate should proportionally increase and decrease. It also must be realized that a certain amount of chlorine will be consumed in reactions upon entering the process water and that this amount of chlorine will not be available as chlorine residual. The amount of chlorine residual consumed in this way is sometimes referred to as the chlorine demand of the water (in units of PPM). The chlorine demand is different for every process water and can range from close to zero to over 20 PPM. Keeping the above points in mind, the following equation is used to determine the required chlorine gas feed rate for each chlorine gas injection point:

[Process Water Flow (m^3/hr)] x [Dosage (PPM)] = Chlorine Gas Feed Rate (gr/hr)

NOTES:
Water Flow (m^3/hr) = Process water flow rate in cubic meters per hour
Dosage (PPM) = [chlorine demand] + [desired chlorine residual]

System Example (Surface Water Treatment Plant): Figure 1 shows a very basic schematic of a surface water treatment plant. The diagram shows three chlorine gas injection points. One gas chlorination system with three injection points is shown in the diagram. The gas chlorination system can be broken down into three sections as indicated in Figure 1.

Figure 1: Surface Water Treatment Plant (Example)



Typical: Gas chlorination systems follow a modular design principle. As seen in Figure 1 above, the gas chlorination equipment can be divided into three sections starting from the chlorine gas containers and ending at the ejectors as follows:

(1) **Chlorine Gas Supply** – This part of the system is designed to provide an uninterupted supply of chlorine gas flowing under vacuum.

(2) **Feed Rate Control** – In this section, equipment is provided to monitor and control the feed rate of chlorine gas to each injection point. The feed rate control can be manual or automatic based on 4-20mA input signals from water flow meters or residual chlorine analyzers. (Step feed control based on switch inputs is also available.)

(3) **Ejector System** – The ejectors create the vacuum that operates the system in an on-off fashion. The chlorine gas enters the water inside the ejector and then the chlorinated water solution is piped to the injection point where it is delivered to the main process water flow.

Safety and monitoring equipment such as gas leak detectors, residual chlorine analyzers, container scales, emergency valve closure systems, emergency repair kits, and chlorine leak absorption systems (scrubber systems) are also available from Hydro Instruments and our sales representatives.

There are many options available for designers to select. This document will review general options for each stage of the system. Please also refer to additional Hydro Instruments product literature for additional details.

Figure 2 is a diagram depicting several of the more common equipment configurations for each part of the gas chlorination system. This figure shows three different options for the chlorine gas supply section and four different options for the feed rate measurement and control section of a system.

Note that one chlorine gas supply section is frequently used to supply chlorine gas to multiple injection points.

Figure 2: System Layout Options

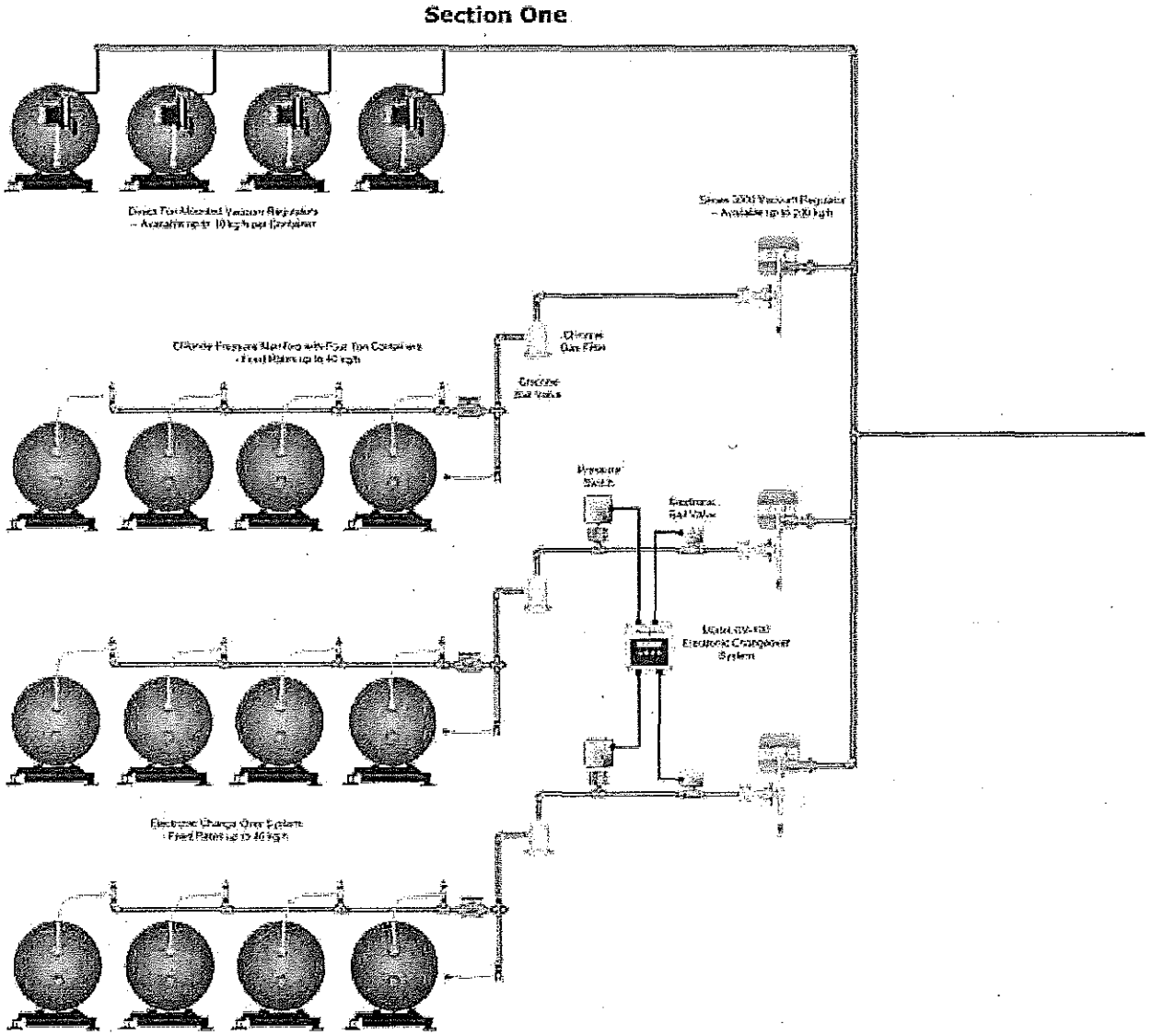
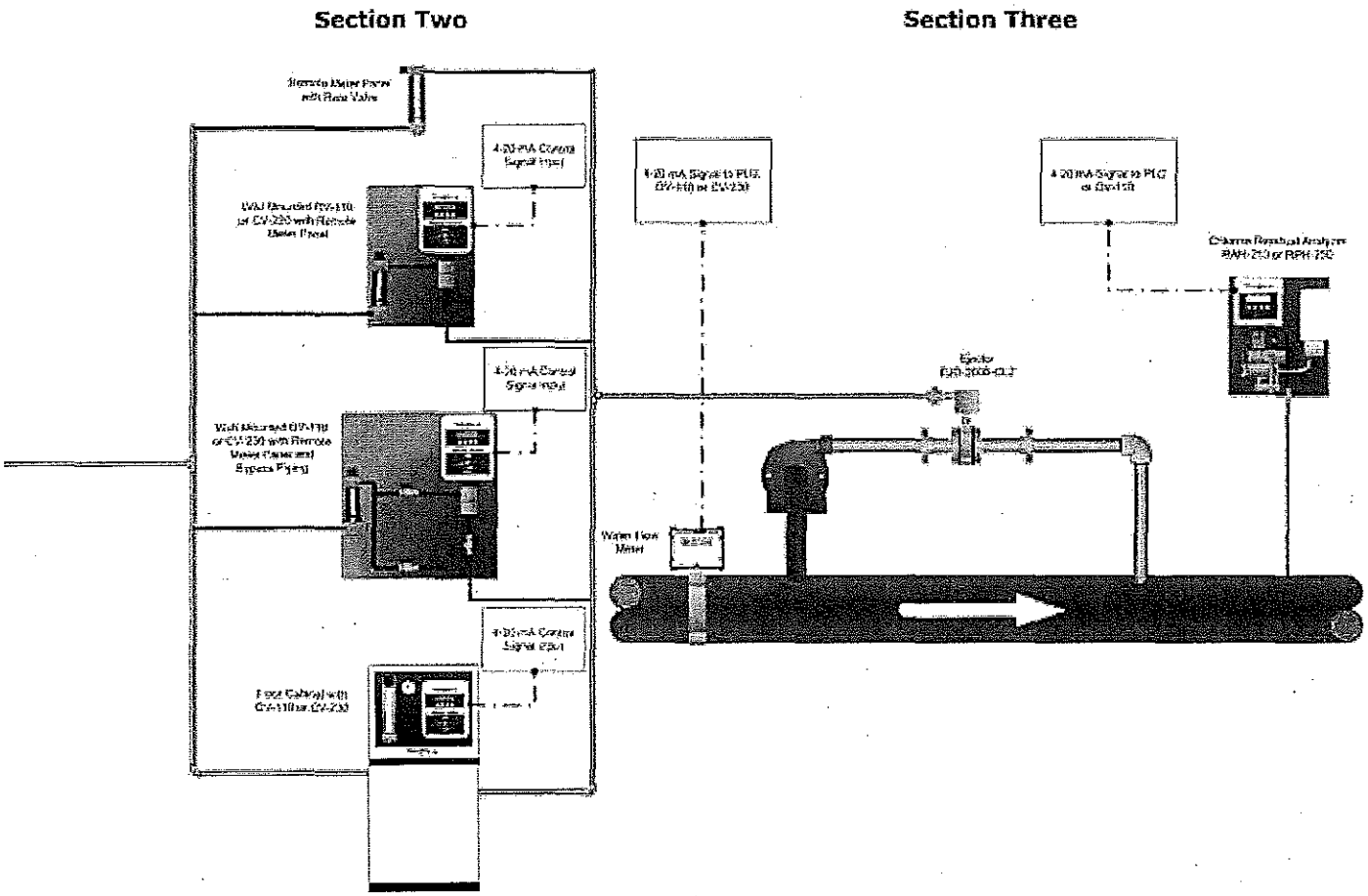


Figure 2: System Layout Options

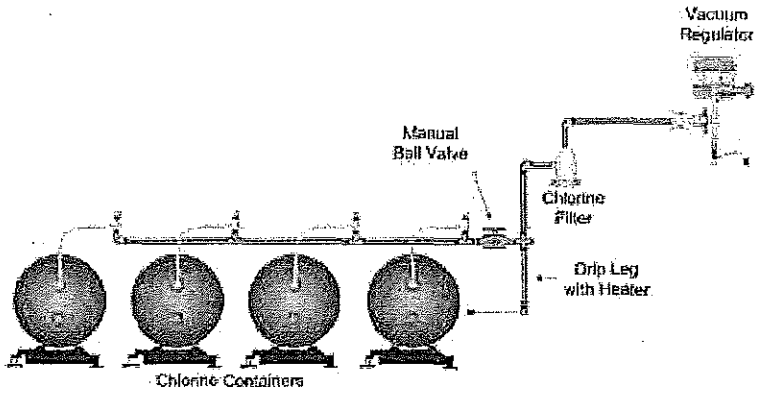


Section 1 – Chlorine Supply: This section of the equipment consists of the chlorine containers, manifolds, vacuum regulators and changeover system.

1a. Ton Containers & Chlorine Manifolds: NOTE: For more detailed technical information, please refer to the latest copy of Hydro Instruments TCM-DC design guide for ton container mounted manifolds.

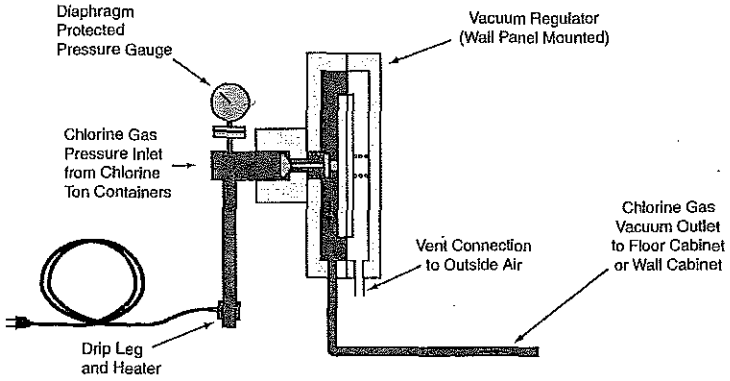
Evaporation cooling limits the chlorine gas withdrawal rate for a single chlorine ton container to approximately 10 kg/hr (500 PPD). Therefore, a 40 kg/hr (2000 PPD) system should be designed so that four ton containers are feeding simultaneously. This can be accomplished by mounting a vacuum regulator on each ton container or by connecting four ton containers together with a pressurized manifold. Pressurized chlorine manifolds are used to collect chlorine gas from one or more chlorine ton containers. The manifold must trap and evaporate liquid chlorine to prevent it from entering and damaging the vacuum section of the equipment.

Figure 3: Chlorine Pressure Manifold



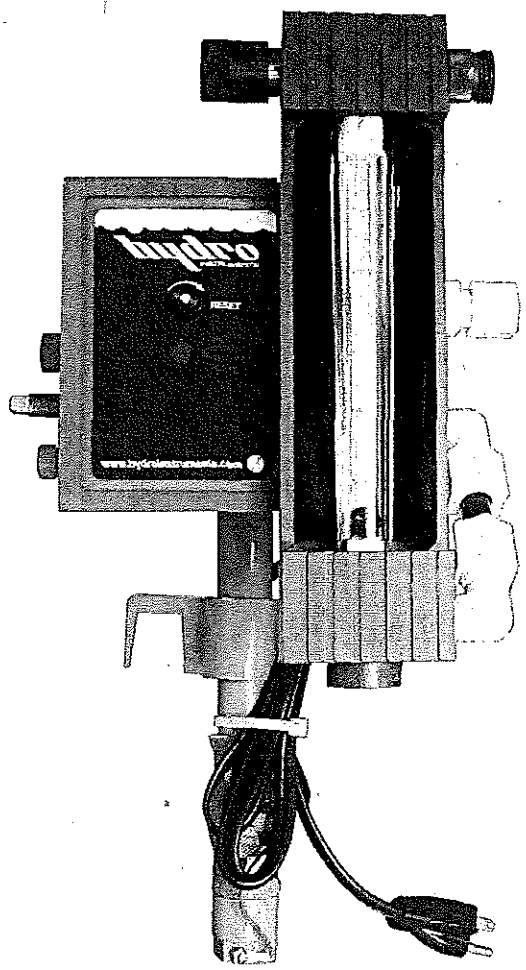
1b. Vacuum Regulators: Chlorine gas enters the vacuum regulator under pressure. When the ejector is in operation it creates a vacuum (that vacuum extends to the rear cavity of the vacuum regulator) that causes the diaphragm assembly to press back against the spring loaded normally closed inlet valve, causing it to open and allow chlorine gas to flow in under vacuum conditions. When vacuum is lost for any reason, the inlet valve spring will close the valve and stop the flow of chlorine immediately.

Figure 4: Vacuum Regulator



001045

The most durable gas chlorinator on the market...



SERIES 700 AND 750

GAS CHLORINATORS

Potable Water Systems • Industrial Process Water
Sanitary Sewage • Industrial Waste Water
Community Water Systems • Power Plants • Swimming Pools & Fountains

EASY INSTALLATION: Advanced product design eliminates the probability of troublesome installations.

FEWER PARTS: Proven product engineering results in fewer parts for exceptional operating reliability, lower cost, and longer life.

TOTAL RELIABILITY: Every part is optimally designed and manufactured using materials proven to be chemically resistant to chlorine gas. Therefore, Hydro Instruments' Series 700 and 750 components can be used to handle chlorine gas with safety and complete control at capacities up to 500 lbs/day (10,000 grams/hour).

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BULLETIN 700/750 Rev. 6/10

GAS CHLORINATORS

Principle of Operation

For a particular ejector back pressure, a minimum water supply is required at the ejector inlet to create vacuum at a level strong enough to operate the chlorinator. This vacuum originates in the throat of the ejector's Venturi nozzle and after opening the ejector check valve, extends into the body of the chlorinator. There it causes the regulating diaphragm to open the inlet safety valve, allowing gas under pressure to pass into the drip leg where the initial liquid is collected. A heater attached to the drip leg evaporates the liquid that is in the eduction tube of the gas valve on startup of a new ton container. This heater remains on constantly, permitting only gas to flow to the vacuum regulator. As it flows across the inlet safety valve assembly, it is filtered and reduced to a vacuum.

The gas then enters a chamber where the vacuum level is maintained by a spring-opposed, sealed regulating diaphragm. It is then drawn through the chlorine flow meter, across the rate control valve and on to the ejector where it dissolves in water. The resultant, highly concentrated solution exits at the ejector outlet and flows to the desired point of application.

Accuracy

Flow meter accuracy is within 4% of the meter's maximum capacity.

Capacities Available

Maximum total operating rate is 500 pounds per day (10,000 grams per hour). Minimum feed rate is 5% of maximum.

Installation of Hydro Gas Chlorinators

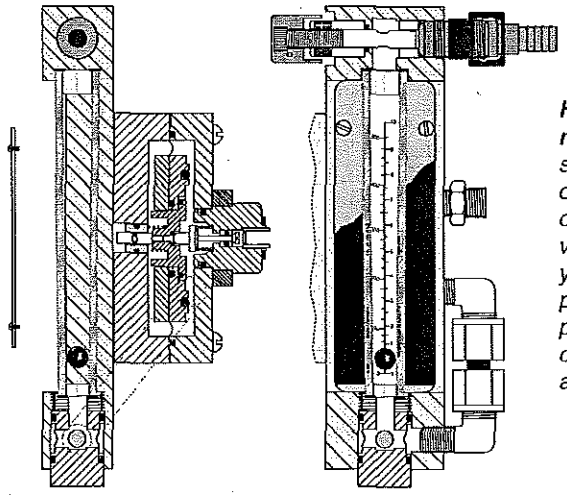
Units of the **Hydro Gas Chlorinator System** can be used for practically any requirement. The schematics show various types of installations using single or multiple containers as well as application of chlorine to pool, basin or pipeline...direct or remote. Basic **Hydro** gas chlorinator units are simply combined to cover all applications.

CHLORINATOR SIZE SHOULD BE BASED ON MAXIMUM POSSIBLE FLOW.

GPM x 0.012 x (PPM) Dosage = PPD

Example:
600 GPM x 0.012 x 3 PPM = 21.6 PPD

In this example a **Hydro** 50 PPD chlorinator would be adequate.



***Hydro Series 700* ton-container mounted gas chlorinators** are designed for manual or semi-automatic operation to meet the highest standards of reliability. They incorporate advanced design features gained through years of research and in-the-field experience. Simplified design and fewer parts mean less maintenance, lower cost with better performance, reliability and long life.*

HYDRO Series 700 Chlorinator

A ton ironwork* is used to mount the **Hydro** chlorinator directly to the container. **This eliminates all pressure lines.** Chlorine gas is taken under vacuum to the point of injection. **This eliminates pressurized solution lines.**

Operator Indicator

During operation the indicator window remains gray; red indicates depletion of the chlorine source.

Inlet Safety Valve

Spring opposed safety valve seals off chlorine in container upon loss of vacuum. Safety valve is encapsulated to permit quick disassembly and cleaning without special tools.

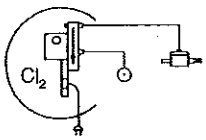
Inlet Sealing Valve

A sealing valve at the chlorinator inlet closes if chlorine supply is interrupted or depleted, sealing the entire vacuum system. Dirt or moisture cannot enter the system when containers are changed.

Regulating Diaphragm

Constant vacuum level is maintained inside the chlorinator by the diaphragm which is O-ring sealed along its entire inner and outer surface to prevent leakage or warping of parts from excessive tightening of the body bolts.

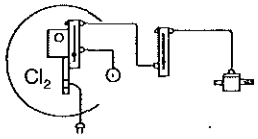
500 PPD systems with one or more wall mounted remote meter(s) (701, 701-2, 702, 702-2, etc.) are standard with chlorinato chlorinator body(ies). The price is reduced if the customer wishes to receive chlorinator(s) with no meter assembly(ies) ("blank at the source (only at the wall mounted remote meter) and on automatic standby systems one will not be able to visually deter



Hydro Model 700
Single-Point Application

Hydro chlorinator mounted on a single container with direct ejector to pipeline or basin. Chlorine capacity to 500 PPD (10,000 grams/hr).

⊙ Vent to safe outside location



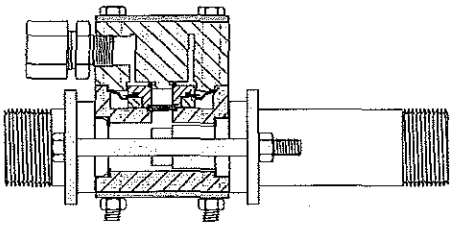
Hydro Model 701
Remote Meter for Single Point of Application

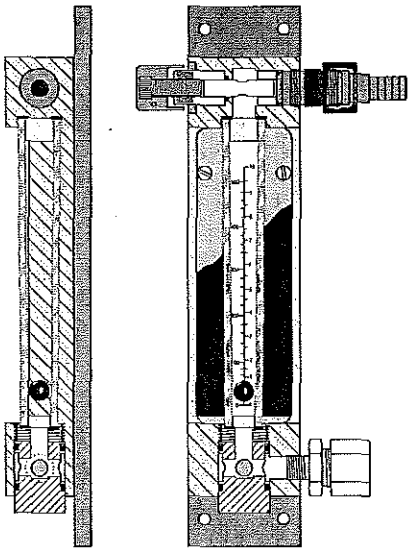
Hydro chlorinator mounted on a single container feeding a remote wall mounted meter with rate valve supplying a single ejector. Chlorine capacity to 500 PPD (10,000 grams/hr).

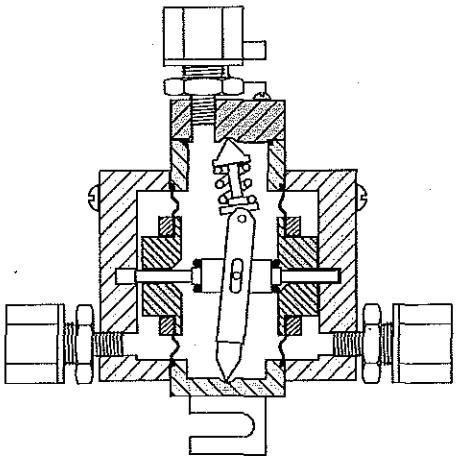
***The Series 750 is the same as the Series 700 but without the ton ironwork. The Series 750**

001047

A complete system for totally reliable control.







HYDRO EJ-5000 Ejector

The **Hydro** ejector utilizes a specially designed O-ring seal check valve which prevents the backflow of water into the chlorinator. The ejector operates on a venturi created by water passing through the ejector nozzle causing the spring opposed diaphragm check valve to open and mix the chlorine gas with the water. The ejector should be supplied with reasonably clean water at temperatures below 80°F (27°C). The **Hydro** ejector is made of durable materials that are resistant to wet and dry chlorine gas use.

HYDRO RM-701 Remote Meter

Any number of **Hydro** Remote Meters may be used in an installation if required. Only the vacuum line is required to the individual ejector which it supplies. Chlorine gas can then be precisely metered at each remote location. If more (or less) is required at one location the meter is simply set at the desired level for that location. By this control of metering at remote locations a perfectly balanced system can be maintained. **Hydro** Remote Meters are practically maintenance free. **Hydro** Remote Meters use a solid silver rate valve. Flow meters are accurate to ±4%.

HYDRO SW-500 Automatic Switchover

Multiple chlorine containers, which prolong the time span before depletion, are easily installed and automatically switch over from a depleted container to the unused container. A **Hydro** Chlorinator is installed on each container and only one Automatic Switchover is required to handle the two containers. The **Hydro** Automatic Switchover can be used with either one remote meter or with two or more remote meters. Use of this switchover module is a great time saver and is a great aid in assuring a more constant supply of chlorine. Once installed, the **Hydro** Automatic Switchover is completely automatic and needs no adjustment or setting.

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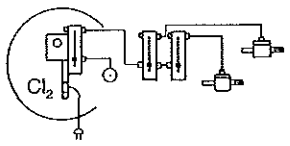
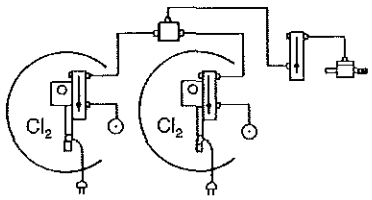
rs that have a remote meter without a rate valve ("plugged") on the
ed"), however it will not be possible to measure the chlorine feed rate
nine which unit is regulating the chlorine supply.



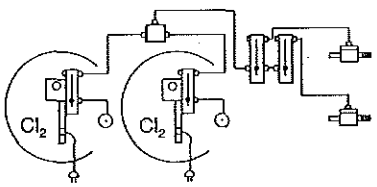
Hydro Model 701-2
Multi-Point Application

Hydro chlorinator mounted on a single container feeding two remote meters for two points of injection using two ejectors. Each meter and ejector operates independently. Chlorine capacity to 500 PPD (10,000 grams/hr).



Hydro Model 702
Automatic Stand-By

Hydro chlorinators – two chlorinators mounted on two containers with switchover module feeding one remote meter with rate valve feeding a single ejector. Capacity to 500 PPD (10,000 grams/hr) maximum.



Hydro Model 702-2
Automatic Stand-By with Multi-Point Feeding

Hydro chlorinators – two chlorinators mounted on two containers with switchover module feeding two or more remote meters with rate valves supplying two ejectors. Capacity to 500 PPD (10,000 grams/hr) maximum.

chlorinator comes complete with a yoke assembly and is used for manifold mounting.

Series 700 and 750
GAS CHLORINATORS

The installation of **Hydro Gas Chlorinators** is easily accomplished. The following will be useful information.

System Operating Temperatures

For best operation and safety, the chlorinator and chlorine supply should be protected from the elements and from direct sunlight.

Methods of Control

Manual
Adjustment of rate valve and start/stop of water to ejector.

Semi-Automatic
- Shutting off booster pump to ejector.
- Using solenoid valve to close vacuum line to ejector.

Step-Feed to multiple flow meters is available using solenoid valves in the vacuum line or water line to the ejector.

STANDARD TUBING CONNECTIONS

Vacuum Tubing Size				Vent
Feed Rate		Length of Tubing		
PPD	Gr/Hr	100 Feet (30m)	200 Feet (60m)	25 Feet (7.5m)
50	1000	3/8" (9.52mm)	3/8" (9.52mm)	3/8" (9.52mm)
100	2000	3/8" (9.52mm)	1/2" (12.7mm)	3/8" (9.52mm)
200	4000	1/2" (12.7mm)	5/8" (15.8mm)	3/8" (9.52mm)
500	10,000	5/8" (15.8mm)	3/4" (19mm)	3/8" (9.52mm)

ACCESSORY EQUIPMENT AVAILABLE

- Loss of Chlorine Alarm
- Multiple Remote Flow Meters and Ejectors
- Inlet Water Assemblies
- Automatic Switchover System
- Booster Pumps
- Gas Masks
- Analyzers
- Leak Detectors

CHLORINE WITHDRAWAL RATE from Horizontal Ton Container

Maximum Chlorinator Withdrawal Capacity		Minimum Ambient Temperature	
PPD	gr/hr	°F	°C
500	10,000	40	4
250	5000	16	-9
150	3000	0	-18
100	2000	-6	-21
50	1000	-20	-29

Ejector Installation

1. Ejector connections must be kept above freezing temperatures.
2. At point of application maximum back pressure for standard ejector is 100 psig. (High pressure ejectors are available.)
3. Long solution lines from ejector should be avoided and if not, solution lines must be of adequate ID to reduce friction loss.
4. To create a vacuum the water supply to the ejector inlet must be higher than the pressure at the point of application (approximately 40 psig differential).
5. Maximum ejector operating temperature is 110° F (43° C).
6. Ejector may be wall mounted for remote applications.

Series No.	(PPD) Maximum Capacity	Mounting
500 Series	100 PPD (2000 gr/hr)	150 lb. cylinder, manifold*, or ton container
200 Series	200 PPD (4000 gr/hr)	150 lb. cylinder, manifold*, or ton container
700 Series	500 PPD (10,000 gr/hr)	Ton container
750 Series	500 PPD (10,000 gr/hr)	Manifold

* For manifold units there is the additional cost of wall mounting manifolds.

Hydro Model EJ-5000 (500 PPD) Ejector Connections

	Standard	Options
Ejector Water Inlet (Nozzle)	EN-296 Nozzle for 1 1/4" NPT	EN-275 Nozzle for 1 1/4" NPT
Ejector Water Outlet (Diffuser)	EDH-560 Diffuser for 1 1/2" ID Hose	EDT-560 Diffuser for 1 1/4" NPT

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Vacuum Regulators

Hydro Instruments manufactures many different designs of vacuum regulators. Some of the most common configurations are shown in the following table. Other designs and configurations are available. Please review our website for more information.

750

- 10 kg/hr
- Optional flow meter
- Optional direct ton container mounting

750W-DL

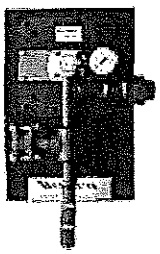
- 10 kg/hr
- Optional flow meter
- Wall-mounted
- Optional drip leg and heater
- Diaphragm protected pressure gauge

SVR-500-CL2

- 10 kg/hr
- Integral vacuum switchover design
- Optional flow meter (5 kg/hr maximum)
- Wall-mounted
- Optional direct ton container mounting

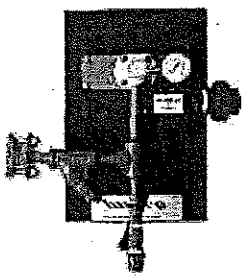
VRH-2000-CL2

- 40 kg/hr
- Drip leg and heater
- 3/4" Steel Union Inlet
- 1" PVC Union Outlet
- Diaphragm protected pressure gauge
- Optional flow indication tube



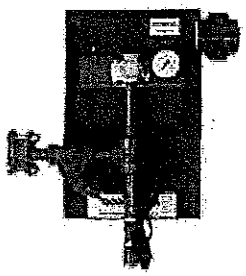
VRH-8000-CL2

- 150 kg/hr
- Drip leg and heater
- 3/4" Steel Union Inlet
- Y-Strainer Inlet Filter
- 1.5" PVC Union Outlet
- Diaphragm protected pressure gauge
- Optional flow indication tube



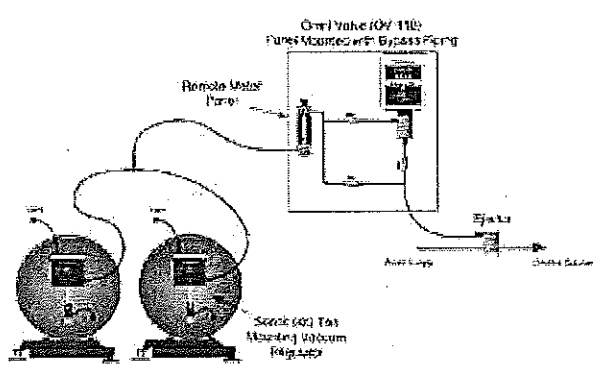
VRH-10000-CL2

- 200 kg/hr
- Drip leg and heater
- 3/4" Steel Union Inlet
- Y-Strainer Inlet Filter
- 2" PVC Union Outlet
- Diaphragm protected pressure gauge
- Optional flow indication tube

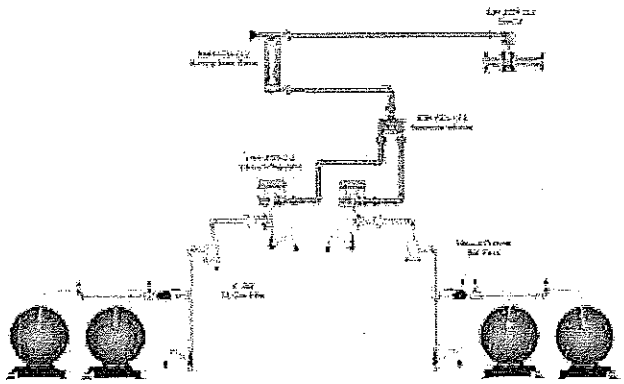
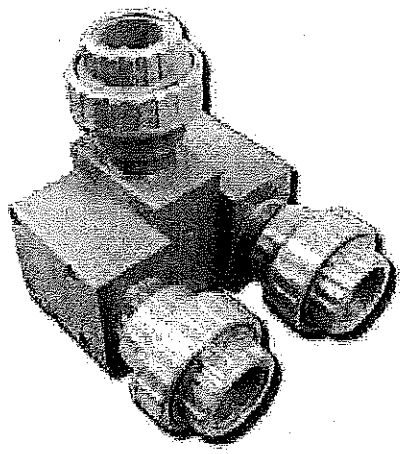


1c. **Changeover Equipment:** Hydro Instruments offers three types of automatic changeover equipment. The function of this equipment is to automatically switch the chlorine gas supply to the standby manifold when the duty manifold containers are empty.

i. **Vacuum Switchover by integral switchover vacuum regulators (Series 900):** This equipment is only available for feed rates up to 10 kg/hr (500 PPD). The Series 900 vacuum regulator design offers automatic switchover based on the high vacuum condition that occurs when the duty chlorine containers are going empty. Once the duty containers are nearly empty, the vacuum level in the system will increase and cause the standby vacuum regulator to switch automatically into the feeding position. The advantage of this system is its simplicity and low cost.

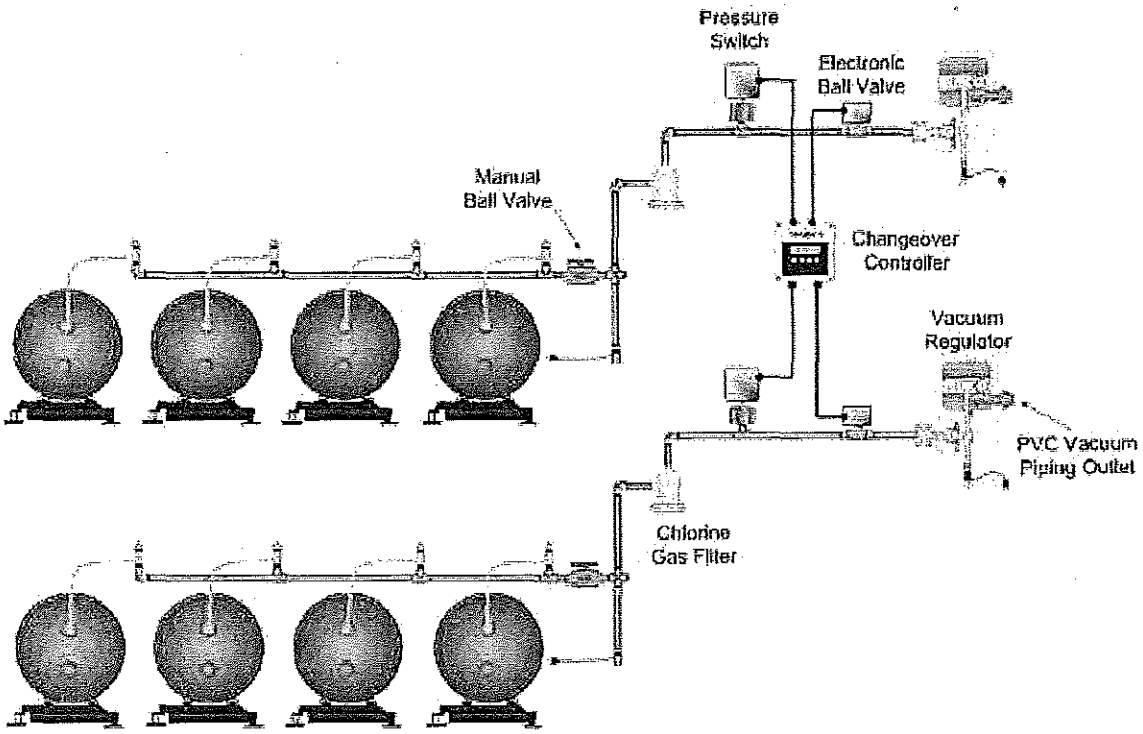
Series 900 System (10 kg/hr)	Series 900 Vacuum Regulator
	

ii. **Vacuum Switchover Modules:** The operation of the vacuum switchover is also based on the rising vacuum level that accompanies the duty manifold ton containers going empty. The switchover module includes a spring loaded mechanism and two diaphragm assemblies. The advantage of this type of switchover mechanism is again the simplicity and relatively low cost.

Model 3105C System (20 kg/hr)	SOH-4000-CL2 (80 kg/hr max.)
	

iii. **Electronic Changeover System (Series CV-100):** The Hydro Instruments Series CV-100 automatic changeover system is designed to allow continuous supply of chlorine gas when using a duty/standby gas container system layout.

Figure 5: Series CV-100 Electronic Changeover System



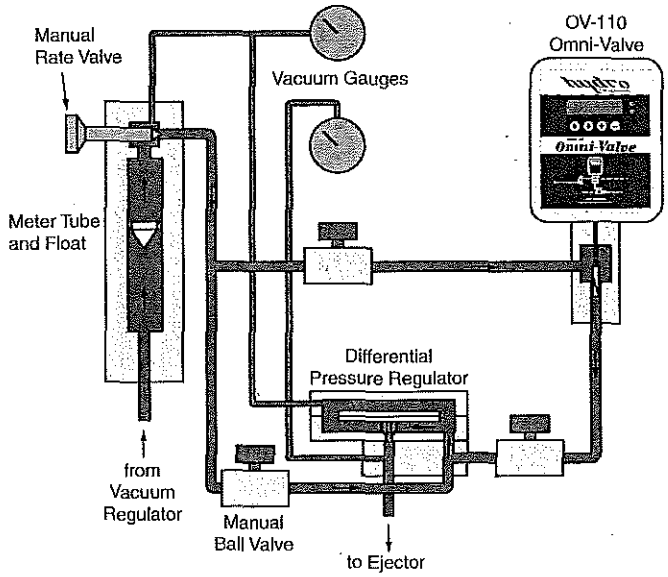
The system consists of a dedicated controller Model CV-100 designed for this application, two pressure switches, and two electronically actuated ball valves. In normal operation, the Model CV-100 controller will keep one of the ball valves open (duty) and the other closed (standby). Upon receiving a low pressure alarm relay signal indicating that the duty gas supply source is nearly depleted, the controller will close the duty ball valve and open the standby ball valve. After such a changeover event, the operator will be required to silence the changeover alarm, change the empty containers, and then acknowledge the container empty alarm.

The Model CV-100 controller also can be used to manually change which ball valve is in operation and to shut down both valves simultaneously. The Model CV-100 controller records the time that each ball valve has been in the duty condition and displays the time of day, day of the week and date of the year on the screen. LEDs on the controller also indicate operation and container empty status for both sides.

Section 2 – Feed Rate Control: This section of the equipment consists of a rotameter type flow meter, manual control valve, automatic control valves and other optional equipment.

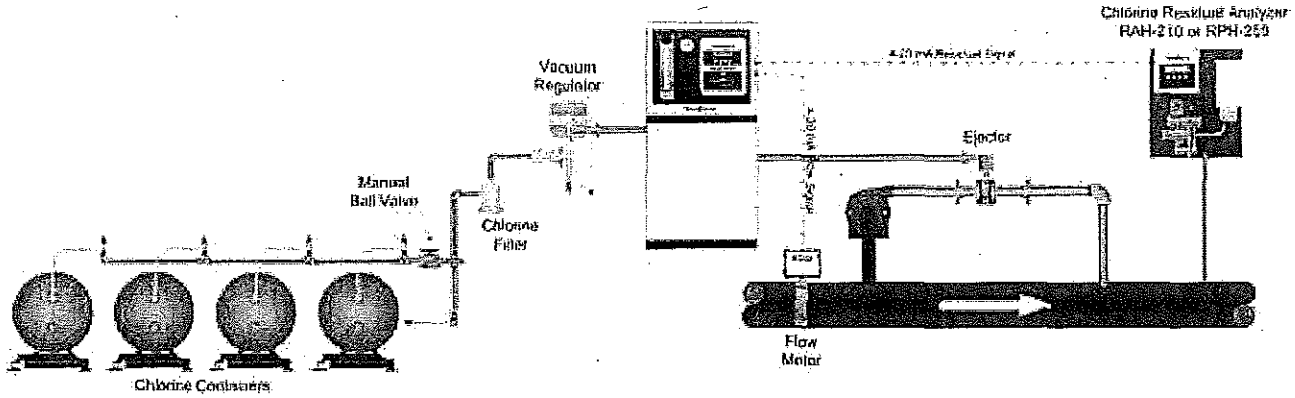
Between the vacuum regulator and the ejector, the chlorine gas flows under vacuum. A chlorine gas flow meter is installed in this section of the system to give a visual indication of the chlorine gas feed rate. Each gas chlorination system will have a manual rate control valve installed after the flow meter tube. An automatic control valve can also be installed in between the flow meter tube and the ejector. Differential pressure regulators, vacuum gauges, vacuum alarms etc. are optional.

Figure 6: Feed Rate Control Equipment



Control Type: The goal of a chlorine gas system is to inject chlorine into the water at a rate that will maintain a desired residual level in the treated process water. Therefore, as the water flow rate and the water quality change, the chlorine feed rate must also be adjusted accordingly to maintain the desired residual in the treated process water. Manual feed rate control can be used in systems where the process water flow and the water quality are both constant. If the water flow rate or water quality are variable, then it is best to use an automatic control system.

Figure 7: Automatic Control System (Compound Loop Control)

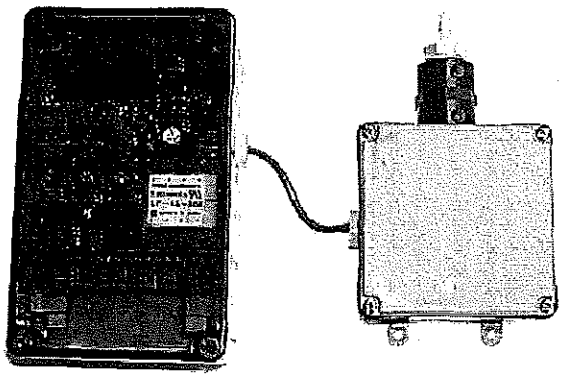


VM-150 Vacuum Monitor

The VM-150 vacuum monitor is 100% electronic, full featured monitoring system with a three digit digital readout. The system utilizes the latest in integrated sensor technology that results in improved accuracy, reliability, versatility , and chemical compatibility. All monitors come standard with an analog output for connection to local monitoring equipment.

The VM-150 comes standard with an oil based protection device that allows direct contact with many gases and liquids including chlorine and sulfur dioxide.

This unit has three alarm relays. One low alarm, one high alarm and one latch relay. All relays are general purpose NO/NC type. These relays give the end user many options on how to respond to an alarm condition.



Specifications & Features

- Input Voltage
  - 115V 60 Hz, 0.1 AMPS
  - 230V 50 Hz, 0.1 AMPS
- Alarm Relays
  - 120V @ 5 AMPS
  - 240V @ 5 AMPS
- NEMA 4X Enclosure
- 1 - 100 Second Alarm Delay
- Temperature Range: -20 - 50 C
- Three Digit LED Digital Readout
- Analog Output: 0 - 30V DC, 0 - 3.0 mA
- One Year Warranty
- Water Tight Fittings
- Three Alarm Relay Outputs:
  1. One NO/NC High
  2. One NO/NC Low
  3. One NO/NC Latch
- Independently Adjustable High/Low Trip Points
- LED Indicator for High/Low Latch Alarm
- IP65 External Latch Alarm Reset Switch

Ordering Information

Model #	Range	Low Alarm	High Alarm	Pressure	Gauge Guard
VM-150-115	0-30 in. Hg	0-15 in. Hg	15-30 in. Hg	30 PSI	Oil
VM-150-230	0-30 in. Hg	0-15 in. Hg	15-30 in. Hg	30 PSI	Oil

Hydro Instruments 600 Emlen Way Telford, PA 18969 Phone: 215.799.0980 Fax: 215.799.0984 Email: sales@hydroinstruments.com Web Address: www.hydroinstruments.com

Specifications subject to change without notice. 2011 Hydro Instruments

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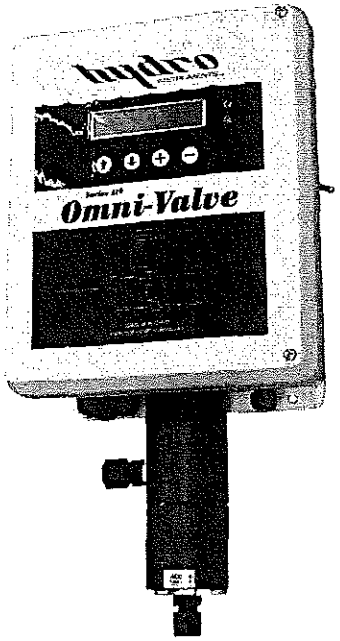
Series 110 Omni-Valve

The valve that does it all...

- **Excellent Accuracy and Repeatability**
- **Maximum Versatility**
- **Remote adjustment and monitoring**
- **Gas or Liquid Metering**
- **Designed for Minimal Wear and Long Life**

With the capability of operating in eight different control modes, handling a wide range of chemicals, covering a wide range of capacities and having a multitude of control options, adjustable features and settings, the Hydro Instruments Omni-Valve is truly an all-in-one automatic control valve for chemical feed.



Control Options (all standard)

Manual Control
Proportional (Flow) Control
Set Point (Residual) Control
Set Point (ORP) Control
Compound Loop (PID) Control
Step Feed Rate Control
Dual Input Feed Forward Control
Dual Set Point Control

Control modes are field selectable and can be changed at any time.

Highlighted Features

2 x 20 Character Liquid Crystal Display
Modbus Communication (RS-485)
3 Analog Inputs
(Flow, Residual and Remote Dosage)
Adjustable: Dosage, Set Points, Lag Time, Signal Filters, Display Ranges, Alarms & More
Linear Operation Eliminates
Rotary Drive Gears & All Rotating Motion
Broad Range of Chemicals & Capacities
Two 4-20 mA Outputs
Password Protected Settings

Because of Hydro Instruments' innovative approach to manufacturing, the ***Omni-Valve*** is the industry's first true directly linear drive control valve design. This linear design provides vast improvements over problematic rotary-driven valves. The ***Omni-Valve*** is the industry leader in terms of offering 8 different control modes (all standard) and a wealth of flexible settings and features. Our state-of-the-art microprocessor technology, highest quality materials of construction, precision machining and a minimal number of moving parts combine to make the ***Omni-Valve*** extremely reliable over long periods of continuous operation and truly the best automatic control valve available on the market.

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PROUDLY MADE IN USA

ISO 9001 Certified

600 Emlen Way, Telford, PA 18969 • Telephone: (215) 799-0980 • Fax: (215) 799-0984
Toll Free in the U.S.: 1 (888) 38-HYDRO • www.hydroinstruments.com • sales@hydroinstruments.com

BULLETIN OV-110 Rev. 5/13

Series 110 Omni-Valve

OV-110 Ordering Information

Model: OV-110 - ____ - ____ - ____ - ____ - ____ - ____ - ____ - ____

MAXIMUM CAPACITY
1. 500 ppd (10 kg/hr)
2. 2000 ppd (40 kg/hr)
3. 6000 ppd (120 kg/hr)

GAS OR LIQUID
A. Ammonia (NH_3)
B. Sodium Bisulfite ($NaHSO_3$)
C. Chlorine (Cl_2)
S. Sulfur Dioxide (SO_2)
H. Sodium Hypochlorite (NaOCl)
Other: Consult Factory

RANGE
1. 10 ppd (200 gr/hr)
2. 25 ppd (500 gr/hr)
3. 50 ppd (1 kg/hr)
4. 100 ppd (2 kg/hr)
5. 250 ppd (5 kg/hr)
6. 500 ppd (10 kg/hr)
7. 1000 ppd (20 kg/hr)
8. 2000 ppd (40 kg/hr)
9. 3000 ppd (60 kg/hr)
10. 4000 ppd (80 kg/hr)
11. 6000 ppd (120 kg/hr)

Note: For liquid use please specify the desired max capacity.

POWER REQUIREMENTS
1. 120V 60Hz
2. 240V 50Hz

CONTROL CONFIGURATION
1. Flow Pacing
2. Residual
3. ORP
4. Compound Loop (Residual)
5. Compound Loop (ORP)
6. Step Feed
7. Dual Input Feed Forward
8. Dual Set Point

POWER CABLE LENGTH
1. 6 feet (1.5 m) standard
2. Other (consult factory)

SIGNAL CABLE LENGTH
1. 25 feet (8 m) per input channel
2. Specify length required

POWER LINE ISOLATOR
1. None (standard)
2. Included

Capacity Ranges	
Gas Feed	10, 25, 50, 100, 250, 500, 1000, 2000, 3000, 4000, & 6000 PPD
Liquid Feed	4 GPH through 10 GPM

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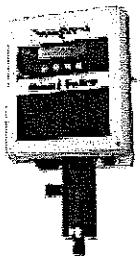
Automatic Control Valves

Hydro Instruments offers two different automatic control valves with the below listed general specifications. The Model 0V-110 offers complete Compound Loop (PID) control capabilities, while the CV-230 is more economical in price for applications that only require proportional control. Both valves use the same 10 point linearization process and automatic self calibration checking. These valves can be provided on wall panels or in floor cabinets.

CV-230

- Flow Pacing Control Only
- One 4-20mA Input Channel
- One Relay Alarm Output
- Two 4-20mA Output Channels
- 120 kg/hr maximum capacity (Cl_2)
- 2 line, 20 character LCD Display
- Linear Stepper Motor

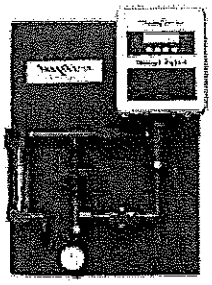
OV-110



- Flow, Residual, Compound Loop & Step Feed
- Three 4-20mA Input Channels
- Four Relay Input Channels (step feed)
- One Relay Alarm Output
- Two 4-20mA Output Channels
- 120 kg/hr maximum capacity (Cl_2)
- 2 line, 20 character LCD Display
- Linear Stepper Motor

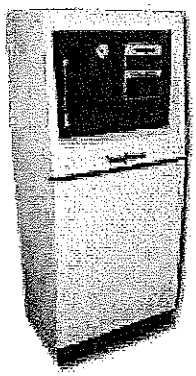
Wall Panel

Hydro Instruments offers prefabricated and tested wall panel mounted chlorine gas feed rate control panels in a variety of configurations. An example of the most common configuration with Model 0V-110 Omni-Valve, bypass piping with true union ball valves, and remote meter with rate valve is shown here. Such wall panels can be provided with vacuum gauges, differential pressure regulators, high/low vacuum alarms, etc.



Floor Cabinet

Hydro Instruments offers prefabricated and tested free standing floor cabinets with a variety of optional features to chose from. Floor cabinets offer a convenient and aesthetic appearance for mounting the control and indication equipment for each chlorine gas feed point. Floor cabinets house the automatic control valve (CV-230 or OV-110), the flow meter tube and manual rate valve, and at least one vacuum gauge with diaphragm protection. Optional equipment includes a second vacuum gauge, high/low vacuum alarm, and differential pressure regulator.



Differential Pressure Regulators

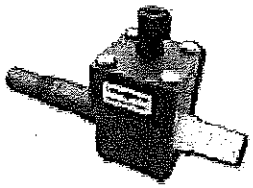
Recommended for feed rates 40 kg/hr and higher
Not necessary for 10 kg/hr and below
Used for stabilizing rotameter indicator float

Will install DP-500

Section 3 – Ejectors: This section creates the vacuum that operates the system and mixes the chlorine gas with the water.

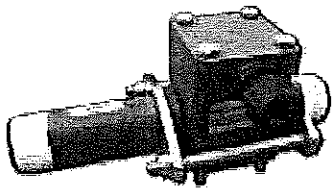
High velocity water flow through the ejector venturi nozzle creates the vacuum that operates the gas chlorination system. Chlorine gas feed is stopped by stopping the water flow to the ejector. When the system is not operating and there is no water flow through the ejector nozzle, there will be no vacuum. Each ejector includes at least one check valve to prevent water from flowing back into the gas chlorination equipment when the system is turned off. Hydro Instruments manufactures a variety of different ejector designs. Refer to the nozzle performance charts and curves that can be found in the Hydro Instruments instruction manuals to consider the water flow and pressure requirements for each ejector. In general, several nozzles are available for each ejector. A list of common ejectors is given here.

EJH-142-CL2, EJH-242-CL2, EJH-542-CL2



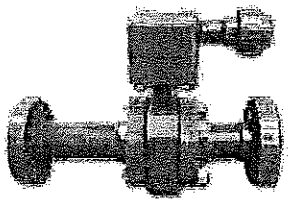
- 10 kg/hr Maximum Capacity
- 3/4" NPT (2 kg/hr)
- 1 1/4" NPT (5 & 10 kg/hr)
- 10 kg/cm² (standard b.p.)
- 20 kg/cm² (high b.p. option)
- Check Valve without diaphragm

EJ-1000, EJ-2000, EJ-5000



- 10 kg/hr Maximum Capacity
- 3/4" NPT (2 kg/hr)
- 1 1/4" NPT (5 & 10 kg/hr)
- Double Check Valve option available
- 10 kg/cm² (standard b.p.)
- 20 kg/cm² (high b.p. option)
- Diaphragm Check Valve

EJH-2000-CL2 and EJH-3000-CL2

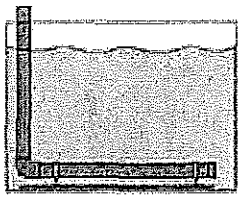


- 120 kg/hr Maximum Capacity
- 2" Flanged and 3" Flanged sizes
- 10 kg/cm² (maximum b.p.)
- Diaphragm Check Valve

The water exiting the ejector contains highly concentrated chlorine solution. Hydro Instruments manufactures a variety of diffusers and corporation stop assemblies that can be used to conveniently and safely inject this solution into the process stream. Secondary check valves are also available for greater protection against water backflow during system stop conditions.

Open Channel Diffusers

Provides more effective mixing in open channels and contact chambers 1/2" through 4" pipe diameter. Every unit is custom-built: pipe size, length, hole diameter, hole quantity, hole spacing and inlet connection.



Spray Diffusers and Corporation Stops

Prevents corrosion of the solution & process piping and provides better mixing in the process line. Corporation stops are designed to allow removal of the diffuser while the process pipe remains pressurized. Available in a range of sizes and materials.

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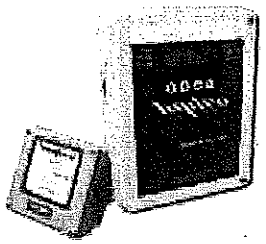
Gas Leak Detectors

Hydro Instruments manufactures two series of gas leak detection equipment. Both series use the same sensors and therefore offer detection of the same set of gases. Sensors are available for Cl_2, SO_2, NH_3, O_3, ClO_2, H_2S, CO_2, H_2, O_2, NO, NO_2, & HCl. The general specifications are shown here below.

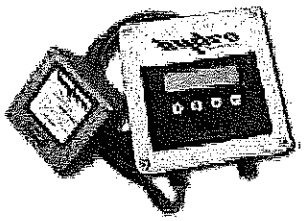
GA-170

- 1 to 4 sensors per monitor
- 2 line, 16 character display
- Integral 90 dB audible alarm
- Optional battery backup
- 6 adjustable relay outputs
- 2 LED indicators per sensor
- RS-232 and 4-20mA outputs



GA-171

- 1 to 2 sensors per monitor
- 2 line, 16 character display
- 1 adjustable common relay output
- 2 LED indicators per sensor
- RS-232 and 4-20mA outputs

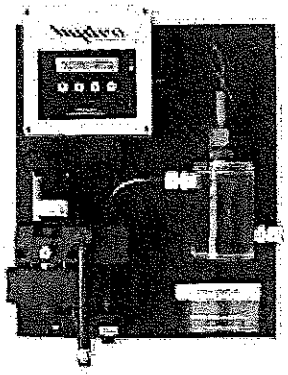


Residual Analyzers

Hydro Instruments produces two series of residual analyzers for online measurement. Both instruments utilize the amperometric method of measurement. The Series RAH-210 incorporates an open flow cell design with large electrode surface area and continuous motor driven cleaning for rugged operation. The Series RPH-250 incorporates a semipermiable membrane and electrolyte design.

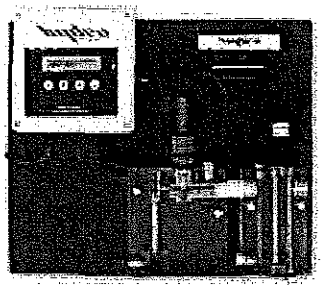
RAH-210

- Free Chlorine, Total Chlorine, & ClO_2
- Continuous Self Cleaning
- PID controller included
- One 4-20mA input channel
- Two 4-20mA output channels
- One alarm relay output
- 2 line, 20 character display
- 2 LED indicators
- RS-232 output
- Temperature Sensor
- Optional pH probe
- Optional Buffer Chemical Feed Systems
- Optional pH Compensation in software



RPH-250

- Free Chlorine & ClO_2
- PID controller included
- One 4-20mA input channel
- Two 4-20mA output channels
- One alarm relay output
- 2 line, 20 character display
- 2 LED indicators
- RS-232 output
- Temperature Sensor
- Optional pH probe
- Optional pH Compensation in software



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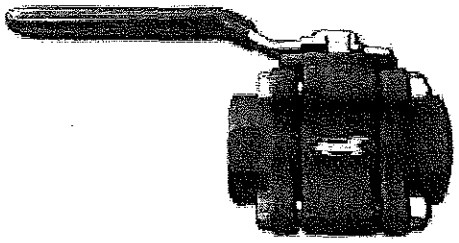
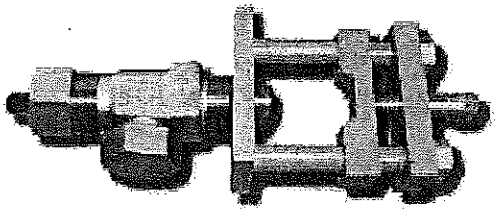
Additional Gas Chlorination Equipment

Chlorine Service Ball Valves



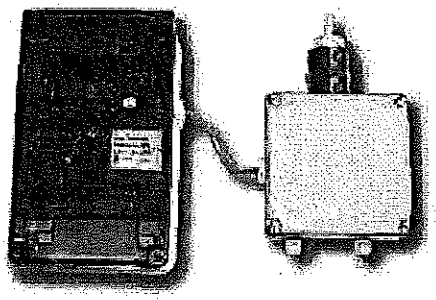
- Manual and electronic with a range of connection sizes. Teflon seals and Carbon Steel housings. Optional Monel or Hastelloy C ball and stem.

Isolation Valve Assemblies



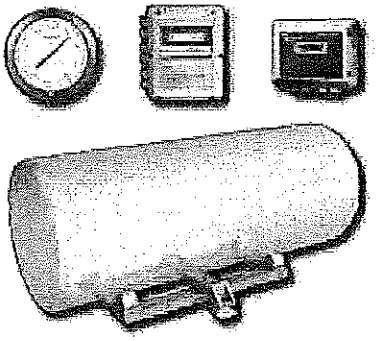
- Eliminate the stress on flexible connectors during cylinder changes. Increase the safety and convenience of changing chlorine containers.

Vacuum Monitor



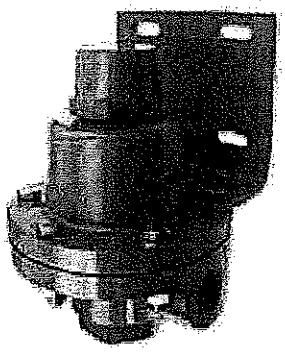
- Continuously monitor the chlorine gas vacuum level with digitial display. Adjustable high and low alarm relays. Specifically designed for chlorine gas application.

Chlorine Container Scales



- Used for monitoring and recording chlorine supply and usage. Electronic and hydraulic scales are available from Hydro Instruments in a variety of configurations. Scale sets are available for weighing the contents of one, two or more chlorine containers simultaneously.

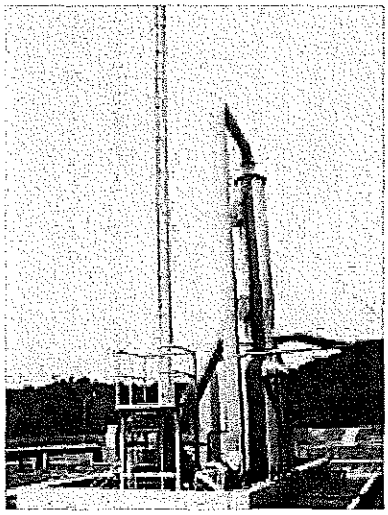
Pressure Reducing Valve



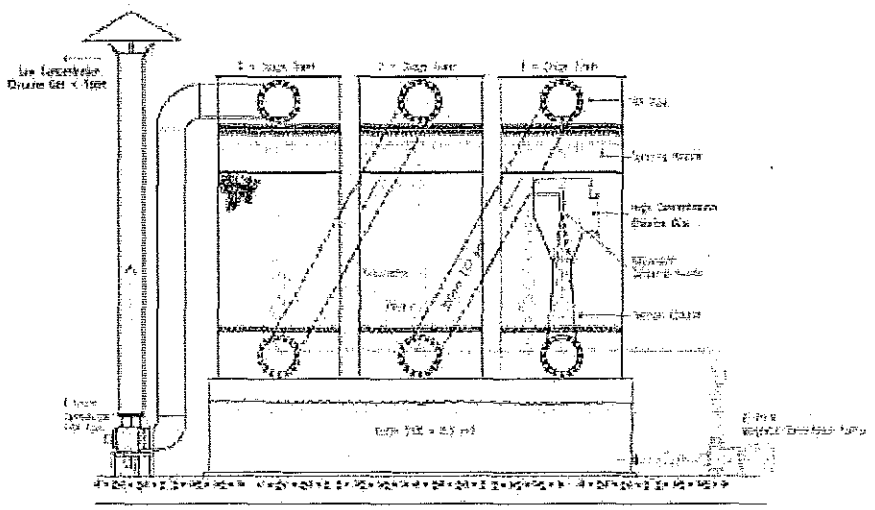
- The Hydro Instruments Series PRV-71H Pressure Reducing Valve is used to reduce and control the gas pressure downstream of the valve. The PRV-71H is designed for chlorine or sulfur dioxide gas service.

Chlorine Leak Absorption Systems

The chlorine scrubber system operation is activated by an alarm relay signal from a gas leak detector. Chlorine storage room air is drawn into the scrubber system where the chlorine is chemically extracted before exhausting the cleaned air to the outside environment. Chlorine scrubber systems are available from Hydro Instruments and our sales representatives in a variety of configurations and sizes.



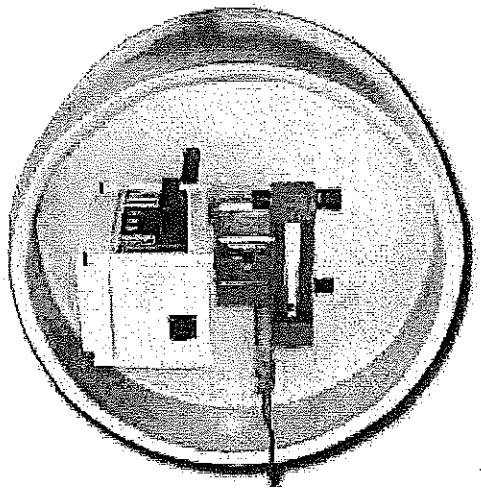
SINGLE STAGE SCRUBBER



3 STAGE SCRUBBER

Emergency Shut-Off Systems

These systems are activated by an alarm relay signal from a gas leak detector. A valve closure acutator (shut-off device) is mounted directly on the chlorine container valve. In the event of a leak, the device will close all of the chlorine container valves immediately to stop the leak. Emergency shut-off systems are available from Hydro Instruments and our sales representatives in a variety of configurations and sizes.



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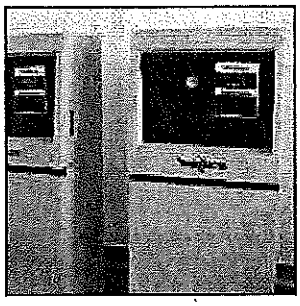
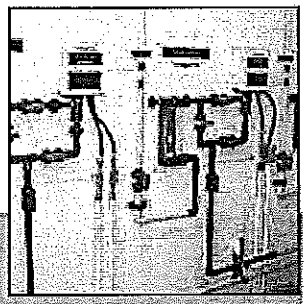
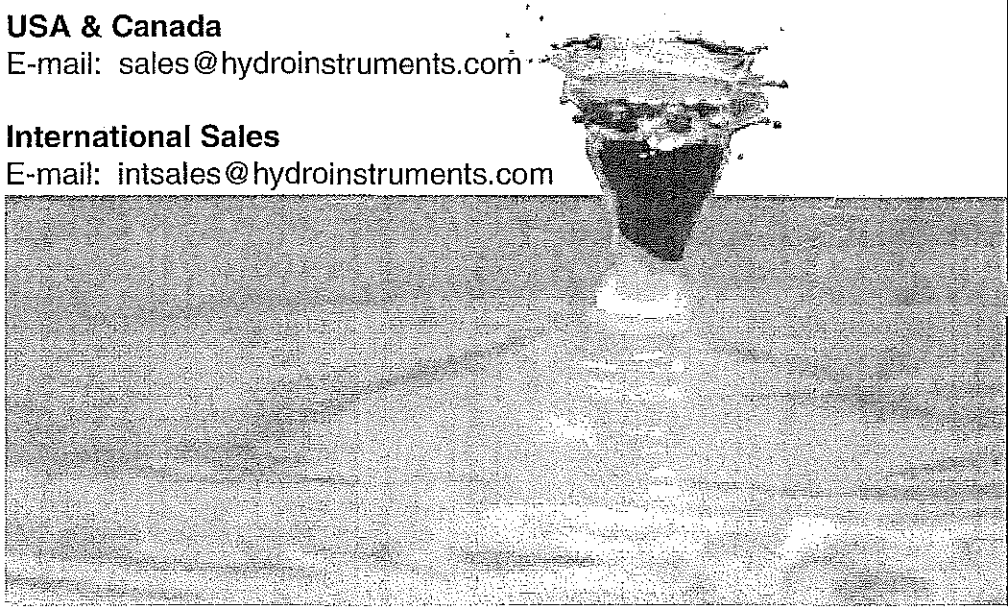
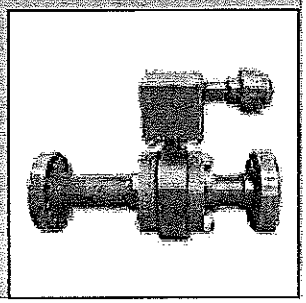


USA & Canada
E-mail: sales@hydroinstruments.com



International Sales
E-mail: intsales@hydroinstruments.com





Represented by:

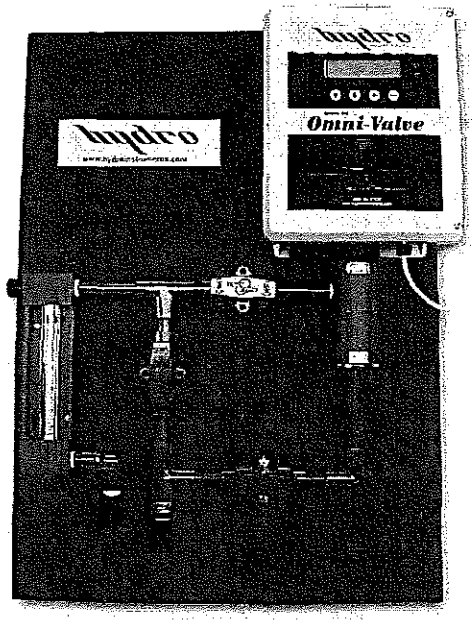
INSTRUMENTS

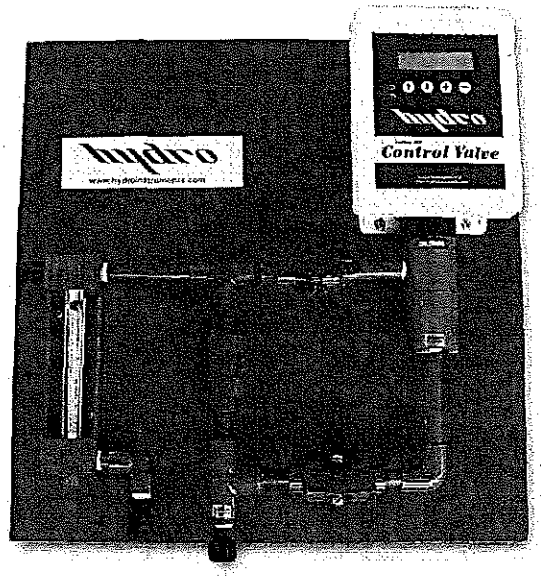
Wall Panel Series
Panel Mounted Products

Wall Panel Series

The Wall Panel Series offers the ability to panel mount the OV-110 and CV-230 automatic feed rate control valves offered by Hydro Instruments.

- Wall panel mounting simplifies the installation process providing easy access to the equipment for operation and maintenance. Panel mounting minimizes the equipments footprint which conserves space and eliminates the use of cabinets.
- Every panel is constructed from the highest quality "high density polyethylene" plastic and schedule 80 PVC piping. Panels are available in standard sizing for the most common configurations. Custom panels are also available. The bypass piping and valve arrangements allows for simple manual feed control whenever maintenance or calibrations are needed on the control valve.





OV-110 Control Options (all standard)

Manual Control
Proportional (Flow) Control
Set Point (Residual) Control
Set Point (ORP) Control
Compound Loop (PID) Control
Step Feed Rate Control
Dual Input Feed Forward
Dual Set Point Control

Control modes are field selectable and can be changed at any time.

OV-110 Highlighted Features

2 x 20 Character Liquid Crystal Display
Modbus Communication (RS-485)
3 Analog Inputs (Flow, Residual and Remote Dosage)
Adjustable: Dosage, Set Points, Lag Time, Signal Filters, Display Ranges, Alarms & More
Linear Operation Eliminates Rotary Drive Gears & All Rotating Motion
Broad Range of Chemicals & Capacities
Two 4-20 mA Outputs
Password Protected Settings
External control of: Duty/Standby & Auto/Manual

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PROUDLY MADE IN USA

ISO 9001 Certified

600 Emlen Way, Telford, PA 18969 • Telephone: (215) 799-0980 • Fax: (215) 799-0984
Toll Free in the U.S.: 1 (888) 38-HYDRO • www.hydroinstruments.com • sales@hydroinstruments.com

Custom Configurations and Options

Wall Panel Series 110 Omni-Valve Order Information

Model: WPOV-110 – ____ – ____ – ____ – ____ – ____ – ____ – ____ – ____ – ____ – ____ – ____
A B C D E F G H I J K

Position	Feature	Description
A. MAXIMUM CAPACITY	1	500 ppd (10 kg/hr):
	2	2000 ppd (40 kg/hr):
	3	6000 ppd (120 kg/hr):
B. GAS OR LIQUID	A	Ammonia (NH_3)
	B	Sodium Bisulfite ($NaHSO_3$)
	C	Chlorine (Cl_2)
	S	Sulfur Dioxide (SO_2)
	H	Sodium Hypochlorite (NaOCl)
	Other	Consult Factory
C. FLOW METER CAPACITY *Note: For liquid use please specify the desired max capacity.*	1	10 ppd (200 gr/hr)
	2	25 ppd (500 gr/hr)
	3	50 ppd (1 kg/hr)
	4	100 ppd (2 kg/hr)
	5	250 ppd (5 kg/hr)
	6	500 PPD (10 kg/hr)
	6A	500 PPD (10 kg/hr) RM-702 *RM-702 Rate Valve Knob protrudes from front of meter*
	7	1000 ppd (20 kg/hr)
	8	2000 ppd (40 kg/hr)
	9	3000 ppd (60 kg/hr)
	10	4000 ppd (80 kg/hr)
	11	6000 ppd (120 kg/hr)
D. POWER REQUIREMENTS	1	120V 60Hz
	2	240V 50Hz
E. CONTROL CONFIGURATION	1	Flow Pacing
	2	Residual
	3	ORP
	4	Compound Loop (Residual)
	5	Compound Loop (ORP)
	6	Step Feed
	7	Dual Input Feed Forward
	8	Dual Set Point
F. POWER CABLE LENGTH	1	6 feet (1.5 m) standard
	2	Other (consult factory)
G. SIGNAL CABLE LENGTH	1	25 feet (8 m) per input channel
	2	Specify length required
H. 4-20 mA OUTPUT	1	Not Included
	2	Included
I. POWER LINE ISOLATOR	1	None (standard)
	2	Included
J. BYPASS PIPING ARRANGEMENT	1	None
	2	Up to 500 ppd (10 kg/hr)
	3	2000 ppd (40 kg/hr)
	4	3000 ppd (60 kg/hr)
	5	6000 ppd (80 kg/hr)
K. DIFFERENTIAL PRESSURE REGULATOR	1	None
	2	Up to 250 ppd (5 kg/hr)
	3	500 ppd (10 kg/hr)
	4	2000 ppd (40 kg/hr)
	5	3000 ppd (60 kg/hr)
	6	4000 ppd (80 kg/hr)
	7	6000 ppd (120 kg/hr)

NOTES:

1. Standard flow tubes for up to 250 PPD (5 kg/hr) are 3" length. For 6" flow tubes on Item C=1-5, add an "A" after this number (i.e., 3 becomes 3A).
2. Port sizes are as follows:
   - up to 250 PPD (5 kg/hr) has ¼" NPT
   - 500 PPD (10 kg/hr) has ½" NPT
   - 1000 & 2000 PPD (20 & 40 kg/hr) has 1" NPT
   - 3000, 4000, & 6000 PPD (60, 80, & 120 kg/hr) has 1.5" Socket

hydro INSTRUMENTS

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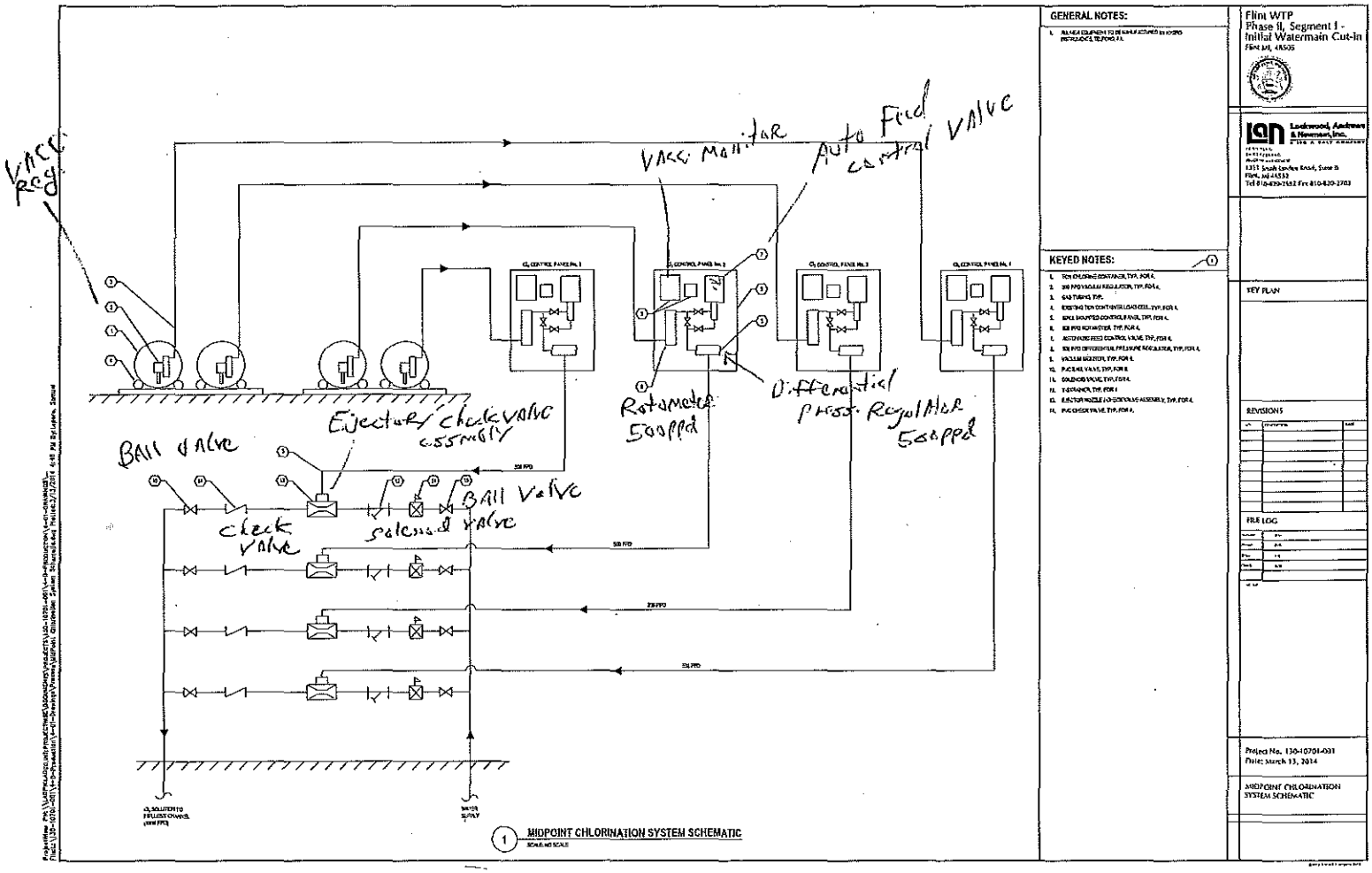
Affects that feeder
feed rate control - not make-up water
— piping not from tank to feeder?
— then from feed to make-up line?



Provide Full Size

OZONE CALCULATIONS

Flint WTP

OXYGEN AND NITROGEN SYSTEMS CAPACITIES

DATA LEGEND

REQUIRED DATA
FIXED DATA - DO NOT CHANGE UNLESS EQUIPMENT IS REPLACED
DATA SHOULD NOT CHANGE (MAY BE TWEAKED BASED ON OPERATIONAL RESULTS)
CALCULATION RESULTS

LOX SYSTEM (AVG DAY - AVG DOSE)	
PRESSURE RATING (psig)	175
OPERATING WT (lbs)	119,600
TARE WT (lbs)	33,000
EFFECTIVE VOLUME (lbs)	86,600
EFFECTIVE VOLUME (gals)	9,084
OXYGEN USAGE (ppd)	2833
OXYGEN GAS FLOW (scfm)	23.8
EFFECTIVE STORAGE (days)	30.6

7.53 LBS / GAL

LN SYSTEM (AVG DAY - AVG DOSE)	
PRESSURE RATING (psig)	250
OPERATING WT (lbs)	7,100
TARE WT (lbs)	3,800
EFFECTIVE VOLUME (lbs)	3,300
EFFECTIVE VOLUME (gals)	540
NITROGEN USAGE (ppd)	71
NITROGEN GAS FLOW (scfm)	0.7
EFFECTIVE STORAGE (days)	46.6

6.11 LBS / GAL

OPERATING CONDITIONS (AVG DAY)	
WATER PLANT FLOW (MGD)	10
OZONE DOSE (mg/l)	2.5
OZONE CONCENTRATION (%)	8
TRANSFER EFFICIENCY (%)	92
OZONE FEED RATE (ppd)	227

2833 ok

OPERATING CONDITIONS (MAX DAY)	
WATER PLANT FLOW (MGD)	18
OZONE DOSE (mg/l)	4
OZONE CONCENTRATION (%)	8
TRANSFER EFFICIENCY (%)	92
OZONE FEED RATE (ppd)	653

8159

STORAGE REQUIREMENTS		
DAYS @ AVG DAY - AVG DOSE	30	
LIQUID OXYGEN (lbs)	84986	
LIQUID NITROGEN (lbs)	2125	Use
NUMBER OF LOX TANKS	0.98	1
NUMBER OF LN TANKS	0.64	1

SUMMARY OF RESULTS

Based on Average Day Demand of 10 MGD and Average Dosage of 2.5 mg/L ozone at 8% concentration, a single 9,084 gallon LOX tank and a single 540 gallon LIN tank will provide the 30 days of storage. Two LOX tanks and two LIN tanks are provided for redundancy.

LOX AVG DAY FEED RATE: 2.5 mg/l * 10 * 8.34 = 208.5 ppd * 10.8 LBS OXY / 8 LBS LOX * 100/92 = 2833 LBS/DAY = 305 DAYS

of MGD MAX DAY: 18 * 8.34 * 100/8 * 100/92 = 8159 LBS/DAY

at 12 MGD → 3400 LB/D OR 25 DAYS

~~LIN → AVG DAY 2.5 * 10 * 8.34 * 10.8 LBS / 6 LBS~~

LN → 2833 * 0.025 = 71 ppd LN → 46 DAYS

@ 12 MGD → 85.2 PPD → 39 DAYS

at 12 MGD MAX 4.0 mg/l = 5490 LB/DAY OR 16 DAYS

D-5a 1/86
Authority; Act 399, P.A. 1976

MICHIGAN DEPARTMENT OF PUBLIC HEALTH

TEST RUN OPERATION REPORT
OF
WATER TREATMENT PLANT

For Month of April 2011

Flint Water Plant — NAME OF WATER SYSTEM
2310 — WSSN
Genesee — COUNTY

CERTIFIED OPERATOR

F-1R S-3 — CLASSIFICATION

SIGNATURE OF APPROPRIATE OFFICIAL

TREATMENT RATE AND FILTER DATA

1. Treatment Rate, Maximum **14** Million Gallons Per Day
2. Treatment Rate, Approved Rated Plant Capacity **36** Million Gallons per Day
3. Average Filter Run **73+** Hours, Average Head Loss n/a Feet
4. Average Filtration Rate **1.9** Gallons per Square Ft. per Minute
5. Maximum Filtration Rate **2.9** Gallons per Square Ft. per Minute
6. Average Wash Water Use n/a percent of Treated Water

CHEMICAL DATA

7. Chlorine on hand _____ lbs.: Estimated supply _____ days
8. Oxygen (O2) on hand _____ lbs.: Estimated supply _____ days
9. Ferric (Fe3+) on hand _____ lbs.: Estimated supply _____ days
10. Cost of All Chemicals per Million Gallons _____
11. Total Power Cost per Million Gallons _____

Remarks:

Submit to: Mike Prysby, P.E.
MDEQ-Water Division-Lansing District
P.O. Box 30242
Lansing, MI 48909

Failure to complete this form is a violation of Act 399, P.A. 1976 and is subject to penalties as outlined in the Act.

Daily Flow & Ozone Parameters WSSN 2310 April 2011

DATE	Average Daily Flow (MGD)	O_3 Dosage (lbs/day)	Ozone residuals (mg/L)												Sodium Bisulfite Dosage (mg/L)
			Contact Chamber #1				Contact Chamber # 2				Contact Chamber # 3				
			# of Samples	Start (avg mg/L)	Middle (avg. mg/L)	End (avg. mg/L)	# of Samples	Start (avg mg/L)	Middle (avg. mg/L)	End (avg. mg/L)	# of Samples	Start (avg mg/L)	Middle (avg. mg/L)	End (avg. mg/L)	
1															
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22															
23															
24															
25	8.0	404	4	0.89	0.06	0.05	4	0.16	0.05	0.05					
26	10.6	830	9	1.02	0.02	0.00	9	0.85	0.01	0.00					
27	9.0	885	4	1.44	0.00	0.00	9	1.33	0.00	0.00					
28	9.2	946					9	1.22	0.00	0.00					
29	5.4	560					3	1.33	0.03	0.03	3	0.80	0.00	0.00	
30															
AVG	8.4	725	6	1.12	0.03	0.02	7	0.98	0.02	0.02	3	0.80	0.00	0.00	
MAX	10.6	946	9	1.44	0.06	0.05	9	1.33	0.05	0.05	3	0.80	0.00	0.00	
MIN	5.4	404	4	0.89	0.00	0.00	3	0.16	0.00	0.00	3	0.80	0.00	0.00	
Total	42.2														

Coagulation & Flocculation Parameters WSSN 2310 April 2011

DATE	Ferric Chloride as $FeCl_3$ mg/l	Ferric Chloride as Fe 3+ mg/l	Turbidity, NTU units											
			Raw			Plate Settler Effluent			Filter Influent			Filter Effluent		
			# of Samples	Avg.	Max	# of Samples	Avg.	Max	# of Samples	Avg.	Max	# of Samples	Avg.	Max
1														
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6														
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23														
24														
25	38.6	13.3	6	16.0	17.8	6	2.22	5.25	4	2.04	1.40			
26	49.3	17.0	10	14.8	18.1	10	0.91	1.17	10	0.97	1.20	12	0.12	0.21
27	47.6	16.4	8	14.7	17.5	8	0.67	0.88	8	0.69	0.80	32	0.08	0.10
28	50.4	17.3	8	26.7	44.7	8	0.65	0.80	8	0.64	0.77	32	0.08	0.09
29	55.9	19.2	6	98.2	150	5	1.65	2.85	5	1.25	2.28	15	0.15	0.31
30														
AVG	48.4	16.6	8	34.1	49.6	7	1.22	2.19	7	1.12	1.29	23	0.11	0.18
MAX	55.9	19.2	10	98.2	150	10	2.22	5.25	10	2.04	2.28	32	0.15	0.31
MIN	38.6	13.3	6	14.7	17.5	5	0.65	0.80	4	0.64	0.77	12	0.08	0.09

Flouridation & Chlorination WSSN 2310 — April 2011

DATE	Fluoride Applied F- mg/l	Fluoride Analyses mg/l			Chlorine App. Mg/l		Chlorine Residual mg/l							
					Chlorine (prior to filtration) mg/L OCl-	Post Chlorine mg/L	Plate Settler Effluent		Contact Clairifier Effluent		Combined Filter Effluent (north)		Combined Filter Effluent (south)	
		Raw	Filter Eff.	Dist			Free	Total	Free	Total	Free	Total	Free	Total
1														
2														
3														
4														
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23														
24														
25		0.16	0.14		2.0		0.5	0.7	0.2	0.4				
26		0.15	0.15		2.7		0.5	0.8	0.2	0.5	0.2	0.4	0.2	0.3
27		0.15	0.13		3.2		0.7	1.0	0.3	0.6	0.2	0.4	0.2	0.3
28		0.17	0.16		3.1		0.7	1.1	0.3	0.5	0.1	0.4	0.1	0.3
29		0.16	0.15		3.2		0.7	1.0	0.2	0.4	0.2	0.3	0.1	0.3
30														
AVG		0.16	0.15		2.8		0.6	0.9	0.2	0.5	0.2	0.4	0.2	0.3
MAX		0.17	0.16		3.2		0.7	1.1	0.3	0.6	0.2	0.4	0.2	0.3
MIN		0.15	0.13		2.0		0.5	0.7	0.2	0.4	0.1	0.3	0.1	0.3

Chemical Analyses WSSN 2310 — April 2011

DATE	pH		Total Hard as $CaCO_3$ mg/l		Total Alk as $CaCO_3$ mg/l		NonCarbonate Hardness as $CaCO_3$ mg/l		Calcium Ca 2+ mg/l		Magnesium as Mg 2+ mg/l		Nitrate as NO_3- mg/l		Chloride as Cl - mg/l	
	Raw	Filter Eff.	Raw	Filter Eff.	Raw	Filter Eff.	Raw	Filter Eff.	Raw	Filter Eff.	Raw	Filter Eff.	Raw	Filter Eff.	Raw	Filter Eff.
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24																
25	8.28		244		174		70		72.1		15.6		1.23		45	
26	8.28	7.21	252	248	198	152	54	96	78.6	68.9	13.6	18.5	0.98	1.03	47	84
27	8.30	7.25	240	244	190	152	50	92	70.5	73.7	15.6	14.6	1.10	1.21	46	76
28	8.36	7.30	244	236	194	138	50	98	77.0	73.3	12.6	12.9	1.21	0.72	46	80
29	8.01	7.09	232	232	146	134	86	98	54.5	60.9	23.3	19.4	0.28	0.42	36	78
30																
AVG	8.25	7.21	242	240	180	144	62	96	70.5	69.2	16.1	16.4	0.96	0.84	44	80
MAX	8.36	7.30	252	248	198	152	86	98	78.6	73.7	23.3	19.4	1.23	1.21	47	84
MIN	8.01	7.09	232	232	146	134	50	92	54.5	60.9	12.6	12.9	0.28	0.42	36	76

Bacteriological & Physical Parameters — April 2011

DATE	Total Coliform							Standard Plate Count		Temperature (Celcius)		Color		Odor	
	Raw	Post O3	Plate Settler Eff.	Filter Inf.	Filter Eff.	Lab Tap		Raw	Filter Eff.	Raw	Tap	Raw	Tap	Raw	Tap
1															
2															
3															
4															
5															
6															
7															
8															
9															
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11															
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16															
17															
18															
19															
20															
21															
22															
23															
24															
25	1500	9.8	2/0	2/0				2230		10.8					
26	1421	23.3	5/0	5/0	12/0			2660	2	11.1					
27	1201	27.9	3/0	3/0	24/0			3110	4	12.6					
28	5172	111.2	3/0	3/0	24/0			6230	6	12.7					
29	11199	43.2	2/0	2/0	20/0			7380	8	11.5					
30															
AVG	* Raw and post-ozone coliform are most probable number maximum daily results.									11.7					
MAX	* Raw HPC counts are daily maximums.									12.7					
MIN										10.8					

D-5a 1/86
Authority; Act 399, P.A. 1976

MICHIGAN DEPARTMENT OF PUBLIC HEALTH

TEST OPERATION REPORT
OF
WATER TREATMENT PLANT

For Month of June 2011

Flint Water Plant	2310	Genesee
NAME OF WATER SYSTEM	WSSN	COUNTY

Michael Glasgow	F-1R S-3
CERTIFIED OPERATOR	CLASSIFICATION

SIGNATURE OF APPROPRIATE OFFICIAL

TREATMENT RATE AND FILTER DATA

1. Treatment Rate, Maximum 10.1 Million Gallons Per Day
2. Treatment Rate, Approved Rated Plant Capacity 36 Million Gallons per Day
3. Average Filter Run 72+ Hours, Average Head Loss _____ Feet
4. Average Filtration Rate 2.3 Gallons per Square Ft. per Minute
5. Maximum Filtration Rate 2.5 Gallons per Square Ft. per Minute
6. Average Wash Water Use _____ percent of Treated Water

CHEMICAL DATA

7. Chlorine on hand _____ lbs.: Estimated supply _____ days
8. Oxygen (O2) on hand _____ lbs.: Estimated supply _____ days
9. Ferric (Fe3+) on hand _____ lbs.: Estimated supply _____ days
10. Cost of All Chemicals per Million Gallons _____
11. Total Power Cost per Million Gallons _____

Remarks:

Submit to: Mike Prysby, P.E.
MDEQ-Water Division-Lansing District
P.O. Box 30242
Lansing, MI 48909

Failure to complete this form is a violation of Act 399, P.A. 1976 and is subject to penalties as outlined in the Act.

Daily Flow & Ozone Parameters WSSN 2310 June 2011

DATE	Average Daily Flow (MGD)	O_3 Dosage (lbs/day)	Ozone residuals (mg/L)												Sodium Bisulfite Dosage (mg/L)
			Contact Chamber #1				Contact Chamber # 2				Contact Chamber # 3				
			# of Samples	Start (avg mg/L)	Middle (avg. mg/L)	End (avg. mg/L)	# of Samples	Start (avg mg/L)	Middle (avg. mg/L)	End (avg. mg/L)	# of Samples	Start (avg mg/L)	Middle (avg. mg/L)	End (avg. mg/L)	
1															
2															
3															
4															
5															
6	5.8	576	4	0.03	0.00	0.00									
7	9.5	1033	3	0.36	0.00	0.00	5	0.63	0.00	0.00					
8	9.4	1132					8	0.33	0.00	0.00					
9	9.0	1156					7	0.20	0.00	0.00					
10	4.8	685					4	0.63	0.00	0.00					
11															
12															
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17															
18															
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26															
27															
28															
29															
30															
AVG	7.7	916	4	0.20	0.00	0.00	6	0.45	0.00	0.00					
MAX	9.5	1156	4	0.36	0.00	0.00	8	0.63	0.00	0.00					
MIN	4.8	576	3	0.03	0.00	0.00	4	0.20	0.00	0.00					
Total	38.5														

Coagulation & Flocculation Parameters WSSN 2310 June 2011

DATE	Ferric Chloride as $FeCl_3$ mg/l	Ferric Chloride as Fe 3+ mg/l	Turbidity, NTU units											
			Raw			Plate Settler Effluent			Filter Influent			Filter Effluent		
			# of Samples	Avg.	Max	# of Samples	Avg.	Max	# of Samples	Avg.	Max	# of Samples	Avg.	Max
1														
2														
3														
4														
5														
6	55.9	19.2	5	5.60	6.70	4	3.15	7.35	2	3.08	3.46			
7	53.0	18.2	9	5.80	6.90	9	0.93	1.22	9	1.15	1.88	12	0.18	0.23
8	47.6	16.3	8	5.53	8.81	8	0.53	0.67	8	0.60	0.70	32	0.10	0.15
9	52.6	18.1	7	5.97	7.08	7	0.59	1.11	8	0.52	0.58	28	0.10	0.17
10	52.7	18.2	4	6.72	7.98	4	0.36	0.38	4	0.36	0.39	16	0.07	0.09
11														
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30														
AVG	52.4	18.0	7	5.92	7.49	6	1.11	2.15	6	1.14	1.40	22	0.11	0.16
MAX	55.9	19.2	9	6.72	8.81	9	3.15	7.35	9	3.08	3.46	32	0.18	0.23
MIN	47.6	16.3	4	5.53	6.70	4	0.36	0.38	2	0.36	0.39	12	0.07	0.09

Flouridation & Chlorination WSSN 2310 — June 2011

DATE	Fluoride Applied F- mg/l	Fluoride Analyses mg/l			Chlorine App. Mg/l		Chlorine Residual mg/l							
					Chlorine (prior to filtration) mg/L OCl-	Post Chlorine mg/L	Plate Settler Effluent		Contact Clairifier Effluent		Combined Filter Effluent (north)		Combined Filter Effluent (south)	
		Raw	Filter Eff.	Dist			Free	Total	Free	Total	Free	Total	Free	Total
1														
2														
3														
4														
5														
6		0.18			3.6		0.3	0.6	0.2	0.3				
7		0.19	0.21		3.8		0.8	1.1	0.2	0.5	0.2	0.4	0.1	0.3
8		0.17	0.19		3.8		1.0	1.3	0.3	0.5	0.1	0.3	0.1	0.3
9		0.18	0.20		4.0		0.8	1.2	0.3	0.6	0.1	0.3	0.1	0.3
10		0.17	0.19		4.1		1.1	1.5	0.3	0.5	0.1	0.3	0.1	0.3
11														
12														
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21														
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26														
27														
28														
29														
30														
AVG		0.18	0.20		3.9		0.8	1.1	0.3	0.5	0.1	0.3	0.1	0.3
MAX		0.19	0.21		4.1		1.1	1.5	0.3	0.6	0.2	0.4	0.1	0.3
MIN		0.17	0.19		3.6		0.3	0.6	0.2	0.3	0.1	0.3	0.1	0.3

Chemical Analyses WSSN 2310 June 2011

DATE	pH		Total Hard as $CaCO_3$ mg/l		Total Alk as $CaCO_3$ mg/l		NonCarbonate Hardness as $CaCO_3$ mg/l		Calcium Ca 2+ mg/l		Magnesium as Mg 2+ mg/l		Nitrate as NO_3- mg/l		Chloride as Cl - mg/l	
	Raw	Filter Eff.	Raw	Filter Eff.	Raw	Filter Eff.	Raw	Filter Eff.	Raw	Filter Eff.	Raw	Filter Eff.	Raw	Filter Eff.	Raw	Filter Eff.
1																
2																
3																
4																
5																
6	8.35		232		198		34		78.6		8.7		0.58		41	
7	8.44	7.18	224	220	200	156	24	64	72.1	70.5	10.7	10.7	0.57	0.67	34	70
8	8.32	7.35	252	232	204	148	48	84	75.4	64.1	15.6	17.5	0.54	0.67	28	48
9	8.38	7.24	248	244	200	150	48	94	64.1	65.7	20.4	22.4	0.53	0.65	44	66
10	8.36	7.28	236	230	196	146	40	84	77	69.7	10.7	13.6	0.83	0.7	46	68
11																
12																
13																
14																
15																
16																
17																
18																
19																
20																
21																
22																
23																
24																
25																
26																
27																
28																
29																
30																
AVG	8.37	7.26	238	232	200	150	39	82	73.4	67.5	13.2	16.1	0.61	0.67	39	63
MAX	8.44	7.35	252	244	204	156	48	94	78.6	70.5	20.4	22.4	0.83	0.70	46	70
MIN	8.32	7.18	224	220	196	146	24	64	64.1	64.1	8.7	10.7	0.53	0.65	28	48

Bacteriological & Physical Parameters — June 2011

DATE	Total Coliform							Standard Plate Count		Temperature (Celcius)		Color		Odor	
	Raw	Post O3	Plate Settler Eff.	Filter Inf.	Filter Eff.			Raw	Filter Eff.	Raw	Tap	Raw	Tap	Raw	Tap
1															
2															
3															
4															
5															
6	2489	129.1	2/0	2/0				>7380		23.4					
7	3255	387.3	6/0	6/0	8/0			4400	2	23.5					
8	3076	344.8	6/0	6/0	24/0			>7380	43	23.9					
9	3873	613.1	5/0	5/0	20/0			7380	392	24.9					
10	3873	461.1	3/0	3/0	12/0			3390	555	22.6					
11															
12															
13															
14															
15															
16															
17															
18															
19															
20															
21															
22															
23															
24															
25															
26															
27															
28															
29															
30															
AVG	* Raw and post-ozone coliform are most probable number maximum daily results.									23.7					
MAX	* Raw HPC counts are daily maximums.									24.9					
MIN										22.6					

MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY
DRINKING WATER LABORATORY
USEPA Region V Drinking Water Cert. No. MI00003
P.O. Box 30270
Lansing, MI 48909
TEL: (517) 335-8184
FAX: (517) 335-8562

Sample Number
LD84508

Official Laboratory Report

Report To: MIKE GLASGOW
4500 N DORT HWY
FLINT MI 48505

System Name/Owner:	CITY OF FLINT	WSSN/Pool ID:	
Collection Address:	4500 N DORT HWY,FLINT	Source:	TYPE I
Collected By:	MIKE GLASGOW	Site Code:	
Township/Well#/Section:	//	Collector:	Public Water Supply Operator
County:	Genesee	Date Collected:	06/10/2011 10:00
Sample Point:	FILTER EFFLUENT C F E	Date Received:	06/13/2011 14:11
Water System:	Other	Purpose:	Other

TESTING INFORMATION			REGULATORY INFORMATION			
Analyte Name	Result (mg/L)	Date Tested	RL (mg/L)	MCL/AL (mg/L)	Method	CAS #
Antimony	Not detected	06/14/2011	0.0006	0.006	EPA 200.8	7440-36-0
Arsenic	Not detected	06/14/2011	0.002	0.010	EPA 200.8	7440-38-2
Barium	0.04	06/14/2011	0.01	2	EPA 200.8	7440-39-3
Beryllium	Not detected	06/14/2011	0.0004	0.004	EPA 200.8	7440-41-7
Cadmium	Not detected	06/14/2011	0.0003	0.005	EPA 200.8	7440-43-9
Chromium	Not detected	06/14/2011	0.01	0.1	EPA 200.8	7440-47-3
Lead	Not detected	06/14/2011	0.001	0.015	EPA 200.8	7439-92-1
Mercury	Not detected	06/14/2011	0.0001	0.002	EPA 200.8	7439-97-6
Nickel	Not detected	06/14/2011	0.01	0.1	EPA 200.8	7440-02-0
Selenium	0.002	06/14/2011	0.001	0.05	EPA 200.8	7782-49-2
Thallium	Not detected	06/14/2011	0.0002	0.002	EPA 200.8	7440-28-0
Chlorinated Acid Herbicides						
2,4,5-T	Not Detected	06/15/2011	0.002		EPA 515.4	93-76-5
2,4,5-TP (silvex)	Not Detected	06/15/2011	0.0003	0.05	EPA 515.4	93-72-1
2,4-D	Not Detected	06/15/2011	0.002	0.07	EPA 515.4	94-75-7
Acifluorfen	Not Detected	06/15/2011	0.004		EPA 515.4	50594-66-6
Bentazon	Not Detected	06/15/2011	0.002		EPA 515.4	25057-89-0
Dicamba	Not Detected	06/15/2011	0.002		EPA 515.4	1918-00-9
Dinoseb	Not Detected	06/15/2011	0.0003	0.007	EPA 515.4	88-85-7
Pentachlorophenol	Not Detected	06/15/2011	0.00006	0.001	EPA 515.4	87-86-5
Picloram	Not Detected	06/15/2011	0.001	0.5	EPA 515.4	1918-02-1
Total DCPA degradates, mono- and di-acid	Not Detected	06/15/2011	0.001		EPA 515.4	1861-32-1

CAS#: Chemical Abstract Service Registry Number
MCL: Maximum Contaminant Level
AL: Action Level
RL: Reporting Limit

mg/L: milligrams / Liter (ppm)
ppm: parts per million
MPN: Most Probable Number
CFU: Colony Forming Unit

Laboratory Contacts
Drinking Water Unit Mgr: Julia Pieper
Systems Mgmt. Unit Mgr: George Krisztian

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TEL: (517) 335-8184
FAX: (517) 335-8562

Sample Number
LD84508

TESTING INFORMATION			REGULATORY INFORMATION			
Analyte Name	Result (mg/L)	Date Tested	RL (mg/L)	MCL/AL (mg/L)	Method	CAS #
Dalapon and Haloacetic						
Bromoacetic acid	Not Detected	06/15/2011	0.001		EPA 552.1/552.2	79-08-3
Bromochloroacetic acid	0.009	06/15/2011	0.001		EPA 552.1/552.2	5589-96-3
Chloroacetic acid	Not Detected	06/15/2011	0.002		EPA 552.1/552.2	79-11-8
Dalapon	Not Detected	06/15/2011	0.001	0.2	EPA 552.1/552.2	75-99-0
Dibromoacetic acid	0.004	06/15/2011	0.001		EPA 552.1/552.2	631-64-1
Dichloroacetic acid	0.014	06/15/2011	0.001		EPA 552.1/552.2	79-43-6
Total Haloacetic Acids (five)	0.026	06/15/2011	0.01	0.060	EPA 552.1/552.2	THA-00-C
Trichloroacetic acid	0.008	06/15/2011	0.001		EPA 552.1/552.2	76-03-9
Total Trihalomethanes						
Bromodichloromethane	0.016	06/15/2011	0.0005	0.080	EPA 524.2	75-27-4
Bromoform	0.0008	06/15/2011	0.0005	0.080	EPA 524.2	75-25-2
Chlorodibromomethane	0.0088	06/15/2011	0.0005	0.080	EPA 524.2	124-48-1
Chloroform	0.017	06/15/2011	0.0005	0.080	EPA 524.2	67-66-3
Total Trihalomethanes	0.0430	06/15/2011	0.0005	0.080	EPA 524.2	TTHM-00-C

The analyses performed by the MDEQ Drinking Water Laboratory were conducted using methods approved by the U.S. Environmental Protection Agency in accordance with the Safe Drinking Water Act, 40 CFR parts 141-143, and other regulatory agencies as appropriate.

Your local health department has detailed information about the quality of drinking water in your area. If you have concerns about the health risks related to the test results of your sample, please contact the Environmental Health Section through the address and telephone number listed below:

Genesee County Health Dept.
630 South Saginaw
Flint, MI 48502-1540
810 257-3603

CAS# : Chemical Abstract Service Registry Number
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Sample Number
LD84508

Official Laboratory Report

Report To: MIKE GLASGOW
4500 N DORT HWY
FLINT MI 48505

System Name/Owner:	CITY OF FLINT	WSSN/Pool ID:	
Collection Address:	4500 N DORT HWY,FLINT	Source:	TYPE I
Collected By:	MIKE GLASGOW	Site Code:	
Township/Well#/Section:	//	Collector:	Public Water Supply Operator
County:	Genesee	Date Collected:	06/10/2011 10:00
Sample Point:	FILTER EFFLUENT C F E	Date Received:	06/13/2011 14:11
Water System:	Other	Purpose:	Other

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Arsenic	Not detected	06/14/2011	0.002	0.010	EPA 200.8	7440-38-2
Barium	0.04	06/14/2011	0.01	2	EPA 200.8	7440-39-3
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Lead	Not detected	06/14/2011	0.001	0.015	EPA 200.8	7439-92-1
Mercury	Not detected	06/14/2011	0.0001	0.002	EPA 200.8	7439-97-6
Nickel	Not detected	06/14/2011	0.01	0.1	EPA 200.8	7440-02-0
Selenium	0.002	06/14/2011	0.001	0.05	EPA 200.8	7782-49-2
Thallium	Not detected	06/14/2011	0.0002	0.002	EPA 200.8	7440-28-0
Chlorinated Acid Herbicides						
2,4,5-T	Not Detected	06/15/2011	0.002		EPA 515.4	93-76-5
2,4,5-TP (silvex)	Not Detected	06/15/2011	0.0003	0.05	EPA 515.4	93-72-1
2,4-D	Not Detected	06/15/2011	0.002	0.07	EPA 515.4	94-75-7
Acifluorfen	Not Detected	06/15/2011	0.004		EPA 515.4	50594-66-6
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Dicamba	Not Detected	06/15/2011	0.002		EPA 515.4	1918-00-9
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Pentachlorophenol	Not Detected	06/15/2011	0.00006	0.001	EPA 515.4	87-86-5
Picloram	Not Detected	06/15/2011	0.001	0.5	EPA 515.4	1918-02-1
Total DCPA degradates, mono- and di-acid	Not Detected	06/15/2011	0.001		EPA 515.4	1861-32-1

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Dibromoacetic acid	0.004	06/15/2011	0.001		EPA 552.1/552.2	631-64-1
Dichloroacetic acid	0.014	06/15/2011	0.001		EPA 552.1/552.2	79-43-6
Total Haloacetic Acids (five)	0.026	06/15/2011	0.01	0.060	EPA 552.1/552.2	THA-00-C
Trichloroacetic acid	0.008	06/15/2011	0.001		EPA 552.1/552.2	76-03-9
Total Trihalomethanes						
Bromodichloromethane	0.016	06/15/2011	0.0005	0.080	EPA 524.2	75-27-4
Bromoform	0.0008	06/15/2011	0.0005	0.080	EPA 524.2	75-25-2
Chlorodibromomethane	0.0088	06/15/2011	0.0005	0.080	EPA 524.2	124-48-1
Chloroform	0.017	06/15/2011	0.0005	0.080	EPA 524.2	67-66-3
Total Trihalomethanes	0.0430	06/15/2011	0.0005	0.080	EPA 524.2	TTHM-00-C

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TEL: (517) 335-8184
FAX: (517) 335-8562

Sample Number
LD84509

Official Laboratory Report

Report To: MIKE GLASGOW
4500 N DORT HWY
FLINT MI 48505

System Name/Owner:	CITY OF FLINT	WSSN/Pool ID:	
Collection Address:	4500 N DORT HWY,FLINT	Source:	TYPE I
Collected By:	MIKE GLASGOW	Site Code:	
Township/Well#/Section:	//	Collector:	Public Water Supply Operator
County:	Genesee	Date Collected:	06/10/2011 10:00
Sample Point:	POST OZONE	Date Received:	06/13/2011 14:11
Water System:	Other	Purpose:	Other

TESTING INFORMATION			REGULATORY INFORMATION			
Analyte Name	Result (mg/L)	Date Tested	RL (mg/L)	MCL/AL (mg/L)	Method	CAS #
Cyanide-Available	Not Detected	06/16/2011	0.02	0.2	OIA-1677	57-12-5
-bamates by HPLC						
.lydroxycarbofuran	Not Detected	06/16/2011	0.001		EPA 531.2	16655-82-6
Aldicarb	Not Detected	06/16/2011	0.0005		EPA 531.2	116-06-3
Aldicarb sulfone	Not Detected	06/16/2011	0.0005		EPA 531.2	1646-88-4
Aldicarb sulfoxide	Not Detected	06/16/2011	0.0005		EPA 531.2	1646-87-3
Carbaryl	Not Detected	06/16/2011	0.001		EPA 531.2	63-25-2
Carbofuran	Not Detected	06/16/2011	0.0005	0.04	EPA 531.2	1563-66-2
Methiocarb	Not Detected	06/16/2011	0.001		EPA 531.2	2032-65-7
Methomyl	Not Detected	06/16/2011	0.001		EPA 531.2	16752-77-5
Oxamyl	Not Detected	06/16/2011	0.001	0.2	EPA 531.2	23135-22-0
Propoxur	Not Detected	06/16/2011	0.001		EPA 531.2	114-26-1

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Laboratory Contacts
Drinking Water Unit Mgr: Julia Pieper
Systems Mgmt. Unit Mgr: George Krisztian

001083

D-5a 1/86
Authority; Act 399, P.A. 1976

MICHIGAN DEPARTMENT OF PUBLIC HEALTH

TEST OPERATION REPORT
OF
WATER TREATMENT PLANT

For Month of Nov/Dec 2011

Flint Water Plant	2310	Genesee
NAME OF WATER SYSTEM	WSSN	COUNTY

Michael Glasgow	F-1R S-3
CERTIFIED OPERATOR	CLASSIFICATION

SIGNATURE OF APPROPRIATE OFFICIAL

TREATMENT RATE AND FILTER DATA

1. Treatment Rate, Maximum **12** Million Gallons Per Day
2. Treatment Rate, Approved Rated Plant Capacity **36** Million Gallons per Day
3. Average Filter Run **70+** Hours, Average Head Loss _____ Feet
4. Average Filtration Rate **2.3** Gallons per Square Ft. per Minute
5. Maximum Filtration Rate **3.2** Gallons per Square Ft. per Minute
6. Average Wash Water Use _____ percent of Treated Water

CHEMICAL DATA

7. Chlorine on hand _____ lbs.: Estimated supply _____ days
8. Oxygen (O2) on hand _____ lbs.: Estimated supply _____ days
9. Ferric (Fe3+) on hand _____ lbs.: Estimated supply _____ days
10. Cost of All Chemicals per Million Gallons _____
11. Total Power Cost per Million Gallons _____

Remarks:

Submit to: Mike Prysby, P.E.
MDEQ-Water Division-Lansing District
P.O. Box 30242
Lansing, MI 48909

Failure to complete this form is a violation of Act 399, P.A. 1976 and is subject to penalties as outlined in the Act.

Daily Flow & Ozone Parameters WSSN 2310 Nov/Dec 2011

DATE	Average Daily Flow (MGD)	O_3 Dosage (lbs/day)	Ozone residuals (mg/L)												Sodium Bisulfite Dosage (mg/L)
			Contact Chamber #1				Contact Chamber # 2				Contact Chamber # 3				
			# of Samples	Start (avg mg/L)	Middle (avg. mg/L)	End (avg. mg/L)	# of Samples	Start (avg mg/L)	Middle (avg. mg/L)	End (avg. mg/L)	# of Samples	Start (avg mg/L)	Middle (avg. mg/L)	End (avg. mg/L)	
28	6.1	550	6	0.38	0.27	0.08									
29	10.7		Equipment Shutdown												
30	10.8														
1	11.8														
2	5.3														
3															
4															
5															
6															
7															
8															
9															
10															
11															
12															
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18															
19															
20															
21															
22															
23															
24															
25															
26															
27															
AVG	8.9	550	6	0.38	0.27	0.08									
MAX	11.8	550	6	0.38	0.27	0.08									
MIN	5.3	550	6	0.38	0.27	0.08									
Total	44.7														

Coagulation & Flocculation Parameters WSSN 2310 Nov/Dec 2011

DATE	Ferric Chloride as $FeCl_3$ mg/l	Ferric Chloride as Fe 3+ mg/l	Turbidity, NTU units											
			Raw			Plate Settler Effluent			Filter Influent			Filter Effluent		
			# of Samples	Avg.	Max	# of Samples	Avg.	Max	# of Samples	Avg.	Max	# of Samples	Avg.	Max
28	30.4	10.5	5	16.7	26.1	5	3.27	3.48	5	2.56	3.37			
29	35.5	12.2	12	9.4	14.0	12	2.16	3.76	12	1.64	2.40	6	0.29	0.38
30	42.3	14.6	12	7.5	11.3	12	1.14	1.36	12	1.19	1.48	9	0.23	0.27
1	32.2	11.1	12	6.9	10.9	12	1.20	1.32	12	1.16	1.29	8	0.19	0.23
2	33.3	11.5	7	12.9	14.9	7	1.24	1.27	12	1.26	1.39	5	0.21	0.22
3														
4														
5														
6														
7														
8														
9														
10														
11														
12														
13														
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15														
16														
17														
18														
19														
20														
21														
22														
23														
24														
25														
26														
27														
AVG	34.7	12.0	10	10.7	15.4	10	1.80	2.24	11	1.56	1.99	7	0.23	0.27
MAX	42.3	14.6	12	16.7	26	12	3.27	3.76	12	2.56	3.37	9	0.29	0.38
MIN	30.4	10.5	5	6.9	10.9	5	1.14	1.27	5	1.16	1.29	5	0.19	0.22

Flouridation & Chlorination WSSN 2310 **Nov/Dec 2011**

DATE	Fluoride Applied F- mg/l	Fluoride Analyses mg/l			Chlorine App. Mg/l		Chlorine Residual mg/l							
					Chlorine (prior to filtration) mg/L OCl-	Post Chlorine mg/L	Plate Settler Effluent		Contact Clairifier Effluent		Combined Filter Effluent (north)		Combined Filter Effluent (south)	
		Raw	Filter Eff.	Dist			Free	Total	Free	Total	Free	Total	Free	Total
28		0.22			2.6		0.7	1.0	0.3	0.4				
29		0.21	0.21		2.6		0.6	0.9	0.2	0.5	0.2	0.3	0.2	0.3
30		0.19	0.19		2.9		0.6	1.1	0.3	0.6	0.2	0.4	0.2	0.3
1		0.20	0.20		2.6		0.4	0.7	0.2	0.5	0.2	0.4	0.2	0.4
2		0.19	0.20		3.0		0.3	0.7	0.1	0.5	0.1	0.4	0.1	0.3
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27														
AVG		0.20	0.20		2.7		0.5	0.9	0.2	0.5	0.2	0.4	0.2	0.3
MAX		0.22	0.21		3.0		0.7	1.1	0.3	0.6	0.2	0.4	0.2	0.4
MIN		0.19	0.19		2.6		0.3	0.7	0.1	0.4	0.1	0.3	0.1	0.3

Chemical Analyses WSSN 2310 Nov/Dec 2011

DATE	pH		Total Hard as $CaCO_3$ mg/l		Total Alk as $CaCO_3$ mg/l		NonCarbonate Hardness as $CaCO_3$ mg/l		Calcium Ca 2+ mg/l		Magnesium as Mg 2+ mg/l		Nitrate as NO_3- mg/l		Chloride as Cl - mg/l	
	Raw	Filter Eff.	Raw	Filter Eff.	Raw	Filter Eff.	Raw	Filter Eff.	Raw	Filter Eff.	Raw	Filter Eff.	Raw	Filter Eff.	Raw	Filter Eff.
28	8.36		268		218		50		88.2		11.7				58	
29	8.35	7.43	280	282	226	186	54	96	85.0	96.2	16.5	10.2			55	73
30	8.32	7.48	284	276	230	182	54	94	75.4	93.8	23.3	10.2			61	80
1	8.36	7.47	284	272	238	190	46	82	104.2	77.0	5.8	19.4			61	91
2	8.28	7.33	304	288	228	188	76	100	89.8	85.0	19.4	18.5			59	95
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AVG	8.33	7.43	284	280	228	187	56	93	88.5	88.0	15.3	14.6	####	####	59	85
MAX	8.36	7.48	304	288	238	190	76	100	104.2	96.2	23.3	19.4	0.00	0.00	61	95
MIN	8.28	7.33	268	272	218	182	46	82	75.4	77.0	5.8	10.2	0.00	0.00	55	73

Bacteriological & Physical Parameters — Nov/Dec 2011

DATE	Total Coliform							Standard Plate Count		Temperature (Celcius)		Color		Odor	
	Raw	Post O3	Plate Settler Eff.	Filter Inf.	Filter Eff.	Lab Tap		Raw	Filter Eff.	Raw	Tap	Raw	Tap	Raw	Tap
28	399	119	2/0	2/0				339		9.9					
29	2143	n/a	6/0	6/0	2/0			177	6	7.0					
30	1986	n/a	6/0	6/0	6/0			507	6	6.1					
1	> 2420	n/a	6/2	6/0	6/0			470	6	5.5					
2	>2420	n/a	3/1	3/0	3/0			623	15	5.6					
3															
4															
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23															
24															
25															
26															
27															
AVG	* Raw and post-ozone coliform are most probable number maximum daily results.									6.8					
MAX	* Raw HPC counts are daily maximums.									9.9					
MIN										5.5					

MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY
DRINKING WATER LABORATORY
USEPA Region V Drinking Water Cert. No. MI00003
P.O. Box 30270
Lansing, MI 48909
TEL: (517) 335-8184
FAX: (517) 335-8562

Sample Number
LE11088

Official Laboratory Report

Report To: MICHAEL GLASGOW
4500 N DORT HWY
FLINT MI 48505

System Name/Owner:	CITY OF FLINT	WSSN/Pool ID:	2310	
Collection Address:	4500 N DORT HWY,FLINT	Source:	TYPE III	
Collected By:	MIKE GLASGOW	Site Code:		
Township/Well#/Section:	//	Collector:	Public Water Supply Operator	
County:	Genesee	Date Collected:	12/02/2011	08:00
Sample Point:	FILTER EFFLUENT	Date Received:	12/07/2011	11:11
Water System:	Other	Purpose:	Other	

TESTING INFORMATION			REGULATORY INFORMATION			
Analyte Name	Result (mg/L)	Date Tested	RL (mg/L)	MCL/AL (mg/L)	Method	CAS #
Antimony	Not detected	12/09/2011	0.0006	0.006	EPA 200.8	7440-36-0
Arsenic	Not detected	12/09/2011	0.002	0.010	EPA 200.8	7440-38-2
Barium	0.04	12/09/2011	0.01	2	EPA 200.8	7440-39-3
Beryllium	Not detected	12/09/2011	0.0004	0.004	EPA 200.8	7440-41-7
Cadmium	Not detected	12/09/2011	0.0003	0.005	EPA 200.8	7440-43-9
Chromium	Not detected	12/09/2011	0.01	0.1	EPA 200.8	7440-47-3
Cyanide-Available	Not Detected	12/09/2011	0.02	0.2	OIA-1677	57-12-5
Lead	Not detected	12/09/2011	0.001	0.015	EPA 200.8	7439-92-1
Mercury	Not detected	12/09/2011	0.0001	0.002	EPA 200.8	7439-97-6
Nickel	Not detected	12/09/2011	0.01	0.1	EPA 200.8	7440-02-0
Selenium	Not detected	12/09/2011	0.001	0.05	EPA 200.8	7782-49-2
Thallium	Not detected	12/09/2011	0.0002	0.002	EPA 200.8	7440-28-0
Carbamates by HPLC						
3 Hydroxycarbofuran	Not Detected	12/15/2011	0.001		EPA 531.2	16655-82-6
Aldicarb	Not Detected	12/15/2011	0.0005		EPA 531.2	116-06-3
Aldicarb sulfone	Not Detected	12/15/2011	0.0005		EPA 531.2	1646-88-4
Aldicarb sulfoxide	Not Detected	12/15/2011	0.0005		EPA 531.2	1646-87-3

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Sample Number
LE11088

TESTING INFORMATION			REGULATORY INFORMATION			
Analyte Name	Result (mg/L)	Date Tested	RL (mg/L)	MCL/AL (mg/L)	Method	CAS #
Carbamates by HPLC						
Chlorinated Acid Herbicides						
2,4,5-T	Not Detected	12/07/2011	0.002		EPA 515.4	93-76-5
2,4,5-TP (silvex)	Not Detected	12/07/2011	0.0003	0.05	EPA 515.4	93-72-1
2,4-D	Not Detected	12/07/2011	0.002	0.07	EPA 515.4	94-75-7
Acifluorfen	Not Detected	12/07/2011	0.004		EPA 515.4	50594-66-6
Bentazon	Not Detected	12/07/2011	0.002		EPA 515.4	25057-89-0
Dicamba	Not Detected	12/07/2011	0.002		EPA 515.4	1918-00-9
Dinoseb	Not Detected	12/07/2011	0.0003	0.007	EPA 515.4	88-85-7
Pentachlorophenol	Not Detected	12/07/2011	0.00006	0.001	EPA 515.4	87-86-5
Picloram	Not Detected	12/07/2011	0.001	0.5	EPA 515.4	1918-02-1
Total DCPA degradates, mono- and di-acid	Not Detected	12/07/2011	0.001		EPA 515.4	1861-32-1
Pesticides Analysis by GC/MS						
4,4'-DDD	Not Detected	12/13/2011	0.001		EPA 525.2	72-54-8
4,4'-DDE	Not Detected	12/13/2011	0.001		EPA 525.2	72-55-9
4,4'-DDT	Not Detected	12/13/2011	0.0005		EPA 525.2	50-29-3
Acetochlor	Not Detected	12/13/2011	0.001		EPA 525.2	34256-82-1
Alachlor	Not Detected	12/13/2011	0.0002	0.002	EPA 525.2	15972-60-8
Aldrin	Not Detected	12/13/2011	0.0004		EPA 525.2	309-00-2
alpha-Chlordane	Not Detected	12/13/2011	0.0002	0.002	EPA 525.2	5103-71-9
Atrazine	Not Detected	12/13/2011	0.0002	0.003	EPA 525.2	1912-24-9
Dieldrin	Not Detected	12/13/2011	0.0005		EPA 525.2	60-57-1
Endrin	Not Detected	12/13/2011	0.0001	0.002	EPA 525.2	72-20-8
Endrin aldehyde	Not Detected	12/13/2011	0.001		EPA 525.2	7421-93-4
gamma-Chlordane	Not Detected	12/13/2011	0.0002	0.002	EPA 525.2	5103-74-2
Heptachlor	Not Detected	12/13/2011	0.0002	0.0004	EPA 525.2	76-44-8
Heptachlor epoxide	Not Detected	12/13/2011	0.0001	0.0002	EPA 525.2	1024-57-3
Hexachlorobenzene	Not Detected	12/13/2011	0.0001	0.001	EPA 525.2	118-74-1
Hexachlorocyclohexane (alpha-BHC)	Not Detected	12/13/2011	0.001		EPA 525.2	319-84-6
Hexachlorocyclohexane (beta-BHC)	Not Detected	12/13/2011	0.001		EPA 525.2	319-85-7
Hexachlorocyclohexane (delta-BHC)	Not Detected	12/13/2011	0.001		EPA 525.2	319-86-8
Hexachlorocyclopentadiene	Not Detected	12/13/2011	0.0005	0.05	EPA 525.2	77-47-4

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TESTING INFORMATION			REGULATORY INFORMATION			
Analyte Name	Result (mg/L)	Date Tested	RL (mg/L)	MCL/AL (mg/L)	Method	CAS #
Pesticides Analysis by GC/MS						
PCB (aroclor 1016)	Not Detected	12/13/2011	0.0001	0.0005	EPA 525.2	12674-11-2
PCB (aroclor 1221)	Not Detected	12/13/2011	0.0001	0.0005	EPA 525.2	11104-28-2
PCB (aroclor 1232)	Not Detected	12/13/2011	0.0001	0.0005	EPA 525.2	11141-16-5
PCB (aroclor 1242)	Not Detected	12/13/2011	0.0001	0.0005	EPA 525.2	53469-21-9
PCB (aroclor 1248)	Not Detected	12/13/2011	0.0001	0.0005	EPA 525.2	12672-29-6
PCB (aroclor 1254)	Not Detected	12/13/2011	0.0001	0.0005	EPA 525.2	11097-69-1
PCB (aroclor 1260)	Not Detected	12/13/2011	0.0001	0.0005	EPA 525.2	11096-82-5
Polybrominated biphenyls	Not Detected	12/13/2011	0.0001		EPA 525.2	59536-65-1
Simazine	Not Detected	12/13/2011	0.0002	0.004	EPA 525.2	122-34-9
Toxaphene	Not Detected	12/13/2011	0.001	0.003	EPA 525.2	8001-35-2
Volatile Organic Compounds						
1,1 Dichloroethane	Not Detected	12/08/2011	0.0005		EPA 524.2	75-34-3
1,1 Dichloroethylene	Not Detected	12/08/2011	0.0005	0.007	EPA 524.2	75-35-4
1,1 Dichloropropene	Not Detected	12/08/2011	0.0005		EPA 524.2	563-58-6
1,1,1 Trichloroethane	Not Detected	12/08/2011	0.0005	0.2	EPA 524.2	71-55-6
,1,1,2 Tetrachloroethane	Not Detected	12/08/2011	0.0005		EPA 524.2	630-20-6
1,1,2 Trichloroethane	Not Detected	12/08/2011	0.0005	0.005	EPA 524.2	79-00-5
1,1,2,2 Tetrachloroethane	Not Detected	12/08/2011	0.0005		EPA 524.2	79-34-5
1,2 Dichlorobenzene	Not Detected	12/08/2011	0.0005	0.6	EPA 524.2	95-50-1
1,2 Dichloroethane	Not Detected	12/08/2011	0.0005	0.005	EPA 524.2	107-06-2
1,2 Dichloropropane	Not Detected	12/08/2011	0.0005	0.005	EPA 524.2	78-87-5
1,2,3 Trichlorobenzene	Not Detected	12/08/2011	0.0005		EPA 524.2	87-61-6
1,2,3 Trichloropropane	Not Detected	12/08/2011	0.0005		EPA 524.2	96-18-4
1,2,4 Trichlorobenzene	Not Detected	12/08/2011	0.0005	0.07	EPA 524.2	120-82-1
1,2,4 Trimethylbenzene	Not Detected	12/08/2011	0.0005		EPA 524.2	95-63-6
1,3 Dichlorobenzene	Not Detected	12/08/2011	0.0005		EPA 524.2	541-73-1
1,3 Dichloropropane	Not Detected	12/08/2011	0.0005		EPA 524.2	142-28-9
1,3,5 Trimethylbenzene	Not Detected	12/08/2011	0.0005		EPA 524.2	108-67-8
1,4 Dichlorobenzene	Not Detected	12/08/2011	0.0005	0.075	EPA 524.2	106-46-7
2,2 Dichloropropane	Not Detected	12/08/2011	0.0005		EPA 524.2	594-20-7
Benzene	Not Detected	12/08/2011	0.0005	0.005	EPA 524.2	71-43-2
Bromobenzene	Not Detected	12/08/2011	0.0005		EPA 524.2	108-86-1

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Sample Number
LE11088

TESTING INFORMATION			REGULATORY INFORMATION			
Analyte Name	Result (mg/L)	Date Tested	RL (mg/L)	MCL/AL (mg/L)	Method	CAS #
Volatile Organic Compounds						
Chlorodibromomethane	0.0065	12/08/2011	0.0005	0.080	EPA 524.2	124-48-1
Chloroethane	Not Detected	12/08/2011	0.0005		EPA 524.2	75-00-3
Chloroform	0.0079	12/08/2011	0.0005	0.080	EPA 524.2	67-66-3
Chloromethane	Not Detected	12/08/2011	0.0005		EPA 524.2	74-87-3
cis-1,2 Dichloroethylene	Not Detected	12/08/2011	0.0005	0.07	EPA 524.2	156-59-2
cis-1,3 Dichloropropene	Not Detected	12/08/2011	0.0005		EPA 524.2	10061-01-5
Dibromomethane	Not Detected	12/08/2011	0.0005		EPA 524.2	74-95-3
Dichlorodifluoromethane	Not Detected	12/08/2011	0.001		EPA 524.2	75-71-8
Dichloromethane	Not Detected	12/08/2011	0.0006	0.005	EPA 524.2	75-09-2
Ethylbenzene	Not Detected	12/08/2011	0.0005	0.7	EPA 524.2	100-41-4
Fluorotrichloromethane	Not Detected	12/08/2011	0.001		EPA 524.2	75-69-4
Hexachlorobutadiene	Not Detected	12/08/2011	0.0005		EPA 524.2	87-68-3
Isopropylbenzene	Not Detected	12/08/2011	0.0005		EPA 524.2	98-82-8
m & p-Xylene	Not Detected	12/08/2011	0.0005	10	EPA 524.2	XYLMP-00-C
Methyl ethyl ketone	Not Detected	12/08/2011	0.005		EPA 524.2	78-93-3
Methyl isobutyl ketone	Not Detected	12/08/2011	0.005		EPA 524.2	108-10-1
Methyl-tert-butyl ether (MTBE)	Not Detected	12/08/2011	0.001		EPA 524.2	1634-04-4
Naphthalene	Not Detected	12/08/2011	0.0005		EPA 524.2	91-20-3
n-Butylbenzene	Not Detected	12/08/2011	0.0005		EPA 524.2	104-51-8
Nitrobenzene	Not Detected	12/08/2011	0.01		EPA 524.2	98-95-3
n-Propylbenzene	Not Detected	12/08/2011	0.0005		EPA 524.2	103-65-1
o-Chlorotoluene	Not Detected	12/08/2011	0.0005		EPA 524.2	95-49-8
o-Xylene	Not Detected	12/08/2011	0.0005	10	EPA 524.2	95-47-6
p-Chlorotoluene	Not Detected	12/08/2011	0.0005		EPA 524.2	106-43-4
p-Isopropyltoluene	Not Detected	12/08/2011	0.0005		EPA 524.2	99-87-6
sec-Butylbenzene	Not Detected	12/08/2011	0.0005		EPA 524.2	135-98-8
Styrene	Not Detected	12/08/2011	0.0005	0.1	EPA 524.2	100-42-5
tert-Butylbenzene	Not Detected	12/08/2011	0.0005		EPA 524.2	98-06-6
Tetrachloroethylene	Not Detected	12/08/2011	0.0005	0.005	EPA 524.2	127-18-4
Tetrahydrofuran	Not Detected	12/08/2011	0.005		EPA 524.2	109-99-9
Toluene	Not Detected	12/08/2011	0.0005	1	EPA 524.2	108-88-3
Total Trihalomethanes	0.027	12/08/2011	NA	0.080	EPA 524.2	TTHM-00-C
Total Xylenes	Not Detected	12/08/2011	NA	10	EPA 524.2	1330-20-7

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TESTING INFORMATION			REGULATORY INFORMATION			
Analyte Name	Result (mg/L)	Date Tested	RL (mg/L)	MCL/AL (mg/L)	Method	CAS #

The analyses performed by the MDEQ Drinking Water Laboratory were conducted using methods approved by the U.S. Environmental Protection Agency in accordance with the Safe Drinking Water Act, 40 CFR parts 141-143, and other regulatory agencies as appropriate.

Your local health department has detailed information about the quality of drinking water in your area. If you have concerns about the health risks related to the test results of your sample, please contact the Environmental Health Section through the address and telephone number listed below:

Genesee County Health Dept.
630 South Saginaw
Flint, MI 48502-1540
810 257-3603

D-5a 1/86
Authority; Act 399, P.A. 1976

MICHIGAN DEPARTMENT OF PUBLIC HEALTH

TEST RUN OPERATION REPORT
OF
WATER TREATMENT PLANT

For Month of February 2012

Flint Water Plant	2310	Genesee
NAME OF WATER SYSTEM	WSSN	COUNTY

	F-1R S-3
CERTIFIED OPERATOR	CLASSIFICATION

SIGNATURE OF APPROPRIATE OFFICIAL

TREATMENT RATE AND FILTER DATA

1. Treatment Rate, Maximum **12.4** Million Gallons Per Day
2. Treatment Rate, Approved Rated Plant Capacity **36** Million Gallons per Day
3. Average Filter Run **72 +** Hours, Average Head Loss n/a Feet
4. Average Filtration Rate **1.9** Gallons per Square Ft. per Minute
5. Maximum Filtration Rate **2.2** Gallons per Square Ft. per Minute
6. Average Wash Water Use n/a percent of Treated Water

CHEMICAL DATA

7. Chlorine on hand _____ lbs.: Estimated supply _____ days
8. Oxygen (O_2) on hand _____ lbs.: Estimated supply _____ days
9. Ferric (Fe^{3+}) on hand _____ lbs.: Estimated supply _____ days
10. Cost of All Chemicals per Million Gallons _____
11. Total Power Cost per Million Gallons _____

Remarks:

Submit to: Mike Prysby, P.E.
MDEQ-Water Division-Lansing District
P.O. Box 30242
Lansing, MI 48909

Failure to complete this form is a violation of Act 399, P.A. 1976 and is subject to penalties as outlined in the Act.

dosing chambers ?

FLINT WATER PLANT & FACILITIES

Daily Flow & Ozone Parameters WSSN 2310 **Feb 2012**

DATE	Average Daily Flow (MGD)	O_3 Dosage (lbs/day)	Ozone residuals (mg/L)												Sodium Bisulfite Dosage (mg/L)
			Contact Chamber #1				Contact Chamber # 2				Contact Chamber # 3				
			# of Samples	Start (avg mg/L)	Middle (avg. mg/L)	End (avg. mg/L)	# of Samples	Start (avg mg/L)	Middle (avg. mg/L)	End (avg. mg/L)	# of Samples	Start (avg mg/L)	Middle (avg. mg/L)	End (avg. mg/L)	
1															
2															
3															
4															
5															
6	4.7	566					5	1.54	1.44	0.70					
7	10.9	656					11	1.50	1.02	0.05					
8	10.4	599					10	1.55	0.96	0.02					
9	10.8	1104					10	0.90	0.78	0.00					
10	5.4	700					5	0.98	0.75	0.00					
11															
12															
13															
14															
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21															
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23															
24															
25															
26															
27															
28															
AVG	8.4	725					8	1.29	0.99	0.15					
MAX	10.9	1104					11	1.55	1.44	0.70					
MIN	4.7	566					5	0.90	0.75	0.00					
Total	42.2														

Coagulation & Flocculation Parameters WSSN 2310 Feb 2012

DATE	Ferric Chloride as $FeCl_3$ mg/l	Ferric Chloride as Fe 3+ mg/l	Turbidity, NTU units											
			Raw			Plate Settler Effluent			Filter Influent			Filter Effluent		
			# of Samples	Avg.	Max	# of Samples	Avg.	Max	# of Samples	Avg.	Max	# of Samples	Avg.	Max
1														
2														
3														
4														
5														
6	33.7	11.6	5	7.03	7.40	4	1.89	2.62	3	4.31	5.72			
7	33.5	11.5	10	6.30	7.10	10	1.10	1.27	10	1.28	1.77	4	0.20	0.25
8	32.2	11.1	9	6.20	6.92	7	0.85	0.97	7	0.91	0.96	12	0.09	0.14
9	31.0	10.7	10	6.04	7.00	9	0.94	1.14	9	0.94	1.03	12	0.07	0.11
10	30.6	10.5	4	6.32	6.49	5	0.92	1.05	5	0.90	0.95	10	0.09	0.13
11														
12														
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20														
21														
22														
23														
24														
25														
26														
27														
28														
AVG	32.2	11.1	8	6.38	6.98	7	1.14	1.41	7	1.67	2.09	10	0.11	0.15
MAX	33.7	11.6	10	7.03	7.40	10	1.89	2.62	10	4.31	5.72	12	0.20	0.25
MIN	30.6	10.5	4	6.04	6.49	4	0.85	0.97	3	0.90	0.95	4	0.07	0.11

Flouridation & Chlorination WSSN 2310 Feb 2012

DATE	Fluoride Applied F- mg/l	Fluoride Analyses mg/l			Chlorine App. Mg/l		Chlorine Residual mg/l							
					Chlorine (prior to filtration) mg/L OCl-	Post Chlorine mg/L	Plate Settler Effluent		Contact Clairifier Effluent		Combined Filter Effluent (north)		Combined Filter Effluent (south)	
		Raw	Filter Eff.	Dist			Free	Total	Free	Total	Free	Total	Free	Total
1														
2														
3														
4														
5														
6		0.17			2.8		0.6	0.9	0.2	0.4				
7		0.16	0.21		2.9		0.7	1.0	0.4	0.6	0.2	0.4	0.2	0.4
8		0.17	0.21		3.2		0.5	0.7	0.3	0.5	0.3	0.4	0.2	0.4
9		0.17	0.21		3.3		0.6	0.8	0.4	0.5	0.3	0.4	0.3	0.4
10		0.18	0.21		3.3		0.5	0.7	0.3	0.5	0.3	0.4	0.3	0.4
11														
12														
13														
14														
15														
16														
17														
18														
19														
20														
21														
22														
23														
24														
25														
26														
27														
28														
AVG		0.17	0.21		3.1		0.6	0.8	0.3	0.5	0.3	0.4	0.3	0.4
MAX		0.18	0.21		3.3		0.7	1.0	0.4	0.6	0.3	0.4	0.3	0.4
MIN		0.16	0.21		2.8		0.5	0.7	0.2	0.4	0.2	0.4	0.2	0.4

Chemical Analyses WSSN 2310 Feb 2012

DATE	pH		Total Hard as $CaCO_3$ mg/l		Total Alk as $CaCO_3$ mg/l		NonCarbonate Hardness as $CaCO_3$ mg/l		Calcium Ca 2+ mg/l		Magnesium as Mg 2+ mg/l		Nitrate as NO_3- mg/l		Chloride as Cl - mg/l	
	Raw	Filter Eff.	Raw	Filter Eff.	Raw	Filter Eff.	Raw	Filter Eff.	Raw	Filter Eff.	Raw	Filter Eff.	Raw	Filter Eff.	Raw	Filter Eff.
1																
2																
3																
4																
5																
6	8.23		280		225		55		98.6		8.3				38	
7	8.29	7.51	296	268	234	172	62	96	96.2	96.2	13.6	6.8			37	60
8	8.25	7.29	280	272	214	172	66	100	81.8	77.0	18.5	19.4			39	60
9	8.22	7.14	316	296	226	176	90	120	97.8	96.2	17.5	13.6			42	61
10	8.17	7.38	272	264	232	176	40	88	86.6	77.0	13.6	15.8			44	65
11																
12																
13																
14																
15																
16																
17																
18																
19																
20																
21																
22																
23																
24																
25																
26																
27																
28																
AVG	8.23	7.33	289	275	226	174	63	101	92.2	86.6	14.3	13.9			40	62
MAX	8.29	7.51	316	296	234	176	90	120	98.6	96.2	18.5	19.4			44	65
MIN	8.17	7.14	272	264	214	172	40	88	81.8	77.0	8.3	6.8			37	60

Bacteriological & Physical Parameters — Feb 2012

DATE	Total Coliform							Standard Plate Count		Temperature (Celcius)		Color		Odor	
	Raw	Post O3	Plate Settler Eff.	Filter Inf.	Filter Eff.			Raw	Filter Eff.	Raw	Tap	Raw	Tap	Raw	Tap
1															
2															
3															
4															
5															
6	687	< 2	2/0	2/0				> 738		4.3					
7	980	4.1	4/0	4/0	16/0			738	< 2	3.6					
8	1120	2	4/0	4/0	16/0			> 738	2	2.5					
9	1203	2	4/0	4/0	16/0			> 738	4	3.1					
10	579	< 2	4/0	4/0	16/0			> 738	< 2	2.6					
11															
12															
13															
14															
15															
16															
17															
18															
19															
20															
21															
22															
23															
24															
25															
26															
27															
28															
AVG	* Raw and post-ozone coliform are most probable number maximum daily results.									3.2					
MAX	* Raw HPC counts are daily maximums.									4.3					
MIN										2.5					

001100

OF

WATER TREATMENT PLANT

For Month of April/May 2012

Flint Water Plant — NAME OF WATER SYSTEM | 2310 — WSSN | Genesee — COUNTY

DEQ
RESOURCE MANAGEMENT DIVISION
FEB 13 2013
LANSING DISTRICT

Michael Glasgow — CERTIFIED OPERATOR | F-1R S-3 — CLASSIFICATION

SIGNATURE OF APPROPRIATE OFFICIAL

TREATMENT RATE AND FILTER DATA

1. Treatment Rate, Maximum **12.1** Million Gallons Per Day
2. Treatment Rate, Approved Rated Plant Capacity **36** Million Gallons per Day
3. Average Filter Run **100+** Hours, Average Head Loss n/a Feet
4. Average Filtration Rate **2.5** Gallons per Square Ft. per Minute
5. Maximum Filtration Rate **3.0** Gallons per Square Ft. per Minute
6. Average Wash Water Use n/a percent of Treated Water

CHEMICAL DATA

7. Chlorine on hand _____ lbs.: Estimated supply _____ days
8. Oxygen (O2) on hand _____ lbs.: Estimated supply _____ days
9. Ferric (Fe3+) on hand _____ lbs.: Estimated supply _____ days
10. Cost of All Chemicals per Million Gallons
11. Total Power Cost per Million Gallons

Remarks:

Submit to: Mike Prysby, P.E.
MDEQ-Water Division-Lansing District
P.O. Box 30242
Lansing, MI 48909

Failure to complete this form is a violation of Act 399, P.A. 1976 and is subject to penalties as outlined in the Act.

Daily Flow & Ozone Parameters WSSN 2310 Apr/May 2012

DATE	Daily Flow (MGD)	O_3 Dosage (lbs/day)	Ozone residuals (mg/L)												Sodium Bisulfite Dosage (mg/L)
			Contact Chamber #1				Contact Chamber # 2				Contact Chamber # 3				
			# of Samples	Start (avg mg/L)	Middle (avg. mg/L)	End (avg. mg/L)	# of Samples	Start (avg mg/L)	Middle (avg. mg/L)	End (avg. mg/L)	# of Samples	Start (avg mg/L)	Middle (avg. mg/L)	End (avg. mg/L)	
1															
2															
3															
4															
5															
6															
7															
8															
9															
10															
11															
12															
13															
14															
15															
16															
17															
18															
19															
20															
21															
22															
23	5.5	768					5	0.54	0.00	0.00					
24	11.4	850					11	0.88	0.01	0.00					
25	11.4	980					8	1.31	0.00	0.08					
26	11.2	1030					6	1.35	0.01	0.04					
27	10.9	1060					6	1.23	0.13	0.15					
28	6.2	1220					4	1.37	0.19	0.13					
29															
30															
1	7.7	1030					4	1.50	0.05	0.05					
2	10.8	980					6	1.19	0.07	0.10					
3	5.5	990					4	1.57	0.03	0.10					
AVG	9.0	990					6	1.22	0.05	0.07					
MAX	11.4	1220					11	1.57	0.19	0.15					
MIN	5.5	768					4	0.54	0.00	0.00					
Total	80.6														

Coagulation & Flocculation Parameters WSSN 2310 Apr/May 2012

DATE	Ferric Chloride as $FeCl_3$ mg/l	Ferric Chloride as Fe 3+ mg/l	Turbidity, NTU units											
			Raw			Plate Settler Effluent			Filter Influent			Filter Effluent		
			# of Samples	Avg.	Max	# of Samples	Avg.	Max	# of Samples	Avg.	Max	# of Samples	Avg.	Max
1														
2														
3														
4														
5														
6														
7														
8														
9														
10														
11														
12														
13														
14														
15														
16														
17														
18														
19														
20														
21														
22														
23	30.4	10.5	6	11.1	12.1	5	4.50	8.40	4	4.83	7.48			
24	28.0	9.6	11	9.50	10.9	12	2.06	3.35	12	1.67	2.18	2	0.26	0.30
25	28.0	9.6	8	9.70	12.6	11	1.03	2.29	10	0.86	2.20	8	0.10	0.15
26	29.8	10.3	8	9.52	12.0	10	0.62	0.69	9	0.75	1.47	6	0.09	0.15
27	26.5	9.1	6	8.40	9.82	11	0.76	1.23	6	0.69	0.99	6	0.08	0.10
28	27.9	9.6	4	8.03	8.14	8	0.56	0.60	4	0.59	0.79	6	0.12	0.15
29														
30														
1	26.5	9.1	4	8.37	8.89	6	0.93	1.91	6	1.31	2.43	1	0.14	0.17
2	30.0	10.2	6	8.42	9.44	10	0.79	1.22	6	0.67	0.96	6	0.08	0.12
3	30.0	10.2	4	8.10	9.21	6	0.53	0.71	4	0.57	0.86	4	0.06	0.07
AVG	28.6	9.8	6	9.0	10.3	9	1.31	2.27	7	1.33	2.15	5	0.12	0.15
MAX	30.4	10.5	11	11.1	13	12	4.50	8.40	12	4.83	7.48	8	0.26	0.30
MIN	26.5	9.1	4	8.0	8.1	5	0.53	0.60	4	0.57	0.79	1	0.06	0.07

Flouridation & Chlorination WSSN 2310 Apr/May 2012

DATE	Fluoride Applied F- mg/l	Fluoride Analyses mg/l			Chlorine App. Mg/l		Chlorine Residual mg/l							
					Chlorine (prior to filtration) mg/L OCl-	Post Chlorine mg/L	Plate Settler Effluent		Contact Clairifier Effluent		Combined Filter Effluent (north)		Combined Filter Effluent (south)	
		Raw	Filter Eff.	Dist			Free	Total	Free	Total	Free	Total	Free	Total
1														
2														
3														
4														
5														
6														
7														
8														
9														
10														
11														
12														
13														
14														
15														
16														
17														
18														
19														
20														
21														
22														
23		0.20			3.0		0.3	0.5	0.1	0.2				
24		0.19	0.23		3.3		0.7	0.8	0.2	0.4	0.1	0.3	0.1	0.3
25		0.21	0.21		3.3		0.7	0.8	0.4	0.6	0.3	0.4	0.3	0.4
26		0.18	0.19		3.0		0.6	0.9	0.2	0.4	0.1	0.3	0.1	0.3
27		0.20	0.22		4.0		0.8	0.9	0.3	0.5	0.2	0.4	0.2	0.4
28		0.21	0.21		4.5		0.9	1.1	0.5	0.6	0.3	0.4	0.3	0.4
29														
30														
1		0.21	0.23		4.2		0.9	1.1	0.4	0.6	0.3	0.4	0.2	0.4
2		0.21	0.22		4.4		1.1	1.3	0.6	0.7	0.4	0.5	0.4	0.5
3		0.20	0.21		4.4		1.1	1.2	0.6	0.7	0.4	0.5	0.4	0.5
AVG		0.20	0.21		3.8		0.8	1.0	0.4	0.5	0.3	0.4	0.3	0.4
MAX		0.21	0.23		4.5		1.1	1.3	0.6	0.7	0.4	0.5	0.4	0.5
MIN		0.18	0.19		3.0		0.3	0.5	0.1	0.2	0.1	0.3	0.1	0.3

Chemical Analyses WSSN 2310 Apr/May 2012

DATE	pH		Total Hard as $CaCO_3$ mg/l		Total Alk as $CaCO_3$ mg/l		NonCarbonate Hardness as $CaCO_3$ mg/l		Calcium Ca 2+ mg/l		Magnesium as Mg 2+ mg/l		Nitrate as NO_3- mg/l		Chloride as Cl - mg/l	
	Raw	Filter Eff.	Raw	Filter Eff.	Raw	Filter Eff.	Raw	Filter Eff.	Raw	Filter Eff.	Raw	Filter Eff.	Raw	Filter Eff.	Raw	Filter Eff.
1																
2																
3																
4																
5																
6																
7																
8																
9																
10																
11																
12																
13																
14																
15																
16																
17																
18																
19																
20																
21																
22																
23	8.48		280		224		56		96.2		9.7				36	
24	8.51	7.53	280	273	240	190	40	83	97.8	95.4	8.8	10.9			38	53
25	8.55	7.72	300	292	228	196	72	96	101.8	100.2	11.2	10.2			36	53
26	8.43	7.62	294	290	240	193	54	97	100.2	100.2	11.0	9.7			38	50
27	8.54	7.58	292	304	230	208	62	96	101.0	97.8	9.7	14.5			36	51
28	8.54	7.53	286	286	237	193	49	93	96.2	94.6	12.2	14.5			36	53
29																
30																
1	8.52	7.67	272	268	224	196	48	72	101.0	99.4	4.9	4.9			36	51
2	8.42	7.54	280	280	240	194	40	86	101.0	93.0	6.8	11.7			41	58
3	8.48	7.60	283	276	226	194	57	82	99.4	97.8	9.2	7.8			38	54
AVG	8.50	7.60	285	284	232	196	53	88	99.4	97.3	9.3	10.5			37	53
MAX	8.55	7.72	300	304	240	208	72	97	101.8	100.2	12.2	14.5			41	58
MIN	8.42	7.53	272	268	224	190	40	72	96.2	93.0	4.9	4.9			36	50

Bacteriological & Physical Parameters — Apr/May 2012

DATE	Total Coliform							Standard Plate Count		Temperature (Celcius)		Color		Odor	
	Raw	Post O3	Plate Settler Eff.	Filter Inf.	Filter Eff.	Lab Tap		Raw	Filter Eff.	Raw	Tap	Raw	Tap	Raw	Tap
1															
2															
3															
4															
5															
6															
7															
8															
9															
10															
11															
12															
13															
14															
15															
16															
17															
18															
19															
20															
21															
22															
23	285	< 1	1/0	1/0				623		12.6					
24	613	13.2	6/0	6/0	4/0			> 738		11.9					
25	435	1	6/0	6/0	24/0			555	10	11.8					
26	387	4	6/0	6/0	24/0			623	12	11.9					
27	613	2	6/0	6/0	24/0			738	30	11.8					
28	285	2	3/0	3/0	12/0			> 738	2	12.1					
29															
30															
1	214	5	1/0	1/0	4/0			> 738	2	12.6					
2	1046	129	6/0	6/0	24/0			> 738	4	13.1					
3	921	184	4/0	4/0	16/0			507	< 2	13.9					
AVG	* Raw and post-ozone coliform are most probable number maximum daily results.									12.4					
MAX	* Raw HPC counts are daily maximums.									13.9					
MIN										11.8					

001106

MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY

DRINKING WATER LABORATORY

USEPA Region V Drinking Water Cert. No. MI00003
P.O. Box 30270
Lansing, MI 48909
TEL: (517) 335-8184
FAX: (517) 335-8562

Sample Number
LE26411

Official Laboratory Report

DEQ
RESOURCE MANAGEMENT DIVISION
FEB 13 2013
LANSING DISTRICT

Report To: MICHAEL GLASGOW
4500 N DORT HWY
FLINT MI 48505

System Name/Owner:	CITY OF FLINT	WSSN/Pool ID:	2310	
Collection Address:	4500 N DORT HWY,FLINT	Source:	Other	
Collected By:	M GLASGOW	Site Code:		
Township/Well#/Section:	//	Collector:	Other	
County:	Genesee	Date Collected:	05/03/2012	13:00
Sample Point:	COMBINED FILTER EFFLUET/POST OZON	Date Received:	05/07/2012	12:35
Water System:	Other	Purpose:	Other	

TESTING INFORMATION			REGULATORY INFORMATION			
Analyte Name	Result (mg/L)	Date Tested	RL (mg/L)	MCL/AL (mg/L)	Method	CAS #
^^^ NOT TESTED^^^	Not Tested	05/11/2012				NOTST-00-C
CXPT sample was lost in laboratory accident.						
Antimony	Not detected	05/11/2012	0.0006	0.006	EPA 200.8	7440-36-0
Arsenic	Not detected	05/11/2012	0.002	0.010	EPA 200.8	7440-38-2
Barium	0.04	05/11/2012	0.01	2	EPA 200.8	7440-39-3
Beryllium	Not detected	05/11/2012	0.0004	0.004	EPA 200.8	7440-41-7
Cadmium	Not detected	05/11/2012	0.0003	0.005	EPA 200.8	7440-43-9
Chromium	Not detected	05/11/2012	0.01	0.1	EPA 200.8	7440-47-3
Cyanide-Available	Not Detected	05/07/2012	0.02	0.2	OIA-1677	57-12-5
Lead	Not detected	05/11/2012	0.001	0.015	EPA 200.8	7439-92-1
Mercury	Not detected	05/11/2012	0.0001	0.002	EPA 200.8	7439-97-6
Nickel	Not detected	05/11/2012	0.01	0.1	EPA 200.8	7440-02-0
Selenium	Not detected	05/11/2012	0.001	0.05	EPA 200.8	7782-49-2
Thallium	Not detected	05/11/2012	0.0002	0.002	EPA 200.8	7440-28-0
Carbamates by HPLC						
3 Hydroxycarbofuran	Not Detected	05/17/2012	0.001		EPA 531.2	16655-82-6
Aldicarb	Not Detected	05/17/2012	0.0005		EPA 531.2	116-06-3
Aldicarb sulfone	Not Detected	05/17/2012	0.0005		EPA 531.2	1646-88-4
Aldicarb sulfoxide	Not Detected	05/17/2012	0.0005		EPA 531.2	1646-87-3
Carbaryl	Not Detected	05/17/2012	0.001		EPA 531.2	63-25-2
Carbofuran	Not Detected	05/17/2012	0.0005	0.04	EPA 531.2	1563-66-2
Methiocarb	Not Detected	05/17/2012	0.001		EPA 531.2	2032-65-7
Methomyl	Not Detected	05/17/2012	0.001		EPA 531.2	16752-77-5

CAS# : Chemical Abstract Service Registry Number
MCL : Maximum Contaminant Level
AL : Action Level
RL : Reporting Limit

mg/L : milligrams / Liter (ppm)
ppm : parts per million
MPN : Most Probable Number
CFU : Colony Forming Unit

Laboratory Contacts
Drinking Water Unit Mgr: Julia Pieper
Systems Mgmt. Unit Mgr: George Krisztian

MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY
DRINKING WATER LABORATORY
USEPA Region V Drinking Water Cert. No. MI00003
P.O. Box 30270
Lansing, MI 48909
TEL: (517) 335-8184
FAX: (517) 335-8562

Sample Number
LE26411

TESTING INFORMATION			REGULATORY INFORMATION			
Analyte Name	Result (mg/L)	Date Tested	RL (mg/L)	MCL/AL (mg/L)	Method	CAS #
Carbamates by HPLC						
Oxamyl	Not Detected	05/17/2012	0.001	0.2	EPA 531.2	23135-22-0
Propoxur	Not Detected	05/17/2012	0.001		EPA 531.2	114-26-1
Chlorinated Acid Herbicides						
2,4,5-T	Not Detected	05/15/2012	0.002		EPA 515.4	93-76-5
2,4,5-TP (silvex)	Not Detected	05/15/2012	0.0003	0.05	EPA 515.4	93-72-1
2,4-D	Not Detected	05/15/2012	0.002	0.07	EPA 515.4	94-75-7
Acifluorfen	Not Detected	05/15/2012	0.004		EPA 515.4	50594-66-6
Bentazon	Not Detected	05/15/2012	0.002		EPA 515.4	25057-89-0
Dicamba	Not Detected	05/15/2012	0.002		EPA 515.4	1918-00-9
Dinoseb	Not Detected	05/15/2012	0.0003	0.007	EPA 515.4	88-85-7
Pentachlorophenol	Not Detected	05/15/2012	0.00006	0.001	EPA 515.4	87-86-5
Picloram	Not Detected	05/15/2012	0.001	0.5	EPA 515.4	1918-02-1
Total DCPA degradates, mono- and di-acid	Not Detected	05/15/2012	0.001		EPA 515.4	1861-32-1

Quality control results for bentazon and acifluorofen were outside allowed limits due to matrix interferences.

Volatile Organic Compounds						
1,1 Dichloroethane	Not Detected	05/17/2012	0.0005		EPA 524.2	75-34-3
1,1 Dichloroethylene	Not Detected	05/17/2012	0.0005	0.007	EPA 524.2	75-35-4
1,1 Dichloropropene	Not Detected	05/17/2012	0.0005		EPA 524.2	563-58-6
1,1,1 Trichloroethane	Not Detected	05/17/2012	0.0005	0.2	EPA 524.2	71-55-6
1,1,1,2 Tetrachloroethane	Not Detected	05/17/2012	0.0005		EPA 524.2	630-20-6
1,1,2 Trichloroethane	Not Detected	05/17/2012	0.0005	0.005	EPA 524.2	79-00-5
1,1,2,2 Tetrachloroethane	Not Detected	05/17/2012	0.0005		EPA 524.2	79-34-5
1,2 Dichlorobenzene	Not Detected	05/17/2012	0.0005	0.6	EPA 524.2	95-50-1
1,2 Dichloroethane	Not Detected	05/17/2012	0.0005	0.005	EPA 524.2	107-06-2
1,2 Dichloropropane	Not Detected	05/17/2012	0.0005	0.005	EPA 524.2	78-87-5
1,2,3 Trichlorobenzene	Not Detected	05/17/2012	0.0005		EPA 524.2	87-61-6
1,2,3 Trichloropropane	Not Detected	05/17/2012	0.0005		EPA 524.2	96-18-4
1,2,4 Trichlorobenzene	Not Detected	05/17/2012	0.0005	0.07	EPA 524.2	120-82-1
1,2,4 Trimethylbenzene	Not Detected	05/17/2012	0.0005		EPA 524.2	95-63-6
1,3 Dichlorobenzene	Not Detected	05/17/2012	0.0005		EPA 524.2	541-73-1
1,3 Dichloropropane	Not Detected	05/17/2012	0.0005		EPA 524.2	142-28-9
1,3,5 Trimethylbenzene	Not Detected	05/17/2012	0.0005		EPA 524.2	108-67-8
1,4 Dichlorobenzene	Not Detected	05/17/2012	0.0005	0.075	EPA 524.2	106-46-7
2,2 Dichloropropane	Not Detected	05/17/2012	0.0005		EPA 524.2	594-20-7
Benzene	Not Detected	05/17/2012	0.0005	0.005	EPA 524.2	71-43-2

CAS# : Chemical Abstract Service Registry Number
MCL : Maximum Contaminant Level
AL : Action Level
RL : Reporting Limit

mg/L : milligrams / Liter (ppm)
ppm : parts per million
MPN : Most Probable Number
CFU : Colony Forming Unit

Laboratory Contacts
Drinking Water Unit Mgr: Julia Pieper
Systems Mgmt. Unit Mgr: George Krisztian

MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY
DRINKING WATER LABORATORY
USEPA Region V Drinking Water Cert. No. MI00003
P.O. Box 30270
Lansing, MI 48909
TEL: (517) 335-8184
FAX: (517) 335-8562

Sample Number
LE26411

TESTING INFORMATION			REGULATORY INFORMATION			
Analyte Name	Result (mg/L)	Date Tested	RL (mg/L)	MCL/AL (mg/L)	Method	CAS #
Volatile Organic Compounds						
Bromobenzene	Not Detected	05/17/2012	0.0005		EPA 524.2	108-86-1
Bromochloromethane	Not Detected	05/17/2012	0.0005		EPA 524.2	74-97-5
Bromodichloromethane	0.0065	05/17/2012	0.0005	0.080	EPA 524.2	75-27-4
Bromoform	0.0023	05/17/2012	0.0005	0.080	EPA 524.2	75-25-2
Bromomethane	Not Detected	05/17/2012	0.001		EPA 524.2	74-83-9
Carbon tetrachloride	Not Detected	05/17/2012	0.0005	0.005	EPA 524.2	56-23-5
Chlorobenzene	Not Detected	05/17/2012	0.0005	0.1	EPA 524.2	108-90-7
Chlorodibromomethane	0.0086	05/17/2012	0.0005	0.080	EPA 524.2	124-48-1
Chloroethane	Not Detected	05/17/2012	0.0005		EPA 524.2	75-00-3
Chloroform	0.0023	05/17/2012	0.0005	0.080	EPA 524.2	67-66-3
Chloromethane	Not Detected	05/17/2012	0.0005		EPA 524.2	74-87-3
cis-1,2 Dichloroethylene	Not Detected	05/17/2012	0.0005	0.07	EPA 524.2	156-59-2
cis-1,3 Dichloropropene	Not Detected	05/17/2012	0.0005		EPA 524.2	10061-01-5
Dibromomethane	Not Detected	05/17/2012	0.0005		EPA 524.2	74-95-3
Dichlorodifluoromethane	Not Detected	05/17/2012	0.001		EPA 524.2	75-71-8
Dichloromethane	Not Detected	05/17/2012	0.0006	0.005	EPA 524.2	75-09-2
Ethylbenzene	Not Detected	05/17/2012	0.0005	0.7	EPA 524.2	100-41-4
Fluorotrichloromethane	Not Detected	05/17/2012	0.001		EPA 524.2	75-69-4
Hexachlorobutadiene	Not Detected	05/17/2012	0.0005		EPA 524.2	87-68-3
Isopropylbenzene	Not Detected	05/17/2012	0.0005		EPA 524.2	98-82-8
m & p-Xylene	Not Detected	05/17/2012	0.0005	10	EPA 524.2	XYLMP-00-C
Methyl ethyl ketone	Not Detected	05/17/2012	0.005		EPA 524.2	78-93-3
Methyl isobutyl ketone	Not Detected	05/17/2012	0.005		EPA 524.2	108-10-1
Methyl-tert-butyl ether (MTBE)	Not Detected	05/17/2012	0.001		EPA 524.2	1634-04-4
Naphthalene	Not Detected	05/17/2012	0.0005		EPA 524.2	91-20-3
n-Butylbenzene	Not Detected	05/17/2012	0.0005		EPA 524.2	104-51-8
Nitrobenzene	Not Detected	05/17/2012	0.01		EPA 524.2	98-95-3
n-Propylbenzene	Not Detected	05/17/2012	0.0005		EPA 524.2	103-65-1
o-Chlorotoluene	Not Detected	05/17/2012	0.0005		EPA 524.2	95-49-8
o-Xylene	Not Detected	05/17/2012	0.0005	10	EPA 524.2	95-47-6
p-Chlorotoluene	Not Detected	05/17/2012	0.0005		EPA 524.2	106-43-4
p-Isopropyltoluene	Not Detected	05/17/2012	0.0005		EPA 524.2	99-87-6
sec-Butylbenzene	Not Detected	05/17/2012	0.0005		EPA 524.2	135-98-8
Styrene	Not Detected	05/17/2012	0.0005	0.1	EPA 524.2	100-42-5
tert-Butylbenzene	Not Detected	05/17/2012	0.0005		EPA 524.2	98-06-6
Tetrachloroethylene	Not Detected	05/17/2012	0.0005	0.005	EPA 524.2	127-18-4
Tetrahydrofuran	Not Detected	05/17/2012	0.005		EPA 524.2	109-99-9
Toluene	Not Detected	05/17/2012	0.0005	1	EPA 524.2	108-88-3

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Laboratory Contacts
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Systems Mgmt. Unit Mgr: George Krisztian

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Lansing, MI 48909
TEL: (517) 335-8184
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Sample Number
LE26411

TESTING INFORMATION			REGULATORY INFORMATION			
Analyte Name	Result (mg/L)	Date Tested	RL (mg/L)	MCL/AL (mg/L)	Method	CAS #
Volatile Organic Compounds						
Total Trihalomethanes	0.020	05/17/2012	NA	0.080	EPA 524.2	TTHM-00-C
Total Xylenes	Not Detected	05/17/2012	NA	10	EPA 524.2	1330-20-7
trans-1,2 Dichloroethylene	Not Detected	05/17/2012	0.0005	0.1	EPA 524.2	156-60-5
trans-1,3 Dichloropropene	Not Detected	05/17/2012	0.0005		EPA 524.2	10061-02-6
Trichloroethylene	Not Detected	05/17/2012	0.0005	0.005	EPA 524.2	79-01-6
Vinyl chloride	Not Detected	05/17/2012	0.0004	0.002	EPA 524.2	75-01-4

The analyses performed by the MDEQ Drinking Water Laboratory were conducted using methods approved by the U.S. Environmental Protection Agency in accordance with the Safe Drinking Water Act, 40 CFR parts 141-143, and other regulatory agencies as appropriate.

Your local health department has detailed information about the quality of drinking water in your area. If you have concerns about the health risks related to the test results of your sample, please contact the Environmental Health Section through the address and telephone number listed below:

Genesee County Health Dept.
630 South Saginaw
Flint, MI 48502-1540
810 257-3603

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MCL : Maximum Contaminant Level
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mg/L : milligrams / Liter (ppm)
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Systems Mgmt. Unit Mgr: George Krisztian

001110

D-5a 1/86
Authority; Act 399, P.A. 1976

MICHIGAN DEPARTMENT OF PUBLIC HEALTH

TEST RUN OPERATION REPORT
OF
WATER TREATMENT PLANT

For Month of June 2012

Flint Water Plant — NAME OF WATER SYSTEM

DEQ RESOURCE MANAGEMENT DIVISION FEB 13 2013 LANSING DISTRICT

2310 — WSSN

Genesee — COUNTY

Michael Glasgow — CERTIFIED OPERATOR

F-1R S-3 — CLASSIFICATION

Michael L Glasgow — SIGNATURE OF APPROPRIATE OFFICIAL

TREATMENT RATE AND FILTER DATA

1. Treatment Rate, Maximum **12.5** Million Gallons Per Day
2. Treatment Rate, Approved Rated Plant Capacity **36** Million Gallons per Day
3. Average Filter Run **80+** Hours, Average Head Loss n/a Feet
4. Average Filtration Rate **2.3** Gallons per Square Ft. per Minute
5. Maximum Filtration Rate **2.8** Gallons per Square Ft. per Minute
6. Average Wash Water Use n/a percent of Treated Water

CHEMICAL DATA

7. Chlorine on hand _____ lbs.: Estimated supply _____ days
8. Oxygen (O2) on hand _____ lbs.: Estimated supply _____ days
9. Ferric (Fe3+) on hand _____ lbs.: Estimated supply _____ days
10. Cost of All Chemicals per Million Gallons _____
11. Total Power Cost per Million Gallons _____

Remarks:

Submit to: Mike Prysby, P.E.
MDEQ-Water Division-Lansing District
P.O. Box 30242
Lansing, MI 48909

Failure to complete this form is a violation of Act 399, P.A. 1976 and is subject to penalties as outlined in the Act.

Daily Flow & Ozone Parameters WSSN 2310 June 2012

DATE	Daily Flow (MGD)	O_3 Dosage (lbs/day)	Ozone residuals (mg/L)												Sodium Bisulfite Dosage (mg/L)
			Contact Chamber #1				Contact Chamber # 2				Contact Chamber # 3				
			# of Samples	Start (avg mg/L)	Middle (avg. mg/L)	End (avg. mg/L)	# of Samples	Start (avg mg/L)	Middle (avg. mg/L)	End (avg. mg/L)	# of Samples	Start (avg mg/L)	Middle (avg. mg/L)	End (avg. mg/L)	
1															
2															
3															
4															
5															
6															
7															
8															
9															
10															
11															
12															
13															
14															
15															
16															
17															
18															
19															
20															
21															
22															
23															
24															
25	7.9	862					7	0.17	0.00	0.00					
26	11.9	820					9	0.32	0.00	0.01					
27	12.0	800					6	0.53	0.02	0.03					
28	11.1	780					7	0.54	0.01	0.00					
29	7.3	750					3	0.73	0.01	0.00					
30															
AVG	10.0	802					6	0.46	0.01	0.01					
MAX	12.0	862					9	0.73	0.02	0.03					
MIN	7.3	750					3	0.17	0.00	0.00					
Total	50.2														

Coagulation & Flocculation Parameters WSSN 2310 June 2012

DATE	Ferric Chloride as FeCl3 mg/l	Ferric Chloride as Fe 3+ mg/l	Turbidity, NTU units											
			Raw			Plate Settler Effluent			Filter Influent			Filter Effluent		
			# of Samples	Avg.	Max	# of Samples	Avg.	Max	# of Samples	Avg.	Max	# of Samples	Avg.	Max
1														
2														
3														
4														
5														
6														
7														
8														
9														
10														
11														
12														
13														
14														
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20														
21														
22														
23														
24														
25	25.8	8.8	7	11.0	15.2	6	1.43	3.34	5	1.28	2.04			
26	26.9	9.2	10	12.3	14.6	12	0.68	0.80	12	0.61	0.68	12	0.18	0.22
27	25.4	8.7	6	9.33	10.5	8	0.52	0.70	8	0.52	0.58	28	0.11	0.15
28	27.4	9.4	6	11.8	17.0	7	0.88	1.94	6	0.69	0.94	24	0.15	0.29
29	27.9	9.6	4	11.2	12.4	5	0.81	1.67	4	0.68	0.87	16	0.12	0.24
30														
AVG	26.7	9.1	7	11.1	13.9	8	0.86	1.69	7	0.76	1.02	20	0.14	0.22
MAX	27.9	9.6	10	12.3	17.0	12	1.43	3.34	12	1.28	2.04	28	0.18	0.29
MIN	25.4	8.7	4	9.33	10.5	5	0.52	0.70	4	0.52	0.58	12	0.11	0.15

Flouridation & Chlorination WSSN 2310 June 2012

DATE	Fluoride Applied F- mg/l	Fluoride Analyses mg/l			Chlorine App. Mg/l		Chlorine Residual mg/l							
					Chlorine (prior to filtration) mg/L OCl-	Post Chlorine mg/L	Plate Settler Effluent		Contact Clairifier Effluent		Combined Filter Effluent		Combined Filter Effluent (south)	
		Raw	Filter Eff.	Dist			Free	Total	Free	Total	Free	Total	Free	Total
1														
2														
3														
4														
5														
6														
7														
8														
9														
10														
11														
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14														
15														
16														
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19														
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21														
22														
23														
24														
25		0.19			2.8		0.4	0.6	0.1	0.3				
26		0.21	0.21		4.0		0.8	1.0	0.3	0.5	0.1	0.3	0.2	0.3
27		0.19	0.21		4.8		1.4	1.6	0.6	0.8	0.2	0.4	0.2	0.4
28		0.22	0.20		5.2		1.3	1.8	0.6	0.9	0.2	0.5	0.3	0.5
29		0.23	0.23		5.3		1.3	1.6	0.7	1.1	0.4	0.5	0.3	0.5
30														
AVG					4.4		1.0	1.3	0.5	0.7	0.2	0.4	0.3	0.4
MAX					5.3		1.4	1.8	0.7	1.1	0.4	0.5	0.3	0.5
MIN					2.8		0.4	0.6	0.1	0.3	0.1	0.3	0.2	0.3

Chemical Analyses WSSN 2310 June 2012

DATE	pH		Total Hard as $CaCO_3$ mg/l		Total Alk as $CaCO_3$ mg/l		NonCarbonate Hardness as $CaCO_3$ mg/l		Calcium Ca 2+ mg/l		Magnesium as Mg 2+ mg/l		Nitrate as NO_3- mg/l		Chloride as Cl - mg/l	
	Raw	Filter Eff.	Raw	Filter Eff.	Raw	Filter Eff.	Raw	Filter Eff.	Raw	Filter Eff.	Raw	Filter Eff.	Raw	Filter Eff.	Raw	Filter Eff.
1																
2																
3																
4																
5																
6																
7																
8																
9																
10																
11																
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20																
21																
22																
23																
24																
25	8.50		264		228		36		80.2		15.6				19	
26	8.43	7.53	268	276	230	190	38	86	73.7	60.9	20.4	30.1			19	28
27	8.56	7.76	252	244	234	194	18	50	62.5	60.9	23.3	22.4			20	28
28	8.30	7.73	274	231	231	183	43	48	78.6	72.9	19.0	22.4			20	29
29	8.42	7.76	264	236	226	192	38	44	73.7	67.3	19.4	16.5			19	27
30																
AVG	8.44	7.70	264	247	230	190	35	57	73.7	65.5	19.5	22.9			19	28
MAX	8.56	7.76	274	276	234	194	43	86	80.2	72.9	23.3	30.1			20	29
MIN	8.30	7.53	252	231	226	183	18	44	62.5	60.9	15.6	16.5			19	27

Bacteriological & Physical Parameters — June 2012

DATE	Total Coliform							Standard Plate Count		Temperature (Celcius)		Color		Odor	
	Raw	Post O3	Plate Settler Eff.	Filter Inf.	Filter Eff.	Lab Tap		Raw	Filter Eff.	Raw	Tap	Raw	Tap	Raw	Tap
1															
2															
3															
4															
5															
6															
7															
8															
9															
10															
11															
12															
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15															
16															
17															
18															
19															
20															
21															
22															
23															
24															
25	> 2419		1/0	1/0				>738	15	25.3					
26	8664	517	6/0	6/1	8/0			2310	2	24.0					
27	8820	921	6/0	6/0	24/0			>738	2	25.4					
28	9600	1203	6/0	6/0	24/0			8300	8	26.1					
29	8164	> 2419	4/0	4/0	16/0			7380	8	26.7					
30															
AVG	* Raw and post-ozone coliform are most probable number maximum daily results.									25.5					
MAX	* Raw HPC counts are daily maximums.									26.7					
MIN										24.0					

MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY
DRINKING WATER LABORATORY

USEPA Region V Drinking Water Cert. No. MI00003
P.O. Box 30270
Lansing, MI 48909
TEL: (517) 335-8184
FAX: (517) 335-8562

Sample Number
LE35013

Official Laboratory Report

Report To: MIKE GLASGOW
4500 N DORT HWY
FLINT MI 48505

System Name/Owner:	CITY OF FLINT	WSSN/Pool ID:	2310
Collection Address:	4500 N DORT HWY,FLINT	Source:	Other
Collected By:	M GLASGOW	Site Code:	
Township/Well#/Section:	//	Collector:	Public Water Supply Operator
County:	Genesee	Date Collected:	06/29/2012 11:45
Sample Point:	COMBINED FILTER EFFLUENT - POST	Date Received:	07/03/2012 11:37
Water System:	Other	Purpose:	Other

TESTING INFORMATION			REGULATORY INFORMATION			
Analyte Name	Result (mg/L)	Date Tested	RL (mg/L)	MCL/AL (mg/L)	Method	CAS #
^^^ NOT TESTED^^^	Not Tested	07/17/2012				NOTST-00-C
Analysis for volatile organic compounds was not completed within EPA holding time due to a clerical error. Please resample for test code CXVO.						
ntimony	Not detected	07/12/2012	0.0006	0.006	EPA 200.8	7440-36-0
Arsenic	Not detected	07/12/2012	0.002	0.010	EPA 200.8	7440-38-2
Barium	0.05	07/12/2012	0.01	2	EPA 200.8	7440-39-3
Beryllium	Not detected	07/12/2012	0.0004	0.004	EPA 200.8	7440-41-7
Cadmium	Not detected	07/12/2012	0.0003	0.005	EPA 200.8	7440-43-9
Chromium	Not detected	07/12/2012	0.01	0.1	EPA 200.8	7440-47-3
Cyanide-Available	Not Detected	07/09/2012	0.02	0.2	OIA-1677	57-12-5
Sample collection date was not given or incorrect date given. Results will be evaluated by regulating agency.						
Lead	Not detected	07/12/2012	0.001	0.015	EPA 200.8	7439-92-1
Mercury	Not detected	07/12/2012	0.0001	0.002	EPA 200.8	7439-97-6
Nickel	Not detected	07/12/2012	0.01	0.1	EPA 200.8	7440-02-0
Selenium	Not detected	07/12/2012	0.001	0.05	EPA 200.8	7782-49-2
Thallium	Not detected	07/12/2012	0.0002	0.002	EPA 200.8	7440-28-0
Carbamates by HPLC						
3 Hydroxycarbofuran	Not Detected	07/13/2012	0.001		EPA 531.2	16655-82-6
Aldicarb	Not Detected	07/13/2012	0.0005		EPA 531.2	116-06-3
Aldicarb sulfone	Not Detected	07/13/2012	0.0005		EPA 531.2	1646-88-4
Aldicarb sulfoxide	Not Detected	07/13/2012	0.0005		EPA 531.2	1646-87-3
Carbaryl	Not Detected	07/13/2012	0.001		EPA 531.2	63-25-2
Carbofuran	Not Detected	07/13/2012	0.0005	0.04	EPA 531.2	1563-66-2
Methiocarb	Not Detected	07/13/2012	0.001		EPA 531.2	2032-65-7

CAS# : Chemical Abstract Service Registry Number
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Laboratory Contacts
Drinking Water Unit Mgr: Julia Pieper
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Sample Number
LE35013

TESTING INFORMATION			REGULATORY INFORMATION			
Analyte Name	Result (mg/L)	Date Tested	RL (mg/L)	MCL/AL (mg/L)	Method	CAS #
Carbamates by HPLC						
Methomyl	Not Detected	07/13/2012	0.001		EPA 531.2	16752-77-5
Oxamyl	Not Detected	07/13/2012	0.001	0.2	EPA 531.2	23135-22-0
Propoxur	Not Detected	07/13/2012	0.001		EPA 531.2	114-26-1
Chlorinated Acid Herbicides						
2,4,5-T	Not Detected	07/11/2012	0.002		EPA 515.4	93-76-5
2,4,5-TP (silvex)	Not Detected	07/11/2012	0.0003	0.05	EPA 515.4	93-72-1
2,4-D	Not Detected	07/11/2012	0.002	0.07	EPA 515.4	94-75-7
Acifluorfen	Not Detected	07/11/2012	0.004		EPA 515.4	50594-66-6
Bentazon	Not Detected	07/11/2012	0.002		EPA 515.4	25057-89-0
Dicamba	Not Detected	07/11/2012	0.002		EPA 515.4	1918-00-9
Dinoseb	Not Detected	07/11/2012	0.0003	0.007	EPA 515.4	88-85-7
Pentachlorophenol	Not Detected	07/11/2012	0.00006	0.001	EPA 515.4	87-86-5
Picloram	Not Detected	07/11/2012	0.001	0.5	EPA 515.4	1918-02-1
Total DCPA degradates, mono- and di-acid	Not Detected	07/11/2012	0.001		EPA 515.4	1861-32-1

Sample collection date was not given or incorrect date given. Results will be evaluated by regulating agency.
Quality control results for pentachlorophenol were outside allowed limits due to matrix interferences.

Pesticides Analysis by GC/MS						
4,4'-DDD	Not Detected	07/09/2012	0.001		EPA 525.2	72-54-8
4,4'-DDE	Not Detected	07/09/2012	0.001		EPA 525.2	72-55-9
4,4'-DDT	Not Detected	07/09/2012	0.0005		EPA 525.2	50-29-3
Acetochlor	Not Detected	07/09/2012	0.001		EPA 525.2	34256-82-1
Alachlor	Not Detected	07/09/2012	0.0002	0.002	EPA 525.2	15972-60-8
Aldrin	Not Detected	07/09/2012	0.0004		EPA 525.2	309-00-2
alpha-Chlordane	Not Detected	07/09/2012	0.0002	0.002	EPA 525.2	5103-71-9
Atrazine	Not Detected	07/09/2012	0.0002	0.003	EPA 525.2	1912-24-9
Dieldrin	Not Detected	07/09/2012	0.0005		EPA 525.2	60-57-1
Endrin	Not Detected	07/09/2012	0.0001	0.002	EPA 525.2	72-20-8
Endrin aldehyde	Not Detected	07/09/2012	0.001		EPA 525.2	7421-93-4
gamma-Chlordane	Not Detected	07/09/2012	0.0002	0.002	EPA 525.2	5103-74-2
Heptachlor	Not Detected	07/09/2012	0.0002	0.0004	EPA 525.2	76-44-8
Heptachlor epoxide	Not Detected	07/09/2012	0.0001	0.0002	EPA 525.2	1024-57-3
Hexachlorobenzene	Not Detected	07/09/2012	0.0001	0.001	EPA 525.2	118-74-1
Hexachlorocyclohexane (alpha-BHC)	Not Detected	07/09/2012	0.001		EPA 525.2	319-84-6
Hexachlorocyclohexane (beta-BHC)	Not Detected	07/09/2012	0.001		EPA 525.2	319-85-7
Hexachlorocyclohexane (delta-BHC)	Not Detected	07/09/2012	0.001		EPA 525.2	319-86-8

CAS# : Chemical Abstract Service Registry Number
MCL : Maximum Contaminant Level
AL : Action Level
RL : Reporting Limit

mg/L : milligrams / Liter (ppm)
ppm : parts per million
MPN : Most Probable Number
CFU : Colony Forming Unit

Laboratory Contacts
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Systems Mgmt. Unit Mgr: George Krisztian

MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY
DRINKING WATER LABORATORY

USEPA Region V Drinking Water Cert. No. MI00003
P.O. Box 30270
Lansing, MI 48909
TEL: (517) 335-8184
FAX: (517) 335-8562

Sample Number
LE35013

TESTING INFORMATION			REGULATORY INFORMATION			
Analyte Name	Result (mg/L)	Date Tested	RL (mg/L)	MCL/AL (mg/L)	Method	CAS #
Pesticides Analysis by GC/MS						
Hexachlorocyclopentadiene	Not Detected	07/09/2012	0.0005	0.05	EPA 525.2	77-47-4
Lindane (gamma-BHC)	Not Detected	07/09/2012	0.0001	0.0002	EPA 525.2	58-89-9
Methoxychlor	Not Detected	07/09/2012	0.0001	0.04	EPA 525.2	72-43-5
Metolachlor	Not Detected	07/09/2012	0.001		EPA 525.2	51218-45-2
Metribuzin	Not Detected	07/09/2012	0.001		EPA 525.2	21087-64-9
Molinate	Not Detected	07/09/2012	0.0005		EPA 525.2	2212-67-1
PCB (aroclor 1016)	Not Detected	07/09/2012	0.0001	0.0005	EPA 525.2	12674-11-2
PCB (aroclor 1221)	Not Detected	07/09/2012	0.0001	0.0005	EPA 525.2	11104-28-2
PCB (aroclor 1232)	Not Detected	07/09/2012	0.0001	0.0005	EPA 525.2	11141-16-5
PCB (aroclor 1242)	Not Detected	07/09/2012	0.0001	0.0005	EPA 525.2	53469-21-9
PCB (aroclor 1248)	Not Detected	07/09/2012	0.0001	0.0005	EPA 525.2	12672-29-6
PCB (aroclor 1254)	Not Detected	07/09/2012	0.0001	0.0005	EPA 525.2	11097-69-1
PCB (aroclor 1260)	Not Detected	07/09/2012	0.0001	0.0005	EPA 525.2	11096-82-5
Polybrominated biphenyls	Not Detected	07/09/2012	0.0001		EPA 525.2	59536-65-1
Simazine	Not Detected	07/09/2012	0.0002	0.004	EPA 525.2	122-34-9
Toxaphene	Not Detected	07/09/2012	0.001	0.003	EPA 525.2	8001-35-2

The analyses performed by the MDEQ Drinking Water Laboratory were conducted using methods approved by the U.S. Environmental Protection Agency in accordance with the Safe Drinking Water Act, 40 CFR parts 141-143, and other regulatory agencies as appropriate.

Your local health department has detailed information about the quality of drinking water in your area. If you have concerns about the health risks related to the test results of your sample, please contact the Environmental Health Section through the address and telephone number listed below:

Genesee County Health Dept.
630 South Saginaw
Flint, MI 48502-1540
810 257-3603

CAS# : Chemical Abstract Service Registry Number
MCL : Maximum Contaminant Level
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Laboratory Contacts
Drinking Water Unit Mgr: Julia Pieper
Systems Mgmt. Unit Mgr: George Krisztian

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USEPA Region V Drinking Water Cert. No. MI00003
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Lansing, MI 48909
TEL: (517) 335-8184
FAX: (517) 335-8562

Sample Number
LE35013

Official Laboratory Report

Report To: MIKE GLASGOW
4500 N DORT HWY
FLINT MI 48505

System Name/Owner:	CITY OF FLINT	WSSN/Pool ID:	2310
Collection Address:	4500 N DORT HWY,FLINT	Source:	Other
Collected By:	M GLASGOW	Site Code:	
Township/Well#/Section:	//	Collector:	Public Water Supply Operator
County:	Genesee	Date Collected:	06/29/2012 11:45
Sample Point:	COMBINED FILTER EFFLUENT - POST O3	Date Received:	07/03/2012 11:37
Water System:	Other	Purpose:	Other

TESTING INFORMATION			REGULATORY INFORMATION			
Analyte Name	Result (mg/L)	Date Tested	RL (mg/L)	MCL/AL (mg/L)	Method	CAS #
^^^ NOT TESTED^^^	Not Tested	07/17/2012				NOTST-00-C
Analysis for volatile organic compounds was not completed within EPA holding time due to a clerical error. Please resample for test code CXVO.						
Antimony	Not detected	07/12/2012	0.0006	0.006	EPA 200.8	7440-36-0
Arsenic	Not detected	07/12/2012	0.002	0.010	EPA 200.8	7440-38-2
Barium	0.05	07/12/2012	0.01	2	EPA 200.8	7440-39-3
Beryllium	Not detected	07/12/2012	0.0004	0.004	EPA 200.8	7440-41-7
Cadmium	Not detected	07/12/2012	0.0003	0.005	EPA 200.8	7440-43-9
Chromium	Not detected	07/12/2012	0.01	0.1	EPA 200.8	7440-47-3
Cyanide-Available	Not Detected	07/09/2012	0.02	0.2	OIA-1677	57-12-5
Sample collection date was not given or incorrect date given. Results will be evaluated by regulating agency.						
Lead	Not detected	07/12/2012	0.001	0.015	EPA 200.8	7439-92-1
Mercury	Not detected	07/12/2012	0.0001	0.002	EPA 200.8	7439-97-6
Nickel	Not detected	07/12/2012	0.01	0.1	EPA 200.8	7440-02-0
Selenium	Not detected	07/12/2012	0.001	0.05	EPA 200.8	7782-49-2
Thallium	Not detected	07/12/2012	0.0002	0.002	EPA 200.8	7440-28-0
Carbamates by HPLC						
3 Hydroxycarbofuran	Not Detected	07/13/2012	0.001		EPA 531.2	16655-82-6
Aldicarb	Not Detected	07/13/2012	0.0005		EPA 531.2	116-06-3
Aldicarb sulfone	Not Detected	07/13/2012	0.0005		EPA 531.2	1646-88-4
Aldicarb sulfoxide	Not Detected	07/13/2012	0.0005		EPA 531.2	1646-87-3
Carbaryl	Not Detected	07/13/2012	0.001		EPA 531.2	63-25-2
Carbofuran	Not Detected	07/13/2012	0.0005	0.04	EPA 531.2	1563-66-2
Methiocarb	Not Detected	07/13/2012	0.001		EPA 531.2	2032-65-7

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Sample Number
LE35013

TESTING INFORMATION			REGULATORY INFORMATION			
Analyte Name	Result (mg/L)	Date Tested	RL (mg/L)	MCL/AL (mg/L)	Method	CAS #
Carbamates by HPLC						
Methomyl	Not Detected	07/13/2012	0.001		EPA 531.2	16752-77-5
Oxamyl	Not Detected	07/13/2012	0.001	0.2	EPA 531.2	23135-22-0
Propoxur	Not Detected	07/13/2012	0.001		EPA 531.2	114-26-1
Chlorinated Acid Herbicides						
2,4,5-T	Not Detected	07/11/2012	0.002		EPA 515.4	93-76-5
2,4,5-TP (silvex)	Not Detected	07/11/2012	0.0003	0.05	EPA 515.4	93-72-1
2,4-D	Not Detected	07/11/2012	0.002	0.07	EPA 515.4	94-75-7
Acifluorfen	Not Detected	07/11/2012	0.004		EPA 515.4	50594-66-6
Bentazon	Not Detected	07/11/2012	0.002		EPA 515.4	25057-89-0
Dicamba	Not Detected	07/11/2012	0.002		EPA 515.4	1918-00-9
Dinoseb	Not Detected	07/11/2012	0.0003	0.007	EPA 515.4	88-85-7
Pentachlorophenol	Not Detected	07/11/2012	0.00006	0.001	EPA 515.4	87-86-5
Picloram	Not Detected	07/11/2012	0.001	0.5	EPA 515.4	1918-02-1
Total DCPA degradates, mono- and di-acid	Not Detected	07/11/2012	0.001		EPA 515.4	1861-32-1

Sample collection date was not given or incorrect date given. Results will be evaluated by regulating agency.
Quality control results for pentachlorophenol were outside allowed limits due to matrix interferences.

Pesticides Analysis by GC/MS						
4,4'-DDD	Not Detected	07/09/2012	0.001		EPA 525.2	72-54-8
4,4'-DDE	Not Detected	07/09/2012	0.001		EPA 525.2	72-55-9
4,4'-DDT	Not Detected	07/09/2012	0.0005		EPA 525.2	50-29-3
Acetochlor	Not Detected	07/09/2012	0.001		EPA 525.2	34256-82-1
Alachlor	Not Detected	07/09/2012	0.0002	0.002	EPA 525.2	15972-60-8
Aldrin	Not Detected	07/09/2012	0.0004		EPA 525.2	309-00-2
alpha-Chlordane	Not Detected	07/09/2012	0.0002	0.002	EPA 525.2	5103-71-9
Atrazine	Not Detected	07/09/2012	0.0002	0.003	EPA 525.2	1912-24-9
Dieldrin	Not Detected	07/09/2012	0.0005		EPA 525.2	60-57-1
Endrin	Not Detected	07/09/2012	0.0001	0.002	EPA 525.2	72-20-8
Endrin aldehyde	Not Detected	07/09/2012	0.001		EPA 525.2	7421-93-4
gamma-Chlordane	Not Detected	07/09/2012	0.0002	0.002	EPA 525.2	5103-74-2
Heptachlor	Not Detected	07/09/2012	0.0002	0.0004	EPA 525.2	76-44-8
Heptachlor epoxide	Not Detected	07/09/2012	0.0001	0.0002	EPA 525.2	1024-57-3
Hexachlorobenzene	Not Detected	07/09/2012	0.0001	0.001	EPA 525.2	118-74-1
Hexachlorocyclohexane (alpha-BHC)	Not Detected	07/09/2012	0.001		EPA 525.2	319-84-6
Hexachlorocyclohexane (beta-BHC)	Not Detected	07/09/2012	0.001		EPA 525.2	319-85-7
Hexachlorocyclohexane (delta-BHC)	Not Detected	07/09/2012	0.001		EPA 525.2	319-86-8

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Sample Number
LE35013

TESTING INFORMATION			REGULATORY INFORMATION			
Analyte Name	Result (mg/L)	Date Tested	RL (mg/L)	MCL/AL (mg/L)	Method	CAS #
Pesticides Analysis by GC/MS						
Hexachlorocyclopentadiene	Not Detected	07/09/2012	0.0005	0.05	EPA 525.2	77-47-4
Lindane (gamma-BHC)	Not Detected	07/09/2012	0.0001	0.0002	EPA 525.2	58-89-9
Methoxychlor	Not Detected	07/09/2012	0.0001	0.04	EPA 525.2	72-43-5
Metolachlor	Not Detected	07/09/2012	0.001		EPA 525.2	51218-45-2
Metribuzin	Not Detected	07/09/2012	0.001		EPA 525.2	21087-64-9
Molinate	Not Detected	07/09/2012	0.0005		EPA 525.2	2212-67-1
PCB (aroclor 1016)	Not Detected	07/09/2012	0.0001	0.0005	EPA 525.2	12674-11-2
PCB (aroclor 1221)	Not Detected	07/09/2012	0.0001	0.0005	EPA 525.2	11104-28-2
PCB (aroclor 1232)	Not Detected	07/09/2012	0.0001	0.0005	EPA 525.2	11141-16-5
PCB (aroclor 1242)	Not Detected	07/09/2012	0.0001	0.0005	EPA 525.2	53469-21-9
PCB (aroclor 1248)	Not Detected	07/09/2012	0.0001	0.0005	EPA 525.2	12672-29-6
PCB (aroclor 1254)	Not Detected	07/09/2012	0.0001	0.0005	EPA 525.2	11097-69-1
PCB (aroclor 1260)	Not Detected	07/09/2012	0.0001	0.0005	EPA 525.2	11096-82-5
Polybrominated biphenyls	Not Detected	07/09/2012	0.0001		EPA 525.2	59536-65-1
Simazine	Not Detected	07/09/2012	0.0002	0.004	EPA 525.2	122-34-9
Toxaphene	Not Detected	07/09/2012	0.001	0.003	EPA 525.2	8001-35-2

The analyses performed by the MDEQ Drinking Water Laboratory were conducted using methods approved by the U.S. Environmental Protection Agency in accordance with the Safe Drinking Water Act, 40 CFR parts 141-143, and other regulatory agencies as appropriate.

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CFU : Colony Forming Unit

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Systems Mgmt. Unit Mgr: George Krisztian

001122
D-5a 1/86
Authority; Act 399, P.A. 1976

MICHIGAN DEPARTMENT OF PUBLIC HEALTH

TEST RUN OPERATION REPORT
OF
WATER TREATMENT PLANT

For Month of October 2012

Flint Water Plant	2310	Genesee
NAME OF WATER SYSTEM	WSSN	COUNTY

Michael Glasgow		F-1R S-3
CERTIFIED OPERATOR		CLASSIFICATION

Michael Glasgow
SIGNATURE OF APPROPRIATE OFFICIAL

DEQ
RESOURCE MANAGEMENT DIVISION
FEB 13 2013
LANSING DISTRICT

TREATMENT RATE AND FILTER DATA

1. Treatment Rate, Maximum 12.2 Million Gallons Per Day
2. Treatment Rate, Approved Rated Plant Capacity 36 Million Gallons per Day
3. Average Filter Run 80+ Hours, Average Head Loss n/a Feet
4. Average Filtration Rate 2.4 Gallons per Square Ft. per Minute
5. Maximum Filtration Rate 3.0 Gallons per Square Ft. per Minute
6. Average Wash Water Use n/a percent of Treated Water

CHEMICAL DATA

7. Chlorine on hand _____ lbs.: Estimated supply _____ days
8. Oxygen (O2) on hand _____ lbs.: Estimated supply _____ days
9. Ferric (Fe3+) on hand _____ lbs.: Estimated supply _____ days
10. Cost of All Chemicals per Million Gallons _____
11. Total Power Cost per Million Gallons _____

Remarks:

Submit to: Mike Prysby, P.E.
MDEQ-Water Division-Lansing District
P.O. Box 30242
Lansing, MI 48909

Failure to complete this form is a violation of Act 399, P.A. 1976 and is subject to penalties as outlined in the Act.

Not much O3 carry over Residual into contact chambers

Int Cl2 MAX 30 PPM @ 26 MGD

Running 2 cells in Pretreat → 24 MGD Rated @ 17

Filters 9-12 .12 - .16 Range

.75 NTU off Plate .7 Applied

Plates .4 Clr F

Filter Appl. .1 IE

Daily Flow & Ozone Parameters WSSN 2310 October 2012

DATE	Daily Flow (MGD)	O_3 Dosage (lbs/day)	Ozone residuals (mg/L)												Sodium Bisulfite Dosage (mg/L)
			Contact Chamber #1				Contact Chamber # 2				Contact Chamber # 3				
			# of Samples	Start (avg mg/L)	Middle (avg. mg/L)	End (avg. mg/L)	# of Samples	Start (avg mg/L)	Middle (avg. mg/L)	End (avg. mg/L)	# of Samples	Start (avg mg/L)	Middle (avg. mg/L)	End (avg. mg/L)	
1															
2															
3															
4															
5															
6															
7															
8	5.9	340	6	0.98	0.15	0.08									
9	11.4	348	9	1.10	0.28	0.10									
10	11.0	352	6	1.09	0.38	0.08									
11	10.4	340	6	1.29	0.64	0.10									
12	6.8	335	5	1.41	0.54	0.14									
13															
14															
15															
16															
17															
18															
19															
20															
21															
22															
23															
24															
25															
26															
27															
28															
29															
30															
AVG	9.1	343	6	1.17	0.40	0.10									
MAX	11.4	352	9	1.41	0.64	0.14									
MIN	5.9	335	5	0.98	0.15	0.08									
Total	45.5														

Coagulation & Flocculation Parameters WSSN 2310 October 2012

DATE	Ferric Chloride as $FeCl_3$ mg/l	Ferric Chloride as Fe^{3+} mg/l	Turbidity, NTU units											
			Raw			Plate Settler Effluent			Filter Influent			Filter Effluent		
			# of Samples	Avg.	Max	# of Samples	Avg.	Max	# of Samples	Avg.	Max	# of Samples	Avg.	Max
1														
2														
3														
4														
5														
6														
7														
8	27.1	9.3	7	10.2	11.7	6	1.47	4.25	4	1.17	1.89			
9	29.4	10.1	7	8.9	10.9	9	0.56	1.30	7	0.48	0.76	2	0.18	0.25
10	27.7	9.5	6	8.5	10.7	12	0.45	0.49	6	0.48	0.67	24	0.10	0.23
11	27.8	9.6	6	7.7	8.6	11	0.57	0.87	6	0.53	0.72	24	0.09	0.11
12	28.3	9.8	5	5.6	6.3	7	0.45	0.47	5	0.47	0.52	20	0.07	0.09
13														
14														
15														
16														
17														
18														
19														
20														
21														
22														
23														
24														
25														
26														
27														
28														
29														
30														
AVG	28.1	9.7	6	8.2	9.6	9	0.70	1.48	6	0.63	0.91	18	0.11	0.17
MAX	29.4	10.1	7	10.2	11.7	12	1.47	4.25	7	1.17	1.89	24	0.18	0.25
MIN	27.1	9.3	5	5.63	6.3	6	0.45	0.47	4	0.47	0.52	2	0.07	0.09

Flouridation & Chlorination WSSN 2310 October 2012

DATE	Fluoride Applied F- mg/l	Fluoride Analyses mg/l			Chlorine App. Mg/l		Chlorine Residual mg/l							
					Chlorine (prior to filtration) mg/L OCl-	Post Chlorine mg/L	Plate Settler Effluent		Contact Clairifier Effluent		Combined Filter Effluent		Combined Filter Effluent (south)	
		Raw	Filter Eff.	Dist			Free	Total	Free	Total	Free	Total	Free	Total
1														
2														
3														
4														
5														
6														
7														
8		0.21			2.8		0.6	0.8	0.2	0.5				
9		0.19	0.21		4.2		0.8	1.0	0.4	0.5	0.3	0.5	0.3	0.4
10		0.21	0.22		4.3		1.0	1.2	0.5	0.8	0.3	0.5	0.3	0.5
11		0.22	0.20		4.6		1.0	1.2	0.6	0.8	0.4	0.6	0.4	0.5
12		0.20	0.24		4.7		1.1	1.3	0.5	0.8	0.3	0.5	0.4	0.5
13														
14														
15														
16														
17														
18														
19														
20														
21														
22														
23														
24														
25														
26														
27														
28														
29														
30														
AVG		0.21	0.22		4.1		0.9	1.1	0.4	0.7	0.3	0.5	0.4	0.5
MAX		0.22	0.24		4.7		1.1	1.3	0.6	0.8	0.4	0.6	0.4	0.5
MIN		0.19	0.20		2.8		0.6	0.8	0.2	0.5	0.3	0.5	0.3	0.4

Chemical Analyses WSSN 2310 October 2012

DATE	pH		Total Hard as $CaCO_3$ mg/l		Total Alk as $CaCO_3$ mg/l		NonCarbonate Hardness as $CaCO_3$ mg/l		Calcium Ca 2+ mg/l		Magnesium as Mg 2+ mg/l		Nitrate as NO_3- mg/l		Chloride as Cl - mg/l	
	Raw	Filter Eff.	Raw	Filter Eff.	Raw	Filter Eff.	Raw	Filter Eff.	Raw	Filter Eff.	Raw	Filter Eff.	Raw	Filter Eff.	Raw	Filter Eff.
1																
2																
3																
4																
5																
6																
7																
8	8.33		242		194		48		75.4		13.1				33	
9	8.22	7.17	240	236	194	162	46	74	83.4	81.8	7.8	7.8			35	37
10	8.30	7.37	246	244	190	154	56	90	76.2	72.1	13.6	15.6			33.5	52
11	8.49	7.34	244	236	194	152	50	84	78.6	85	11.7	5.8			38	59
12	8.35	7.38	254	238	194	156	60	82	83.4	74.5	11.2	12.6			33	52
13																
14																
15																
16																
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19																
20																
21																
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23																
24																
25																
26																
27																
28																
29																
30																
AVG	8.34	7.32	245	239	193	156	52	83	79.4	78.4	11.5	10.5			35	50
MAX	8.49	7.38	254	244	194	162	60	90	83.4	85.0	13.6	15.6			38	59
MIN	8.22	7.17	240	236	190	152	46	74	75.4	72.1	7.8	5.8			33	37

Bacteriological & Physical Parameters — October 2012

DATE	Total Coliform							Standard Plate Count		Temperature (Celcius)		Color		Odor	
	Raw	Post O3	Plate Settler Eff.	Filter Inf.	Filter Eff.	Lab Tap		Raw	Filter Eff.	Raw	Tap	Raw	Tap	Raw	Tap
1															
2															
3															
4															
5															
6															
7															
8	659	2	1/0	1/0				248		13.9					
9	1553	2	5/0	5/0	8/0			>738	2	12.4					
10	>2419	1	6/1	6/0	24/0			>738	< 2	13.0					
11	1300	1	6/0	6/0	24/0			>738	< 2	11.7					
12	1300	1	5/0	5/0	20/0			>738	< 2	12.3					
13															
14															
15															
16															
17															
18															
19															
20															
21															
22															
23															
24															
25															
26															
27															
28															
29															
30															
AVG	* Raw and post-ozone coliform are most probable number maximum daily results.									12.7					
MAX	* Raw HPC counts are daily maximums.									13.9					
MIN										11.7					

MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY
DRINKING WATER LABORATORY

USEPA Region V Drinking Water Cert. No. MI00003
P.O. Box 30270
Lansing, MI 48909
TEL: (517) 335-8184
FAX: (517) 335-8562

Sample Number
LE52512

Official Laboratory Report

Report To: MIKE GLASGOW
4500 N DORT HWY
FLINT MI 48505

System Name/Owner:	CITY OF FLINT	WSSN/Pool ID:	
Collection Address:	4500 N DORT HWY,FLINT	Source:	Other
Collected By:	M GLASGOW	Site Code:	
Township/Well#/Section:	//	Collector:	Public Water Supply Operator
County:	Genesee	Date Collected:	10/12/2012 13:00
Sample Point:	COMBINED FILTER EFFLUENT	Date Received:	10/16/2012 12:56
Water System:	Other	Purpose:	Other

TESTING INFORMATION			REGULATORY INFORMATION			
Analyte Name	Result (mg/L)	Date Tested	RL (mg/L)	MCL/AL (mg/L)	Method	CAS #
^^^ NOT TESTED^^^	Not Tested	10/22/2012				NOTST-00-C
Sample analysis was not completed. Sample was lost in laboratory accident due to extractor equipment malfunction. Please resample for test code CXPT.						
Antimony	Not detected	10/17/2012	0.0006	0.006	EPA 200.8	7440-36-0
Arsenic	Not detected	10/17/2012	0.002	0.010	EPA 200.8	7440-38-2
Barium	0.05	10/17/2012	0.01	2	EPA 200.8	7440-39-3
Beryllium	Not detected	10/17/2012	0.0004	0.004	EPA 200.8	7440-41-7
Cadmium	Not detected	10/17/2012	0.0003	0.005	EPA 200.8	7440-43-9
Chromium	Not detected	10/17/2012	0.01	0.1	EPA 200.8	7440-47-3
Cyanide-Available	Not Detected	10/22/2012	0.02	0.2	OIA-1677	57-12-5
Lead	Not detected	10/17/2012	0.001	0.015	EPA 200.8	7439-92-1
Mercury	Not detected	10/17/2012	0.0001	0.002	EPA 200.8	7439-97-6
Nickel	Not detected	10/17/2012	0.01	0.1	EPA 200.8	7440-02-0
Selenium	0.001	10/17/2012	0.001	0.05	EPA 200.8	7782-49-2
Thallium	Not detected	10/17/2012	0.0002	0.002	EPA 200.8	7440-28-0
Carbamates by HPLC						
3 Hydroxycarbofuran	Not Detected	10/23/2012	0.001		EPA 531.2	16655-82-6
Aldicarb	Not Detected	10/23/2012	0.0005		EPA 531.2	116-06-3
Aldicarb sulfone	Not Detected	10/23/2012	0.0005		EPA 531.2	1646-88-4
Aldicarb sulfoxide	Not Detected	10/23/2012	0.0005		EPA 531.2	1646-87-3
Carbaryl	Not Detected	10/23/2012	0.001		EPA 531.2	63-25-2
Carbofuran	Not Detected	10/23/2012	0.0005	0.04	EPA 531.2	1563-66-2
Methiocarb	Not Detected	10/23/2012	0.001		EPA 531.2	2032-65-7

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mg/L : milligrams / Liter (ppm)
ppm : parts per million
MPN : Most Probable Number
CFU : Colony Forming Unit

Laboratory Contacts
Drinking Water Unit Mgr: Julia Pieper
Systems Mgmt. Unit Mgr: George Krisztian

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Lansing, MI 48909
TEL: (517) 335-8184
FAX: (517) 335-8562

Sample Number
LE52512

TESTING INFORMATION			REGULATORY INFORMATION			
Analyte Name	Result (mg/L)	Date Tested	RL (mg/L)	MCL/AL (mg/L)	Method	CAS #
Carbamates by HPLC						
Methomyl	Not Detected	10/23/2012	0.001		EPA 531.2	16752-77-5
Oxamyl	Not Detected	10/23/2012	0.001	0.2	EPA 531.2	23135-22-0
Propoxur	Not Detected	10/23/2012	0.001		EPA 531.2	114-26-1
Chlorinated Acid Herbicides						
2,4,5-T	Not Detected	10/18/2012	0.002		EPA 515.4	93-76-5
2,4,5-TP (silvex)	Not Detected	10/18/2012	0.0003	0.05	EPA 515.4	93-72-1
2,4-D	Not Detected	10/18/2012	0.002	0.07	EPA 515.4	94-75-7
Acifluorfen	Not Detected	10/18/2012	0.004		EPA 515.4	50594-66-6
Bentazon	Not Detected	10/18/2012	0.002		EPA 515.4	25057-89-0
Dicamba	Not Detected	10/18/2012	0.002		EPA 515.4	1918-00-9
Dinoseb	Not Detected	10/18/2012	0.0003	0.007	EPA 515.4	88-85-7
Pentachlorophenol	Not Detected	10/18/2012	0.00006	0.001	EPA 515.4	87-86-5
Picloram	Not Detected	10/18/2012	0.001	0.5	EPA 515.4	1918-02-1
Total DCPA degradates, mono- and di-acid	Not Detected	10/18/2012	0.001		EPA 515.4	1861-32-1
Volatile Organic Compounds						
1,1 Dichloroethane	Not Detected	10/22/2012	0.0005		EPA 524.2	75-34-3
1,1 Dichloroethylene	Not Detected	10/22/2012	0.0005	0.007	EPA 524.2	75-35-4
1,1 Dichloropropene	Not Detected	10/22/2012	0.0005		EPA 524.2	563-58-6
1,1,1 Trichloroethane	Not Detected	10/22/2012	0.0005	0.2	EPA 524.2	71-55-6
1,1,1,2 Tetrachloroethane	Not Detected	10/22/2012	0.0005		EPA 524.2	630-20-6
1,1,2 Trichloroethane	Not Detected	10/22/2012	0.0005	0.005	EPA 524.2	79-00-5
1,1,2,2 Tetrachloroethane	Not Detected	10/22/2012	0.0005		EPA 524.2	79-34-5
1,2 Dichlorobenzene	Not Detected	10/22/2012	0.0005	0.6	EPA 524.2	95-50-1
1,2 Dichloroethane	Not Detected	10/22/2012	0.0005	0.005	EPA 524.2	107-06-2
1,2 Dichloropropane	Not Detected	10/22/2012	0.0005	0.005	EPA 524.2	78-87-5
1,2,3 Trichlorobenzene	Not Detected	10/22/2012	0.0005		EPA 524.2	87-61-6
1,2,3 Trichloropropane	Not Detected	10/22/2012	0.0005		EPA 524.2	96-18-4
1,2,4 Trichlorobenzene	Not Detected	10/22/2012	0.0005	0.07	EPA 524.2	120-82-1
1,2,4 Trimethylbenzene	Not Detected	10/22/2012	0.0005		EPA 524.2	95-63-6
1,3 Dichlorobenzene	Not Detected	10/22/2012	0.0005		EPA 524.2	541-73-1
1,3 Dichloropropane	Not Detected	10/22/2012	0.0005		EPA 524.2	142-28-9
1,3,5 Trimethylbenzene	Not Detected	10/22/2012	0.0005		EPA 524.2	108-67-8
1,4 Dichlorobenzene	Not Detected	10/22/2012	0.0005	0.075	EPA 524.2	106-46-7
2,2 Dichloropropane	Not Detected	10/22/2012	0.0005		EPA 524.2	594-20-7
Benzene	Not Detected	10/22/2012	0.0005	0.005	EPA 524.2	71-43-2

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Systems Mgmt. Unit Mgr: George Krisztian

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Lansing, MI 48909
TEL: (517) 335-8184
FAX: (517) 335-8562

Sample Number
LE52512

TESTING INFORMATION			REGULATORY INFORMATION			
Analyte Name	Result (mg/L)	Date Tested	RL (mg/L)	MCL/AL (mg/L)	Method	CAS #
Volatile Organic Compounds						
Bromobenzene	Not Detected	10/22/2012	0.0005		EPA 524.2	108-86-1
Bromochloromethane	Not Detected	10/22/2012	0.0005		EPA 524.2	74-97-5
Bromodichloromethane	0.0050	10/22/2012	0.0005	0.080	EPA 524.2	75-27-4
Bromoform	0.0010	10/22/2012	0.0005	0.080	EPA 524.2	75-25-2
Bromomethane	Not Detected	10/22/2012	0.001		EPA 524.2	74-83-9
Carbon tetrachloride	Not Detected	10/22/2012	0.0005	0.005	EPA 524.2	56-23-5
Chlorobenzene	Not Detected	10/22/2012	0.0005	0.1	EPA 524.2	108-90-7
Chlorodibromomethane	0.0056	10/22/2012	0.0005	0.080	EPA 524.2	124-48-1
Chloroethane	Not Detected	10/22/2012	0.0005		EPA 524.2	75-00-3
Chloroform	0.0029	10/22/2012	0.0005	0.080	EPA 524.2	67-66-3
Chloromethane	Not Detected	10/22/2012	0.0005		EPA 524.2	74-87-3
cis-1,2 Dichloroethylene	Not Detected	10/22/2012	0.0005	0.07	EPA 524.2	156-59-2
cis-1,3 Dichloropropene	Not Detected	10/22/2012	0.0005		EPA 524.2	10061-01-5
Dibromomethane	Not Detected	10/22/2012	0.0005		EPA 524.2	74-95-3
Dichlorodifluoromethane	Not Detected	10/22/2012	0.001		EPA 524.2	75-71-8
Dichloromethane	Not Detected	10/22/2012	0.0006	0.005	EPA 524.2	75-09-2
Ethylbenzene	Not Detected	10/22/2012	0.0005	0.7	EPA 524.2	100-41-4
Fluorotrichloromethane	Not Detected	10/22/2012	0.001		EPA 524.2	75-69-4
Hexachlorobutadiene	Not Detected	10/22/2012	0.0005		EPA 524.2	87-68-3
Isopropylbenzene	Not Detected	10/22/2012	0.0005		EPA 524.2	98-82-8
m & p-Xylene	Not Detected	10/22/2012	0.0005	10	EPA 524.2	XYLMP-00-C
Methyl ethyl ketone	Not Detected	10/22/2012	0.005		EPA 524.2	78-93-3
Methyl isobutyl ketone	Not Detected	10/22/2012	0.005		EPA 524.2	108-10-1
Methyl-tert-butyl ether (MTBE)	Not Detected	10/22/2012	0.001		EPA 524.2	1634-04-4
Naphthalene	Not Detected	10/22/2012	0.0005		EPA 524.2	91-20-3
n-Butylbenzene	Not Detected	10/22/2012	0.0005		EPA 524.2	104-51-8
Nitrobenzene	Not Detected	10/22/2012	0.01		EPA 524.2	98-95-3
n-Propylbenzene	Not Detected	10/22/2012	0.0005		EPA 524.2	103-65-1
o-Chlorotoluene	Not Detected	10/22/2012	0.0005		EPA 524.2	95-49-8
o-Xylene	Not Detected	10/22/2012	0.0005	10	EPA 524.2	95-47-6
p-Chlorotoluene	Not Detected	10/22/2012	0.0005		EPA 524.2	106-43-4
p-Isopropyltoluene	Not Detected	10/22/2012	0.0005		EPA 524.2	99-87-6
sec-Butylbenzene	Not Detected	10/22/2012	0.0005		EPA 524.2	135-98-8
Styrene	Not Detected	10/22/2012	0.0005	0.1	EPA 524.2	100-42-5
tert-Butylbenzene	Not Detected	10/22/2012	0.0005		EPA 524.2	98-06-6
Tetrachloroethylene	Not Detected	10/22/2012	0.0005	0.005	EPA 524.2	127-18-4
Tetrahydrofuran	Not Detected	10/22/2012	0.005		EPA 524.2	109-99-9
Toluene	Not Detected	10/22/2012	0.0005	1	EPA 524.2	108-88-3

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Laboratory Contacts
Drinking Water Unit Mgr: Julia Pieper
Systems Mgmt. Unit Mgr: George Krisztian

MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY
DRINKING WATER LABORATORY

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Lansing, MI 48909
TEL: (517) 335-8184
FAX: (517) 335-8562

Sample Number
LE52512

TESTING INFORMATION			REGULATORY INFORMATION			
Analyte Name	Result (mg/L)	Date Tested	RL (mg/L)	MCL/AL (mg/L)	Method	CAS #
Volatile Organic Compounds						
Total Trihalomethanes	0.015	10/22/2012	NA	0.080	EPA 524.2	TTHM-00-C
Total Xylenes	Not Detected	10/22/2012	NA	10	EPA 524.2	1330-20-7
trans-1,2 Dichloroethylene	Not Detected	10/22/2012	0.0005	0.1	EPA 524.2	156-60-5
trans-1,3 Dichloropropene	Not Detected	10/22/2012	0.0005		EPA 524.2	10061-02-6
Trichloroethylene	Not Detected	10/22/2012	0.0005	0.005	EPA 524.2	79-01-6
Vinyl chloride	Not Detected	10/22/2012	0.0004	0.002	EPA 524.2	75-01-4

The analyses performed by the MDEQ Drinking Water Laboratory were conducted using methods approved by the U.S. Environmental Protection Agency in accordance with the Safe Drinking Water Act, 40 CFR parts 141-143, and other regulatory agencies as appropriate.

Your local health department has detailed information about the quality of drinking water in your area. If you have concerns about the health risks related to the test results of your sample, please contact the Environmental Health Section through the address and telephone number listed below:

Genesee County Health Dept.
630 South Saginaw
Flint, MI 48502-1540
810 257-3603

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001132

D-5a 1/86
Authority: Act 399, P.A. 1976

MICHIGAN DEPARTMENT OF PUBLIC HEALTH

TEST RUN OPERATION REPORT
OF
WATER TREATMENT PLANT

ENTERED

For Month of January 2013

Flint Water Plant — 2310 — Genesee
NAME OF WATER SYSTEM — WSSN — COUNTY

Michael Glasgow — F-1R S-3
CERTIFIED OPERATOR — CLASSIFICATION

Michael Glasgow
SIGNATURE OF APPROPRIATE OFFICIAL

DEQ
RESOURCE MANAGEMENT DIVISION
MAR 13 2013
LANSING DISTRICT

TREATMENT RATE AND FILTER DATA

1. Treatment Rate, Maximum 12 Million Gallons Per Day
2. Treatment Rate, Approved Rated Plant Capacity 36 Million Gallons per Day
3. Average Filter Run 80+ Hours, Average Head Loss n/a Feet
4. Average Filtration Rate 1.8 Gallons per Square Ft. per Minute
5. Maximum Filtration Rate 2.5 Gallons per Square Ft. per Minute
6. Average Wash Water Use n/a percent of Treated Water

CHEMICAL DATA

7. Chlorine on hand _____ lbs.: Estimated supply _____ days
8. Oxygen (O2) on hand _____ lbs.: Estimated supply _____ days
9. Ferric (Fe3+) on hand _____ lbs.: Estimated supply _____ days
10. Cost of All Chemicals per Million Gallons _____
11. Total Power Cost per Million Gallons _____

Remarks:

Submit to: Mike Prysby, P.E.
MDEQ-Water Division-Lansing District
P.O. Box 30242
Lansing, MI 48909

Failure to complete this form is a violation of Act 399, P.A. 1976 and is subject to penalties as outlined in the Act.

Daily Flow & Ozone Parameters WSSN 2310 Jan 2013

DATE	Daily Flow (MGD)	O_3 Dosage (lbs/day)	Ozone residuals (mg/L)												Sodium Bisulfite Dosage (mg/L)
			Contact Chamber #1				Contact Chamber # 2				Contact Chamber # 3				
			# of Samples	Start (avg mg/L)	Middle (avg. mg/L)	End (avg. mg/L)	# of Samples	Start (avg mg/L)	Middle (avg. mg/L)	End (avg. mg/L)	# of Samples	Start (avg mg/L)	Middle (avg. mg/L)	End (avg. mg/L)	
1															
2															
3															
4															
5															
6															
7															
8															
9															
10															
11															
12															
13															
14	7.6	332	5	1.32	0.81	0.76									
15	11.3	319	9	1.19	0.85	0.35									
16	11.2	266	4	1.16	0.80	0.50	5	1.05	0.82	0.01					
17	11.3	301					3	1.55	1.22	0.00	4	1.20	0.85	0.40	
18	7.5	334									5	1.37	1.09	0.17	
19															
20															
21															
22															
23															
24															
25															
26															
27															
28															
29															
30															
31															
AVG	9.8	310	6	1.22	0.82	0.54	4	1.30	1.02	0.01	5	1.29	0.97	0.29	
MAX	11.3	334	9	1.32	0.85	0.76	5	1.55	1.22	0.01	5	1.37	1.09	0.40	
MIN	7.5	266	4	1.16	0.80	0.35	3	1.05	0.82	0.00	4	1.20	0.85	0.17	
Total	48.9														

Coagulation & Flocculation Parameters WSSN 2310 Jan 2013

DATE	Ferric Chloride as $FeCl_3$ mg/l	Ferric Chloride as Fe 3+ mg/l	Turbidity, NTU units											
			Raw			Plate Settler Effluent			Filter Influent			Filter Effluent		
			# of Samples	Avg.	Max	# of Samples	Avg.	Max	# of Samples	Avg.	Max	# of Samples	Avg.	Max
1														
2														
3														
4														
5														
6														
7														
8														
9														
10														
11														
12														
13														
14	30.2	10.4	6	16.8	29.5	5	2.05	3.95	3	2.16	2.81			
15	32.2	11.1	8	13.1	13.7	12	1.43	1.87	12	1.42	1.67	16	0.09	0.20
16	33.1	11.4	7	9.7	12.2	11	1.20	1.69	11	1.18	1.32	28	0.10	0.22
17	32.9	11.3	8	8.2	9.1	10	0.95	1.09	10	0.91	1.09	40	0.06	0.08
18	33	11.3	5	9.3	10.7	7	1.13	1.21	6	1.06	1.24	20	0.07	0.13
19														
20														
21														
22														
23														
24														
25														
26														
27														
28														
29														
30														
31														
AVG	32.3	11.1	7	11.4	15.0	9	1.35	1.96	8	1.35	1.63	26	0.08	0.16
MAX	33.1	11.4	8	16.8	30	12	2.05	3.95	12	2.16	2.81	40	0.10	0.22
MIN	30.2	10.4	5	8.2	9.1	5	0.95	1.09	3	0.91	1.09	16	0.06	0.08

Flouridation & Chlorination WSSN 2310 Jan 2013

DATE	Fluoride Applied F- mg/l	Fluoride Analyses mg/l			Chlorine App. Mg/l		Chlorine Residual mg/l							
					Chlorine (prior to filtration) mg/L OCl-	Post Chlorine mg/L	Plate Settler Effluent		Contact Clairifier Effluent		Combined Filter Effluent (north)		Combined Filter Effluent (south)	
		Raw	Filter Eff.	Dist			Free	Total	Free	Total	Free	Total	Free	Total
1														
2														
3														
4														
5														
6														
7														
8														
9														
10														
11														
12														
13														
14		0.21			3.1		0.3	0.7	0.1	0.4				
15		0.18	0.20		3.1		0.6	1.0	0.3	0.5	0.1	0.3	0.1	0.3
16		0.20	0.17		3.1		0.4	0.8	0.2	0.4	0.1	0.3	0.1	0.3
17		0.19	0.21		3.1		0.3	0.6	0.2	0.4	0.1	0.3	0.1	0.3
18		0.19	0.22		3.1		0.3	0.5	0.2	0.4	0.2	0.3	0.2	0.3
19														
20														
21														
22														
23														
24														
25														
26														
27														
28														
29														
30														
31														
AVG		0.19	0.20		3.1		0.4	0.7	0.2	0.4	0.1	0.3	0.1	0.3
MAX		0.21	0.22		3.1		0.6	1.0	0.3	0.5	0.2	0.3	0.2	0.3
MIN		0.18	0.17		3.1		0.3	0.5	0.1	0.4	0.1	0.3	0.1	0.3

Chemical Analyses WSSN 2310 Jan 2013

DATE	pH		Total Hard as $CaCO_3$ mg/l		Total Alk as $CaCO_3$ mg/l		NonCarbonate Hardness as $CaCO_3$ mg/l		Calcium Ca 2+ mg/l		Magnesium as Mg 2+ mg/l		Nitrate as NO_3- mg/l		Chloride as Cl - mg/l	
	Raw	Filter Eff.	Raw	Filter Eff.	Raw	Filter Eff.	Raw	Filter Eff.	Raw	Filter Eff.	Raw	Filter Eff.	Raw	Filter Eff.	Raw	Filter Eff.
1																
2																
3																
4																
5																
6																
7																
8																
9																
10																
11																
12																
13																
14	8.14		300		216		84		99.4		12.6				37	
15	8.13	7.28	320	284	226	178	94	106	81.8	75.4	28.8	23.3			43	63
16	8.26	7.66	316	316	242	184	74	132	109.0	104.2	10.7	13.6			44	65
17	8.23	7.37	316	304	238	194	78	110	104.2	104.2	13.6	10.7			44	64
18	8.12	7.21	304	284	226	186	78	98	101.0	89.8	12.6	14.6			40	61
19																
20																
21																
22																
23																
24																
25																
26																
27																
28																
29																
30																
31																
AVG	8.18	7.38	311	297	230	186	82	112	99.1	93.4	15.7	15.6			42	63
MAX	8.26	7.66	320	316	242	194	94	132	109.0	104.2	28.8	23.3			44	65
MIN	8.12	7.21	300	284	216	178	74	98	81.8	75.4	10.7	10.7			37	61

Bacteriological & Physical Parameters — Jan 2013

DATE	Total Coliform							Standard Plate Count		Temperature (Celcius)		Color		Odor	
	Raw	Post O3	Plate Settler Eff.	Filter Inf.	Filter Eff.	Lab Tap		Raw	Filter Eff.	Raw	Tap	Raw	Tap	Raw	Tap
1															
2															
3															
4															
5															
6															
7															
8															
9															
10															
11															
12															
13															
14	> 2419	< 1	1/0	1/0				> 2419		4.2					
15	> 2419	2	6/0	6/0	4/0			> 2419	167	2.9					
16	> 2419	26	6/0	6/1	24/0			> 2419	229	2.7					
17	> 2419	3	6/0	6/0	24/0			> 2419	68	2.5					
18	> 2419	2	5/0	5/0	20/0			> 2419	53	2.1					
19															
20															
21															
22															
23															
24															
25															
26															
27															
28															
29															
30															
31															
AVG	* Raw and post-ozone coliform are most probable number maximum daily results.									2.9					
MAX	* Raw HPC counts are daily maximums.									4.2					
MIN	* 6/0 = # of Samples / # of positive samples									2.1					

MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY
DRINKING WATER LABORATORY

USEPA Region V Drinking Water Cert. No. MI00003
P.O. Box 30270
Lansing, MI 48909
TEL: (517) 335-8184
FAX: (517) 335-8562

Sample Number
LE83917

Official Laboratory Report

Report To: MICHAEL GLASGOW
4500 N DORT HWY
FLINT MI 48505

DEQ
RESOURCE MANAGEMENT DIVISION
SEP 17 2013
LANSING DISTRICT

System Name/Owner:	CITY OF FLINT	WSSN/Pool ID:	2310
Collection Address:	4500 N DORT HWY,FLINT	Source:	TYPE III
Collected By:	MICHAEL GLASGOW	Site Code:	FILTER EFF
Township/Well#/Section:	//	Collector:	Public Water Supply Operator
County:	Genesee	Date Collected:	07/18/2013 07:30
Sample Point:	FILTER EFFLUENT	Date Received:	07/18/2013 12:23
Water System:	Other	Purpose:	Routine Monitoring

TESTING INFORMATION			REGULATORY INFORMATION			
Analyte Name	Result (mg/L)	Date Tested	RL (mg/L)	MCL/AL (mg/L)	Method	CAS #
Antimony	Not detected	07/19/2013	0.0006	0.006	EPA 200.8	7440-36-0
Arsenic	Not detected	07/19/2013	0.002	0.010	EPA 200.8	7440-38-2
Barium	0.04	07/19/2013	0.01	2	EPA 200.8	7440-39-3
Beryllium	Not detected	07/19/2013	0.0004	0.004	EPA 200.8	7440-41-7
Cadmium	Not detected	07/19/2013	0.0003	0.005	EPA 200.8	7440-43-9
Chloride	72	07/18/2013	4		SM 4500-Cl E	7647-14-5
Chromium	Not detected	07/19/2013	0.01	0.1	EPA 200.8	7440-47-3
Cyanide-Available	Not Detected	07/26/2013	0.02	0.2	OIA-1677	57-12-5
Fluoride	0.13	07/18/2013	0.1	4.0	SM 4500 FC	16984-48-8
Hardness as CaCO3	168	07/18/2013	20		SM 2340 C	HARD-00-C
Iron (automated)	Not detected	07/18/2013	0.1		SM 3500 FeB	7439-89-6
Lead	Not detected	07/19/2013	0.001	0.015	EPA 200.8	7439-92-1
Mercury	Not detected	07/19/2013	0.0001	0.002	EPA 200.8	7439-97-6
Nickel	Not detected	07/19/2013	0.01	0.1	EPA 200.8	7440-02-0
Nitrate as N	0.5	07/18/2013	0.4	10	10-107-04-2-B	14797-55-8
Nitrite as N	Not detected	07/18/2013	0.05	1	10-107-04-2-B	14797-65-0
Selenium	Not Detected	07/19/2013	0.001	0.05	EPA 200.8	7782-49-2
Sodium (automated)	13	07/18/2013	5		SM 3500 NaB	7440-23-5
Sulfate	12	07/18/2013	10		SM 4500 SO4E	14808-79-8
Thallium	Not detected	07/19/2013	0.0002	0.002	EPA 200.8	7440-28-0

Carbamates by HPLC

CAS# : Chemical Abstract Service Registry Number
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mg/L : milligrams / Liter (ppm)
ppm : parts per million
MPN : Most Probable Number
CFU : Colony Forming Unit

Laboratory Contacts
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Systems Mgmt. Unit Mgr: George Krisztian

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DEQ
RESOURCE MANAGEMENT DIVISION
SEP 17 2013
LANSING DISTRICT

TESTING INFORMATION			REGULATORY INFORMATION			
Analyte Name	Result (mg/L)	Date Tested	RL (mg/L)	MCL/AL (mg/L)	Method	CAS #
Carbamates by HPLC						
3 Hydroxycarbofuran	Not Detected	07/23/2013	0.001		EPA 531.2	16655-82-6
Aldicarb	Not Detected	07/23/2013	0.0005		EPA 531.2	116-06-3
Aldicarb sulfone	Not Detected	07/23/2013	0.0005		EPA 531.2	1646-88-4
Aldicarb sulfoxide	Not Detected	07/23/2013	0.0005		EPA 531.2	1646-87-3
Carbaryl	Not Detected	07/23/2013	0.001		EPA 531.2	63-25-2
Carbofuran	Not Detected	07/23/2013	0.0005	0.04	EPA 531.2	1563-66-2
Methiocarb	Not Detected	07/23/2013	0.001		EPA 531.2	2032-65-7
Methomyl	Not Detected	07/23/2013	0.001		EPA 531.2	16752-77-5
Oxamyl	Not Detected	07/23/2013	0.001	0.2	EPA 531.2	23135-22-0
Propoxur	Not Detected	07/23/2013	0.001		EPA 531.2	114-26-1
Chlorinated Acid Herbicides						
2,4,5-T	Not Detected	07/24/2013	0.002		EPA 515.4	93-76-5
2,4,5-TP (silvex)	Not Detected	07/24/2013	0.0003	0.05	EPA 515.4	93-72-1
2,4-D	Not Detected	07/24/2013	0.002	0.07	EPA 515.4	94-75-7
Acifluorfen	Not Detected	07/24/2013	0.004		EPA 515.4	50594-66-6
Bentazon	Not Detected	07/24/2013	0.002		EPA 515.4	25057-89-0
Dicamba	Not Detected	07/24/2013	0.002		EPA 515.4	1918-00-9
Dinoseb	Not Detected	07/24/2013	0.0003	0.007	EPA 515.4	88-85-7
Pentachlorophenol	Not Detected	07/24/2013	0.00006	0.001	EPA 515.4	87-86-5
Picloram	Not Detected	07/24/2013	0.001	0.5	EPA 515.4	1918-02-1
Total DCPA degradates, mono- and di-acid	Not Detected	07/24/2013	0.001		EPA 515.4	1861-32-1
Pesticides Analysis by GC/MS						
4,4'-DDD	Not Detected	07/23/2013	0.001		EPA 525.2	72-54-8
4,4'-DDE	Not Detected	07/23/2013	0.001		EPA 525.2	72-55-9
4,4'-DDT	Not Detected	07/23/2013	0.0005		EPA 525.2	50-29-3
Acetochlor	Not Detected	07/23/2013	0.001		EPA 525.2	34256-82-1
Alachlor	Not Detected	07/23/2013	0.0002	0.002	EPA 525.2	15972-60-8
Aldrin	Not Detected	07/23/2013	0.0004		EPA 525.2	309-00-2
alpha-Chlordane	Not Detected	07/23/2013	0.0002	0.002	EPA 525.2	5103-71-9
Atrazine	0.0005	07/23/2013	0.0002	0.003	EPA 525.2	1912-24-9
Dieldrin	Not Detected	07/23/2013	0.0005		EPA 525.2	60-57-1
Endrin	Not Detected	07/23/2013	0.0001	0.002	EPA 525.2	72-20-8
Endrin aldehyde	Not Detected	07/23/2013	0.001		EPA 525.2	7421-93-4
gamma-Chlordane	Not Detected	07/23/2013	0.0002	0.002	EPA 525.2	5103-74-2
Heptachlor	Not Detected	07/23/2013	0.0002	0.0004	EPA 525.2	76-44-8
Heptachlor epoxide	Not Detected	07/23/2013	0.0001	0.0002	EPA 525.2	1024-57-3
Hexachlorobenzene	Not Detected	07/23/2013	0.0001	0.001	EPA 525.2	118-74-1

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Laboratory Contacts
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Sample Number
LE83917

TESTING INFORMATION			REGULATORY INFORMATION			
Analyte Name	Result (mg/L)	Date Tested	RL (mg/L)	MCL/AL (mg/L)	Method	CAS #
Pesticides Analysis by GC/MS						
Hexachlorocyclohexane (alpha-BHC)	Not Detected	07/23/2013	0.001		EPA 525.2	319-84-6
Hexachlorocyclohexane (beta-BHC)	Not Detected	07/23/2013	0.001		EPA 525.2	319-85-7
Hexachlorocyclohexane (delta-BHC)	Not Detected	07/23/2013	0.001		EPA 525.2	319-86-8
Hexachlorocyclopentadiene	Not Detected	07/23/2013	0.0005	0.05	EPA 525.2	77-47-4
Lindane (gamma-BHC)	Not Detected	07/23/2013	0.0001	0.0002	EPA 525.2	58-89-9
Methoxychlor	Not Detected	07/23/2013	0.0001	0.04	EPA 525.2	72-43-5
Metolachlor	Not Detected	07/23/2013	0.001		EPA 525.2	51218-45-2
Metribuzin	Not Detected	07/23/2013	0.001		EPA 525.2	21087-64-9
Molinate	Not Detected	07/23/2013	0.0005		EPA 525.2	2212-67-1
PCB (aroclor 1016)	Not Detected	07/23/2013	0.0001	0.0005	EPA 525.2	12674-11-2
PCB (aroclor 1221)	Not Detected	07/23/2013	0.0001	0.0005	EPA 525.2	11104-28-2
PCB (aroclor 1232)	Not Detected	07/23/2013	0.0001	0.0005	EPA 525.2	11141-16-5
PCB (aroclor 1242)	Not Detected	07/23/2013	0.0001	0.0005	EPA 525.2	53469-21-9
PCB (aroclor 1248)	Not Detected	07/23/2013	0.0001	0.0005	EPA 525.2	12672-29-6
PCB (aroclor 1254)	Not Detected	07/23/2013	0.0001	0.0005	EPA 525.2	11097-69-1
PCB (aroclor 1260)	Not Detected	07/23/2013	0.0001	0.0005	EPA 525.2	11096-82-5
Polybrominated biphenyls	Not Detected	07/23/2013	0.0001		EPA 525.2	59536-65-1
Simazine	Not Detected	07/23/2013	0.0002	0.004	EPA 525.2	122-34-9
Toxaphene	Not Detected	07/23/2013	0.001	0.003	EPA 525.2	8001-35-2
Volatile Organic Compounds						
1,1 Dichloroethane	Not Detected	07/25/2013	0.0005		EPA 524.2	75-34-3
1,1 Dichloroethylene	Not Detected	07/25/2013	0.0005	0.007	EPA 524.2	75-35-4
1,1 Dichloropropene	Not Detected	07/25/2013	0.0005		EPA 524.2	563-58-6
1,1,1 Trichloroethane	Not Detected	07/25/2013	0.0005	0.2	EPA 524.2	71-55-6
1,1,1,2 Tetrachloroethane	Not Detected	07/25/2013	0.0005		EPA 524.2	630-20-6
1,1,2 Trichloroethane	Not Detected	07/25/2013	0.0005	0.005	EPA 524.2	79-00-5
1,1,2,2 Tetrachloroethane	Not Detected	07/25/2013	0.0005		EPA 524.2	79-34-5
1,2 Dichlorobenzene	Not Detected	07/25/2013	0.0005	0.6	EPA 524.2	95-50-1
1,2 Dichloroethane	Not Detected	07/25/2013	0.0005	0.005	EPA 524.2	107-06-2
1,2 Dichloropropane	Not Detected	07/25/2013	0.0005	0.005	EPA 524.2	78-87-5
1,2,3 Trichlorobenzene	Not Detected	07/25/2013	0.0005		EPA 524.2	87-61-6
1,2,3 Trichloropropane	Not Detected	07/25/2013	0.0005		EPA 524.2	96-18-4
1,2,4 Trichlorobenzene	Not Detected	07/25/2013	0.0005	0.07	EPA 524.2	120-82-1
1,2,4 Trimethylbenzene	Not Detected	07/25/2013	0.0005		EPA 524.2	95-63-6
1,3 Dichlorobenzene	Not Detected	07/25/2013	0.0005		EPA 524.2	541-73-1
1,3 Dichloropropane	Not Detected	07/25/2013	0.0005		EPA 524.2	142-28-9
1,3,5 Trimethylbenzene	Not Detected	07/25/2013	0.0005		EPA 524.2	108-67-8
1,4 Dichlorobenzene	Not Detected	07/25/2013	0.0005	0.075	EPA 524.2	106-46-7

DEQ
RESOURCE MANAGEMENT DIVISION
SEP 17 2013
LANSING DISTRICT

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Sample Number
LE83917

TESTING INFORMATION			REGULATORY INFORMATION			
Analyte Name	Result (mg/L)	Date Tested	RL (mg/L)	MCL/AL (mg/L)	Method	CAS #
Volatile Organic Compounds						
2,2 Dichloropropane	Not Detected	07/25/2013	0.0005		EPA 524.2	594-20-7
Benzene	Not Detected	07/25/2013	0.0005	0.005	EPA 524.2	71-43-2
Bromobenzene	Not Detected	07/25/2013	0.0005		EPA 524.2	108-86-1
Bromochloromethane	Not Detected	07/25/2013	0.0005		EPA 524.2	74-97-5
Bromodichloromethane	0.029	07/25/2013	0.0005	0.080	EPA 524.2	75-27-4
Bromoform	0.0008	07/25/2013	0.0005	0.080	EPA 524.2	75-25-2
Bromomethane	Not Detected	07/25/2013	0.001		EPA 524.2	74-83-9
Carbon tetrachloride	Not Detected	07/25/2013	0.0005	0.005	EPA 524.2	56-23-5
Chlorobenzene	Not Detected	07/25/2013	0.0005	0.1	EPA 524.2	108-90-7
Chlorodibromomethane	0.014	07/25/2013	0.0005	0.080	EPA 524.2	124-48-1
Chloroethane	Not Detected	07/25/2013	0.0005		EPA 524.2	75-00-3
Chloroform	0.030	07/25/2013	0.0005	0.080	EPA 524.2	67-66-3
Chloromethane	Not Detected	07/25/2013	0.0005		EPA 524.2	74-87-3
cis-1,2 Dichloroethylene	Not Detected	07/25/2013	0.0005	0.07	EPA 524.2	156-59-2
cis-1,3 Dichloropropene	Not Detected	07/25/2013	0.0005		EPA 524.2	10061-01-5
Dibromomethane	Not Detected	07/25/2013	0.0005		EPA 524.2	74-95-3
Dichlorodifluoromethane	Not Detected	07/25/2013	0.001		EPA 524.2	75-71-8
Dichloromethane	Not Detected	07/25/2013	0.0006	0.005	EPA 524.2	75-09-2
Ethylbenzene	Not Detected	07/25/2013	0.0005	0.7	EPA 524.2	100-41-4
Fluorotrichloromethane	Not Detected	07/25/2013	0.001		EPA 524.2	75-69-4
Hexachlorobutadiene	Not Detected	07/25/2013	0.0005		EPA 524.2	87-68-3
Isopropylbenzene	Not Detected	07/25/2013	0.0005		EPA 524.2	98-82-8
m & p-Xylene	Not Detected	07/25/2013	0.0005	10	EPA 524.2	XYLMP-00-C
Methyl ethyl ketone	Not Detected	07/25/2013	0.005		EPA 524.2	78-93-3
Methyl isobutyl ketone	Not Detected	07/25/2013	0.005		EPA 524.2	108-10-1
Methyl-tert-butyl ether (MTBE)	Not Detected	07/25/2013	0.001		EPA 524.2	1634-04-4
Naphthalene	Not Detected	07/25/2013	0.0005		EPA 524.2	91-20-3
n-Butylbenzene	Not Detected	07/25/2013	0.0005		EPA 524.2	104-51-8
Nitrobenzene	Not Detected	07/25/2013	0.01		EPA 524.2	98-95-3
n-Propylbenzene	Not Detected	07/25/2013	0.0005		EPA 524.2	103-65-1
o-Chlorotoluene	Not Detected	07/25/2013	0.0005		EPA 524.2	95-49-8
o-Xylene	Not Detected	07/25/2013	0.0005	10	EPA 524.2	95-47-6
p-Chlorotoluene	Not Detected	07/25/2013	0.0005		EPA 524.2	106-43-4
p-Isopropyltoluene	Not Detected	07/25/2013	0.0005		EPA 524.2	99-87-6
sec-Butylbenzene	Not Detected	07/25/2013	0.0005		EPA 524.2	135-98-8
Styrene	Not Detected	07/25/2013	0.0005	0.1	EPA 524.2	100-42-5
tert-Butylbenzene	Not Detected	07/25/2013	0.0005		EPA 524.2	98-06-6
Tetrachloroethylene	Not Detected	07/25/2013	0.0005	0.005	EPA 524.2	127-18-4

DEQ
SOURCE MANAGEMENT DIVISION
SEP 17 2013
LANSING DISTRICT

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Sample Number
LE83917

TESTING INFORMATION			REGULATORY INFORMATION			
Analyte Name	Result (mg/L)	Date Tested	RL (mg/L)	MCL/AL (mg/L)	Method	CAS #
Volatile Organic Compounds						
Tetrahydrofuran	Not Detected	07/25/2013	0.005		EPA 524.2	109-99-9
Toluene	Not Detected	07/25/2013	0.0005	1	EPA 524.2	108-88-3
Total Trihalomethanes	0.074	07/25/2013	NA	0.080	EPA 524.2	TTHM-00-C
Total Xylenes	Not Detected	07/25/2013	NA	10	EPA 524.2	1330-20-7
trans-1,2 Dichloroethylene	Not Detected	07/25/2013	0.0005	0.1	EPA 524.2	156-60-5
trans-1,3 Dichloropropene	Not Detected	07/25/2013	0.0005		EPA 524.2	10061-02-6
Trichloroethylene	Not Detected	07/25/2013	0.0005	0.005	EPA 524.2	79-01-6
Vinyl chloride	Not Detected	07/25/2013	0.0004	0.002	EPA 524.2	75-01-4

A trip blank was not available for analysis with this sample. This sample contained acetone at an approximate concentrtation of 20 ppb.

The analyses performed by the MDEQ Drinking Water Laboratory were conducted using methods approved by the U.S. Environmental Protection Agency in accordance with the Safe Drinking Water Act, 40 CFR parts 141-143, and other regulatory agencies as appropriate.

Your local health department has detailed information about the quality of drinking water in your area. If you have concerns about the health risks related to the test results of your sample, please contact the Environmental Health Section through the address and telephone number listed below:

Genesee County Health Dept.
630 South Saginaw
Flint, MI 48502-1540
810 257-3603

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Sample Number
LE83918

Official Laboratory Report

Report To: MICHAEL GLASGOW
4500 N DORT HWY
FLINT MI 48505

System Name/Owner:	CITY OF FLINT	WSSN/Pool ID:	2310
Collection Address:	4500 N DORT HWY,FLINT	Source:	TYPE III
Collected By:	MICHAEL GLASGOW	Site Code:	LAB TAP
Township/Well#/Section:	//	Collector:	Public Water Supply Operator
County:	Genesee	Date Collected:	07/18/2013 07:30
Sample Point:	LAB TAP	Date Received:	07/18/2013 12:23
Water System:	Other	Purpose:	Routine Monitoring

TESTING INFORMATION			REGULATORY INFORMATION			
Analyte Name	Result (mg/L)	Date Tested	RL (mg/L)	MCL/AL (mg/L)	Method	CAS #
Chloride	11	07/18/2013	4		SM 4500-Cl E	7647-14-5
Chloride quality control results were outside allowed limits due to matrix interferences.						
Fluoride	0.58	07/18/2013	0.1	4.0	SM 4500 FC	16984-48-8
Hardness as CaCO3	72	07/18/2013	20		SM 2340 C	HARD-00-C
Iron (automated)	Not detected	07/18/2013	0.1		SM 3500 FeB	7439-89-6
Nitrate as N	0.4	07/18/2013	0.4	10	10-107-04-2-B	14797-55-8
Nitrite as N	Not detected	07/18/2013	0.05	1	10-107-04-2-B	14797-65-0
Matrix spike recovery was below the acceptance criteria due to the presence of residual chlorine in the sample. This does not affect the validity of the sample result.						
Sodium (automated)	6	07/18/2013	5		SM 3500 NaB	7440-23-5
Sulfate	12	07/18/2013	10		SM 4500 SO4E	14808-79-8

The analyses performed by the MDEQ Drinking Water Laboratory were conducted using methods approved by the U.S. Environmental Protection Agency in accordance with the Safe Drinking Water Act, 40 CFR parts 141-143, and other regulatory agencies as appropriate.

Your local health department has detailed information about the quality of drinking water in your area. If you have concerns about the health risks related to the test results of your sample, please contact the Environmental Health Section through the address and telephone number listed below:

Genesee County Health Dept.
630 South Saginaw
Flint, MI 48502-1540
810 257-3603

CAS# : Chemical Abstract Service Registry Number
MCL : Maximum Contaminant Level
AL : Action Level
RL : Reporting Limit

mg/L : milligrams / Liter (ppm)
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MPN : Most Probable Number
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Laboratory Contacts
Drinking Water Unit Mgr: Julia Pieper
Systems Mgmt. Unit Mgr: George Krisztian

MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY
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USEPA Region V Drinking Water Cert. No. MI00003
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Lansing, MI 48909
TEL: (517) 335-8184
FAX: (517) 335-8562

Sample Number
LE83917

Official Laboratory Report

Report To: MICHAEL GLASGOW
4500 N DORT HWY
FLINT MI 48505

System Name/Owner:	CITY OF FLINT	WSSN/Pool ID:	2310
Collection Address:	4500 N DORT HWY,FLINT	Source:	TYPE III
Collected By:	MICHAEL GLASGOW	Site Code:	FILTER EFF
Township/Well#/Section:	//	Collector:	Public Water Supply Operator
County:	Genesee	Date Collected:	07/18/2013 07:30
Sample Point:	FILTER EFFLUENT	Date Received:	07/18/2013 12:23
Water System:	Other	Purpose:	Routine Monitoring

TESTING INFORMATION			REGULATORY INFORMATION			
Analyte Name	Result (mg/L)	Date Tested	RL (mg/L)	MCL/AL (mg/L)	Method	CAS #
Antimony	Not detected	07/19/2013	0.0006	0.006	EPA 200.8	7440-36-0
Arsenic	Not detected	07/19/2013	0.002	0.010	EPA 200.8	7440-38-2
Barium	0.04	07/19/2013	0.01	2	EPA 200.8	7440-39-3
Beryllium	Not detected	07/19/2013	0.0004	0.004	EPA 200.8	7440-41-7
Cadmium	Not detected	07/19/2013	0.0003	0.005	EPA 200.8	7440-43-9
Chloride	72	07/18/2013	4		SM 4500-Cl E	7647-14-5
Chromium	Not detected	07/19/2013	0.01	0.1	EPA 200.8	7440-47-3
Cyanide-Available	Not Detected	07/26/2013	0.02	0.2	OIA-1677	57-12-5
Fluoride	0.13	07/18/2013	0.1	4.0	SM 4500 FC	16984-48-8
Hardness as CaCO3	168	07/18/2013	20		SM 2340 C	HARD-00-C
Iron (automated)	Not detected	07/18/2013	0.1		SM 3500 FeB	7439-89-6
Lead	Not detected	07/19/2013	0.001	0.015	EPA 200.8	7439-92-1
Mercury	Not detected	07/19/2013	0.0001	0.002	EPA 200.8	7439-97-6
Nickel	Not detected	07/19/2013	0.01	0.1	EPA 200.8	7440-02-0
Nitrate as N	0.5	07/18/2013	0.4	10	10-107-04-2-B	14797-55-8
Nitrite as N	Not detected	07/18/2013	0.05	1	10-107-04-2-B	14797-65-0
Selenium	Not Detected	07/19/2013	0.001	0.05	EPA 200.8	7782-49-2
Sodium (automated)	13	07/18/2013	5		SM 3500 NaB	7440-23-5
Sulfate	12	07/18/2013	10		SM 4500 SO4E	14808-79-8
Thallium	Not detected	07/19/2013	0.0002	0.002	EPA 200.8	7440-28-0

Carbamates by HPLC

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Sample Number
LE83917

TESTING INFORMATION			REGULATORY INFORMATION			
Analyte Name	Result (mg/L)	Date Tested	RL (mg/L)	MCL/AL (mg/L)	Method	CAS #
Carbamates by HPLC						
3 Hydroxycarbofuran	Not Detected	07/23/2013	0.001		EPA 531.2	16655-82-6
Aldicarb	Not Detected	07/23/2013	0.0005		EPA 531.2	116-06-3
Aldicarb sulfone	Not Detected	07/23/2013	0.0005		EPA 531.2	1646-88-4
Aldicarb sulfoxide	Not Detected	07/23/2013	0.0005		EPA 531.2	1646-87-3
Carbaryl	Not Detected	07/23/2013	0.001		EPA 531.2	63-25-2
Carbofuran	Not Detected	07/23/2013	0.0005	0.04	EPA 531.2	1563-66-2
Methiocarb	Not Detected	07/23/2013	0.001		EPA 531.2	2032-65-7
Methomyl	Not Detected	07/23/2013	0.001		EPA 531.2	16752-77-5
Oxamyl	Not Detected	07/23/2013	0.001	0.2	EPA 531.2	23135-22-0
Propoxur	Not Detected	07/23/2013	0.001		EPA 531.2	114-26-1
Chlorinated Acid Herbicides						
2,4,5-T	Not Detected	07/24/2013	0.002		EPA 515.4	93-76-5
2,4,5-TP (silvex)	Not Detected	07/24/2013	0.0003	0.05	EPA 515.4	93-72-1
2,4-D	Not Detected	07/24/2013	0.002	0.07	EPA 515.4	94-75-7
Acifluorfen	Not Detected	07/24/2013	0.004		EPA 515.4	50594-66-6
Bentazon	Not Detected	07/24/2013	0.002		EPA 515.4	25057-89-0
Dicamba	Not Detected	07/24/2013	0.002		EPA 515.4	1918-00-9
Dinoseb	Not Detected	07/24/2013	0.0003	0.007	EPA 515.4	88-85-7
Pentachlorophenol	Not Detected	07/24/2013	0.00006	0.001	EPA 515.4	87-86-5
Picloram	Not Detected	07/24/2013	0.001	0.5	EPA 515.4	1918-02-1
Total DCPA degradates, mono- and di-acid	Not Detected	07/24/2013	0.001		EPA 515.4	1861-32-1
Pesticides Analysis by GC/MS						
4,4'-DDD	Not Detected	07/23/2013	0.001		EPA 525.2	72-54-8
4,4'-DDE	Not Detected	07/23/2013	0.001		EPA 525.2	72-55-9
4,4'-DDT	Not Detected	07/23/2013	0.0005		EPA 525.2	50-29-3
Acetochlor	Not Detected	07/23/2013	0.001		EPA 525.2	34256-82-1
Alachlor	Not Detected	07/23/2013	0.0002	0.002	EPA 525.2	15972-60-8
Aldrin	Not Detected	07/23/2013	0.0004		EPA 525.2	309-00-2
alpha-Chlordane	Not Detected	07/23/2013	0.0002	0.002	EPA 525.2	5103-71-9
Atrazine	0.0005	07/23/2013	0.0002	0.003	EPA 525.2	1912-24-9
Dieldrin	Not Detected	07/23/2013	0.0005		EPA 525.2	60-57-1
Endrin	Not Detected	07/23/2013	0.0001	0.002	EPA 525.2	72-20-8
Endrin aldehyde	Not Detected	07/23/2013	0.001		EPA 525.2	7421-93-4
gamma-Chlordane	Not Detected	07/23/2013	0.0002	0.002	EPA 525.2	5103-74-2
Heptachlor	Not Detected	07/23/2013	0.0002	0.0004	EPA 525.2	76-44-8
Heptachlor epoxide	Not Detected	07/23/2013	0.0001	0.0002	EPA 525.2	1024-57-3
Hexachlorobenzene	Not Detected	07/23/2013	0.0001	0.001	EPA 525.2	118-74-1

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Sample Number
LE83917

TESTING INFORMATION			REGULATORY INFORMATION			
Analyte Name	Result (mg/L)	Date Tested	RL (mg/L)	MCL/AL (mg/L)	Method	CAS #
Pesticides Analysis by GC/MS						
Hexachlorocyclohexane (alpha-BHC)	Not Detected	07/23/2013	0.001		EPA 525.2	319-84-6
Hexachlorocyclohexane (beta-BHC)	Not Detected	07/23/2013	0.001		EPA 525.2	319-85-7
Hexachlorocyclohexane (delta-BHC)	Not Detected	07/23/2013	0.001		EPA 525.2	319-86-8
Hexachlorocyclopentadiene	Not Detected	07/23/2013	0.0005	0.05	EPA 525.2	77-47-4
Lindane (gamma-BHC)	Not Detected	07/23/2013	0.0001	0.0002	EPA 525.2	58-89-9
Methoxychlor	Not Detected	07/23/2013	0.0001	0.04	EPA 525.2	72-43-5
Metolachlor	Not Detected	07/23/2013	0.001		EPA 525.2	51218-45-2
Metribuzin	Not Detected	07/23/2013	0.001		EPA 525.2	21087-64-9
Molinate	Not Detected	07/23/2013	0.0005		EPA 525.2	2212-67-1
PCB (aroclor 1016)	Not Detected	07/23/2013	0.0001	0.0005	EPA 525.2	12674-11-2
PCB (aroclor 1221)	Not Detected	07/23/2013	0.0001	0.0005	EPA 525.2	11104-28-2
PCB (aroclor 1232)	Not Detected	07/23/2013	0.0001	0.0005	EPA 525.2	11141-16-5
PCB (aroclor 1242)	Not Detected	07/23/2013	0.0001	0.0005	EPA 525.2	53469-21-9
PCB (aroclor 1248)	Not Detected	07/23/2013	0.0001	0.0005	EPA 525.2	12672-29-6
PCB (aroclor 1254)	Not Detected	07/23/2013	0.0001	0.0005	EPA 525.2	11097-69-1
PCB (aroclor 1260)	Not Detected	07/23/2013	0.0001	0.0005	EPA 525.2	11096-82-5
Polybrominated biphenyls	Not Detected	07/23/2013	0.0001		EPA 525.2	59536-65-1
Simazine	Not Detected	07/23/2013	0.0002	0.004	EPA 525.2	122-34-9
Toxaphene	Not Detected	07/23/2013	0.001	0.003	EPA 525.2	8001-35-2
Volatile Organic Compounds						
1,1 Dichloroethane	Not Detected	07/25/2013	0.0005		EPA 524.2	75-34-3
1,1 Dichloroethylene	Not Detected	07/25/2013	0.0005	0.007	EPA 524.2	75-35-4
1,1 Dichloropropene	Not Detected	07/25/2013	0.0005		EPA 524.2	563-58-6
1,1,1 Trichloroethane	Not Detected	07/25/2013	0.0005	0.2	EPA 524.2	71-55-6
1,1,1,2 Tetrachloroethane	Not Detected	07/25/2013	0.0005		EPA 524.2	630-20-6
1,1,2 Trichloroethane	Not Detected	07/25/2013	0.0005	0.005	EPA 524.2	79-00-5
1,1,2,2 Tetrachloroethane	Not Detected	07/25/2013	0.0005		EPA 524.2	79-34-5
1,2 Dichlorobenzene	Not Detected	07/25/2013	0.0005	0.6	EPA 524.2	95-50-1
1,2 Dichloroethane	Not Detected	07/25/2013	0.0005	0.005	EPA 524.2	107-06-2
1,2 Dichloropropane	Not Detected	07/25/2013	0.0005	0.005	EPA 524.2	78-87-5
1,2,3 Trichlorobenzene	Not Detected	07/25/2013	0.0005		EPA 524.2	87-61-6
1,2,3 Trichloropropane	Not Detected	07/25/2013	0.0005		EPA 524.2	96-18-4
1,2,4 Trichlorobenzene	Not Detected	07/25/2013	0.0005	0.07	EPA 524.2	120-82-1
1,2,4 Trimethylbenzene	Not Detected	07/25/2013	0.0005		EPA 524.2	95-63-6
1,3 Dichlorobenzene	Not Detected	07/25/2013	0.0005		EPA 524.2	541-73-1
1,3 Dichloropropane	Not Detected	07/25/2013	0.0005		EPA 524.2	142-28-9
1,3,5 Trimethylbenzene	Not Detected	07/25/2013	0.0005		EPA 524.2	108-67-8
1,4 Dichlorobenzene	Not Detected	07/25/2013	0.0005	0.075	EPA 524.2	106-46-7

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Sample Number
LE83917

TESTING INFORMATION			REGULATORY INFORMATION			
Analyte Name	Result (mg/L)	Date Tested	RL (mg/L)	MCL/AL (mg/L)	Method	CAS #
Volatile Organic Compounds						
2,2 Dichloropropane	Not Detected	07/25/2013	0.0005		EPA 524.2	594-20-7
Benzene	Not Detected	07/25/2013	0.0005	0.005	EPA 524.2	71-43-2
Bromobenzene	Not Detected	07/25/2013	0.0005		EPA 524.2	108-86-1
Bromochloromethane	Not Detected	07/25/2013	0.0005		EPA 524.2	74-97-5
Bromodichloromethane	0.029	07/25/2013	0.0005	0.080	EPA 524.2	75-27-4
Bromoform	0.0008	07/25/2013	0.0005	0.080	EPA 524.2	75-25-2
Bromomethane	Not Detected	07/25/2013	0.001		EPA 524.2	74-83-9
Carbon tetrachloride	Not Detected	07/25/2013	0.0005	0.005	EPA 524.2	56-23-5
Chlorobenzene	Not Detected	07/25/2013	0.0005	0.1	EPA 524.2	108-90-7
Chlorodibromomethane	0.014	07/25/2013	0.0005	0.080	EPA 524.2	124-48-1
Chloroethane	Not Detected	07/25/2013	0.0005		EPA 524.2	75-00-3
Chloroform	0.030	07/25/2013	0.0005	0.080	EPA 524.2	67-66-3
Chloromethane	Not Detected	07/25/2013	0.0005		EPA 524.2	74-87-3
cis-1,2 Dichloroethylene	Not Detected	07/25/2013	0.0005	0.07	EPA 524.2	156-59-2
cis-1,3 Dichloropropene	Not Detected	07/25/2013	0.0005		EPA 524.2	10061-01-5
Dibromomethane	Not Detected	07/25/2013	0.0005		EPA 524.2	74-95-3
Dichlorodifluoromethane	Not Detected	07/25/2013	0.001		EPA 524.2	75-71-8
Dichloromethane	Not Detected	07/25/2013	0.0006	0.005	EPA 524.2	75-09-2
Ethylbenzene	Not Detected	07/25/2013	0.0005	0.7	EPA 524.2	100-41-4
Fluorotrichloromethane	Not Detected	07/25/2013	0.001		EPA 524.2	75-69-4
Hexachlorobutadiene	Not Detected	07/25/2013	0.0005		EPA 524.2	87-68-3
Isopropylbenzene	Not Detected	07/25/2013	0.0005		EPA 524.2	98-82-8
m & p-Xylene	Not Detected	07/25/2013	0.0005	10	EPA 524.2	XYLMP-00-C
Methyl ethyl ketone	Not Detected	07/25/2013	0.005		EPA 524.2	78-93-3
Methyl isobutyl ketone	Not Detected	07/25/2013	0.005		EPA 524.2	108-10-1
Methyl-tert-butyl ether (MTBE)	Not Detected	07/25/2013	0.001		EPA 524.2	1634-04-4
Naphthalene	Not Detected	07/25/2013	0.0005		EPA 524.2	91-20-3
n-Butylbenzene	Not Detected	07/25/2013	0.0005		EPA 524.2	104-51-8
Nitrobenzene	Not Detected	07/25/2013	0.01		EPA 524.2	98-95-3
n-Propylbenzene	Not Detected	07/25/2013	0.0005		EPA 524.2	103-65-1
o-Chlorotoluene	Not Detected	07/25/2013	0.0005		EPA 524.2	95-49-8
o-Xylene	Not Detected	07/25/2013	0.0005	10	EPA 524.2	95-47-6
p-Chlorotoluene	Not Detected	07/25/2013	0.0005		EPA 524.2	106-43-4
p-Isopropyltoluene	Not Detected	07/25/2013	0.0005		EPA 524.2	99-87-6
sec-Butylbenzene	Not Detected	07/25/2013	0.0005		EPA 524.2	135-98-8
Styrene	Not Detected	07/25/2013	0.0005	0.1	EPA 524.2	100-42-5
tert-Butylbenzene	Not Detected	07/25/2013	0.0005		EPA 524.2	98-06-6
Tetrachloroethylene	Not Detected	07/25/2013	0.0005	0.005	EPA 524.2	127-18-4

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TESTING INFORMATION			REGULATORY INFORMATION			
Analyte Name	Result (mg/L)	Date Tested	RL (mg/L)	MCL/AL (mg/L)	Method	CAS #
Volatile Organic Compounds						
Tetrahydrofuran	Not Detected	07/25/2013	0.005		EPA 524.2	109-99-9
Toluene	Not Detected	07/25/2013	0.0005	1	EPA 524.2	108-88-3
Total Trihalomethanes	0.074	07/25/2013	NA	0.080	EPA 524.2	TTHM-00-C
Total Xylenes	Not Detected	07/25/2013	NA	10	EPA 524.2	1330-20-7
trans-1,2 Dichloroethylene	Not Detected	07/25/2013	0.0005	0.1	EPA 524.2	156-60-5
trans-1,3 Dichloropropene	Not Detected	07/25/2013	0.0005		EPA 524.2	10061-02-6
Trichloroethylene	Not Detected	07/25/2013	0.0005	0.005	EPA 524.2	79-01-6
Vinyl chloride	Not Detected	07/25/2013	0.0004	0.002	EPA 524.2	75-01-4

A trip blank was not available for analysis with this sample. This sample contained acetone at an approximate concentrtation of 20 ppb.

The analyses performed by the MDEQ Drinking Water Laboratory were conducted using methods approved by the U.S. Environmental Protection Agency in accordance with the Safe Drinking Water Act, 40 CFR parts 141-143, and other regulatory agencies as appropriate.

Your local health department has detailed information about the quality of drinking water in your area. If you have concerns about the health risks related to the test results of your sample, please contact the Environmental Health Section through the address and telephone number listed below:

Genesee County Health Dept.
630 South Saginaw
Flint, MI 48502-1540
810 257-3603

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001149

D-5a 1/86
Authority: Act 399, P.A. 1976

MICHIGAN DEPARTMENT OF PUBLIC HEALTH

TEST RUN OPERATION REPORT
OF
WATER TREATMENT PLANT

For Month of April 2013

Flint Water Plant	2310	Genesee
NAME OF WATER SYSTEM	WSSN	COUNTY

DEQ
RESOURCE MANAGEMENT DIVISION
MAY 13 2013
LANSING DISTRICT

Michael Glasgow	F-1R S-3
CERTIFIED OPERATOR	CLASSIFICATION

Michael Glasgow
SIGNATURE OF APPROPRIATE OFFICIAL

TREATMENT RATE AND FILTER DATA

1. Treatment Rate, Maximum **11.3** Million Gallons Per Day
2. Treatment Rate, Approved Rated Plant Capacity **36** Million Gallons per Day
3. Average Filter Run **70+** Hours, Average Head Loss n/a Feet
4. Average Filtration Rate **1.4** Gallons per Square Ft. per Minute
5. Maximum Filtration Rate **2.5** Gallons per Square Ft. per Minute
6. Average Wash Water Use n/a percent of Treated Water

CHEMICAL DATA

7. Chlorine on hand _____ lbs.: Estimated supply _____ days
8. Oxygen (O2) on hand _____ lbs.: Estimated supply _____ days
9. Ferric (Fe3+) on hand _____ lbs.: Estimated supply _____ days
10. Cost of All Chemicals per Million Gallons _____
11. Total Power Cost per Million Gallons _____

Remarks:

During this test run source water turbidities were extremely high due to flood conditions. It took a little longer than usual to produce good turbidities, however this was a good training opportunity for our operations staff. Samples were collected for public water supply monitoring (Unit #37), however, carbamate results were not available due to an accident in the lab according to Julia Piper with the DEQ lab.

Submit to: Mike Prysby, P.E.
MDEQ-Water Division-Lansing District
P.O. Box 30242
Lansing, MI 48909

Failure to complete this form is a violation of Act 399, P.A. 1976 and is subject to penalties as outlined in the Act.

Daily Flow & Ozone Parameters WSSN 2310 Apr 2013

DATE	Daily Flow (MGD)	O_3 Dosage (lbs/day)	Ozone residuals (mg/L)												Sodium Bisulfite Dosage (mg/L)
			Contact Chamber #1				Contact Chamber # 2				Contact Chamber # 3				
			# of Samples	Start (avg mg/L)	Middle (avg. mg/L)	End (avg. mg/L)	# of Samples	Start (avg mg/L)	Middle (avg. mg/L)	End (avg. mg/L)	# of Samples	Start (avg mg/L)	Middle (avg. mg/L)	End (avg. mg/L)	
1															
2															
3															
4															
5															
6															
7															
8															
9															
10															
11															
12															
13															
14															
15	7.9	350	4	1.02	0.00	0.00	4	1.05	0.00	0.00					
16	11.0	357	12	0.85	0.01	0.00	12	0.95	0.01	0.00					
17	10.6	303	12	0.53	0.00	0.00	12	0.82	0.01	0.00					
18	10.7	291	12	0.64	0.00	0.00	12	0.63	0.03	0.00					
19	7.1	394	7	1.25	0.02	0.00	7	0.95	0.01	0.00					
20															
21															
22															
23															
24															
25															
26															
27															
28															
29															
30															
AVG	9.5	339	9	0.86	0.01	0.00	9	0.88	0.01	0.00					
MAX	11.0	394	12	1.25	0.02	0.00	12	1.05	0.03	0.00					
MIN	7.1	291	4	0.53	0.00	0.00	4	0.63	0.00	0.00					
Total	47.3														

Coagulation & Flocculation Parameters WSSN 2310 Apr 2013

DATE	Ferric Chloride as $FeCl_3$ mg/l	Ferric Chloride as Fe 3+ mg/l	Turbidity, NTU units											
			Raw			Plate Settler Effluent			Filter Influent			Filter Effluent		
			# of Samples	Avg.	Max	# of Samples	Avg.	Max	# of Samples	Avg.	Max	# of Samples	Avg.	Max
1														
2														
3														
4														
5														
6														
7														
8														
9														
10														
11														
12														
13														
14														
15	37.4	12.9	4	74.6	77.5	5	11.70	20.5	3	11.50	13.0			
16	47.0	16.2	6	62.6	67.8	12	4.54	8.71	12	5.35	10.2	8	0.63	0.75
17	54.3	18.7	6	50.9	56.9	12	1.61	2.99	12	1.84	3.17	32	0.29	0.62
18	55.0	18.9	9	47.8	53.9	12	1.03	1.45	12	1.02	1.25	46	0.14	0.27
19	63.0	21.7	5	73.7	82.0	9	0.67	0.80	9	0.72	0.86	40	0.06	0.07
20														
21														
22														
23														
24														
25														
26														
27														
28														
29														
30														
AVG	51.3	17.7	6	61.9	67.6	10	3.91	6.89	10	4.09	5.70	32	0.28	0.42
MAX	63.0	21.7	9	74.6	82.0	12	11.7	20.5	12	11.5	13.0	46	0.63	0.75
MIN	37.4	12.9	4	47.8	53.9	5	0.67	0.80	3	0.72	0.86	8	0.06	0.07

Flouridation & Chlorination WSSN 2310 Apr 2013

DATE	Fluoride Applied F- mg/l	Fluoride Analyses mg/l			Chlorine App. Mg/l		Chlorine Residual mg/l							
					Chlorine (prior to filtration) mg/L OCl-	Post Chlorine mg/L	Plate Settler Effluent		Contact Clairifier Effluent		Combined Filter Effluent (north)		Combined Filter Effluent (south)	
		Raw	Filter Eff.	Dist			Free	Total	Free	Total	Free	Total	Free	Total
1														
2														
3														
4														
5														
6														
7														
8														
9														
10														
11														
12														
13														
14														
15		0.13			3.2		0.1	0.4	0.1	0.4				
16		0.15	0.14		4.5		0.3	0.8	0.3	0.6	0.1	0.7	0.1	0.6
17		0.12	0.15		4.9		0.3	0.7	0.2	0.6	0.1	0.6	0.1	0.5
18		0.15	0.17		5.3		0.2	0.7	0.2	0.6	0.1	0.5	0.1	0.5
19		0.13	0.17		5.6		0.3	0.7	0.2	0.6	0.1	0.5	0.1	0.5
20														
21														
22														
23														
24														
25														
26														
27														
28														
29														
30														
AVG		0.13	0.15		4.7		0.2	0.7	0.2	0.6	0.1	0.6	0.1	0.5
MAX		0.15	0.17		5.6		0.3	0.8	0.3	0.6	0.1	0.7	0.1	0.6
MIN		0.12	0.14		3.2		0.1	0.4	0.1	0.4	0.1	0.5	0.1	0.5

Chemical Analyses WSSN 2310 — April 2013

DATE	pH		Total Hard as $CaCO_3$ mg/l		Total Alk as $CaCO_3$ mg/l		NonCarbonate Hardness as $CaCO_3$ mg/l		Calcium Ca 2+ mg/l		Magnesium as Mg 2+ mg/l		Nitrate as NO_3- mg/l		Chloride as Cl - mg/l	
	Raw	Filter Eff.	Raw	Filter Eff.	Raw	Filter Eff.	Raw	Filter Eff.	Raw	Filter Eff.	Raw	Filter Eff.	Raw	Filter Eff.	Raw	Filter Eff.
1																
2																
3																
4																
5																
6																
7																
8																
9																
10																
11																
12																
13																
14																
15	7.87		162		146		16		56.9		4.8				10	
16	7.88	6.95	192	172	132	74	60	98	57.7	62.5	11.7	3.9			25	55
17	7.89	6.80	194	172	140	72	54	100	57.7	53.7	12.2	9.2			20	51
18	7.93	6.91	192	184	140	76	52	108	57.7	59.3	11.7	8.7			25	54
19	7.87	6.68	170	174	132	62	38	112	56.1	53.7	7.3	9.7			19	59
20																
21																
22																
23																
24																
25																
26																
27																
28																
29																
30																
AVG	7.89	6.84	182	176	138	71	44	105	57.2	57.3	9.5	7.9			20	55
MAX	7.93	6.95	194	184	146	76	60	112	57.7	62.5	12.2	9.7			25	59
MIN	7.87	6.68	162	172	132	62	16	98	56.1	53.7	4.8	3.9			10	51

Bacteriological & Physical Parameters — Apr 2013

DATE	Total Coliform							Standard Plate Count		Temperature (Celcius)		Color		Odor	
	Raw	Post O3	Plate Settler Eff.	Filter Inf.	Filter Eff.	Lab Tap		Raw	Filter Eff.	Raw	Tap	Raw	Tap	Raw	Tap
1															
2															
3															
4															
5															
6															
7															
8															
9															
10															
11															
12															
13															
14															
15	> 2420	< 1	2/0	2/0				> 738		5.7					
16	> 2420	7	6/0	6/0	8/0			> 738	10	9.5	11.1				
17	> 2420	6	6/0	6/0	32/0			> 738	15	10.2	11.5				
18	> 2420	6	6/0	6/0	46/0			> 738	97	11.1	12.4				
19	15531	4	5/0	5/0	40/0			6230	2	11.2	11.1				
20															
21															
22															
23															
24															
25															
26															
27															
28															
29															
30															
AVG	* Raw and post-ozone coliform are most probable number maximum daily results.									9.5	11.5				
MAX	* Raw HPC & filter HPC counts are daily maximums.									11.2	12.4				
MIN	* 6/0 = # of Samples / # of positive samples									5.7	11.1				

MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY
DRINKING WATER LABORATORY

USEPA Region V Drinking Water Cert. No. MI00003
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TEL: (517) 335-8184
FAX: (517) 335-8562

Sample Number
LE70723

Official Laboratory Report

Report To: MICHAEL GLASGOW
4500 N DORT HWY
FLINT MI 48505

System Name/Owner:	CITY OF FLINT	WSSN/Pool ID:	2310
Collection Address:	4500 N DORT HWY,FLINT	Source:	Surface Water
Collected By:	MICHAEL GLASGOW	Site Code:	
Township/Well#/Section:	//	Collector:	Public Water Supply Operator
County:	Genesee	Date Collected:	04/18/2013 14:00
Sample Point:	FILTER EFFLUENT/POST OZONE	Date Received:	04/19/2013 13:05
Water System:	Treated Public Distribution System	Purpose:	Other

TESTING INFORMATION			REGULATORY INFORMATION			
Analyte Name	Result (mg/L)	Date Tested	RL (mg/L)	MCL/AL (mg/L)	Method	CAS #
^^^ NOT TESTED^^^	Not Tested	04/30/2013				NOTST-00-C
Carbamate (CXLP) analysis was not completed. Sample was lost in laboratory accident.						
Antimony	Not detected	04/26/2013	0.0006	0.006	EPA 200.8	7440-36-0
Arsenic	Not detected	04/26/2013	0.002	0.010	EPA 200.8	7440-38-2
Barium	0.03	04/26/2013	0.01	2	EPA 200.8	7440-39-3
Beryllium	Not detected	04/26/2013	0.0004	0.004	EPA 200.8	7440-41-7
Cadmium	Not detected	04/26/2013	0.0003	0.005	EPA 200.8	7440-43-9
Chloride	74	04/19/2013	4		SM 4500-Cl E	7647-14-5
Chromium	Not detected	04/26/2013	0.01	0.1	EPA 200.8	7440-47-3
Cyanide-Available	Not Detected	04/24/2013	0.02	0.2	OIA-1677	57-12-5
Fluoride	0.13	04/19/2013	0.1	4.0	SM 4500 FC	16984-48-8
Hardness as CaCO3	175	04/19/2013	20		SM 2340 C	HARD-00-C
Iron (automated)	Not detected	04/19/2013	0.1		SM 3500 FeB	7439-89-6
Lead	0.002	04/26/2013	0.001	0.015	EPA 200.8	7439-92-1
Mercury	Not detected	04/26/2013	0.0001	0.002	EPA 200.8	7439-97-6
Nickel	Not detected	04/26/2013	0.01	0.1	EPA 200.8	7440-02-0
Nitrate as N	1.6	04/19/2013	0.4	10	10-107-04-2-B	14797-55-8
Nitrite as N	Not detected	04/19/2013	0.05	1	10-107-04-2-B	14797-65-0
Selenium	Not detected	04/26/2013	0.001	0.05	EPA 200.8	7782-49-2
Sodium (automated)	11	04/19/2013	5		SM 3500 NaB	7440-23-5
Sulfate	20	04/19/2013	10		SM 4500 SO4E	14808-79-8
Thallium	Not detected	04/26/2013	0.0002	0.002	EPA 200.8	7440-28-0

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mg/L : milligrams / Liter (ppm)
ppm : parts per million
MPN : Most Probable Number
CFU : Colony Forming Unit

Laboratory Contacts
Drinking Water Unit Mgr: Julia Pieper
Systems Mgmt. Unit Mgr: George Krisztian

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Sample Number
LE70723

TESTING INFORMATION			REGULATORY INFORMATION			
Analyte Name	Result (mg/L)	Date Tested	RL (mg/L)	MCL/AL (mg/L)	Method	CAS #
Chlorinated Acid Herbicides						
2,4,5-T	Not Detected	04/22/2013	0.002		EPA 515.4	93-76-5
2,4,5-TP (silvex)	Not Detected	04/22/2013	0.0003	0.05	EPA 515.4	93-72-1
2,4-D	Not Detected	04/22/2013	0.002	0.07	EPA 515.4	94-75-7
Acifluorfen	Not Detected	04/22/2013	0.004		EPA 515.4	50594-66-6
Bentazon	Not Detected	04/22/2013	0.002		EPA 515.4	25057-89-0
Dicamba	Not Detected	04/22/2013	0.002		EPA 515.4	1918-00-9
Dinoseb	Not Detected	04/22/2013	0.0003	0.007	EPA 515.4	88-85-7
Pentachlorophenol	Not Detected	04/22/2013	0.00006	0.001	EPA 515.4	87-86-5
Picloram	Not Detected	04/22/2013	0.001	0.5	EPA 515.4	1918-02-1
Total DCPA degradates, mono- and di-acid	Not Detected	04/22/2013	0.001		EPA 515.4	1861-32-1
Pesticides Analysis by GC/MS						
4,4'-DDD	Not Detected	04/23/2013	0.001		EPA 525.2	72-54-8
4,4'-DDE	Not Detected	04/23/2013	0.001		EPA 525.2	72-55-9
4,4'-DDT	Not Detected	04/23/2013	0.0005		EPA 525.2	50-29-3
Acetochlor	Not Detected	04/23/2013	0.001		EPA 525.2	34256-82-1
Alachlor	Not Detected	04/23/2013	0.0002	0.002	EPA 525.2	15972-60-8
Aldrin	Not Detected	04/23/2013	0.0004		EPA 525.2	309-00-2
alpha-Chlordane	Not Detected	04/23/2013	0.0002	0.002	EPA 525.2	5103-71-9
Atrazine	Not Detected	04/23/2013	0.0002	0.003	EPA 525.2	1912-24-9
Dieldrin	Not Detected	04/23/2013	0.0005		EPA 525.2	60-57-1
Endrin	Not Detected	04/23/2013	0.0001	0.002	EPA 525.2	72-20-8
Endrin aldehyde	Not Detected	04/23/2013	0.001		EPA 525.2	7421-93-4
gamma-Chlordane	Not Detected	04/23/2013	0.0002	0.002	EPA 525.2	5103-74-2
Heptachlor	Not Detected	04/23/2013	0.0002	0.0004	EPA 525.2	76-44-8
Heptachlor epoxide	Not Detected	04/23/2013	0.0001	0.0002	EPA 525.2	1024-57-3
Hexachlorobenzene	Not Detected	04/23/2013	0.0001	0.001	EPA 525.2	118-74-1
Hexachlorocyclohexane (alpha-BHC)	Not Detected	04/23/2013	0.001		EPA 525.2	319-84-6
Hexachlorocyclohexane (beta-BHC)	Not Detected	04/23/2013	0.001		EPA 525.2	319-85-7
Hexachlorocyclohexane (delta-BHC)	Not Detected	04/23/2013	0.001		EPA 525.2	319-86-8
Hexachlorocyclopentadiene	Not Detected	04/23/2013	0.0005	0.05	EPA 525.2	77-47-4
Lindane (gamma-BHC)	Not Detected	04/23/2013	0.0001	0.0002	EPA 525.2	58-89-9
Methoxychlor	Not Detected	04/23/2013	0.0001	0.04	EPA 525.2	72-43-5
Metolachlor	Not Detected	04/23/2013	0.001		EPA 525.2	51218-45-2
Metribuzin	Not Detected	04/23/2013	0.001		EPA 525.2	21087-64-9
Molinate	Not Detected	04/23/2013	0.0005		EPA 525.2	2212-67-1
PCB (aroclor 1016)	Not Detected	04/23/2013	0.0001	0.0005	EPA 525.2	12674-11-2
PCB (aroclor 1221)	Not Detected	04/23/2013	0.0001	0.0005	EPA 525.2	11104-28-2

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mg/L : milligrams / Liter (ppm)
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Sample Number
LE70723

TESTING INFORMATION			REGULATORY INFORMATION			
Analyte Name	Result (mg/L)	Date Tested	RL (mg/L)	MCL/AL (mg/L)	Method	CAS #
Pesticides Analysis by GC/MS						
PCB (aroclor 1232)	Not Detected	04/23/2013	0.0001	0.0005	EPA 525.2	11141-16-5
PCB (aroclor 1242)	Not Detected	04/23/2013	0.0001	0.0005	EPA 525.2	53469-21-9
PCB (aroclor 1248)	Not Detected	04/23/2013	0.0001	0.0005	EPA 525.2	12672-29-6
PCB (aroclor 1254)	Not Detected	04/23/2013	0.0001	0.0005	EPA 525.2	11097-69-1
PCB (aroclor 1260)	Not Detected	04/23/2013	0.0001	0.0005	EPA 525.2	11096-82-5
Polybrominated biphenyls	Not Detected	04/23/2013	0.0001		EPA 525.2	59536-65-1
Simazine	Not Detected	04/23/2013	0.0002	0.004	EPA 525.2	122-34-9
Toxaphene	Not Detected	04/23/2013	0.001	0.003	EPA 525.2	8001-35-2
Volatile Organic Compounds						
1,1 Dichloroethane	Not Detected	04/24/2013	0.0005		EPA 524.2	75-34-3
1,1 Dichloroethylene	Not Detected	04/24/2013	0.0005	0.007	EPA 524.2	75-35-4
1,1 Dichloropropene	Not Detected	04/24/2013	0.0005		EPA 524.2	563-58-6
1,1,1 Trichloroethane	Not Detected	04/24/2013	0.0005	0.2	EPA 524.2	71-55-6
1,1,1,2 Tetrachloroethane	Not Detected	04/24/2013	0.0005		EPA 524.2	630-20-6
1,1,2 Trichloroethane	Not Detected	04/24/2013	0.0005	0.005	EPA 524.2	79-00-5
1,1,2,2 Tetrachloroethane	Not Detected	04/24/2013	0.0005		EPA 524.2	79-34-5
1,2 Dichlorobenzene	Not Detected	04/24/2013	0.0005	0.6	EPA 524.2	95-50-1
1,2 Dichloroethane	Not Detected	04/24/2013	0.0005	0.005	EPA 524.2	107-06-2
1,2 Dichloropropane	Not Detected	04/24/2013	0.0005	0.005	EPA 524.2	78-87-5
1,2,3 Trichlorobenzene	Not Detected	04/24/2013	0.0005		EPA 524.2	87-61-6
1,2,3 Trichloropropane	Not Detected	04/24/2013	0.0005		EPA 524.2	96-18-4
1,2,4 Trichlorobenzene	Not Detected	04/24/2013	0.0005	0.07	EPA 524.2	120-82-1
1,2,4 Trimethylbenzene	Not Detected	04/24/2013	0.0005		EPA 524.2	95-63-6
1,3 Dichlorobenzene	Not Detected	04/24/2013	0.0005		EPA 524.2	541-73-1
1,3 Dichloropropane	Not Detected	04/24/2013	0.0005		EPA 524.2	142-28-9
1,3,5 Trimethylbenzene	Not Detected	04/24/2013	0.0005		EPA 524.2	108-67-8
1,4 Dichlorobenzene	Not Detected	04/24/2013	0.0005	0.075	EPA 524.2	106-46-7
2,2 Dichloropropane	Not Detected	04/24/2013	0.0005		EPA 524.2	594-20-7
Benzene	Not Detected	04/24/2013	0.0005	0.005	EPA 524.2	71-43-2
Bromobenzene	Not Detected	04/24/2013	0.0005		EPA 524.2	108-86-1
Bromochloromethane	Not Detected	04/24/2013	0.0005		EPA 524.2	74-97-5
Bromodichloromethane	0.0010	04/24/2013	0.0005	0.080	EPA 524.2	75-27-4
Bromoform	Not Detected	04/24/2013	0.0005	0.080	EPA 524.2	75-25-2
Bromomethane	Not Detected	04/24/2013	0.001		EPA 524.2	74-83-9
Carbon tetrachloride	Not Detected	04/24/2013	0.0005	0.005	EPA 524.2	56-23-5
Chlorobenzene	Not Detected	04/24/2013	0.0005	0.1	EPA 524.2	108-90-7
Chlorodibromomethane	0.0007	04/24/2013	0.0005	0.080	EPA 524.2	124-48-1
Chloroethane	Not Detected	04/24/2013	0.0005		EPA 524.2	75-00-3

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Sample Number
LE70723

TESTING INFORMATION			REGULATORY INFORMATION			
Analyte Name	Result (mg/L)	Date Tested	RL (mg/L)	MCL/AL (mg/L)	Method	CAS #
Volatile Organic Compounds						
Chloroform	0.0007	04/24/2013	0.0005	0.080	EPA 524.2	67-66-3
Chloromethane	0.0009	04/24/2013	0.0005		EPA 524.2	74-87-3
cis-1,2 Dichloroethylene	Not Detected	04/24/2013	0.0005	0.07	EPA 524.2	156-59-2
cis-1,3 Dichloropropene	Not Detected	04/24/2013	0.0005		EPA 524.2	10061-01-5
Dibromomethane	Not Detected	04/24/2013	0.0005		EPA 524.2	74-95-3
Dichlorodifluoromethane	Not Detected	04/24/2013	0.001		EPA 524.2	75-71-8
Dichloromethane	Not Detected	04/24/2013	0.0006	0.005	EPA 524.2	75-09-2
Ethylbenzene	Not Detected	04/24/2013	0.0005	0.7	EPA 524.2	100-41-4
Fluorotrichloromethane	Not Detected	04/24/2013	0.001		EPA 524.2	75-69-4
Hexachlorobutadiene	Not Detected	04/24/2013	0.0005		EPA 524.2	87-68-3
Isopropylbenzene	Not Detected	04/24/2013	0.0005		EPA 524.2	98-82-8
m & p-Xylene	Not Detected	04/24/2013	0.0005	10	EPA 524.2	XYLMP-00-C
Methyl ethyl ketone	Not Detected	04/24/2013	0.005		EPA 524.2	78-93-3
Methyl isobutyl ketone	Not Detected	04/24/2013	0.005		EPA 524.2	108-10-1
Methyl-tert-butyl ether (MTBE)	Not Detected	04/24/2013	0.001		EPA 524.2	1634-04-4
Naphthalene	Not Detected	04/24/2013	0.0005		EPA 524.2	91-20-3
n-Butylbenzene	Not Detected	04/24/2013	0.0005		EPA 524.2	104-51-8
Nitrobenzene	Not Detected	04/24/2013	0.01		EPA 524.2	98-95-3
n-Propylbenzene	Not Detected	04/24/2013	0.0005		EPA 524.2	103-65-1
o-Chlorotoluene	Not Detected	04/24/2013	0.0005		EPA 524.2	95-49-8
o-Xylene	Not Detected	04/24/2013	0.0005	10	EPA 524.2	95-47-6
p-Chlorotoluene	Not Detected	04/24/2013	0.0005		EPA 524.2	106-43-4
p-Isopropyltoluene	Not Detected	04/24/2013	0.0005		EPA 524.2	99-87-6
sec-Butylbenzene	Not Detected	04/24/2013	0.0005		EPA 524.2	135-98-8
Styrene	Not Detected	04/24/2013	0.0005	0.1	EPA 524.2	100-42-5
tert-Butylbenzene	Not Detected	04/24/2013	0.0005		EPA 524.2	98-06-6
Tetrachloroethylene	Not Detected	04/24/2013	0.0005	0.005	EPA 524.2	127-18-4
Tetrahydrofuran	Not Detected	04/24/2013	0.005		EPA 524.2	109-99-9
Toluene	Not Detected	04/24/2013	0.0005	1	EPA 524.2	108-88-3
Total Trihalomethanes	0.0024	04/24/2013	NA	0.080	EPA 524.2	TTHM-00-C
Total Xylenes	Not Detected	04/24/2013	NA	10	EPA 524.2	1330-20-7
trans-1,2 Dichloroethylene	Not Detected	04/24/2013	0.0005	0.1	EPA 524.2	156-60-5
trans-1,3 Dichloropropene	Not Detected	04/24/2013	0.0005		EPA 524.2	10061-02-6
Trichloroethylene	Not Detected	04/24/2013	0.0005	0.005	EPA 524.2	79-01-6
Vinyl chloride	Not Detected	04/24/2013	0.0004	0.002	EPA 524.2	75-01-4

A trip blank was not available for analysis with this sample. The QC results for chloromethane were high. Results presented are estimated. This sample contained acetone at a concentration of 40 ppb.

CAS# : Chemical Abstract Service Registry Number
MCL : Maximum Contaminant Level
AL : Action Level
RL : Reporting Limit

mg/L : milligrams / Liter (ppm)
ppm : parts per million
MPN : Most Probable Number
CFU : Colony Forming Unit

Laboratory Contacts
Drinking Water Unit Mgr: Julia Pieper
Systems Mgmt. Unit Mgr: George Krisztian

MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY
DRINKING WATER LABORATORY
USEPA Region V Drinking Water Cert. No. MI00003
P.O. Box 30270
Lansing, MI 48909
TEL: (517) 335-8184
FAX: (517) 335-8562

Sample Number
LE70723

TESTING INFORMATION			REGULATORY INFORMATION			
Analyte Name	Result (mg/L)	Date Tested	RL (mg/L)	MCL/AL (mg/L)	Method	CAS #

The analyses performed by the MDEQ Drinking Water Laboratory were conducted using methods approved by the U.S. Environmental Protection Agency in accordance with the Safe Drinking Water Act, 40 CFR parts 141-143, and other regulatory agencies as appropriate.

Your local health department has detailed information about the quality of drinking water in your area. If you have concerns about the health risks related to the test results of your sample, please contact the Environmental Health Section through the address and telephone number listed below:

Genesee County Health Dept.
630 South Saginaw
Flint, MI 48502-1540
810 257-3603

CAS# : Chemical Abstract Service Registry Number
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Drinking Water Unit Mgr: Julia Pieper
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001160

D-5a 1/86
Authority; Act 399, P.A. 1976

MICHIGAN DEPARTMENT OF PUBLIC HEALTH

TEST RUN OPERATION REPORT
OF
WATER TREATMENT PLANT

For Month of July/August 2013

Flint Water Plant — NAME OF WATER SYSTEM
2310 — WSSN
Genesee — COUNTY

Michael Glasgow — CERTIFIED OPERATOR
F-1R S-3 — CLASSIFICATION

SIGNATURE OF APPROPRIATE OFFICIAL

TREATMENT RATE AND FILTER DATA

1. Treatment Rate, Maximum **18.7** Million Gallons Per Day
2. Treatment Rate, Approved Rated Plant Capacity **36** Million Gallons per Day
3. Average Filter Run **96** Hours, Average Head Loss n/a Feet
4. Average Filtration Rate **2.3** Gallons per Square Ft. per Minute
5. Maximum Filtration Rate **3.5** Gallons per Square Ft. per Minute
6. Average Wash Water Use n/a percent of Treated Water

CHEMICAL DATA

7. Chlorine on hand _____ lbs.: Estimated supply _____ days
8. Oxygen (O2) on hand _____ lbs.: Estimated supply _____ days
9. Ferric (Fe3+) on hand _____ lbs.: Estimated supply _____ days
10. Cost of All Chemicals per Million Gallons
11. Total Power Cost per Million Gallons

Remarks:

The plant test operation began with flows near 18 MGD for hydraulic measurements, during this time we tested filters at rates above 3.0 gpm/sq. ft. Flow was then reduced to 12 -13 MGD to correspond to normal test operations. Lime softening began on July 25th, to test equipment operation.

DEQ
RESOURCE MANAGEMENT DIVISION
SEP 17 2013
LANSING DISTRICT

Submit to: Mike Prysby, P.E.
MDEQ-Water Division-Lansing District
P.O. Box 30242
Lansing, MI 48909

Failure to complete this form is a violation of Act 399, P.A. 1976 and is subject to penalties as outlined in the Act.

Daily Flow & Ozone Parameters WSSN 2310 July/August 2013

DATE	Daily Flow (MGD)	O_3 Dosage (lbs/day)	Ozone residuals (mg/L)												Sodium Bisulfite (mg/L)
			Contact Chamber #1				Contact Chamber # 2				Contact Chamber # 3				
			# of Samples	Start (avg mg/L)	Middle (avg. mg/L)	End (avg. mg/L)	# of Samples	Start (avg mg/L)	Middle (avg. mg/L)	End (avg. mg/L)	# of Samples	Start (avg mg/L)	Middle (avg. mg/L)	End (avg. mg/L)	
8	17.3	225	6	0.00	0.00	0.00	6	0.00	0.00	0.00					
9	17.0	368	6	0.00	0.00	0.00	6	0.00	0.00	0.00					
10	17.1	373	6	0.00	0.00	0.00	6	0.00	0.00	0.00					
11	16.8	339	6	0.00	0.00	0.00	6	0.00	0.00	0.00					
12	13.6	371	6	0.00	0.00	0.00	6	0.00	0.00	0.00					
13	13.0	344	6	0.00	0.00	0.00	6	0.00	0.00	0.00					
14	12.9	358	6	0.00	0.00	0.00	6	0.00	0.00	0.00					
15	12.7	367	6	0.00	0.00	0.00	6	0.00	0.00	0.00					
16	12.0	351	6	0.00	0.00	0.00	6	0.00	0.00	0.00					
17	11.3	410	6	0.00	0.00	0.00	6	0.00	0.00	0.00					
18	3.9	354	6	0.00	0.00	0.00	6	0.00	0.00	0.00					
19	3.7	377	6	0.00	0.00	0.00	6	0.00	0.00	0.00					
20	10.6	403	6	0.00	0.00	0.00	6	0.00	0.00	0.00					
21	10.8	423	6	0.00	0.00	0.00	6	0.00	0.00	0.00					
22	10.8	401	6	0.00	0.00	0.00	6	0.00	0.00	0.00					
23	10.7	384	6	0.00	0.00	0.00	6	0.00	0.00	0.00					
24	5.9	314	6	0.00	0.00	0.00	6	0.00	0.00	0.00					
25	2.5	383	6	0.00	0.00	0.00	6	0.00	0.00	0.00					
26	10.6	384	6	0.00	0.00	0.00	6	0.00	0.00	0.00					
27	10.8	372	6	0.00	0.00	0.00	6	0.00	0.00	0.00					
28	10.8	280	6	0.00	0.00	0.00	6	0.00	0.00	0.00					
29	10.8	341	6	0.00	0.00	0.00	6	0.00	0.00	0.00					
30	10.6	371	6	0.00	0.00	0.00	6	0.00	0.00	0.00					
31	9.7	369	6	0.00	0.00	0.00	6	0.00	0.00	0.00					
1	10.6	359	6	0.00	0.00	0.00	6	0.00	0.00	0.00					
2	10.7	358	6	0.00	0.00	0.00	6	0.00	0.00	0.00					
3	3.6	359	6	0.00	0.00	0.00	6	0.00	0.00	0.00					
AVG	10.8	361	6	0.00	0.00	0.00	6	0.00	0.00	0.00					
MAX	17.3	423	6	0.00	0.00	0.00	6	0.00	0.00	0.00					
MIN	2.5	225	6	0.00	0.00	0.00	6	0.00	0.00	0.00					
Total	290.8														

Coagulation & Flocculation Parameters WSSN 2310 July/August 2013

DATE	Ferric Chloride as $FeCl_3$ mg/l	Ferric Chloride as Fe 3+ mg/l	Turbidity, NTU units											
			Raw			Plate Settler Effluent			Filter Influent			Filter Effluent		
			# of Samples	Avg.	Max	# of Samples	Avg.	Max	# of Samples	Avg.	Max	# of Samples	Avg.	Max
8	30.0	10.3	1	26.8	26.8	6	2.50	7.00	5	1.80	3.33	n/a	n/a	n/a
9	32.4	11.1	5	9.7	15.2	12	0.91	1.10	12	0.97	1.37	10	0.16	0.19
10	32.8	11.3	10	10.6	13.1	12	0.81	1.05	12	0.79	1.01	55	0.14	0.15
11	31.3	10.8	5	7.8	9.6	12	0.85	1.24	12	0.79	1.04	25	0.13	0.16
12	29.0	10.0	6	7.7	9.1	12	0.59	0.78	12	0.55	0.69	40	0.11	0.13
13	29.8	10.2	6	7.8	9.0	12	0.69	1.25	12	0.77	0.96	30	0.16	0.21
14	30.3	10.4	6	6.4	7.3	12	0.59	0.87	12	0.56	0.71	30	0.15	0.16
15	35.8	12.3	7	6.1	7.7	12	0.53	0.7	12	0.51	0.65	30	0.13	0.14
16	38.4	13.2	6	7.2	8.4	12	0.50	0.62	12	0.50	0.54	30	0.12	0.13
17	40.5	13.9	6	8.4	10.7	12	0.49	0.55	12	0.53	0.65	30	0.13	0.15
18	39.7	13.6	2	6.5	6.7	4	0.36	0.38	4	0.47	0.58	15	0.10	0.11
19	41.5	14.3	1	9.5	9.5	4	1.00	1.66	4	1.07	1.30	n/a	n/a	n/a
20	40.4	13.9	6	8.9	10.4	12	0.39	0.43	12	0.49	0.76	20	0.11	0.12
21	38.5	13.3	6	9.3	11.4	12	0.35	0.37	12	0.36	0.39	40	0.11	0.12
22	38.6	13.3	6	8.5	10.0	12	0.36	0.44	12	0.37	0.47	24	0.11	0.12
23	38.2	13.1	6	7.4	8.1	12	0.38	0.43	12	0.40	0.48	24	0.11	0.12
24	34.7	11.9	4	7.3	9.0	6	0.46	0.49	7	0.46	0.53	12	0.11	0.12
25	37.4	12.9	2	10.1	10.6	2	0.96	1.22	2	0.97	0.97	n/a	n/a	n/a
26	35.3	12.1	4	10.0	12.0	10	0.55	0.9	11	6.90	17.8	n/a	n/a	n/a
27	35.2	12.1	6	10.0	12.2	12	0.73	1.98	8	9.70	22.7	n/a	n/a	n/a
28	33.6	11.6	5	10.4	11.2	11	0.48	0.50	11	7.11	17.6	5	0.09	0.13
29	34.6	11.9	6	10.6	12.4	12	0.46	0.50	12	13.1	47.2	12	0.08	0.12
30	35.2	12.1	6	10.7	11.7	13	0.72	1.22	9	9.18	12.6	n/a	n/a	n/a
31	36.8	12.7	6	12.7	15.3	12	0.43	0.52	7	5.60	12.1	n/a	n/a	n/a
1	33.7	11.6	6	13.4	16.2	12	0.48	0.53	8	50.7	66.8	n/a	n/a	n/a
2	33.5	11.5	6	10.8	12.4	12	0.54	1.16	11	41.2	127	n/a	n/a	n/a
3	32.8	11.3	2	9.8	9.9	4	0.39	0.43	4	31.6	61.9	n/a	n/a	n/a
AVG	35.2	12.1	5	9.8	11.3	10	0.68	1.12	10	6.94	14.9	25	0.12	0.14
MAX	41.5	14.3	10	26.8	26.8	13	2.50	7.00	12	50.7	127.0	55	0.16	0.21
MIN	29.0	10.0	1	6.1	6.7	2	0.35	0.37	2	0.36	0.39	5	0.08	0.11

n/a = Filters not in service

Flouridation & Chlorination WSSN 2310 **July/August 2013**

DATE	Fluoride Applied F- mg/l	Fluoride Analyses mg/l			Chlorine prior to filtration (mg/L OCl-)	Lime dosage (mg/L)	Chlorine Residual mg/l							
							Plate Settler Effluent		Contact Clairifier Effluent		Combined Filter Effluent (north)		Combined Filter Effluent (south)	
		Raw	Filter Eff.	Dist			Free	Total	Free	Total	Free	Total	Free	Total
8		0.17	n/a		3.4		0.3	0.6	0.1	0.4	n/a	n/a	n/a	n/a
9		0.18	0.18		4.4		0.4	0.7	0.1	0.4	0.1	0.2	0.1	0.2
10		0.15	0.19		4.4		0.5	0.8	0.1	0.4	0.1	0.3	0.1	0.3
11		0.18	0.16		4.2		0.8	1.2	0.3	0.6	0.1	0.3	0.1	0.3
12		0.17	0.18		4.1		0.6	0.9	0.2	0.4	0.1	0.3	0.1	0.3
13		0.18	0.19		5.2		0.4	0.7	0.1	0.3	0.1	0.3	0.1	0.3
14		0.18	0.19		5.7		0.5	0.9	0.2	0.4	0.1	0.3	0.1	0.3
15		0.17	0.17		5.9		0.6	0.9	0.2	0.4	0.1	0.3	0.1	0.3
16		0.17	0.19		6.2		0.6	1.1	0.3	0.5	0.1	0.2	0.1	0.2
17		0.17	0.20		6.6		1.0	1.3	0.4	0.7	0.1	0.3	0.1	0.3
18		0.18	0.19		6.5		1.2	1.5	0.6	0.9	0.2	0.3	0.1	0.3
19		0.18	n/a		6.5		1.1	1.4	0.3	0.5	n/a	n/a	n/a	n/a
20		0.17	0.17		5.3		0.9	1.3	0.4	0.6	0.2	0.4	0.2	0.4
21		0.18	0.17		5.2		1.0	1.2	0.4	0.6	0.2	0.3	0.2	0.3
22		0.17	0.17		5.4		0.8	1.1	0.3	0.4	0.2	0.3	0.2	0.3
23		0.18	0.20		6.8		1.0	1.3	0.3	0.6	0.1	0.2	0.1	0.2
24		0.17	0.19		6.5		0.8	1.1	0.3	0.5	0.0	0.2	0.0	0.2
25		0.16	n/a		6.2	270	0.8	1.3	0.2	0.5	n/a	n/a	n/a	n/a
26		0.18	n/a		5.5	272	1.1	1.4	0.3	0.5	n/a	n/a	n/a	n/a
27		0.17	n/a		6.0	270	0.6	0.9	0.1	0.2	n/a	n/a	n/a	n/a
28		0.18	0.17		6.1	270	0.7	1.0	0.1	0.2	n/a	n/a	n/a	n/a
29		0.17	n/a		6.1	270	0.7	0.9	0.1	0.1	n/a	n/a	n/a	n/a
30		0.18	n/a		6.2	272	0.7	1.1	0.1	0.1	n/a	n/a	n/a	n/a
31		0.17	n/a		6.8	280	0.6	0.9	0.0	0.2	n/a	n/a	n/a	n/a
1		0.18	n/a		6.2	272	0.4	0.8	0.0	0.1	n/a	n/a	n/a	n/a
2		0.18	n/a		6.5	270	0.3	0.5	0.1	0.1	n/a	n/a	n/a	n/a
3			n/a		0.0	270	0.0	0.0	0.0	0.0	n/a	n/a	n/a	n/a
AVG		0.17	0.18		5.5	272	0.7	1.0	0.2	0.4	0.1	0.3	0.1	0.3
MAX		0.18	0.20		6.8	280	1.2	1.5	0.6	0.9	0.2	0.4	0.2	0.4
MIN		0.15	0.16		0.0	270	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.2

n/a = Filters not in service

Chemical Analyses WSSN 2310 July/August 2013

DATE	pH		Total Hard as $CaCO_3$ mg/l		Total Alk as $CaCO_3$ mg/l		NonCarbonate Hardness as $CaCO_3$ mg/l		Calcium Ca 2+ mg/l		Magnesium as Mg 2+ mg/l		Nitrate as NO_3- mg/l		Chloride as Cl - mg/l	
	Raw	Filter Eff.	Raw	Filter Eff.	Raw	Filter Eff.	Raw	Filter Eff.	Raw	Filter Eff.	Raw	Filter Eff.	Raw	Filter Eff.	Raw	Filter Eff.
8	8.19	n/a	238	n/a	202	n/a	36	n/a	75.4	n/a	12.2	n/a			39	n/a
9	8.45	7.72	238	230	194	160	44	70	77.8	78.6	10.7	8.3			39	68
10	8.24	7.29	228	230	200	156	28	74	75.4	78.6	9.7	8.3			39	68
11	8.40	7.45	222	222	192	154	30	68	72.1	75.4	10.2	8.7			39	66
12	8.56	7.37	226	230	196	150	30	80	72.9	72.9	10.7	11.7			32	67
13	8.46	7.50	224	220	196	156	28	64	67.3	71.3	13.7	10.2			38	65
14	8.49	7.58	222	222	192	144	30	78	76.2	72.9	7.8	9.7			35	66
15	8.39	7.24	216	208	186	146	30	62	72.1	64.1	8.7	11.7			35	73
16	8.48	7.41	216	220	186	142	30	78	68.9	66.5	11.7	13.1			34	72
17	8.20	7.13	222	220	194	136	28	84	71.3	64.1	10.7	14.6			36	77
18																
19	7.96	n/a	224	n/a	200	n/a	24	n/a	70.5	n/a	11.7	n/a			40	n/a
20																
21																
22	8.28	7.25	212	220	184	132	28	88	64.9	68.1	12.2	12.2			39	77
23	8.13	7.29	218	212	190	134	28	78	54.5	59.3	19.9	15.6			39	85
24	8.11	7.23	226	232	188	140	38	92	73.7	77.8	10.2	9.2			40	75
25	8.19	n/a	230	n/a	190	n/a	40	n/a	80.2	n/a	7.3	n/a			41	n/a
26	8.34	n/a	224	n/a	192	n/a	32	n/a	79.4	n/a	6.3	n/a			38	n/a
27	8.23	n/a	228	n/a	190	n/a	38	n/a	73.7	n/a	10.7	n/a			39	n/a
28	8.15	8.92	240	92	194	17	46	75	72.1	36.9	14.6	0.0			36	68
29	8.18	n/a	230	n/a	188	n/a	42	n/a	77.0	n/a	9.2	n/a			41	n/a
30	8.29	n/a	226	n/a	196	n/a	30	n/a	71.3	n/a	11.7	n/a			40	n/a
31	8.26	n/a	234	n/a	196	n/a	38	n/a	78.6	n/a	9.7	n/a			41	n/a
1	8.37	n/a	226	n/a	198	n/a	28	n/a	69.7	n/a	12.6	n/a			41	n/a
2	8.13	n/a	226	n/a	196	n/a	30	n/a	72.9	n/a	10.7	n/a			40	n/a
3		n/a		n/a		n/a		n/a		n/a		n/a				n/a
AVG	8.29	7.49	226	212	193	136	33	76	72.3	68.2	11.0	10.3			38	71
MAX	8.56	8.92	240	232	202	160	46	92	80.2	78.6	19.9	15.6			41	85
MIN	7.96	7.13	212	92	184	17	24	62	54.5	36.9	6.3	0.0			32	65

n/a = Filters not in service

Bacteriological & Physical Parameters — July/August 2013

DATE	Total Coliform							Standard Plate Count		Temperature (Celcius)		Color		Odor	
	Raw	Post O3	Plate Settler Eff.	Filter Inf.	Filter Eff.	Lab Tap		Raw	Filter Eff.	Raw	Tap	Raw	Tap	Raw	Tap
8	>2419	> 2419	1/0	1/0	n/a				n/a	19.4					
9	> 2419	1414	6/0	6/0	10/0			4440	17	24.6					
10	> 2419	> 2419	6/1	6/0	30/3			2480	189	25.5					
11	19863	1553	6/0	6/0	30/0			4140	146	25.9					
12	12033	579	6/0	6/0	30/10			6230	> 738	26.2					
13	6294	1300	6/0	6/0	23/20			1950	> 738	27.0					
14	12997	1046	6/0	6/0	30/5			7380	> 738	26.8					
15	14136	>2419	6/0	6/1	30/5			3550	>738	27.8					
16	15531	> 2419	6/0	6/0	30/16			5070	> 738	29.8					
17	19863	> 2419	6/0	6/1	30/2			4140	> 738	28.4					
18	17329	> 2419	4/0	4/0	10/3			4400	> 738	28.6					
19										27.6					
20										28.4					
21	17329	> 2419	2/0	2/0	4/0			6230	> 738	28.6					
22	24196	>2419	6/0	6/0	24/5			6230	> 738	28.6					
23	17329	> 2419	6/0	6/1	24/0			7380	> 738	26.9					
24	17329	> 2419	3/0	3/0	15/5			4400	> 738	25.5					
25										25.5					
26	14136	>2419	3/0	3/1	n/a			4400	n/a	24.9					
27	15531	> 2419	6/0	6/0	5/1			3550	> 738	24.1					
28	17329	> 2419	6/0	6/0	12/4			4700	> 738	23.2					
29	14136	> 2419	6/0	6/0	n/a			2990	n/a	22.3					
30	12997	> 2419	6/0	6/0	n/a			4400	n/a	22.5					
31	15531	> 2419	6/0	6/0	n/a			6230	n/a	23.3					
1	19863	> 2419	6/0	6/0	n/a			5070	n/a	22.4					
2	17329	> 2419	6/0	6/0	n/a			4140	n/a	22.2					
3	7701	>2419	2/0	2/0	n/a			3110	n/a	22.2					
AVG	* Raw and post-ozone coliform are most probable number maximum daily results.									25.5					
MAX	* Raw HPC & filter HPC counts are daily maximums.									29.8					
MIN	* 6/0 = # of Samples collected/ # of positive samples (NO samples were positive for *E. coli*)									19.4					

n/a = Filters not in service

FLINT
WATER PLANT & FACILITIES

Daily Flow & Ozone Parameters WSSN 2310 September 2013

DATE	Daily Flow (MGD)	O_3 Dosage (lbs/day)	Ozone residuals (mg/L)												Sodium Bisulfite (mg/L)
			Contact Chamber #1				Contact Chamber # 2				Contact Chamber # 3				
			# of Samples	Start (avg mg/L)	Middle (avg. mg/L)	End (avg. mg/L)	# of Samples	Start (avg mg/L)	Middle (avg. mg/L)	End (avg. mg/L)	# of Samples	Start (avg mg/L)	Middle (avg. mg/L)	End (avg. mg/L)	
1															
2															
3															
4															
5															
6															
7															
8															
9															
10															
11															
12															
13															
14															
15															
16	3.5		1	0.00	0.00	0.00									
17	10.6		8	0.30	0.06	0.00									
18	10.6		7	0.46	0.07	0.00									
19	10.7		11	0.37	0.01	0.00									
20	10.7		12	0.44	0.00	0.00									
21	10.7		12	0.49	0.00	0.00									
22	10.7		12	0.86	0.00	0.00									
23	10.7		4	0.78	0.00	0.01									
24	3.5		1	0.88	0.00	0.00									
25	10.7		16	1.14	0.00	0.00									
26	10.6		12	0.92	0.05	0.02									
27	10.6		16	1.20	0.02	0.01									
28	5.5		8	0.99	0.03	0.00									
29															
30															
AVG	9.2	######	9	0.68	0.02	0.00									
MAX	10.7	0	16	1.20	0.07	0.02									
MIN	3.5	0	1	0.00	0.00	0.00									
Total	119.1														

Coagulation & Flocculation Parameters WSSN 2310 September 2013

DATE	Ferric Chloride as $FeCl_3$ mg/l	Ferric Chloride as Fe 3+ mg/l	Turbidity, NTU units											
			Raw			Plate Settler Effluent			Filter Influent			Filter Effluent		
			# of Samples	Avg.	Max	# of Samples	Avg.	Max	# of Samples	Avg.	Max	# of Samples	Avg.	Max
1														
2														
3														
4														
5														
6														
7														
8														
9														
10														
11														
12														
13														
14														
15														
16	39.8	13.7	4	10.5	11.0	6	1.05	2.32	4	15.6	19.1			
17	39.0	13.4	6	11.1	13.2	12	0.45	0.49	12					
18	39.6	13.6	6	10.9	12.6	12	0.43	0.54	12	0.62	0.99			
19	39.3	13.5	6	10.2	11.4	12	0.39	0.48	12	0.34	0.44	8	0.08	0.09
20	39.8	13.7	6	9.3	9.5	12	0.37	0.51	12	0.37	0.59	36		
21	39.6	13.6	6	11.8	16.4	12	0.33	0.37	12	0.44	0.69			
22	43.1	14.8	6	10.7	11.9	12	0.29	0.31	12	0.89	1.43			
23	47.4	16.3	6	10.7	11.7	12	0.35	0.43	12	1.64	5.91			
24	47.1	16.2	2	10.1	10.2	4	0.35	0.35	4	3.01	3.20			
25	47.4	16.3	6	10.3	11.1	11	0.39	0.49	11	6.77	21.20			
26	47.8	16.4	6	10.5	12.6	12	0.32	0.36	12	1.25	1.62			
27	47.7	16.4	6	11.4	12.6	11	0.34	0.42	12	0.89	1.63			
28	47.7	16.4	2	10.6	11.1	6	0.31	0.35	6	0.64	0.88			
29														
30														
AVG	43.5	14.9	5	10.6	11.9	10	0.41	0.57	10	2.70	4.81	22	0.08	0.09
MAX	47.8	16.4	6	11.8	16.4	12	1.05	2.32	12	15.6	21.2	36	0.08	0.09
MIN	39.0	13.4	2	9.3	9.5	4	0.29	0.31	4	0.34	0.44	8	0.08	0.09

n/a = Filters not in service

Chemical Analyses WSSN 2310 — September 2013

DATE	pH		Total Hard as $CaCO_3$ mg/l		Total Alk as $CaCO_3$ mg/l		NonCarbonate Hardness as $CaCO_3$ mg/l		Calcium Ca^{2+} mg/l		Magnesium Mg^{2+} mg/l		Nitrate as NO_3- mg/l		Chloride as Cl - mg/l	
	Raw	Filter Eff.	Raw	Filter Eff.	Raw	Filter Eff.	Raw	Filter Eff.	Raw	Filter Eff.	Raw	Filter Eff.	Raw	Filter Eff.	Raw	Filter Eff.
1							0	0								
2							0	0								
3							0	0								
4							0	0								
5							0	0								
6							0	0								
7							0	0								
8							0	0								
9							0	0								
10							0	0								
11							0	0								
12							0	0								
13							0	0								
14							0	0								
15							0	0								
16	8.25		254		212		42	0	79.4		13.6				47	
17	8.28		254		212		42	0	80.2		13.1				46	
18	8.31		276		206		70	0	64.9		27.7				50	
19	8.39		252		210		42	0	72.1		17.5				40	
20	8.54	8.86	254	160	218	84	36	76	78.6	52.9	14.6	6.8			46	67
21	8.36		252		204		48	0	83.4		10.7				48	
22	8.24		240		212		28	0	62.5		20.4				51	
23	8.27		256		214		42	0	80.2		13.6				48	
24	8.48		260		214		46	0	78.6		15.6				44	
25	8.44		256		212		44	0	89.8		7.8				54	
26	8.39		252		222		30	0	73.7		16.5				47	
27	8.30	8.94	242	158	212	84	30	74	77.0	59.3	12.2	2.4			58	83
28	8.28	8.29	254	150	212	76	42	74	75.4	56.1	16.0	2.4			61	85
29							0	0								
30							0	0								
AVG	8.35	8.70	254	160	212	81	15	3	76.6	52.9	15.3	3.9			49	78
MAX	8.54	8.94	276	160	222	84	70	76	89.8	52.9	27.7	6.8			61	85
MIN	8.24	8.29	240	160	204	76	0	0	62.5	52.9	7.8	2.4			40	67

n/a = Filters not in service

FLINT WATER PLANT & FACILITIES

Bacteriological & Physical Parameters — September 2013

DATE	Total Coliform							Standard Plate Count		Temperature (Celcius)		Color		Odor	
	Raw	Post O3	Plate Settler Eff.	Filter Inf.	Filter Eff.	Lab Tap		Raw	Filter Eff.	Raw	Tap	Raw	Tap	Raw	Tap
1															
2															
3															
4															
5															
6															
7															
8															
9															
10															
11															
12															
13															
14															
15															
16															
17	7568	378	411	5				>14,760							
18	7308	900	816	1				3420							
19	4764	492	2420	17	50			2820							
20	3700	1042	> 2420	280	206			2740	> 738						
21	10950	2134	> 2420	40				2480							
22	39726	590	> 2420	77				2920							
23	3316	168	48392	10344				3020							
24	3978	3106	48392	1414											
25	2224	816	> 2420	> 2420				3420							
26	2038	1042	> 2420	3				2640							
27	2500	1226	> 2420	1	84			7440	> 738						
28	1560	2900	n/a	1				1940							
29															
30															
AVG	*All coliform results are most probable number maximum daily results. HPC & filter HPC counts are daily maximums. (NO filter samples were positive for *E. coli*)								* Raw	#####					
MAX										0.0					
MIN										0.0					

n/a = Filters not in service

Prysby, Mike (DEQ)

From: Daugherty Johnson <djohnson@cityofflint.com>
Sent: Thursday, April 24, 2014 12:03 PM
To: Prysby, Mike (DEQ); Busch, Stephen (DEQ); Howard Croft
Subject: DWSD back up agreement

Follow Up Flag: Flag for follow up
Flag Status: Flagged

Hello Steve and Mike. As you are aware, the City has undergone extensive upgrades to our Water Treatment Plant and it's associated facilities. Our intentions and efforts have been to operate our facility as the primary drinking water source for the City of Flint. Through consultation with your office and our engineering firm we've developed a system of redundant electrical systems, treatment processes and adequate finished water storage to negate the need for a signed back up agreement with DWSD due to their termination of our contract. Upon inspection of these facilities would you convey your concurrence that there is no regulatory requirement for us to sign a back up agreement with DWSD.

Thank you
Daugherty Johnson
Utilities Administrator
City of Flint

Prysby, Mike (DEQ)

From: Michael Glasgow <mglasgow@cityofflint.com>
Sent: Thursday, April 17, 2014 11:05 AM
To: Rosenthal, Adam (DEQ)
Cc: Prysby, Mike (DEQ); Busch, Stephen (DEQ)
Subject: Re: Proposed Water Monitoring - City of Flint

Adam,

Thank you for the quick response. I assumed there would be dramatic changes to our monitoring. I have people above me making plans to distribute water ASAP. I was reluctant before, but after looking at the monitoring schedule and our current staffing, I do not anticipate giving the OK to begin sending water out anytime soon. If water is distributed from this plant in the next couple weeks, it will be against my direction. I need time to adequately train additional staff and to update our monitoring plans before I will feel we are ready. I will reiterate this to management above me, but they seem to have their own agenda.

Thank you,

Mike Glasgow
Laboratory & Water Quality Supervisor
City of Flint Water Plant

On Wed, Apr 16, 2014 at 2:49 PM, Rosenthal, Adam (DEQ) <ROSENTHALA@michigan.gov> wrote:

Mike, we have been working on a revised schedule for the City of Flint, which is being sent out today in response to your email indicating the plant startup. Mike Prysby must have been the one in contact with Mr. Croft, not sure what was discussed. Mike is out and will return 4/21/14. Until then our supervisor, Steve Bush, can be contacted at 517-643-2314 for plant operation questions.

see attached schedule.

Adam Rosenthal, EQA

MDEQ – Office of Drinking Water and Municipal Assistance

Lansing District – Constitution Hall 1SW

PO Box 30242

Lansing, MI 48909

517-284-6644

fax: 517-241-3571

From: Michael Glasgow [mailto:mglasgow@cityofflint.com]
Sent: Wednesday, April 16, 2014 12:59 PM
To: Rosenthal, Adam (DEQ)
Subject: Proposed Water Monitoring - City of Flint

Adam,

Good afternoon, I am contacting you in regards to possible changes in our monitoring for our change to full time operation out of the Flint river. I am expecting changes to our Water Quality Monitoring parameters, and possibly our DBP and lead & copper monitoring plan. Also, I am wondering about our MOR required testing. I know you have probably been in contact with Howard Croft, however I have not seen anything except the notes you or Prysby made on the last page of our 2014 monitoring schedule "that things were subject to change". Any information would be greatly appreciated, because it looks as if we will be starting the plant up tomorrow and are being pushed to start distributing water as soon as possible. As the acting F-1, I would like to make sure we are monitoring, reporting and meeting our requirements before I give the O.K to start distributing water.

Thanks,

Mike Glasgow

Laboratory & Water Quality Supervisor

City of Flint Water Plant

(810)787-6537 ext. 3512

2014 Monitoring Schedule

FLINT, CITY OF

WSSN: 02310

Collect samples early in the monitoring period. This schedule reflects your expected routine monitoring and is subject to change. To receive credit for monitoring, include the **WSSN, Site Code**, and **County** on your request for analysis form. Collect Bacteriological and Automated Partial Chemistry samples close to the shipping time and send overnight delivery. Send all sample results to your Department of Environmental Quality (DEQ) district office unless you use the DEQ laboratory. Test codes, sample units, and costs are listed to help you complete the DEQ laboratory form. Prices are subject to change without notice. The DEQ laboratory is closed on state holidays.

Location: Plant Tap

Collect these samples at the entry point to the distribution system (after treatment, if applicable.)

Sample Type	# Samples/ Frequency	Collect Before	Site Code	Fee	Unit Number	Test Code	
Automated Partial Chemistry	This DEQ lab scan includes nitrate, nitrite, fluoride, and sodium whose monitoring frequency requirements differ from one another. Before requesting analyses from a laboratory other than the DEQ laboratory, check with your DEQ district staff for the specific monitoring requirements.						
	1/3 months	**Quarterly**	TP001	$18.00	32	R	72
Volatile Organic Compounds	1/3 months	**Quarterly**	TP001	$100.00	36VO	CXVO	400
Complete Metals	1/36 months	**09/30/2014**	TP001	$102.00	36ME	CMET2	102
Arsenic	1/3 months	**Quarterly**	TP001	$18.00	36ME	CAS	72
Cyanide	1/3 months	**Quarterly**	TP001	$25.00	36CNa	CCN	100
SOC – Pesticides	1/3 months	**Quarterly**	TP001	$125.00	36PT	CXPT	500
SOC – Herbicides	1/3 months	**Quarterly**	TP001	$120.00	36HB	CXHB	480
SOC – Carbamates	1/3 months	**Quarterly**	TP001	$120.00	36LP	CXLP	480
Gross Alpha (Radiological)	1/3 months	**Quarterly**	TP001	Not performed at the DEQ Laboratory. A list of certified labs is at www.michigan.gov/DEQ. Select Water, Drinking Water, Community Water Supply, then Certified Labs under Programs and Activities.			
Radium 226 & Radium 228	1/3 months	**Quarterly**	TP001				
Water Quality Parameters	Bi-weekly	**Every 2 Weeks**	TP001	Various	Various	Various	840
Total Organic Carbon (TOC)	Pair/Monthly	**Monthly**	TP001	$35.00	36TO	CTOC	
	Monitor for TOC in the source water before any treatment at the same time as monitoring for TOC in the treated water. These samples (source water and treated water) are referred to as "paired samples." Collect the treated water sample not later than the point of combined filter effluent turbidity monitoring and representative of treated water.						
Expanded SOCs							
Dalapon & Haloacetic Acids	1/12 months	**Between 04/01 and 09/30/2014**	TP001	$130.00	36HA	CXHA	130
Diquate	1/12 months	**Between 04/01 and 09/30/2014**	TP001	$150.00	36DQ	CXDQ	
Endothall	1/12 months	**Between 04/01 and 09/30/2014**	TP001	$150.00	36EN	CXEN	
EDB & DBCP	1/12 months	**Between 04/01 and 09/30/2014**	TP001	$70.00	36VO	CXEV	

2014 Monitoring Schedule

FLINT, CITY OF **WSSN: 02310**

Collect samples early in the monitoring period. This schedule reflects your expected routine monitoring and is subject to change. To receive credit for monitoring, include the **WSSN, Site Code**, and **County** on your request for analysis form. Collect Bacteriological and Automated Partial Chemistry samples close to the shipping time and send overnight delivery. Send all sample results to your Department of Environmental Quality (DEQ) district office unless you use the DEQ laboratory. Test codes, sample units, and costs are listed to help you complete the DEQ laboratory form. Prices are subject to change without notice. The DEQ laboratory is closed on state holidays.

Location: Distribution System

Sample Type	Collect Samples According to the ...	# Samples/ Frequency	Collect	Site Code	Fee	Unit Number	Test Code
Bacteriological – coliforms	TCR Sampling Site Plan	100/Monthly	**Monthly**	DIST	$16.00	30	BPTC
Chlorine Residual	DBP Monitoring Plan	Measure the residual disinfectant level at the same point and at the same time as the bacteriological sample and report the average to the DEQ.					
Lead Copper for Corrosion Control	Lead and Copper Sampling Pool	100/6 months	**Between 07/01 and 12/31/2014**	DIST	$26.00	36CC	CCUB
Water Quality Parameters	Representative Sites	25/Quarterly	**Quarterly**	DIST	Various	Various	Various
Total Trihalomethanes	DBP Monitoring Plan	8/3 months	**During February, May, August and November 2014**	See DBP Monitoring Plan	$65.00	36VO	CXTM
Haloacetic Acids		8/3 months	**During February, May, August and November 2014**	See DBP Monitoring Plan	$130.00	36HA	CXHA

Prysby, Mike (DEQ)

From: Matta, Samir <SFMatta@lan-inc.com>
Sent: Wednesday, March 19, 2014 6:49 PM
To: Prysby, Mike (DEQ)
Subject: FW: City of Flint WTP Improvements Phase II - MDEQ Comments.
Attachments: Flint WTP 2013 Site Plan.pdf

Hi Mike,

Does this address your needs for the "current yard piping diagram"?

The language below was also used for the addendum that the City issued to the contractor for the Mid-Point Clorination

1. Sheet C-104 – Construction Notes: Add the following Note 6 – A 1" Anti-syphon / Back Pressure Valve and additional 1" ball valve shall be added just prior to the trough wall penetration. The anti-syphon / back pressure valve shall be PVC and designed for use with chlorine systems. The valve shall be a LMI #35856, Walchem E90422, or engineer approved equivalent. The valve shall be installed between the two 1" ball valves to allow for isolation during servicing. The valve shall be located above the high water level in the trough. The Contractor shall install a 1" drain line from the relief port to the finished floor elevation of the pipe gallery.

Jeremy will provide written responses for your file on the other questions as requested.

Thanks.

Samir F. Matta
Senior Project Manager

Lockwood, Andrews & Newnam, Inc.
A LEO A DALY COMPANY
D 517.819.2367 **C** 517.819.2367
www.lan-inc.com • sfmatta@lan-inc.com

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Prysby, Mike (DEQ)

From:	Nakashima, Jeremy <JNNakashima@lan-inc.com>
Sent:	Friday, March 14, 2014 12:51 PM
To:	Prysby, Mike (DEQ)
Cc:	Green, Warren; Matta, Samir; Brent Wright (bwright@cityofflint.com)
Subject:	Flint WTP Improvements - Midpoint Chlorination System Basis of Design and LOX/LIN Storage Calculations
Attachments:	Flint WTP Midpoint Chlorination Basis of Design 3-13-14.pdf; LOX-LIN revised drawings 3-5-14.pdf; Flint WTP LOX - LIN Storage Basis of Design Calcs 3-13-14.pdf

Mike,

As requested, attached are the following documents in support of the construction permit for the Flint WTP improvements:

- Basis of Design for Midpoint Chlorination
- LOX/LIN storage tank calculations
- Revised LOX/LIN drawings which clarify process piping

If needed, Samir can drop off hard copies.

Please call me if you have any questions or require additional information.

Thank you,
Jeremy

Jeremy N. Nakashima, PE
Associate, Senior Project Manager

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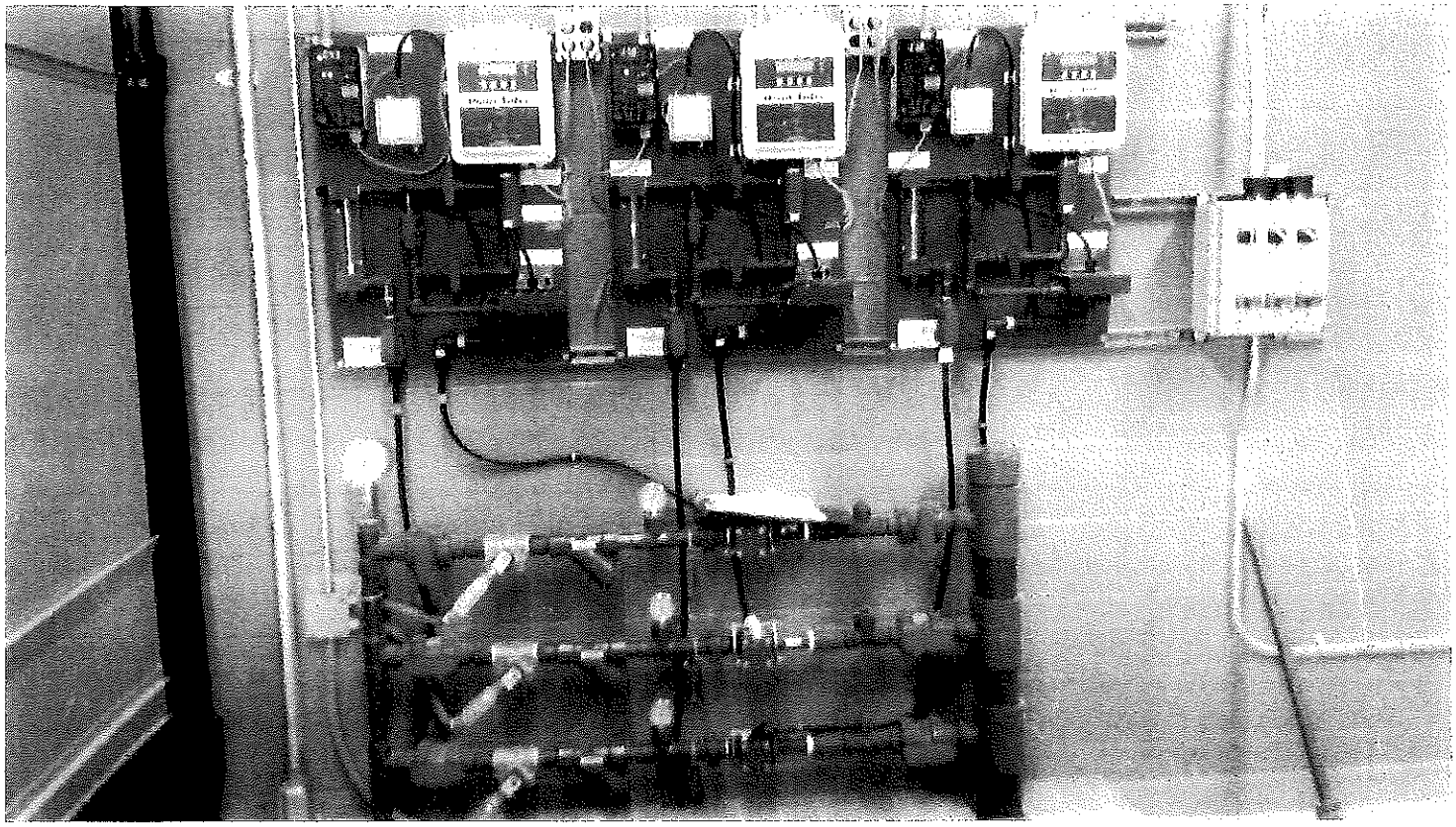
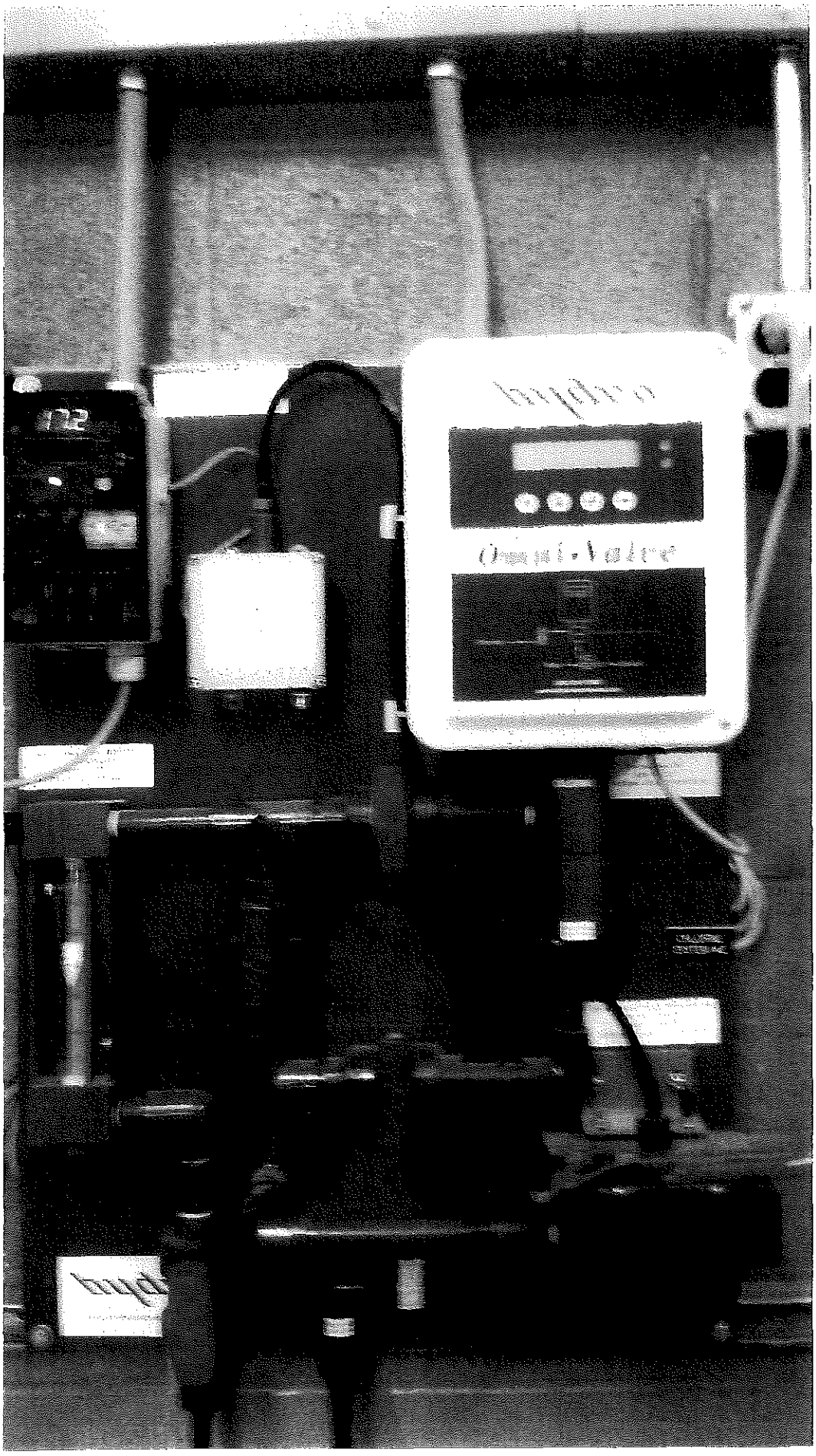



Omni-Valve

Hydro Gas Chlorination Systems

Instruction Manual

All HYDRO Chlorination systems are carefully designed and tested for years of safe, accurate field service. All HYDRO Chlorination systems are carefully tested prior to shipment. All HYDRO products are made of the finest materials. To ensure best operation, read these instructions carefully and completely and store them where all maintenance personnel will have access to them.

Each chlorination system consists of the following:

1. The vacuum regulator which mounts on the chlorine cylinder.
2. The ejector assembly mounts directly to the pipe line, storage tank, wet well, or to a solution line.
3. Standard accessories:
   a. Cylinder wrench.
   b. Twenty-five feet of appropriate polyethylene tubing for vacuum lines.
   c. Ten lead gaskets for vacuum regulator to cylinder connection.
4. Additional parts available from any plumbing supply (or through HYDRO):
   a. Pressure gauge.
   b. Water shut off valve.
   c. Y-type strainer.

The information contained in this manual was current at the time of printing. The most current versions of all Hydro Instruments manuals can be found on our website: **www.hydroinstruments.com**

Hydro Gas Chlorination Systems
Table of Contents

1. Torque Specifications 2
2. SECTION I-A: Safety Information (150 lb. Cylinders) 3
3. SECTION I-B: Safety Information (Ton Cylinders) 4
4. SECTION II: Design and Installation Notes 5
5. SECTION III: System Installation 5
6. SECTION IV: Chlorination System Vacuum Test 9
7. SECTION V: Start Up of Chlorination 9
8. SECTION VI: Shut Down Procedure 9
9. SECTION VII: Rate Valve Operation 10
10. SECTION VIII: Troubleshooting 10
11. APPENDIX: Servicing the Hydro System 12
    a. Section A-I: Cleaning the Safety Shut Off Valve and Seat 12
    b. Section A-II: Servicing Flow Meter Assembly 13
    d. Section A-III: Replacing Rate Valve O-Ring and Servicing Rate Valve 13
    e. Section A-IV: Disassembly of Vacuum Regulator Unit 14
    f. Section A-V: Servicing Ejector Nozzle 14
    g. Section A-VI: Servicing Ejector Check Valve Assembly 15
    h. Section A-VII: Servicing Switchover Module 15
12. Parts Drawings 16-35
13. Ejector Performance Curves 36-38
14. Nozzle Tables 39-41

Hydro Instruments
Gas Chlorination Equipment
Torque Specifications

Item	Min. inch•lbs.	Max. inch•lbs.
Yoke Bolts	20	25
Body Bolts	20	25
Meter Block Bolts	20	25
Vacuum Fittings	15	20
Inlet Plug	10	15
Dummy Plug	7	10
Item	**Min. foot•lbs.**	**Max. foot•lbs.**
Yoke Half Dog	20	25

SECTION I-A: SAFETY INFORMATION (150 LB. CYLINDERS)

TAKE CARE WITH CHLORINE!

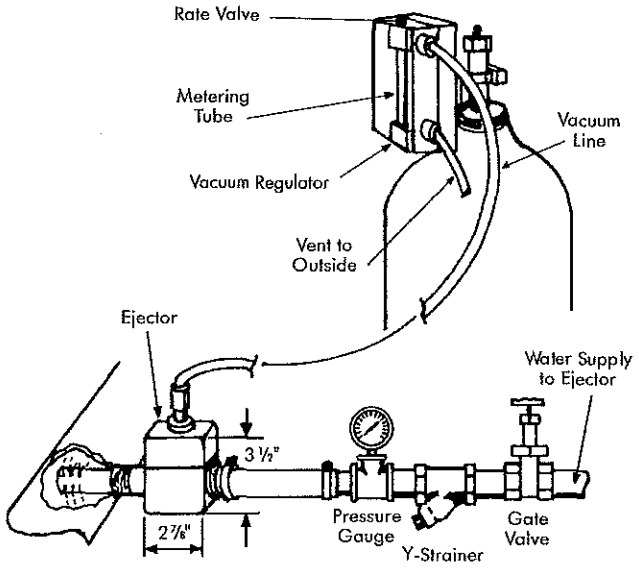
1. Always keep chlorine cylinders in an upright position with the valve cap tightened before moving full or empty cylinders. Cylinders should be moved with care.
2. A safety chain must be placed around the cylinder and secured to a wall. Spare full cylinders should also be secured carefully.
3. For best operation and safety, the **vacuum regulator and cylinders should be protected from the elements including direct sunlight.**
4. **Never** place heaters or heat lamps directly on a cylinder.
5. **Ammonia gas should NOT be stored or fed in the same room with chlorine.** Contact of the gases will result in an explosive mixture.

IMPORTANT NOTE:

HYDRO does not recommend the use of chlorine gas manifolds. *Manifolds contain pressurized chlorine gas thereby increasing the risk of a pressurized chlorine leak. HYDRO vacuum regulators are designed to mount directly onto the valve of chlorine and sulfur dioxide cylinders.* ***Direct cylinder mounting*** *is the easiest and* ***safest*** *configuration to operate and maintain. With this configuration, the chlorine gas flows under vacuum everywhere beyond the one pressure point at the chlorine cylinder valve.*

A typical HYDRO Model 500 series installation injecting chlorine into a pipe line using city water. The water supply to the ejector should be approximately twice the pressure of the chlorinated pipe line in order to create a sufficient vacuum at the ejector.

FIGURE 1A



SECTION I-B: SAFETY INFORMATION (TON CYLINDERS)

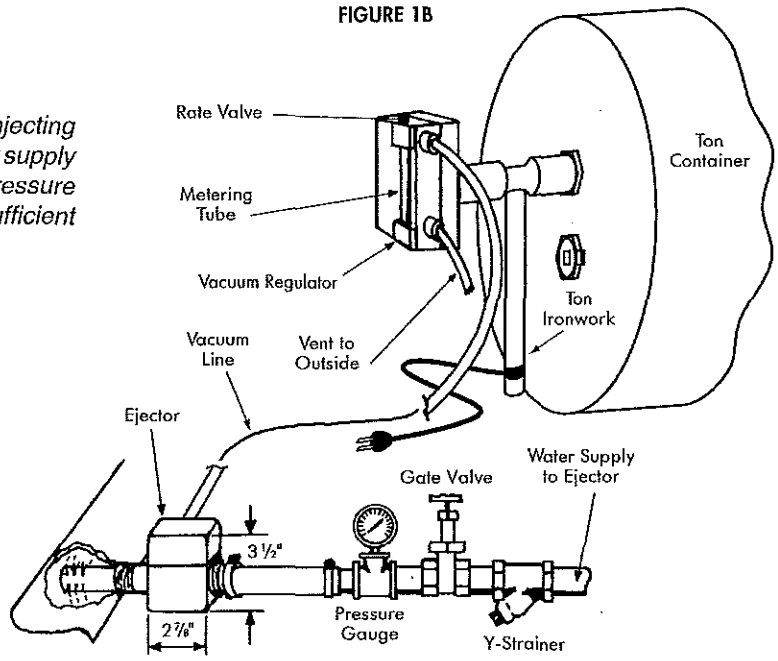
TAKE CARE WITH CHLORINE!

1. Valve protection covers must be on ton container valves **before they are ever moved.**
2. The ton container should be levelly placed on a pair of trunions.
3. Always place container so valves are at vertical position and use only the top valve which is the gas valve. **BOTTOM VALVE IS LIQUID—DO NOT USE.**
4. For best operation and safety, the ton container and vacuum regulator should be protected from the elements and direct sunlight.
5. **NEVER** apply heaters or heat lamps directly on a chlorine container.

IMPORTANT NOTE:

HYDRO does not recommend the use of chlorine gas manifolds. *Manifolds contain pressurized chlorine gas thereby increasing the risk of a pressurized chlorine leak. HYDRO vacuum regulators are designed to mount directly onto the valve of chlorine and sulfur dioxide cylinders.* ***Direct cylinder mounting*** *is the easiest and* ***safest*** *configuration to operate and maintain. With this configuration, the chlorine gas flows under vacuum everywhere beyond the one pressure point at the chlorine container valve.*

FIGURE 1B



A typical HYDRO Model 700 series installation injecting chlorine into a pipe line using city water. The water supply to the ejector should be approximately twice the pressure of the chlorinated pipe line in order to create a sufficient vacuum at the ejector.

SECTION II: DESIGN AND INSTALLATION NOTES

1. **The "all vacuum" system** means that system will shut off at the cylinder valve, should the vacuum line be broken, if water is stopped for any reason, or if the vacuum regulator is physically damaged.

2. Choosing a **vacuum regulator feed capacity:**

   VACUUM REGULATOR SIZE SHOULD BE ON MAXIMUM POSSIBLE FLOW.

   Imperial Units:

GPM	x	0.012	x	(PPM) Dosage	=	PPD
Gallons Per Minute				Parts Per Million		Pounds Per Day (Cl_2)

   Example: 600 GPM x 0.012 x 3 PPM = 21.6 PPD
   In this example a HYDRO 50 PPD vacuum regulator would be adequate.

   12,500 GPM X 0.012 = 150 PPD

   Metric Units:

LPM	x	0.0599	x	(PPM) Dosage	=	GPH
Liters Per Minute				Parts Per Million		Grams Per Hour (Cl_2)

   Flint WTP
   Long Side IN
   From P.S. 4 to
   Pt of Int. Cl2

3. **TOTAL BACK PRESSURE** is the pressure in the pipeline to be chlorinated plus the friction losses in the solution line between the ejector and the point of injection at the pipeline. Ejectors capable of operating with back pressures up to 300 Psig are available.

4. It is preferable that the ejector be located at the point of solution injection in order to eliminate the need for **solution lines.** Friction losses in the solution line will **increase the ejector back pressure.** Friction losses can be reduced by increasing the solution line internal diameter and limiting the number of flow restrictions and turns. Also, be sure that the solution line material is resistant to **the highly concentrated chlorine mixture. Avoid solution lines wherever possible.**

5. The only connection between the ejector and the vacuum regulator is the HYDRO specified black polyethylene tubing which carries the vacuum (originating at the ejector) to the vacuum regulator, allowing the system to operate. Up to 100 feet of polyethylene tubing between vacuum regulator and ejector is standard. For longer distances consult HYDRO.

SECTION III: SYSTEM INSTALLATION

(I) INSTALLATION OF HYDRO EJECTOR (Refer to Figure 1)

1. Installation of HYDRO EJECTOR:
   a. Remove the diffuser from the ejector assembly and place two wraps of Teflon tape on diffuser threads.
   b. **Do Not** install diffuser into pipe line when assembled with ejector.
   c. Turn diffuser by hand into NPT threads of pipe line ($^3/_4$" or 1 $^1/_4$" NPT). Place wrench on diffuser and tighten an additional **one half turn maximum.**
   d. Reconnect diffuser to ejector making sure O-rings are on each side of nozzle and diffuser.

2. Testing of ejector. *(Note: The vacuum regulator should still be in the shipping case.)*
   i. Piping hook up to ejector (Refer to Figure 1 and **Servicing Section in this Manual**).
      a. Ejector should be installed down stream at a sufficient distance so that chlorinated water is not re-circulated through the booster pump.
      b. On the water inlet side to the ejector nozzle the following should be installed: a water inlet valve, Y-strainer, and a pressure gauge.

ii. Testing for sufficient pump pressure to operate ejector. Also checking that booster pump (if applicable) operating in the proper direction.

Note 1: Ejector must have some back pressure to prevent jetting. (Jetting causes loss of vacuum)

Note 2: When chlorinating into a contact chamber a tee should be installed on the solution line with a vacuum breaker to prevent siphoning.

a. If operating with city water pressure (no booster pump), open the water inlet valve to the ejector and feel for suction (with your finger) at the fitting on the top of the ejector.

b. If using a booster pump, open the water inlet valve to the ejector and the pressure gauge should indicate a sufficient boost. (See ejector curves at the end of this manual.) If pump is operating in proper direction there should be a strong vacuum at the fitting on the top of the ejector. Feel for suction (with your finger) at the fitting on the top of the ejector.

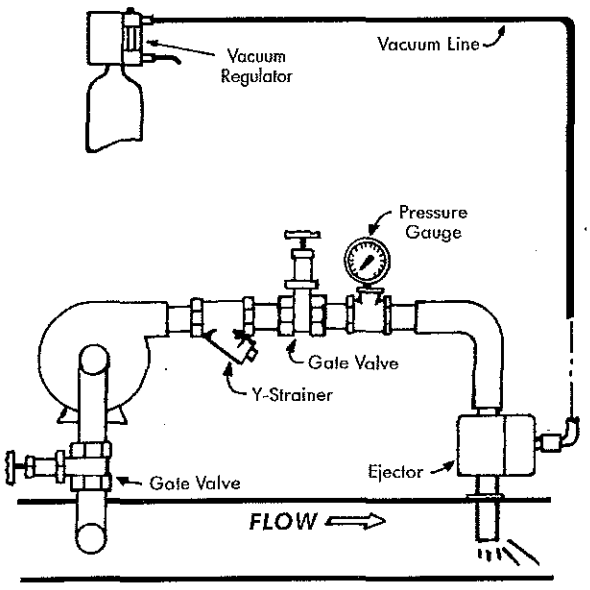
c. If the ejector has tested satisfactorily continue on to the next step (Mounting the Vacuum Regulator).

(II-A) INSTALLATION OF HYDRO VACUUM REGULATOR (150 lbs. Cylinders)

NOTE: The chlorine cylinder valve is CLOSED. Do not open the cylinder until instructed to do so.

1. See that safety chain is secured around chlorine cylinder.
2. Remove the cylinder protection cap from the chlorine cylinder.
3. Examine the vacuum regulator for obvious damage.
4. Remove masking tape on the back of the vacuum regulator used for shipping purposes.
5. Place lead gasket over vacuum regulator inlet assembly.
6. While placing lead gasket on vacuum regulator see that the filter is installed in the inlet assembly. (This filter is necessary to remove particles that may cause the vacuum regulator to leak to vent.)
7. Mount vacuum regulator on cylinder valve being sure the yoke screw is backed out far enough for sufficient clearance. While tightening the yoke screw be certain that the lead gasket stays in place. Excessive tightening can damage gasket and/or yoke screw. DO NOT USE EXCESSIVE FORCE.

FIGURE 2A



A typical HYDRO Model 500 series installation injecting chlorine into a pipe line using a centrifugal pump. Note the location of gate valves for easy Y-strainer cleaning and practical pump maintenance.

NOTE: Pump suction should be 5 feet away from ejector injection point. On larger pipe diameters of 6 inches or greater a distance of 10 times the pipe diameter should be maintained so that chlorinated water is not recirculated through the booster pump.

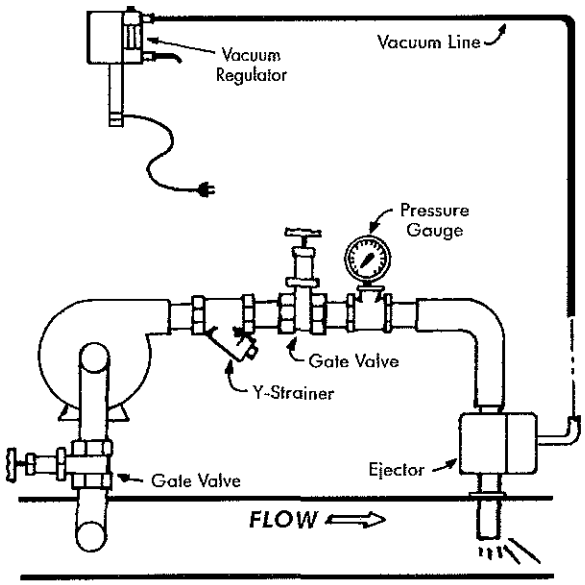
NOTE: Pump suction and ejector must be from the side of pipeline, not from top of the main.

(II-B) INSTALLATION OF HYDRO VACUUM REGULATOR (Ton Cylinders)

NOTE: The chlorine container valve is CLOSED. Do not open the valve until instructed to do so.

1. After the chlorine container has been properly installed, remove the valve protector.
2. Chlorine container valves must be in the vertical position with one valve directly above the other.
3. Look at position of top valve. If it faces to or opens on left, a left hand vacuum regulator is required. Check the vacuum regulator to see if you have a left hand unit.
4. Prior to removing the valve cap covering the chlorine container valve outlet, make certain the valve is in the closed position. Proceed by removing the cap **slowly.**
5. Inspect for and remove any debris found on the chlorine container valve or on the outlet gasket surface. Do not use a screwdriver or sharp tool to clean.
6. Before mounting, remove all tags and tape from the vacuum regulator. *NOTE: Check that all bolts are tight.*
7. Loosen yoke half-dog until the valve plate can be pushed all the way back.
8. Place a **new** $^1/_{16}$" gasket over chlorine inlet assembly. **Never** use any other type of gasket or re-use the same gasket.
9. Mount the vacuum regulator on container valve with yoke over the valve with the inlet and outlet properly aligned. Tighten the yoke screw while making certain the gasket has not fallen out. Excessive tightening can damage the gasket or yoke screw.
10. Place the support bracket, found on the vacuum regulator drip leg, over the lower valve.
11. Warm liquid drip leg by plugging in 25-watt heater. **This must be turned on 15 minutes before start-up.**

FIGURE 2B



A typical HYDRO basic installation injecting chlorine into a pipe line using a centrifugal pump. Note the location of gate valves for easy Y-strainer cleaning and practical pump maintenance.

NOTE: Pump suction should be 5 feet away from ejector injection point. On larger pipe diameters of 6 inches or greater a distance of 10 times the pipe diameter should be maintained so that chlorinated water is not recirculated through the booster pump.

NOTE: Pump suction and ejector must be from the side of pipeline, not from top of the main.

(III) CONNECTING VACUUM LINES BETWEEN VACUUM REGULATOR, EJECTOR AND VACUUM REGULATOR VENT TO OUTSIDE (Refer to Figures 1 and 2)

1. For units of 250 PPD (5 kg/hr) or less, the upper connector on right top of vacuum regulator is for vacuum line tubing to ejector. For 500 PPD (10 kg/hr) and above units, the lower connector on the right side of the back body is for the vacuum tubing to the ejector. (Allow enough vacuum tubing for changing cylinders.)
2. Connect vacuum tubing to second connector on the vacuum regulator and vent to safe area outside of building. (Place bug screen outside on end of vent tubing.)

   *NOTE: **Do Not** connect vent lines from two vacuum regulators to one common vent. You **must run separate** vent lines to the outside, when using multiple vacuum regulators.*

SERIES VM-150 VACUUM MONITOR INSTRUCTION MANUAL

VM-150 Rev.12/27/2011

TABLE OF CONTENTS

SECTION I: Introduction 3
SECTION II: Inventory 3
SECTION III: Specifications 3
SECTION IV: Operation Basics 4
A: Digital Display 4
B: LED Indicators 5
C: Alarm Relays 5
SECTION V: Installation .....

Series OV-110
Omni-Valve

Instruction Manual

The information contained in this manual was current at the time of printing. The most current versions of all Hydro Instruments manuals can be found on our website: **www.hydroinstruments.com**

Hydro Instruments
Series OV-110 Omni-Valve

Table of Contents

I. Functions, Capabilities, and Construction 3
1. Safety Precautions
2. Function of the OV-110
3. Physical Installation
4. Chemical Types and Ranges
5. Physical Design
6. Electrical Power, Inputs & Outputs
7. Alarm Conditions & Acknowledgement
8. Dip Switches

II. Control Methods 7
1. Flow Pacing (Proportional)
2. Residual (Set Point)
3. Compound Loop (PID)
4. Dual Input Feed Forward
5. Step Feed
6. Dual Set Point

III. User Interface 14

IV. Motion Control, Valve, and 10 Point Linearization 14

V. Operation Mode Screens 16

VI. Configuration Mode Screens 17

VII. Advanced Calibration Mode Screens 21
1. Purge Feature (for liquid feed systems)
2. Dosage Method Selection
3. Flow Stop
4. External Duty/Standby and Auto/Manual control options

VIII. Troubleshooting and Maintenance 23
1. Factory Default
2. Service

Figures:
1. Installation Drawing 3
2. Omni-Valve Construction 4
3. Omni-Valve Circuit Board 6
4. Figures 4-9: Control Schemes 7-13
5. Figures 10-12: Valve Linearization 14-15
6. Figures 13-16: Valve Body Diagrams 24-27

I. FUNCTIONS, CAPABILITIES, AND CONSTRUCTION

1. SAFETY PRECAUTIONS

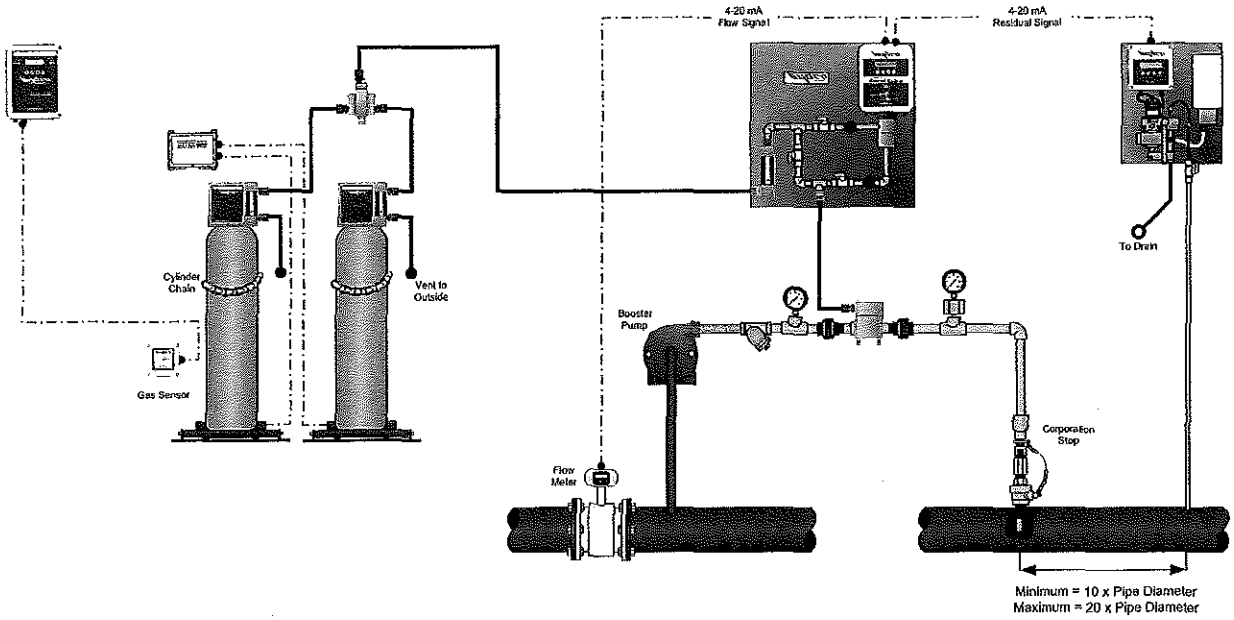
GENERAL: Be sure to follow all applicable and prudent safety precautions when working with chemicals and electrical equipment.

ELECTRICAL: The circuit board and incoming A/C power line do include electrical shock risk. Take care to avoid electrical shocks and do not touch any part of the circuit board or A/C power line unless you are certain that A/C power has been disconnected from the system.

CHECK FOR DAMAGE: Before removing the product from the shipping packaging, carefully check the equipment for damage. If any product is found damaged, do not put it into operation or install it. Contact Hydro Instruments to discuss repair or replacement of the damaged equipment.

2. **Function of the OV-110:** The OV-110 Omni-Valve is designed to automatically control chemical feed rate based on one or more electrical input signals. Figure 1 shows an example installation drawing.

FIGURE 1



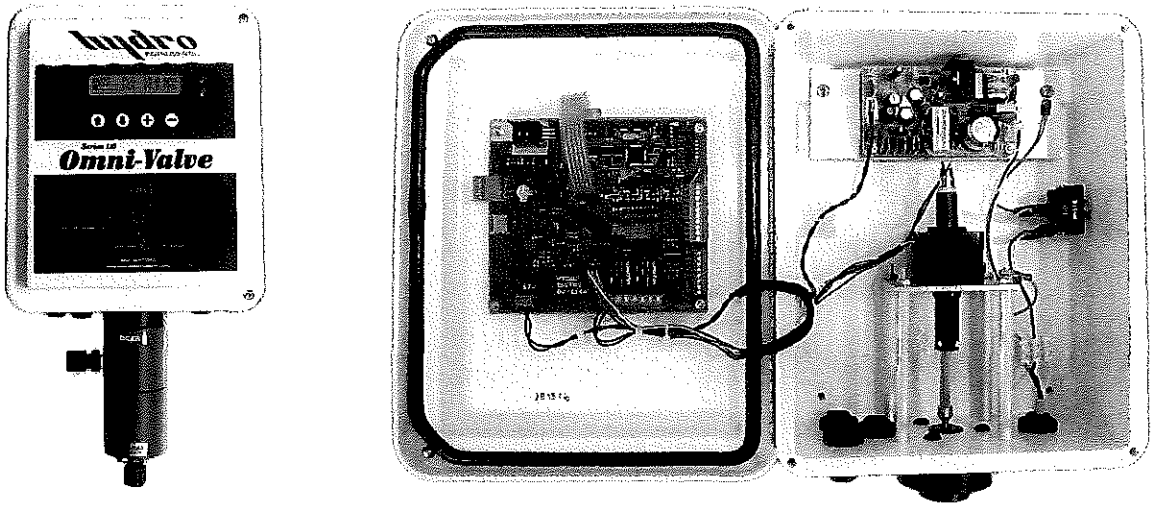
3. **Physical Installation:** The Omni-Valve must be mounted in the chemical feed line downstream from a chemical flow meter and upstream from the feed point (i.e. ejector, vacuum pump or check valve diffuser). Consider Figure 1 above.

   NOTE: If the automatic valve is being used for liquid chemical feed such as sodium hypochlorite, having the chemical physically higher than the valve will create a hydrostatic pressure which could cause failure of the valves internal seals.

4. **Chemical Types and Ranges:** For gaseous chemical feed applications, the OV-110 Omni-Valve is most commonly used for chlorine, sulfur dioxide, ammonia, and carbon dioxide. For liquid chemical feed applications, the OV-110 Omni-Valve is most commonly used for sodium hypochlorite, hydrochloric acid, sodium bisulfite, sodium bisulfate, sodium chlorite, and aqueous ammonia solutions. Consult Hydro Instruments for usage in other chemical applications and for available feed rate ranges.

5. **Physical Design:** *(See Figure 2)*
The Omni-Valve is the combination of a microprocessor controller and control valve in one compact unit. Both the microprocessor and the valve motor assembly are housed together in one NEMA 4X rated enclosure. The valve body is mounted onto the bottom face of the enclosure. The valve body is constructed of solid machined PVC parts. There are several different valve body sizes available. Valve shafts, valve stems, valve seats, and O-ring materials are selected for maximum corrosion resistance to the chemical being used. Two PTFE shaft seals separate the chemical from the interior of the enclosure. There is also a vent port to the outside in between the two shaft seals for additional protection against chemical entry to the enclosure. A variety of valve seats and valve stems are available to provide many different chemical feed rate ranges.

FIGURE 2



6. **Electrical Power, Inputs & Outputs:** *(See Figure 3)* The Omni-Valve has the following electrical connections.
   a. Offered in either 120 VAC or 240 VAC. (50 to 60 Hz)
   b. Three analog input channels. Each channel has dip switches to select between 4-20mA and 0-10V. Each channel has a 150 Ohm input impedance.
   FLO – Used for water flow meter or proportional control input signals.
   RES – Used for residual, ORP, or other set point input signals.
   DOS – Various user selected uses available. See Sections II and VII.2.
   c. Four 24 VDC relay input channels (SF1 – SF4). Used for Step Feed Control. NOTE: The acceptable range is 12 to 24 VDC. See Section II.6. If not using step feed control, then SF3 can be used for external selection of duty/standby. Also, (if enabled in Section VII.4 then) SF4 can be used for remote control of Auto/Manual mode. See Figure 3 and Section VII.4.
   d. Two 4-20mA analog output channels. Both represent chemical feed rate (based on valve position). Each channel has a 250 Ohm output impedance.
   e. There are two relays. Both NC and NO connections are available. Rating is 10 Ampere (resistive) and 250 VAC 250 VDC.
   See Figure 3 and Section VI screen 6b. This relay can be selected to be a common alarm relay or to indicate AUTO or MANL operation.

f. Modbus RS-485 communication. The Omni-Valve is equipped for remote display and communication using the modbus RS-485 standard. To do this, you must define the node, baud rate and parity of the system. For more information on how to setup modbus refer to the Modbus Communication Setup document.

7. **Alarm Conditions & Acknowledgement:** Alarm conditions are displayed on the alarm screen in operation mode. See Section V.

   Acknowledgement – Press the "minus" ⊖ key to acknowledge the alarm.

   NOTE: Any of the below contacts will activate this alarm relay. The alarm is non latching.

Control Mode	Alarm Condition	Description	Action
Flow Pacing	Flow Signal Loss	PV1 Signal below 4 mA	Valve Close or Hold Position**
Flow Pacing	Low Flow	PV1 Signal below set point*	None
Residual/ORP	Res/ORP Signal Loss	PV2 Signal below 4 mA	Valve Close or Hold Position**
Residual/ORP	Low Residual	PV2 Signal below set point***	None
Residual/ORP	High Residual	PV2 Signal above set point***	None
Compound Loop or Feed Forward	Flow Signal Loss	PV1 Signal below 4 mA	Switch to Residual/ORP Condn 1
Compound Loop or Feed Forward	Low Flow	PV1 Signal below set point*	None
Compound Loop or Feed Forward	Res/ORP Signal Loss	PV2 Signal below 4 mA	Switch to Flow Pacing Control
Compound Loop or Feed Forward	Low Set Point	PV2 Signal below set point***	None
Compound Loop or Feed Forward	High Set Point	PV2 Signal above set point***	None

8. **Dip Switches:** These switches are used to select whether the analog input channels are to be used for 4-20 mA or 0-10 Volts. They are always set for 4-20 mA at the factory. *(See Figure 3.)*
   a. Switch 1 and 2 set the FLO (PV1) input channel for a 4-20 mA input when switch 1 is on (up) and switch 2 is off (down). The FLO input channel is set for 0-10 Volts when switch 1 is off (down) and switch 2 is on (up).
   b. Switch 3 and 4 set the RES (PV2) input channel for a 4-20 mA input when switch 3 is on (up) and switch 4 is off (down). The RES input channel is set for 0-10 Volts when switch 3 is off (down) and switch 4 is on (up).
   c. Switch 5 and 6 set the DOS (PV3) input channel for a 4-20 mA input when switch 5 is on (up) and switch 6 is off (down). The DOS input channel is set for 0-10 Volts when switch 5 is off (down) and switch 6 is on (up).

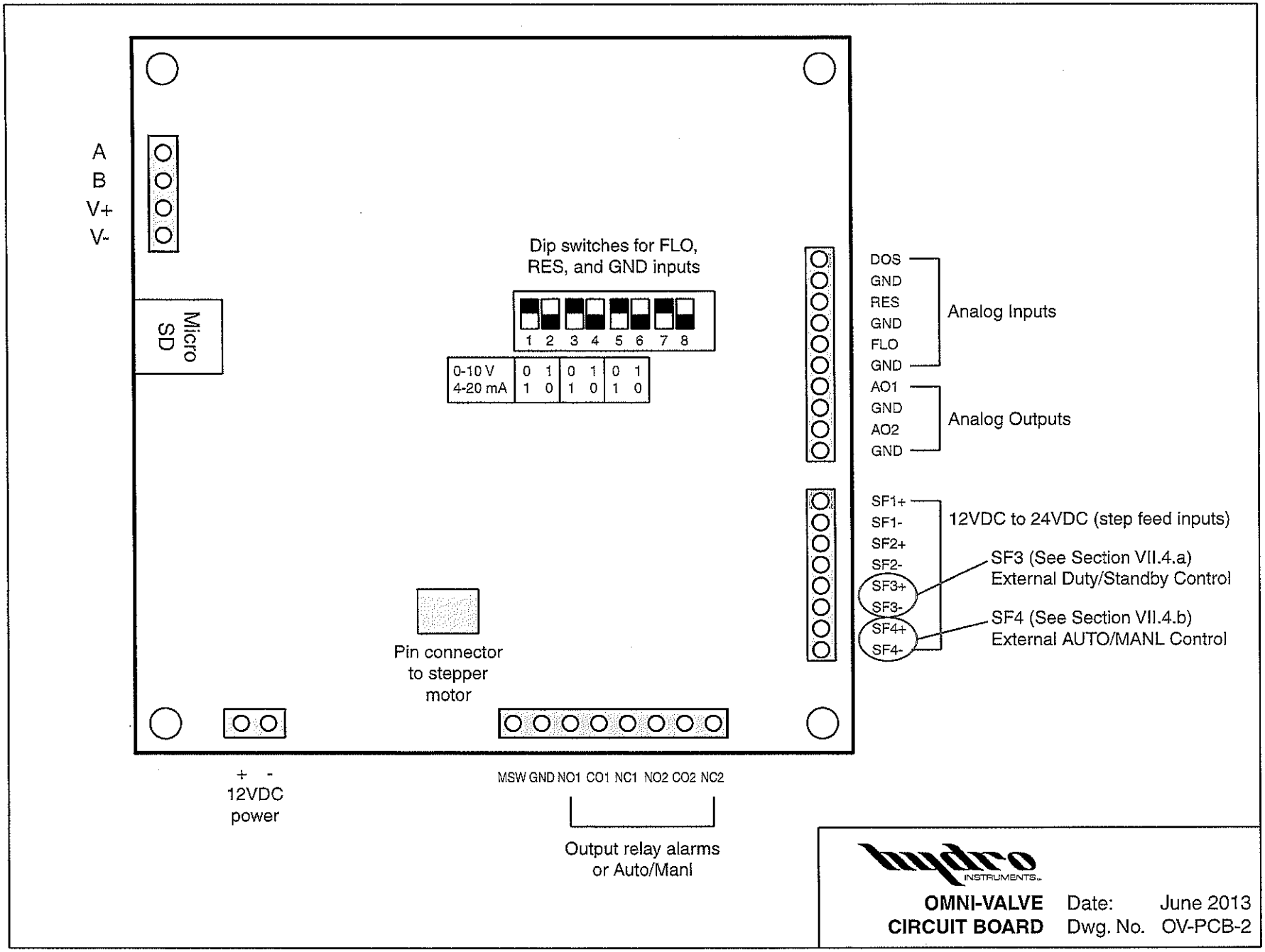

A
B
V+
V-
Micro SD
Dip switches for FLO, RES, and GND inputs
1 2 3 4 5 6 7 8
0-10 V 0 1 0 1 0 1
4-20 mA 1 0 1 0 1 0
DOS
GND
RES
GND
FLO
GND
Analog Inputs
AO1
GND
AO2
GND
Analog Outputs
SF1+
SF1-
SF2+
SF2-
SF3+
SF3-
SF4+
SF4-
12VDC to 24VDC (step feed inputs)
SF3 (See Section VII.4.a) External Duty/Standby Control
SF4 (See Section VII.4.b) External AUTO/MANL Control
Pin connector to stepper motor
+ -
12VDC power
MSW GND NO1 CO1 NC1 NO2 CO2 NC2
Output relay alarms or Auto/Manl
OMNI-VALVE CIRCUIT BOARD
Date: June 2013
Dwg. No. OV-PCB-2

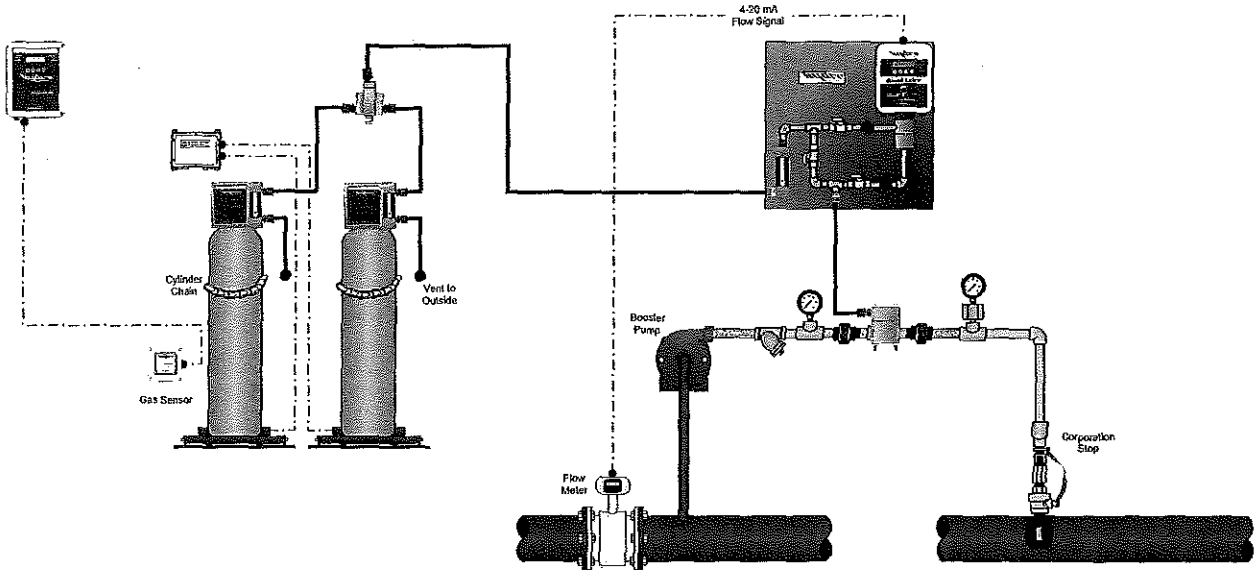
FIGURE 3

II. CONTROL METHODS

The OV-110 Omni-Valve offers the following control methods. The control method is selected in the Configuration Mode (See Section VI).

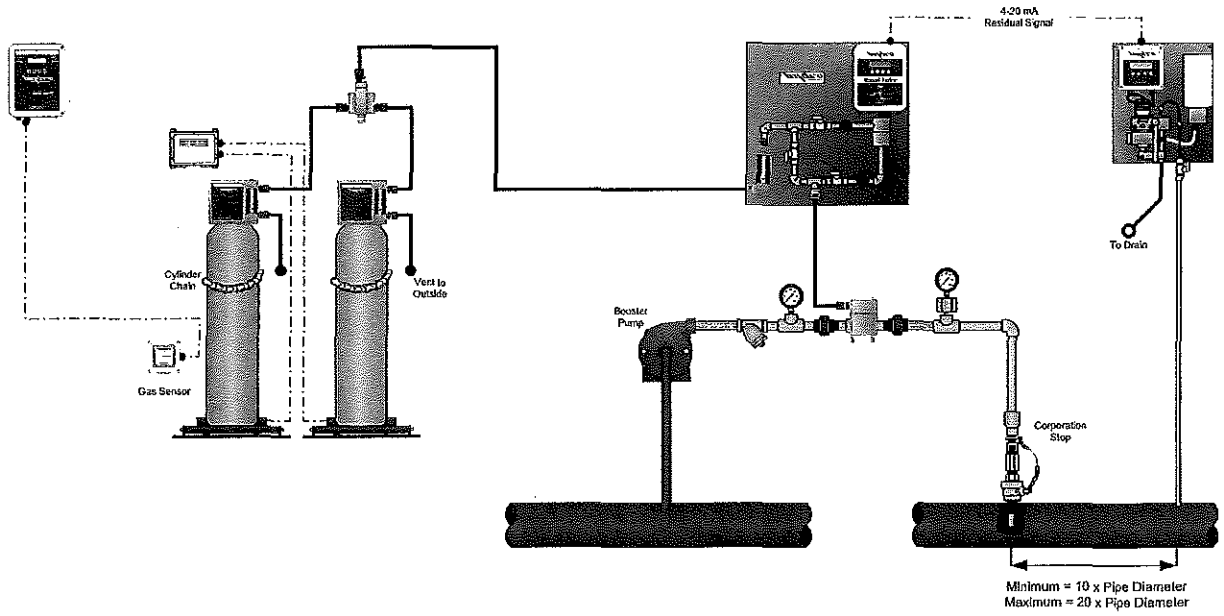
1. **Flow Pacing (Proportional):** Figure 4 below shows an example installation.
   a. *Application:* This control method is suitable when water quality is consistent, but water flow rate is variable.
   b. *Control Signals:* In this case, a 4-20mA (or 0-10V) signal from the water flow meter (measuring water flow just upstream from the injection point) is input to the FLO/GND input channel of the OV-110.
   NOTE: If desired, a proportional 4-20mA control signal from any PLC can be used in the same fashion.
   c. *Control Concept:* Chemical feed rate is adjusted in direct proportion to the input signal with no delay.
   d. *Initial Settings:* In the Configuration Mode (Section VI), the flow settings will need to be adjusted to match the water flow meter being used.
   e. *User Interaction:* During operation, the user only needs to adjust the dosage setting to adjust the ratio of chemical feed rate to water flow rate. Optionally the dosage can be remotely adjusted by means of the DOS/GND input channel. See Section VII.2.

FIGURE 4 – FLOW PACING



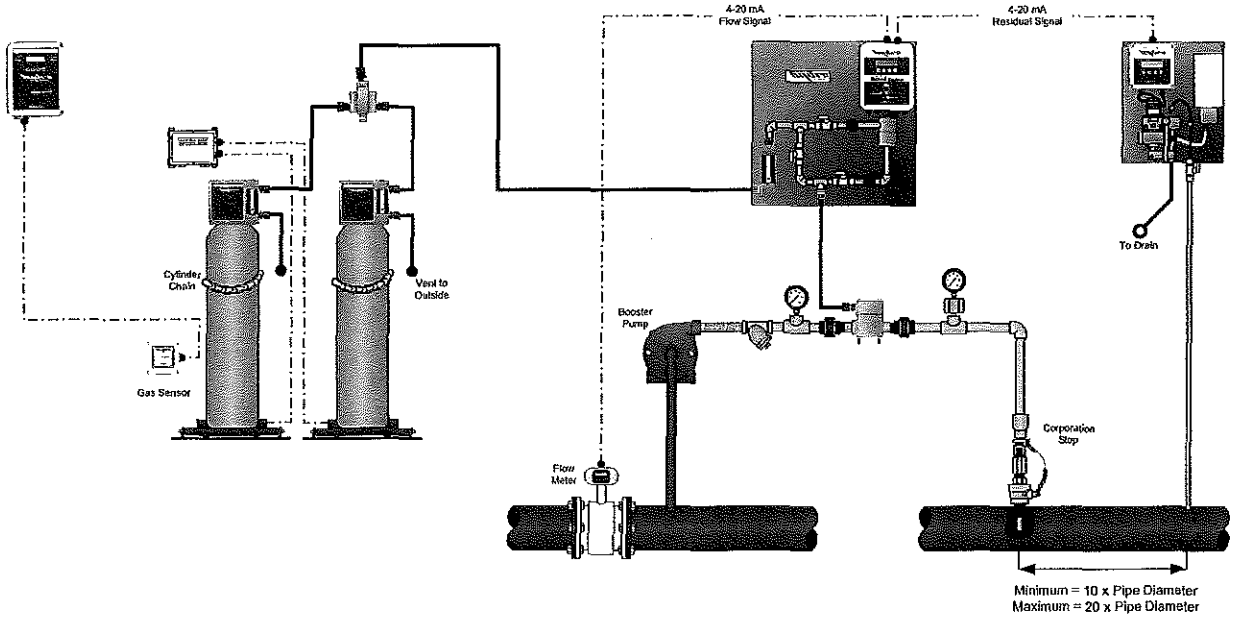
2. **Residual/ORP (Set Point):** Figure 5 below shows an example installation.
   a. *Application:* This control method is suitable when water quality is variable, but water flow rate is constant or relatively steady.
   b. *Control Signals:* In this case, a 4-20mA (or 0-10V) signal from the residual analyzer (measuring residual just downstream from the injection point) is input to the RES/GND input channel of the OV-110.
   c. *Control Concept:* Chemical feed rate is periodically adjusted in order to keep the resultant chlorine residual (or ORP or similar chemical concentration) on the user determined set point.
      i. Sample point selection is very important. Sample point must be at least 10 x pipe diameter downstream (to ensure complete mixing prior to sampling) and the lag time ("lag time" = the time it takes the chemical to travel from the Omni-Valve to the residual analyzer) should be minimized to optimize control (ideally limit this time to less than 5 minutes).
      ii. The Omni-Valve will only adjust chemical feed rate once every lag time. Each time the lag time expires, the Omni-Valve will compare the residual reading with the residual set point and if the residual reading is not on set point, then the chemical feed rate will be adjusted to bring the residual back toward the set point.
   d. *Initial Settings:* In the Configuration Mode (Section VI):
      i. The residual settings will need to be adjusted to match the residual analyzer that is being used.
      ii. The lag time will need to be measured on site and then entered.
      iii. Dead Band: The Dead Band allows for an adjustable range around the set point that is considered acceptable for residual. As long as the residual reading is within this range (+ or -) from the set point, then the residual is considered to be on set point.
      iv. Integral: The Integral "I" controls the magnitude of each chemical feed rate adjustment. The typical range is $10\% < I < 30\%$. If the integral setting is too low, then the Omni-Valve will be too slow in making adjustments and if the integral setting is too high, then it will continually overshoot the set point (residual oscillating between too high and too low).
   e. *User Interaction:* During operation, the user only needs to adjust the residual set point. Optionally the set point can be remotely adjusted by means of the DOS/GND input channel. See Section VII.2.

FIGURE 5 – RESIDUAL (SET POINT)



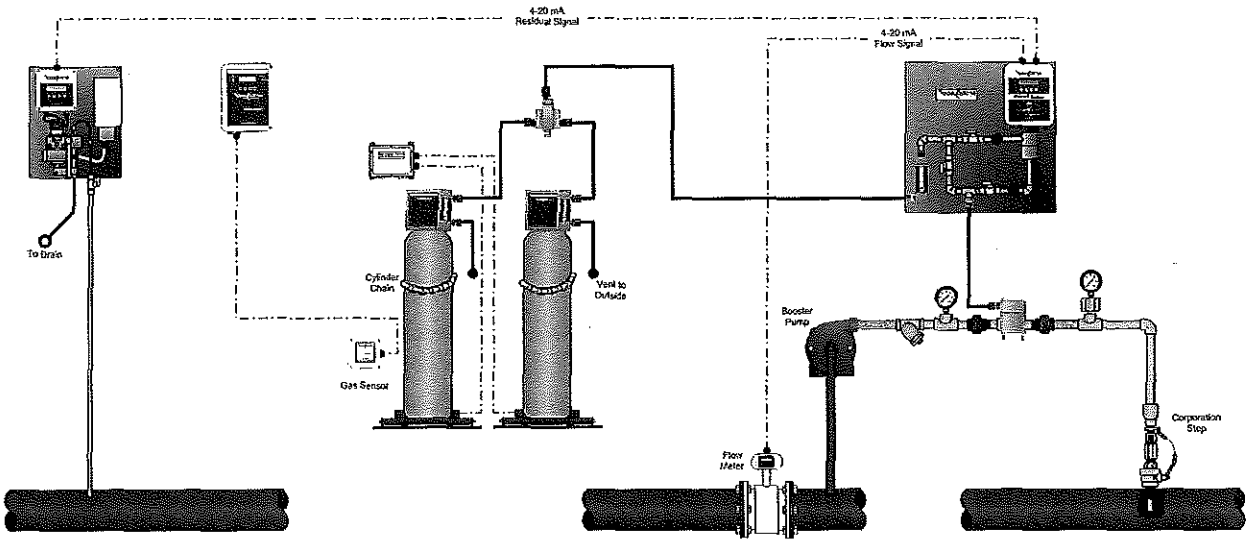
3. **Compound Loop (PID):** Figure 6 below shows an example installation.
   a. *Application:* This control method is suitable when both water quality and water flow rate are variable.
   b. *Control Signals:* In this case, two input signals are required:
      i. A 4-20mA (or 0-10V) signal from the water flow meter (measuring water flow just upstream from the injection point) is input to the FLO/GND input channel of the OV-110.
      ii. A 4-20mA (or 0-10V) signal from the residual analyzer (measuring residual just downstream from the injection point) is input to the RES/GND input channel of the OV-110.
   c. *Control Concept:* Both Flow Pacing (Section II.1) and Residual (Section II.2) are being carried out simultaneously. Review both above Flow Pacing and the Residual Control sections.
   d. *Initial Settings:* In the Configuration Mode (Section VI):
      i. All of the settings from both Flow Pacing (Section II.1) and Residual (Section II.2).
      ii. Flow Stop: If the water flow completely stops, then the Omni-Valve will continue to adjust based on residual. This can be avoided by setting a lower limit on the flow signal below which the automatic control will automatically turn off. See section VII.3.
      iii. Variable lag time: Since the lag time is often approximately inversely proportional to the water flow rate (meaning as the water flows faster, the lag time will decrease), Compound Loop Control method allows for a variable lag time. If variable lag time is to be used, then it needs to be enabled, the lag time, the water flow rate at that entered lag time, and a maximum allowable value for lag time must all be entered in the Configuration Mode.
   e. *User Interaction:* During operation, the user will adjust both the dosage (Section II.1) and the residual set point (Section II.2). Optionally the dosage or the set point can be remotely adjusted by means of the DOS/GND input channel. See section VII.2.

FIGURE 6 – COMPOUND LOOP (PID)



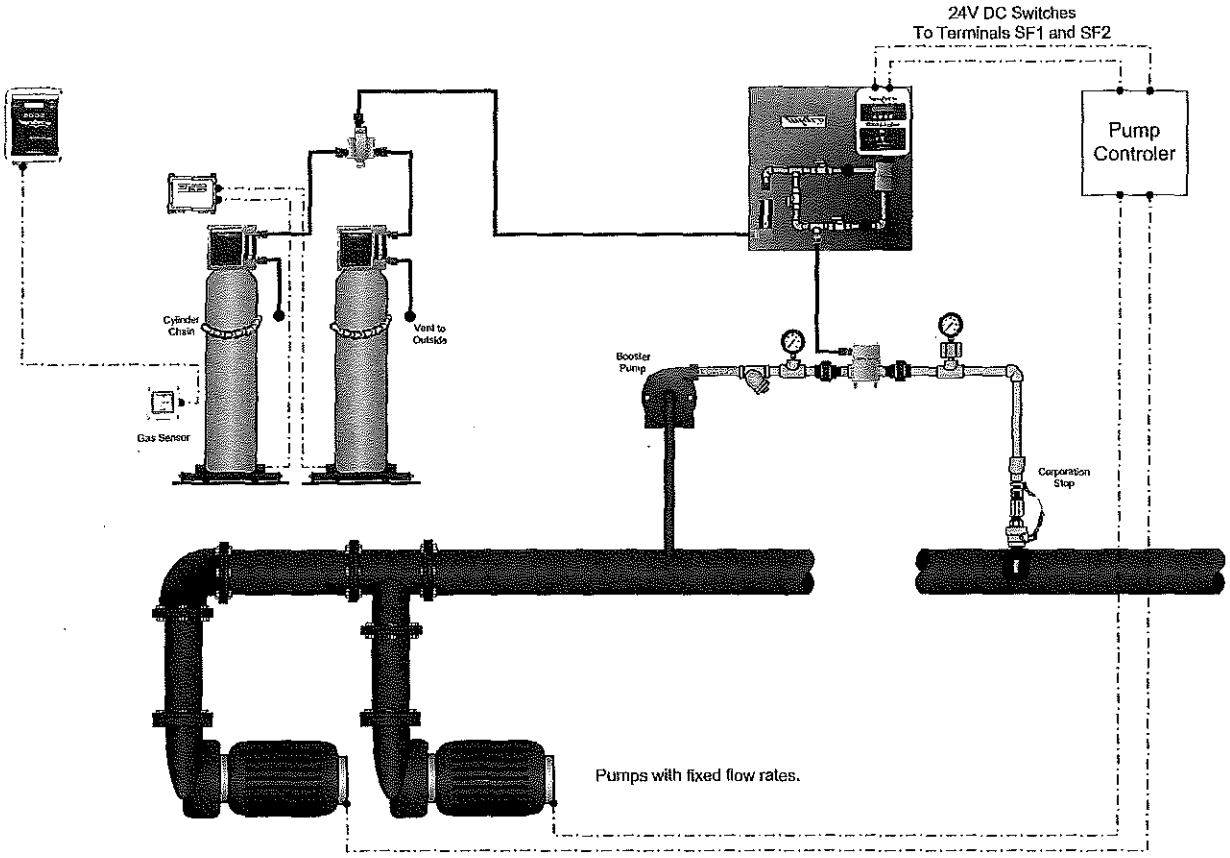
4. **Dual Input Feed Forward:** Figure 7 below shows an example installation.
   a. *Application:* Chemical feed rate is controlled in proportion to the mass flow rate of a second chemical that is already in the water stream. This is most commonly used in de-chlorination and chloramination applications. In these applications, chemical is being injected in order to react with another chemical that is already present in the water stream.
   b. *Control Signals:* In this case, two input signals are required:
      i. A 4-20mA (or 0-10V) signal from the water flow meter (measuring water flow just upstream from the injection point) is input to the FLO/GND input channel of the OV-110.
      ii. A 4-20mA (or 0-10V) signal from the residual analyzer (measuring residual of the target chemical just upstream from the injection point) is input to the RES/GND input channel of the OV-110.
   c. *Control Concept:* This method requires a water flow signal and a residual signal for the other chemical that is already present in the water stream. The Omni-Valve uses these two signals to calculate the mass flow rate of the other chemical in the water stream. The Omni-Valve will then control chemical feed rate in proportion to this mass flow rate.
   d. *Initial Settings:* In the Configuration Mode (Section VI):
      i. All of the settings from both Flow Pacing (Section II.1).
      ii. Residual (Section II.2) signal reading parameters only (no Dead Band, Lag Time, or Integral).
   e. *User Interaction:* During operation, the user only needs to adjust the dosage setting to adjust the ratio of chemical feed rate to the other chemical mass flow rate. Optionally the dosage can be remotely adjusted by means of the DOS/GND input channel. See Section VII.2.

FIGURE 7 – DUAL INPUT FEED FORWARD



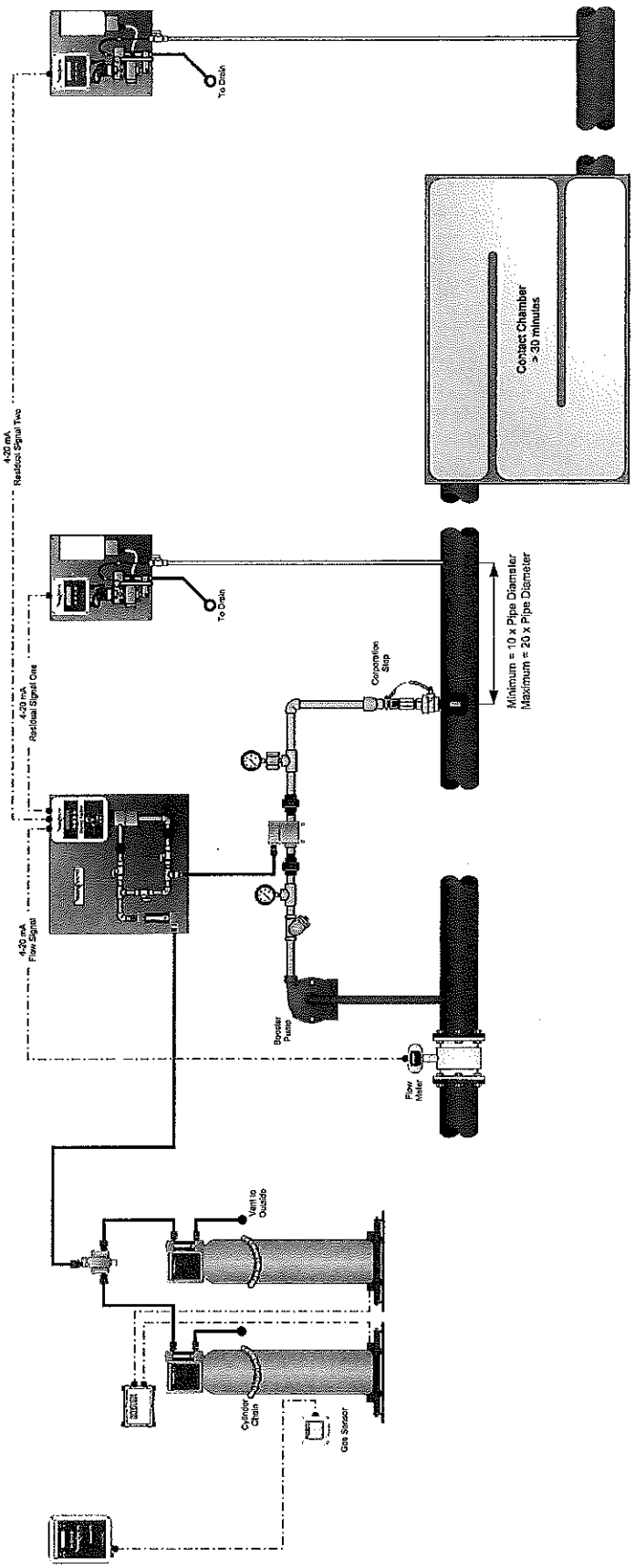
5. **Step Feed:** Figure 8 below shows an example installation.
   a. *Application:* This control method is useful for systems injecting chemical into a line downstream of one to four supply pumps when each of the pumps has a fixed flow rate (up to four wells or other pumps feeding one line).
   b. *Control Signals:* In this case, there will be up to four 24VDC dry contact input signals. These signals are used to indicate whether each pump is on or off. The signals are to be connected to the SF1+/SF1-, SF2+/SF2-, SF3+/SF3-, and SF4+/SF4- input channels. NOTE: The acceptable range is 12 to 24 VDC.
   c. *Control Concept:* Up to four relay contact signals are input to the Omni-Valve. Each relay can be allotted a fixed chemical feed rate. The Omni-Valve chemical feed rate is then set to the sum of the feed rates allotted to the relays that are active.
   d. *Initial Settings:* In the Configuration Mode (Section VI), the chemical feed rate for each input channel must be entered.
   e. *User Interaction:* During operation, no user interaction is required.

FIGURE 8 – STEP FEED



6. **Dual Set Point:** Figure 9 shows an example installation.
   a. *Application:* This control method is designed for applications injecting chemical upstream of a contact chamber. In such cases, a residual analyzer nearby the injection point can be used to control chemical injection. This allows for automatic control of residual at the injection point. However, control of the residual at the outlet of the contact chamber is the ultimate goal. If water quality remains constant then there will be a fixed drop in residual between the injection point and the contact chamber outlet. However, water quality variations will cause this residual drop to be variable. This control method is used to overcome this problem and allow for fully automated chemical feed rate control in such situations.
   b. *Control Signals:* In this case, two input signals are required:
      NOTE: Refer to Section VII.2.d. for information on how to activate the DOS/GND input.
      i. A 4-20mA (or 0-10V) signal from the residual analyzer (measuring residual just downstream from the injection point) is input to the RES/GND input channel of the OV-110.
      ii. A 4-20mA (or 0-10V) signal from the residual analyzer (measuring residual at the contact chamber outlet) is input to the DOS/GND input channel of the OV-110.
   c. *Control Concept:* The OV-110 can be operated in either Residual Control or Compound Loop Control using the Dual Set Point control method. In either case, the chemical feed rate control will be carried out using the residual signal coming into RES/GND (as described in Sections II.2 and II.3).
      i. As in the above Section II.2 and II.3, there will be a lag time for the injection point analyzer (RES/GND channel). We will call this lag time "LT1". As described in Sections II.2 and II.3, this lag time should be limited to 5 minutes or less.
      ii. There will also be a lag time for the residual analyzer (DOS/GND channel) that is located at the outlet of the contact chamber. This lag time (call it LT2) should be set as the delay from feed rate changes to registering on the DOS/GND analyzer plus 3 to 4 times LT1. For example, if LT1 = 100 seconds and the delay for the DOS/GND analyzer is 1800 seconds, then set LT2 = 1,800 + 3 x 100 = 2,100 seconds. LT2 has a range up to 9999 seconds (over 2 hours & 46 minutes).
      iii. In this Dual Set Point control method, there is a user adjustable set point for each of the analyzers. We will call them SP2 (RES/GND channel) and SP3 (DOS/GND channel).
      iv. The Dual Set Point control method concept is that each time the LT2 lag time expires, the Omni-Valve will compare the residual reading (on DOS/GND channel) with its SP3 set point. If this residual reading is not on set point, then the Omni-Valve will then automatically adjust the SP2 accordingly.
   d. *Initial Settings:* In the Configuration Mode:
      i. The residual settings will need to be adjusted to match each of the residual analyzers.
      ii. Both of the lag times (LT1 and LT2) will need to be measured on site and entered.
      iii. "PV3 Integral" is used to adjust the magnitude of each SP2 adjustment. (1% < PV2 Integral < 100%). The default value is 50%. See section VI, screen 8c.
      iv. Some of the settings made for the "Res" input will be used for "Res2". Those include: units, decimal position, filter time, and dead band.
   e. *User Interaction:* If in Residual Control Mode, then the user will be able to adjust both of the residual set points (SP2 and SP3). If in Compound Loop Control Mode, then the user will also adjust the dosage.

FIGURE 9 – DUAL SET POINT



III. USER INTERFACE

The Omni-Valve operation and adjustments are carried out through the following interface features.

1. **Display:** Two line, 20 character per line, alphanumeric LCD.
   Keypad Operation – The keypad is used in all three modes of the OV-110. Generally the keys are used as outlined here below. However, detailed instructions will follow.
   a. ⬆ & ⬇ keys – These keys are used to cycle through the various display screens. These keys will be referred to as "up arrow" and "down arrow".
   b. ⊕ & ⊖ keys – These keys are generally used to adjust settings and values within the screen being displayed. These keys will be referred to as "plus" and "minus". Additionally, the plus key is used as Enter for blinking options on the Configuration modes SETUP screen or to Enter yes/no selections while in the Advanced Calibration mode.
2. On the main operating screen you can manually switch between automatic (AUTO) and manual (MANL) modes of the Omni-Valve by pressing the ⊕ key. The valve can be changed from AUTO to MANL remotely as well, see section VII.4 for details.

IV. MOTION CONTROL, VALVE, AND 10 POINT LINEARIZATION

The Omni-Valve uses a linear stepper motor for valve stem motion control. The motor shaft is directly coupled to the valve shaft. The motor covers its range of motion in 2000 steps. The motor position over the range can also be described in terms of motor steps (where a position of 0 steps is the fully closed position and a position of 2000 steps is the fully open position). In a given system, each motor position will correspond to a chemical feed rate. For example motor positions from 0 to 215 might correspond to zero chemical feed and motor position 1925 might correspond to the maximum chemical feed rate. There is a calibration procedure that must be carried out with an external chemical flow meter in order to calibrate each Omni-Valve in each installation (calibrate the motor position vs. chemical feed rate). Consider Figures 10 through 12 and review Section VII screens 6a – 7.

FIGURE 10

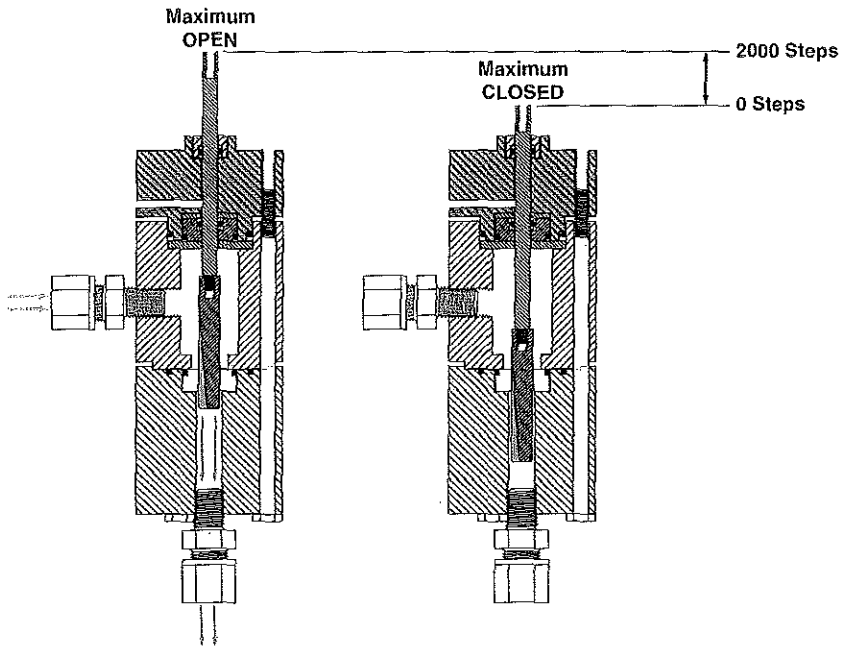
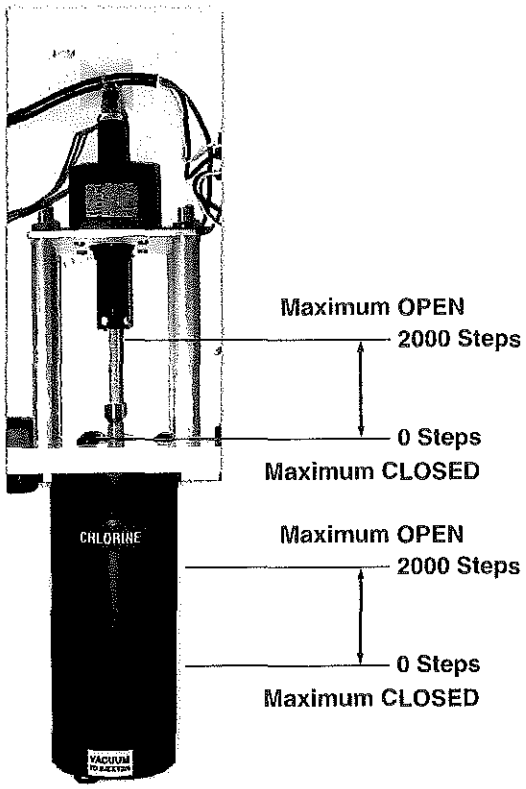
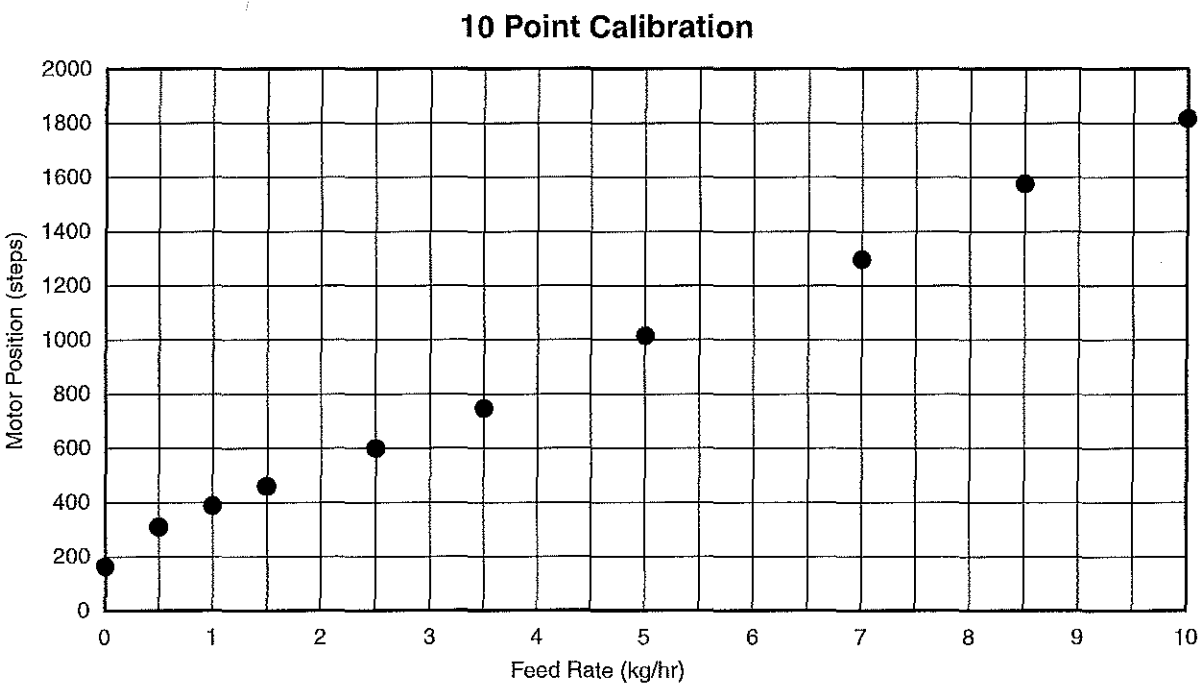


FIGURE 11



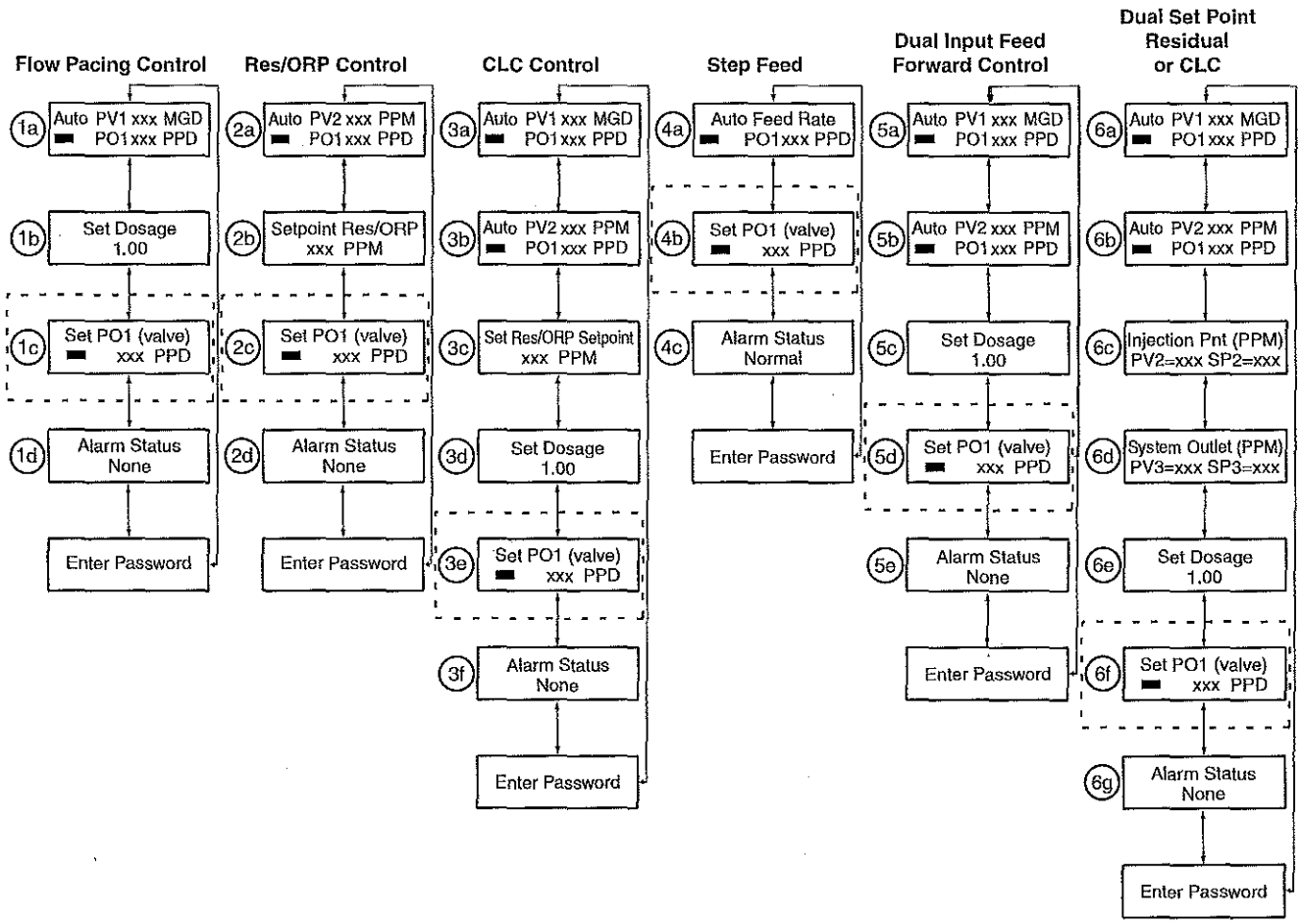
Feed Rate %	Feed Rate kg/hr	Motor Position Steps
0%	0	160
5%	0.5	305
10%	1	395
15%	1.5	450
25%	2.5	600
35%	3.5	750
50%	5	1010
70%	7	1300
85%	8.5	1570
100%	10	1820

FIGURE 12



V. OPERATION MODE

The operation mode is a set of screens that display the main operating parameters based on the control type selected in the configuration mode. The dosage, residual/ORP set point, and chemical feed rate can be adjusted from these screens.



NOTES:

1. On the first screen on each mode, use the ⊕ key to switch between AUTO and MANL.
2. "Set PO1 (valve)" screens only appear if set to MANL mode. From this screen the user can set the Omni-Valve feed rate manually using the ⊕ and ⊖ keys.
3. Use the ⊕ and ⊖ keys to adjust Dosage, Set Points, Valve Position (PO1) etc...
4. Screens 6a and 6e only appear if Compound Loop is selected when in Dual Set Point Mode.

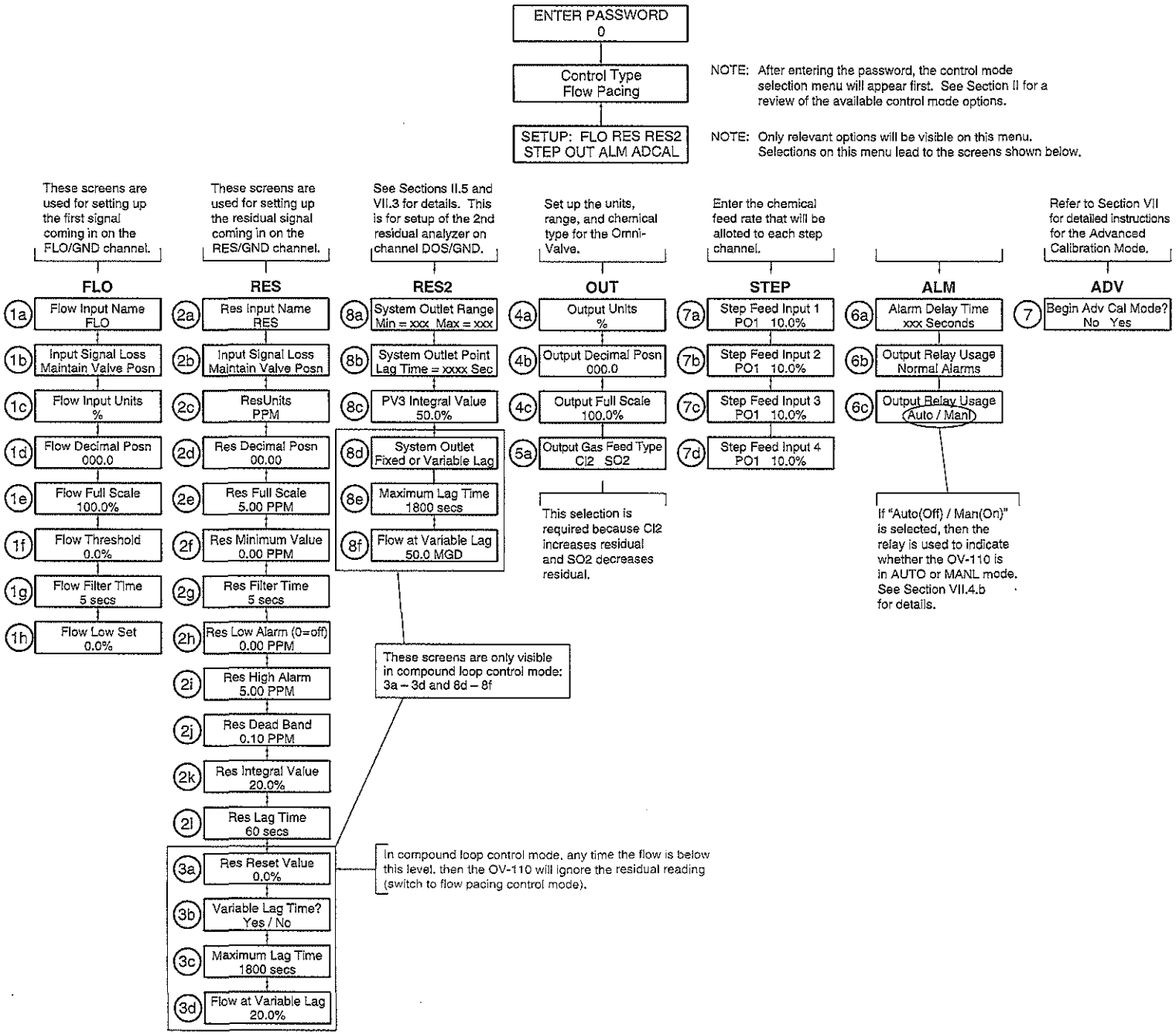
Dosage: This value is a multiplication factor for the calculated chemical feed rate. It can be set to fine tune the feed rate when in Flow Pacing, Compound Loop, Feed Forward or Dual Set Point control.

Flow Pacing Example:

Valve Output = [(Actual Flow/Flow Full Scale) * Valve Full Scale] * Dosage

Setpoint: The set point is the residual/ORP/pH value that the Omni-Valve will try to maintain.

VI. CONFIGURATION MODE



The configuration mode of the Omni-Valve allows the user to adjust key parameters to the control type selected. As a general reference all settings on the analyzer should match the setting on the incoming signals. The following is a brief description of what each setting does. Note that based on the type of control method selected all the screens may not appear.

Enter Password: To enter the configuration mode, a password must be entered. Hydro Instruments' has set this password equal to "110".

Control Type: This screen allows the user to select the control type desired. Refer to section II for the optimal control type desired.

FLO – Flow

These screens are used for setting up the water flow signal and control parameters.

Flow Input name: This screen allows the user to enter a name for the flow signal. Options include: PV1, H2O, PRO, FLO.

Input Signal loss: This screen will dictate to the omni-valve what to do when an input signal (FLO, RES, DOS) has be lost. The omni-valve can be selected to either maintain its current position, or close the valve and shut off feed until the signal is restored.

Flow Input Units: This screen allows the user to set the flow units on the omni-valve. Options included: %, GPM, MGD, LPM, MLD, GPD, M^3/HR.

Flow Decimal Posn: This screen sets the decimal position of flow signal on the omni-valve.

Flow Full Scale: This screen sets the full scale of flow rate the omni valve will display. I.E. the flow rate when the signal input is at 20 mA (or 10 V). It is very important to match this with the full scale of the flow meter.

Flow Threshold: This value determines the flow percentage below which the flow signal will be ignored. This also re-scales the incoming flow signal. For example, with a 4-20 mA signal and a flow threshold of 50%, the omni-valve will remain closed at any signal below 12 mA and will begin feeding above 12 mA linearly up to 20 mA. For normal operation this value should be set at 0% so that it will feed throughout the whole 4-20 mA range.

Flow Filter Time: This value will set the time over which the omni-valve will average incoming flow signal.

Flow Low Set: This is used for alarm indication for when the flow rate has gone below the set value.

RES – Residual

These screens are used for setting up the residual signal and control parameters.

Res Input name: This screen allows the user to enter a name for the residual signal. Options include: RES, ORP, pH, Ch1, PV2.

Res Units: This screen allows the user to enter the units for the incoming residual signal. Options include: PPM, mg/L, mV, pH, GPD.

Res Decimal Posn: This screen sets the decimal position of residual on the Omni-Valve.

Res Full Scale: This screen sets the full scale residual/ORP displayed on the Omni-Valve. This corresponds the 20 mA (or 10 V) output from the downstream controller.

Res Minimum Value: This screen sets the low end value of the residual/ORP signal. This would correspond to the 4 mA (or 0V) incoming signal from the downstream controller. This value is more often adjusted in ORP control type applications.

Res Filter Time: This value will set the time over which the omni-valve will average incoming residual/ ORP signal.

Res Low Set: This is used for alarm indication for when the residual/ORP fall below the set value. Setting this value to 0 turns the alarm off.

Res High Set: This is used for alarm indication for when the residual/ORP is above the set value.

Res Dead Band: the dead band allow for an adjustable range around the set point that is considered an acceptable residual level. As long as the residual/ORP value is within +/- this value from the set point, the omni-valve will consider this level "ok" and not make any adjustments.

Res Integral Value: This value is used in the PID control calculations to make calculated adjustments back to the set point. An integral value too high will cause large swings above and below the set point and an integral value to low will take too long to reach the set point. A typical value will be between 10-30 %. Hydro Instruments' factory sets this value at 20%.

Res Lag Time: The lag time is the time between when the omni-valve makes and adjustment and when it reads the incoming residual signal based on the adjustment. Lag times should be measured (and then entered) between when the omni-valve makes and adjustment and when that adjustment reaches the downstream instrument. This is a very important value for the most accurate and reliable control.

Res Reset Value: This value is used in compound loop control for when the flow signal falls below the set value the incoming residual/ORP signal will be ignored.

Variable Lag Time: This value is used in compound loop mode; to adjust the residual lag time based on changes in flow as a faster flow rate will reach the downstream instrument faster. To activate the variable lag time select yes.

Maximum Lag Time: When variable lag time is activated this is the longest time the omni-valve will wait to take a reading once an adjustment has been made.

Flow at Variable Lag: This value is the flow value at which the residual lag time was measured.

System Outlet Range: This screen is used to set the minimum and maximum value of a second residual/ ORP analyzer. This is for dual set point control and the inputs for this analyzer should be wired into the DOS/GND line.

RES2 – Residual Outlet

These screens are used for setting up the second residual signal and control parameters. These are for use with Dual Set-Point Control only.

System Outlet Point Lag Time 2: This value sets the time between when the omni-valve makes and adjustment and when it measures the incoming signal from the DOS/GND connection based on that adjustment.

PV3 Integral Value: This value is used in the PID control calculations to make calculated adjustments back to the set point. A larger integral value will make larger feed rate changes. Setting the value too high will cause rapid swings above and below the set point and setting it too low will take too long to reach the set point. Hydro Instruments recommends this value be set at 50%.

System Outlet Lag Time Variable: This value is used in compound loop mode; to adjust the residual lag time based on changes in flow as a faster flow rate will reach the downstream instrument faster. To activate the variable lag time select yes.

OUT – Output

These screens are used for setting up the valves chemical feed output.

Output Units: This screen allows the user to select the units or the chemical feed rate (PO1). Options include: %, PPD, g/hr, kg/hr, GPH, GPM, GPD, LPM, LPH.

Output Decimal Posn: This screen sets the decimal position of chemical feed rate on the omni-valve.

Output Full Scale: This screen sets the full scale of the chemical feed rate the omni valve will display.

Output Gas Type: This screen allows the user to select between CL2 and SO2. This is important for control types where residual control is important as the CL2 acts proportionally to the residual signal (i.e. when the value is below set point it adds more chemical) and SO2 acts inversely proportional to the residual signal (I.E. when the residual signal is above the set point it adds more chemical). Thus SO2 is most commonly selected when de-chlorinating or pH control.

STEP – Step Feed

These screens are used for setting the incremental feed rates when using step feed control.

Step Feed Input 1: This value sets the percentage of full scale the omni-valve will feed when the SF1 terminal is activated.

Step Feed Input 2: This value sets the percentage of full scale the omni-valve will feed when the SF2 terminal is activated.

Step Feed Input 3: This value sets the percentage of full scale the omni-valve will feed when the SF3 terminal is activated.

Step Feed Input 4: This value sets the percentage of full scale the omni-valve will feed when the SF4 terminal is activated.
**Note that if multiple pumps will be activated at once, the sum should not exceed 100%.*

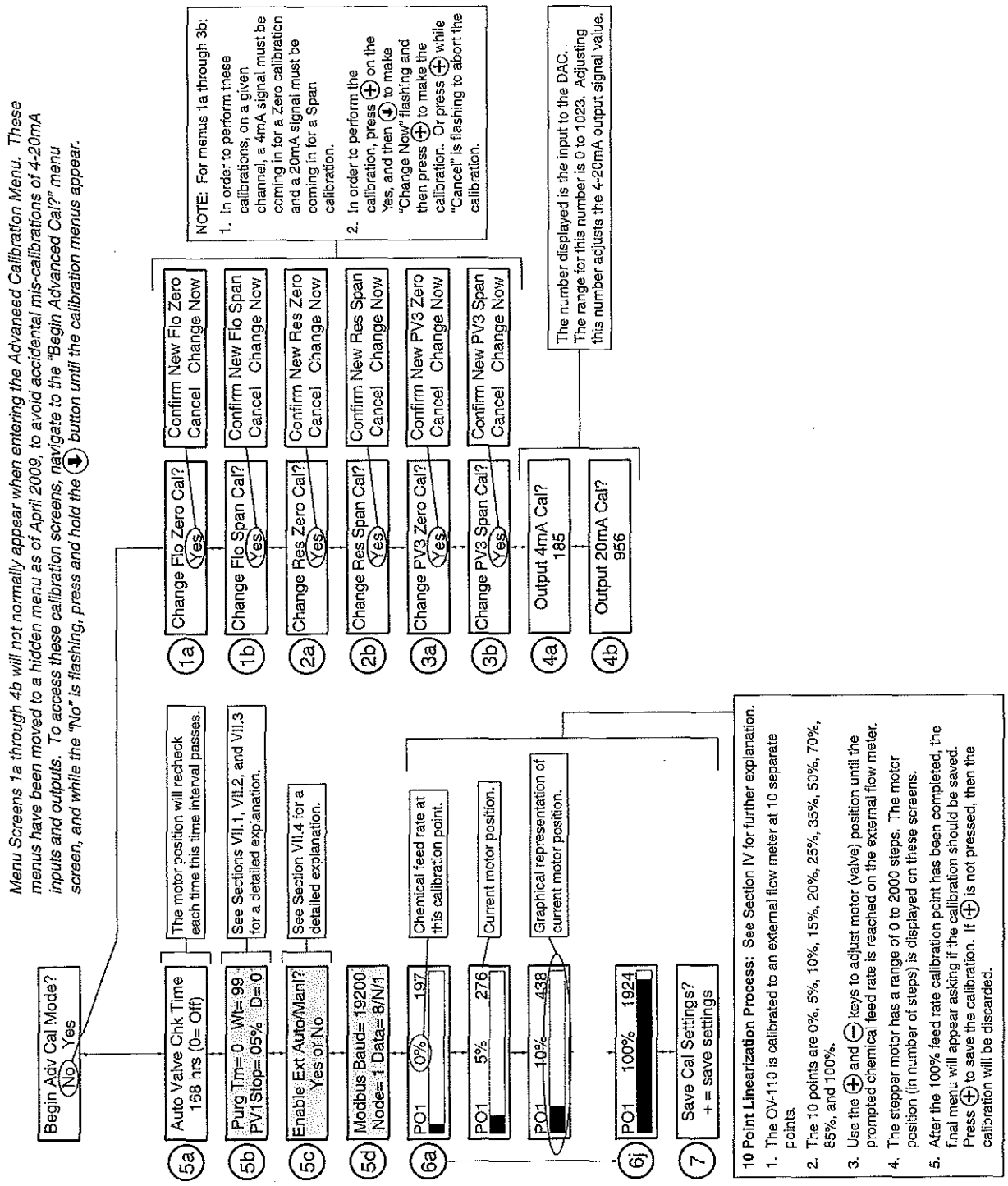
ALM – Alarm

These screens are used for setting up additional alarm features.

Alarm Delay Time: Set the time for which a condition must be in alarm state for the alarm to activate.

Output Relay Usage: The user can adjust the alarm relay output to indicate when an alarm condition exists, or when the unit is in auto or manual mode.

VII. ADVANCED CALIBRATION MODE



NOTE: Accessing hidden screens "5b" & "5c" – In order to access screens 5b and 5c for purge, flow stop, remote dosage settings, and external mode control follow these instructions:

a. Navigate to the "Begin Adv Cal Mode?" screen with "Yes" flashing.

b. On this screen with "Yes" flashing press and hold the ⬇ key for five seconds. At first, screen 5a will appear, but you must continue to hold the ⬇ key until screen 5b appears.

c. After reaching this screen consider below Sections VII.1, VII.2, VII.3, and VII.4.

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1. **Purge Feature (For Liquid Feed Systems):** In applications using the Omni-Valve to feed liquid chemicals (especially at low flow rates), the valve orifice can become blocked with particles in the liquid chemical. In order to overcome this issue, the Omni-Valve can be programmed to fully open for a set time on a periodic basis. The two parameters on line one of screen 5b are related to the Purge Feature.
   a. The period between openings is the "Purg Tm" (the time is in minutes). A setting of 60 means that the valve will open once every 60 minutes. A setting of 0 means that the purge feature is not enabled.
   b. The "Wt" is the duration of time resting at fully open (the time is in seconds). A setting of 15 means that when the valve opens, it will remain fully open for 15 seconds.

2. **Dosage Method Selection:** The parameter "D" on the bottom right of hidden screen 5b is used to determine the use of the 3rd 4-20mA input channel (DOS/GND). The options are as follows:

   NOTE: If D is not set = 0, then an appropriate 4-20mA input signal must be connected to DOS/GND.
   a. *D = 0:* The 3rd 4-20mA input channel is not being used.
   b. *D = 1:* This is valid for Flow Pacing, Compound Loop, and Dual Input Feed Forward Control Methods. With D = 1 the user will not be able to adjust the dosage in operation mode using the keypad.
      i. If the OV-110 is in AUTO mode, then the 3rd 4-20mA input channel will set the dosage (refer to Section II.1). In this case, an input value of 4 mA will set dosage = 0 and a 20 mA input signal will set dosage = 10.0.
      ii. If the OV-110 is in MANL mode and the Purge Feature is not enabled, then the 3rd 4-20mA input channel will directly control the chemical feed rate (1:1 ratio between input and feed rate).
   c. *D = 2:* This is valid for Residual & Compound Loop Control Methods. With D =2 the user will not be able to adjust the residual set point in operation mode using the keypad. The 3rd 4-20mA input channel will set the residual set point (see Section II.2). In this case, an input value of 4 mA will set residual set point = "Res Min" and a 20 mA input signal will set residual set point = "Res Span".
   d. *D = 3:* This is only valid for Dual Set Point Control Method. See Section II.5. The 3rd 4-20mA input channel will be used for the residual analyzer at the outlet of the contact chamber. The residual decimal points and units for display must be the same as the residual analyzer on RES/GND.

3. **Flow Stop:** This feature is specifically intended for use with the compound loop control method to prevent valve adjustments based on the residual signal when water flow has stopped. This feature allows the user to enter a flow value below which the valve will drive closed and remain closed (until flow returns above the entered value). This setting is the "PV1Stop" parameter on the bottom left of hidden screen 5b. The default value is zero (PV1Stop = 0 means this feature is not enabled), but the PV1Stop setting can be adjusted using the ⊕ and ⊖ keys as desired.

4. **External Duty/Standby and Auto/Manual Control Options:** The following features allow the 24VDC SF3 and SF4 channels to be used for external control of these settings.

   NOTE: Any DC voltage between 12 and 24 volts is acceptable for these input channels. See Figure 3.

   NOTE: These features are only available if the OV-110 is not set to step feed control mode.
   a. *Duty / Standby (SF3):* This feature does not require any user adjustments. If the OV-110 is not in step feed control mode, then a 24 VDC input signal to channel SF3 will put the OV-110 into standby condition (in standby the OV-110 will drive closed and remain closed). If there is no voltage signal into SF3, then the OV-110 will operate normally.
   b. *Auto / Manual (SF4):* This feature requires the user to first enable external control of AUTO/MANL mode on advanced calibration screen 5c. If external control has been enabled, then a 24 VDC input signal into channel SF4 will set the OV-110 into AUTO (automatic) mode and if there is no voltage signal into SF4, then the OV-110 will be in MANL (manual) mode. When external control has been enabled, the user will not be able to select AUTO/MANL using the keypad.

VIII. TROUBLESHOOTING AND MAINTENANCE

1. **Factory Default**: If there is an electronics problem that cannot be solved by any of the below efforts, then you might consider performing a factory default. However, when this is done all calibration data is lost and must be reset. Therefore it is best to try other steps first because you will have to go through both the Advance Calibration Mode and the Configuration Mode to enter all control and calibration settings.. In order to perform a factory default follow these steps:
   1. Turn off the power to the OV-110.
   2. Hold both the "up arrow" ⬆ key and the "down arrow" ⬇ key on the front panel.
   3. While holding both keys, turn on the power to the OV-110.

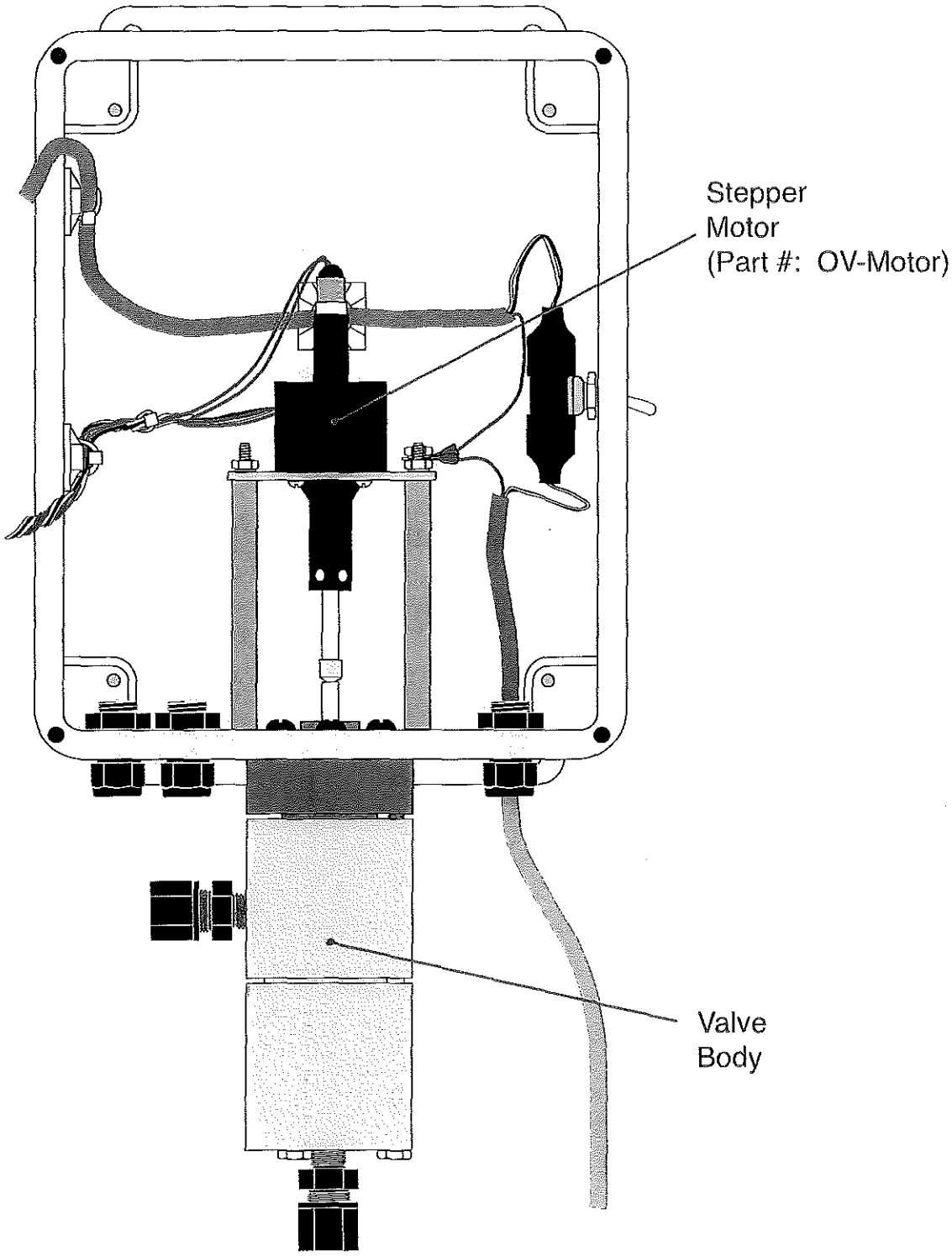
   SAFETY NOTE: Be sure to follow all safety precautions before attempting to service the OV-110 Omni-Valve. Be sure to disconnect power from the OV-110 Omni-Valve before servicing electronics.

2. **Servicing the Valve Body:** (See Figures 14 and 16) If the valve becomes difficult to move or for the purpose of preventative maintenance (recommended every 12 to 24 months) the valve body should be serviced according to the following procedure:
   a. **Removal of the valve body from the monitor enclosure:**
      i. Remove the three bolts at the bottom end of the valve body.
      ii. Remove the Lower Body and Middle Body parts of the valve body assembly.
      iii. Unscrew the Valve Stem and intermediate Valve Stem from the motor shaft. Avoid using pliers or any tool that will scar the surface of these parts.
      iv. Unscrew and remove the three bolts inside the enclosure that hold the Upper Body to the enclosure.
   b. **Top Shaft Seal**: Also remove the OV2-33 Seal Cap from the top of the Upper Body using a spanner wrench. There is a 3RS-108 O-Ring and Teflon seal under this part. When reinstalling the OV2-33 Seal Cap do not over tighten. Use 7-10 inch-pounds torque.
   c. **Maintenance**: All parts should be inspected for damage, cleaned, and lubricated* before reassembly. Generally, O-Rings should be replaced if in use for more than 12 months. The Valve Seat may require replacement if there are any cuts or burrs noticed. Hydro recommends replacement of AV2-62 during valve servicing.

      ** Use appropriate lubrication for your chemical application. Contact your local representative of Hydro Instruments if there is any uncertainty.*
   d. **Reinstallation: IMPORTANT** – It is critically important that the threads on the Valve Stem and Intermediate Valve Stem be securely tightened during installation. Follow this procedure:
      i. Install all O-rings, Teflon Seals, Seal Cap and Stem Seal parts into the Upper body first. Then slip the Intermediate Valve Stem through the assembly.
      ii. Secure the Upper Body to the enclosure being sure to use a new gasket between the two parts.
      iii. Thread the Intermediate Valve Stem hand tight onto the motor shaft threaded adapter. Avoid using pliers or any tool that will scar the surface of the stem.
      iv. Thread the Valve Stem hand tight onto the Intermediate Valve Stem. Avoid using pliers or any tool that will scar the surface of the stem.
      v. Install the Middle Body and Lower Body being sure not to move them in a way that would possibly unthread the Intermediate Valve Stem or the Valve Stem threads.

      NOTE: The bolts used to secure the valve body (3 bottom + 3 top) should be tightened to 20-25 inch-pounds torque.

FIGURE 13

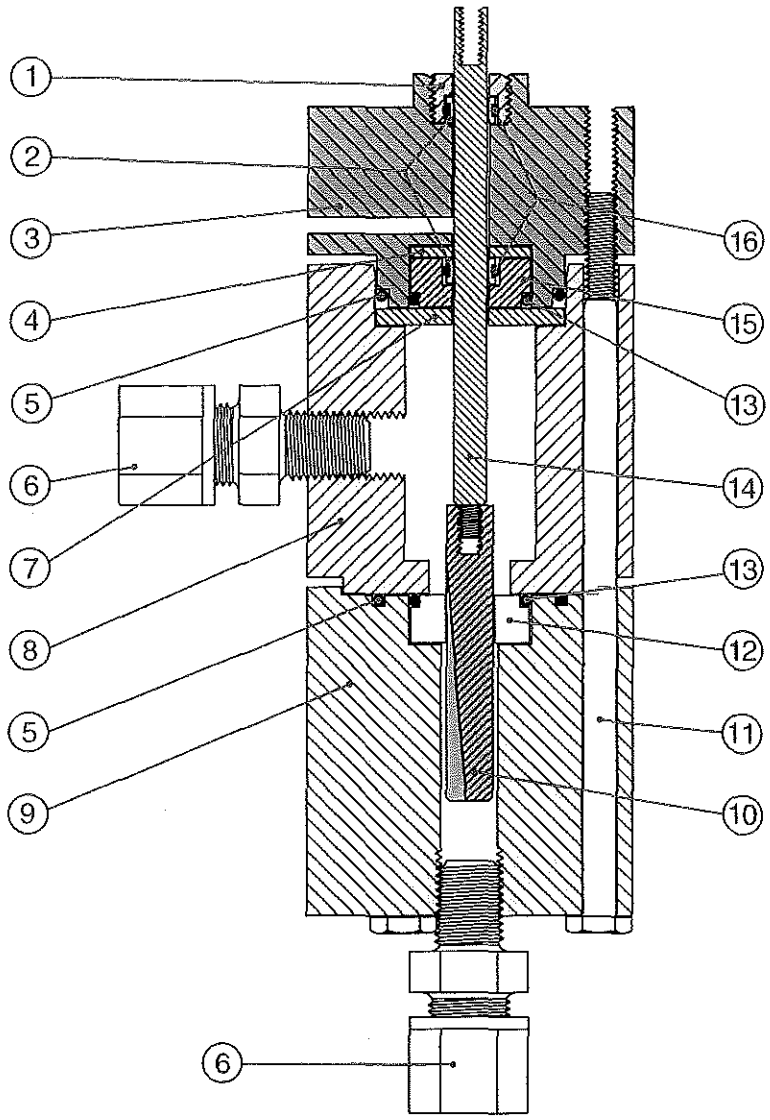


hydro INSTRUMENTS

OMNI-VALVE (OV-110)
FEATURING MOTOR ASSEMBLY

Date: November 2007
Scale: 45%
Dwg. No.: OV-110-MA

FIGURE 14



Item No.	Description	Quantity	Part No.
1	Seal Cap	1	OV2-33
2	Teflon Seal	2	OVS-108
3	Upper Body	1	ABV-10-2
4	Small Disc	1	AV-4
5	O-Ring	2	3RS-124
6	NPT Fitting (100 PPD)	2	BKF64
6	NPT Fitting (250 PPD)	2	BKF84
6	NPT Fitting (500 PPD)	2	BKF108
7	Large Disc	1	AV-3
8	Middle Body (250 PPD)	1	AV2-112-250
8	Middle Body (500 PPD)	1	AV2-112-500
8	Middle Body (2000 PPD)	1	AV2-112-000
9	Lower Body (250 PPD)	1	AV2-92-250
9	Lower Body (500 PPD)	1	AV2-92-500
9	Lower Body (2000 PPD)	1	AV2-92-000
10	Valve Stem (10 PPD)	1	AV2-72-010
10	Valve Stem (25 PPD)	1	AV2-72-025

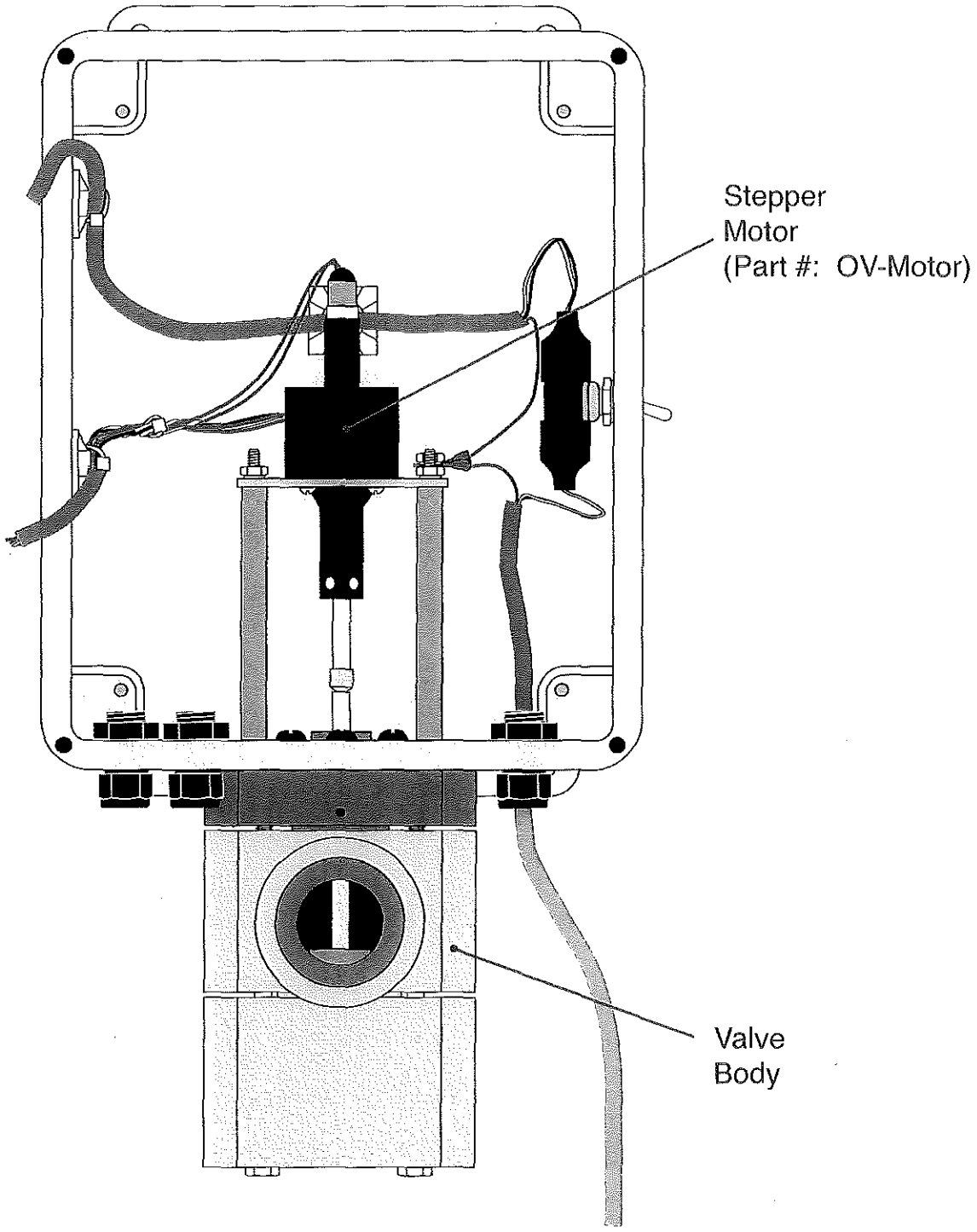
Item No.	Description	Quantity	Part No.
10	Valve Stem (50 PPD)	1	AV2-72-050
10	Valve Stem (100 PPD)	1	AV2-72-100
10	Valve Stem (250 PPD)	1	AV2-72-250
10	Valve Stem (500 PPD)	1	AV2-72-500
10	Valve Stem (1000 PPD)	1	AV2-72-1000
10	Valve Stem (2000 PPD)	1	AV2-72-2000
11	Bolts	3	1/4"-20 x 5 1/2"
12	Valve Stem Seat (500 PPD)	1	AV2-62
12	Valve Stem Seat (2000 PPD)	1	AV2-6-000
13	O-Ring	2	3RS-116
14	Valve Shaft	1	AV2-12
15	Stem Seal	1	OV-5
16	O-Ring	2	3RS-108

Hydro Instruments

OMNI-VALVE

Date: April 2009
Scale: 75%
Dwg. No. OV-110

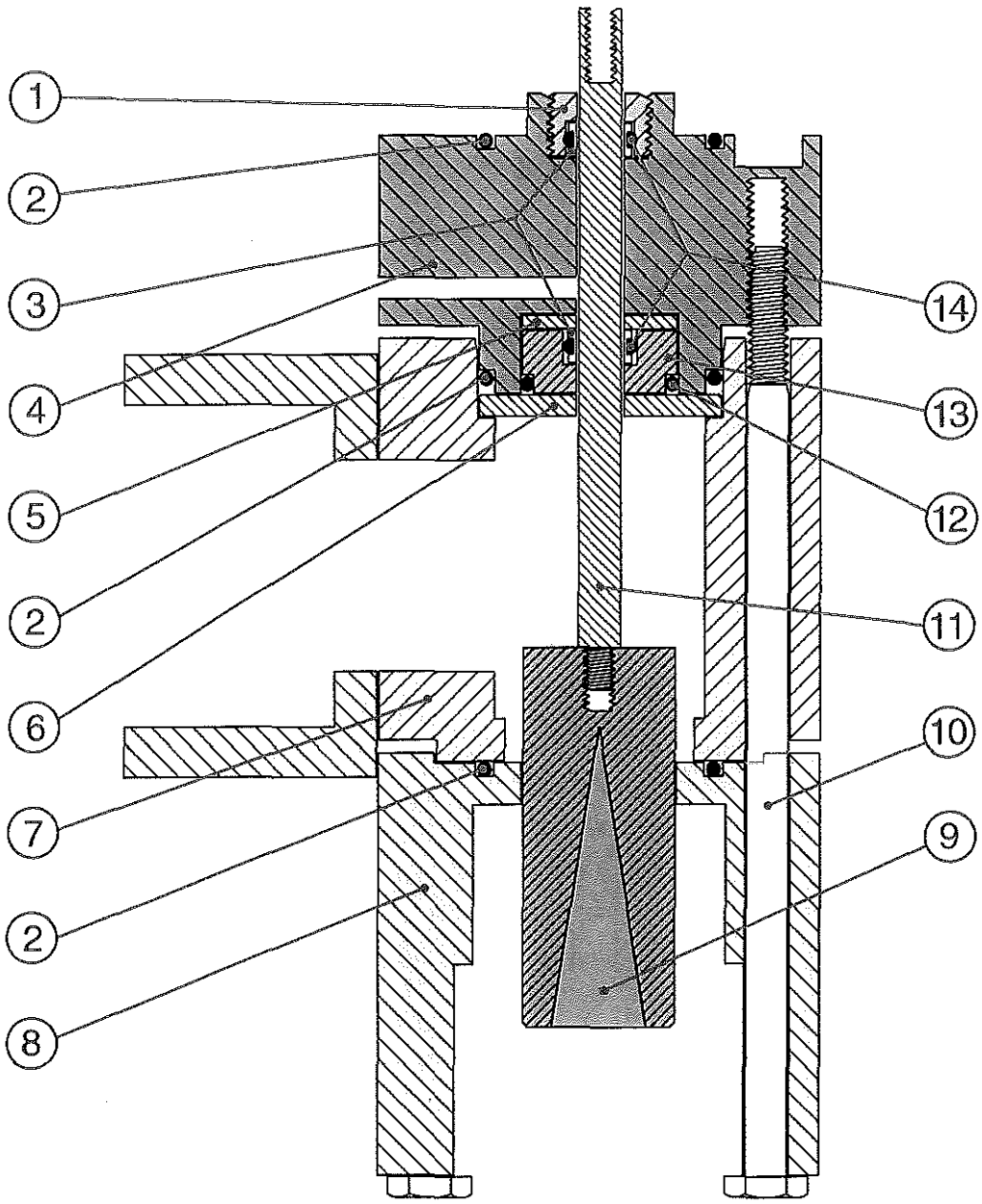
FIGURE 15



HIGH CAPACITY OMNI-VALVE (OV-110HC)
FEATURING MOTOR ASSEMBLY

Date: May 2008
Scale: 45%
Dwg. No.: OV-110HC-MA

FIGURE 16



Item No.	Description	Quantity	Part No.	Item No.	Description	Quantity	Part No.
1	Seal Cap	1	OV2-33	9	Valve Stem (3000 PPD)	1	AV2-72-3000
2	O-Ring	3	3RS-124	9	Valve Stem (4000 PPD)	1	AV2-72-4000
3	Teflon Seal	2	OVS-108	9	Valve Stem (6000 PPD)	1	AV2-72-6000
4	Upper Body	1	OVB-UB-6000	10	Bolts	4	1/4"-20 x 5 1/2"
5	Small Disc	1	AV-4	11	Valve Shaft	1	AV2-12
6	Large Disc	1	AV-3	12	O-Ring	1	3RS-116
7	Middle Body	1	OVB-MB-6000	13	Stem Seal	1	OV-5
8	Lower Body	1	OVB-LB-6000	14	O-Ring	2	3RS-108

Inlet and outlet process connections are 1.5" Socket.

hydro INSTRUMENTS

OMNI-VALVE
(HIGH CAPACITY)

Date: September 2009
Scale: 100%
Dwg. No. OV-110HC

Enviro-Aire / Total Balance Company, Inc.

Professional Independent Services

28915 Harper Ave. ~ St. Clair Shores, MI. 48081
(586) 779-6200 FAX: (586) 779-8312

FLINT WATER TREATMENT PLANT
CHLORINE ROOM EF-1 SURVEY

FLINT, MICHIGAN

CERTIFIED AIR TEST SURVEY REPORT

DATE COMPILED: MARCH 18, 2014

"THE DATA PRESENTED IN THIS REPORT IS A RECORD OF SYSTEM MEASUREMENTS AND FINAL ADJUSTMENTS THAT HAVE BEEN OBTAINED IN ACCORDANCE WITH THE CURRENT EDITION OF THE NEBB *PROCEDURAL STANDARDS FOR TESTING, ADJUSTING, AND BALANCING OF ENVIRONMENTAL SYSTEMS.* ANY VARIANCES FROM DESIGN QUANTITIES, WHICH EXCEED NEBB TOLERANCES, ARE NOTED IN THE TEST – ADJUST – BALANCE REPORT PROJECT SUMMARY."

DATE: 3/18/14

Enviro-Aire/Total Balance Co., Inc.
NEBB
PATRICK L. GILES
CERTIFICATION
2726
Exp. 3/31/15
Air and Hydronic Systems

Enviro-Aire / TOTAL BALANCE CO., Inc.

SUMMARY OF BALANCING REPORTS
N.E.B.B. CERTIFIED

PROJECT:	Flint Water Treatment Plant - Chlorine Room EF-1 Survey
LOCATION:	Flint, Michigan
CONTRACTOR:	William E. Walter, Inc. 1917 Howard Ave. Flint, Michigan 48503
TESTS WERE EVALUATED BY:	Rich Park, M.E.
TESTS WERE PERFORMED BY:	Phill Kinzie OUR JOB NO. 14-SC-4022

INDEX NUMBER	SYSTEM DESCRIPTION	
SUM	Report Summary	(1 Page)
1	Air Change Report	(1 Page)
2	Existing EF-1 Chlorine Room Exhaust	(1 Page)
3	System Schematic	(1 Page)
	Symbol & Abbreviation Library	(3 Pages)

Enviro-Aire, Inc. Test Form © 2000

Enviro-Aire, Inc.	SUMMARY SHEET	DATE: 3/18/14	INDEX NUMBER: SUM PAGE NUMBER: 1
BUILDING: Flint Water Treatment Plant - Chlorine Room EF-1 Survey		SYSTEM: Report Summary @ J#14-SC-4022	

Scope of Work:

Perform Air Test Survey for EF-1 Chlorine Room Exhaust Fan at the Flint Water Treatment Plant located in Flint, Michigan.

Summary of Findings:

Existing EF-1 Exhaust Fan is running at 1.48 Brake Horse Power.
Motor is running at maximum capacity
Fan is delivering 4309 CFM resulting in 18.3 Air Changes per Hour for the Chlorine Room.

Enviro-Aire, Inc. Test Form © 2000

Air Change Report

Flint Water Treatment Plant - Chlorine Room EF-1 Survey

Chlorine Room

Ventilation Information

1: -- **Return System:** -- **Exhaust System:**

)R	ROOM VOLUME IN CUBIC FEET	DESIGN SUPPLY CFM	ACTUAL SUPPLY CFM	DESIGN EXHAUST CFM	ACTUAL EXHAUST CFM	VOLUME DIFFERENCE	ROOM PRESSURE	AIR CHAN PER HO
om	14,100	No Spec	Note (1)	No Spec	4309	0	-.024"	18.3

IENTS: Note: (1) Motorized wall damper interlocked with fan for make-up air.

N.E.B.B. Certified - Test and Balance

Enviro-Aire, Inc.

Air Handling Equipment Test Data Sheet

Building:	Flint Water Treatment Plant - Chlorine Room EF-1 Survey	Index :	2
System:	Existing EF-1 Chlorine Room Exhaust Fan	Page :	1
		Date :	3/14/14

Fan Number	Existing EF-1			Service	Chlorine Room						
Location	North Side Wall			Interlocked Equip.	---						
	Design Data	Test Results		Testing Data							
Total CFM	No Spec	4309		Fan Static Pressures							
Minimum O.A.	--	--		Suction	-.94"	Disch.	Atmos.				
T.Sp./E.Sp.	No Spec	.94"	.94"	Component Pressure Drops							
Fan RPM		789		Pre-Filter	H.E.F.	Final Filter	Pre-Heat Coil	Htg. Coil	Clg. Coil		
Brake Hspwr.		1.48	98.6%	---	---	---	---	---	---		
Test Condition Configuration	R.A. Damper	O.A.Damper	Rel. Damper	Vortex/ VFD	Other Pressure Drops						
	--	--	--	--	---	---	---	---	---		

Additional Field Testing Data

Fan Data		Motor Data			
Manufacturer	Greenheck	Mtr. Manuf.	Marathon		
Model No.	GWB-24-15X	H.P./Amps	1 1/2	2.4	
Type / Size	-- --	Ph./Cy./Volt	3	60	460
Class/Ser.No.	93H03475	Frame/RPM	56	1725	
Drive Data		S.F./P.F./Eff.	1.15	--	--
Fan: fixed	Motor: near max.	**Electrical Test Data**			
Sheave Size	AK74 / 1VL40		Ph. 1	Ph. 2	Ph. 3
Shaft Size	1" / 5/8"	Oper. Amps	2.3	2.2	2.1
Belt Size	(1) 4L320	Oper. Volts	496	494	495
Ctr. to Ctr.	7 1/4"	O'load Size	H22	2.96 - 3.32	
Motor Adj.	Plus: 1" Minus: 1"				

Duct Traverse Readings

Total of East Duct

Duct Size	Design CFM	Duct Sq. Ft.	Design FPM/ Vp	Velocity / FPM						Final Avg. FPM	Final CFM
20" x 12"	No	1.67	--	965	993	1050				1484	2478
	Spec			1435	1184	1346					
Remarks:				1595	1519	1644					
Volume damper is 100% open.				1881	1799	1672				Dsp=	-.57"
				1732	1855	1584					

Total of West Duct

20" x 10"	No	1.39	--	975	1044					1317	1831
	Spec			818	1206						
Remarks:				1072	1361						
Volume damper is 100% open.				1551	1725					Dsp=	-.75"
				1732	1684						
										FTC =	4309

N.E.B.B. Certified - Test and Balance

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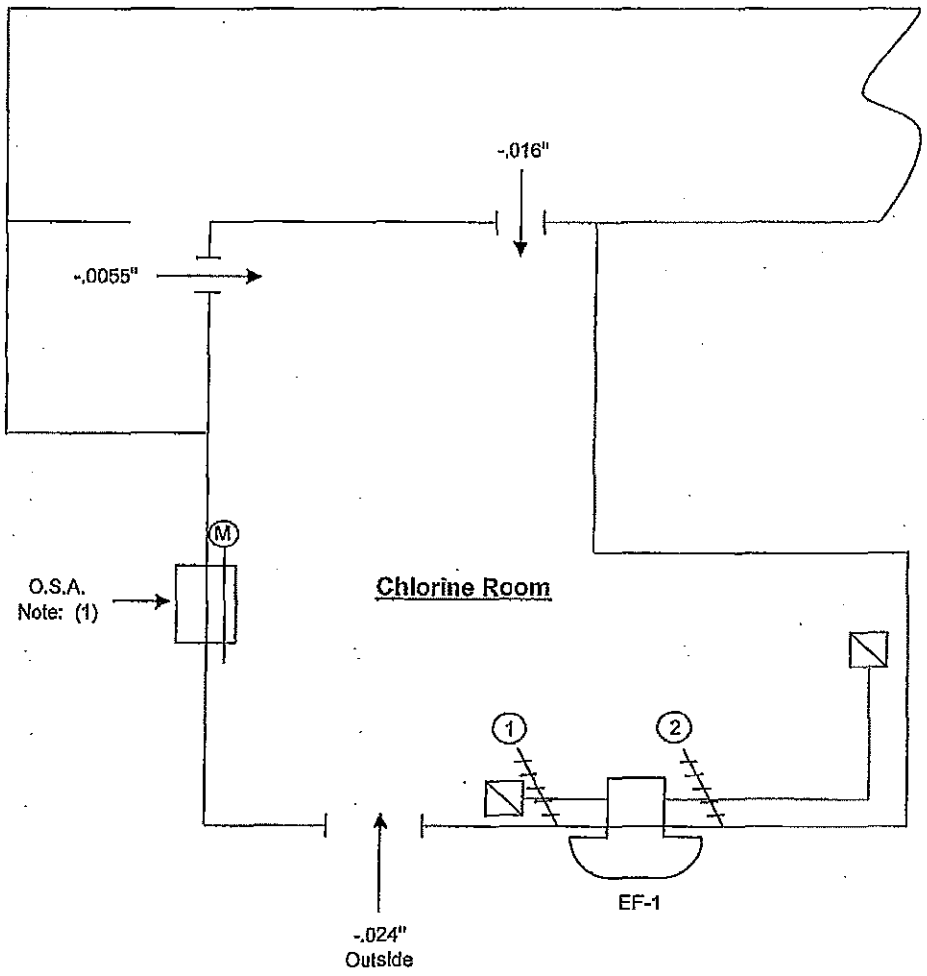
Enviro-Aire, Inc.	SCHEMATIC SHEET	DATE: 3/14/14	INDEX NUMBER: 3 / PAGE NUMBER: 1
BUILDING: Flint Water Treatment Plant - Chlorine Room EF-1 Survey		SYSTEM: Chlorine Room Exhaust	



Note: (1) Motorized Damper Interlocked With EF-1 For Make-Up Air

N

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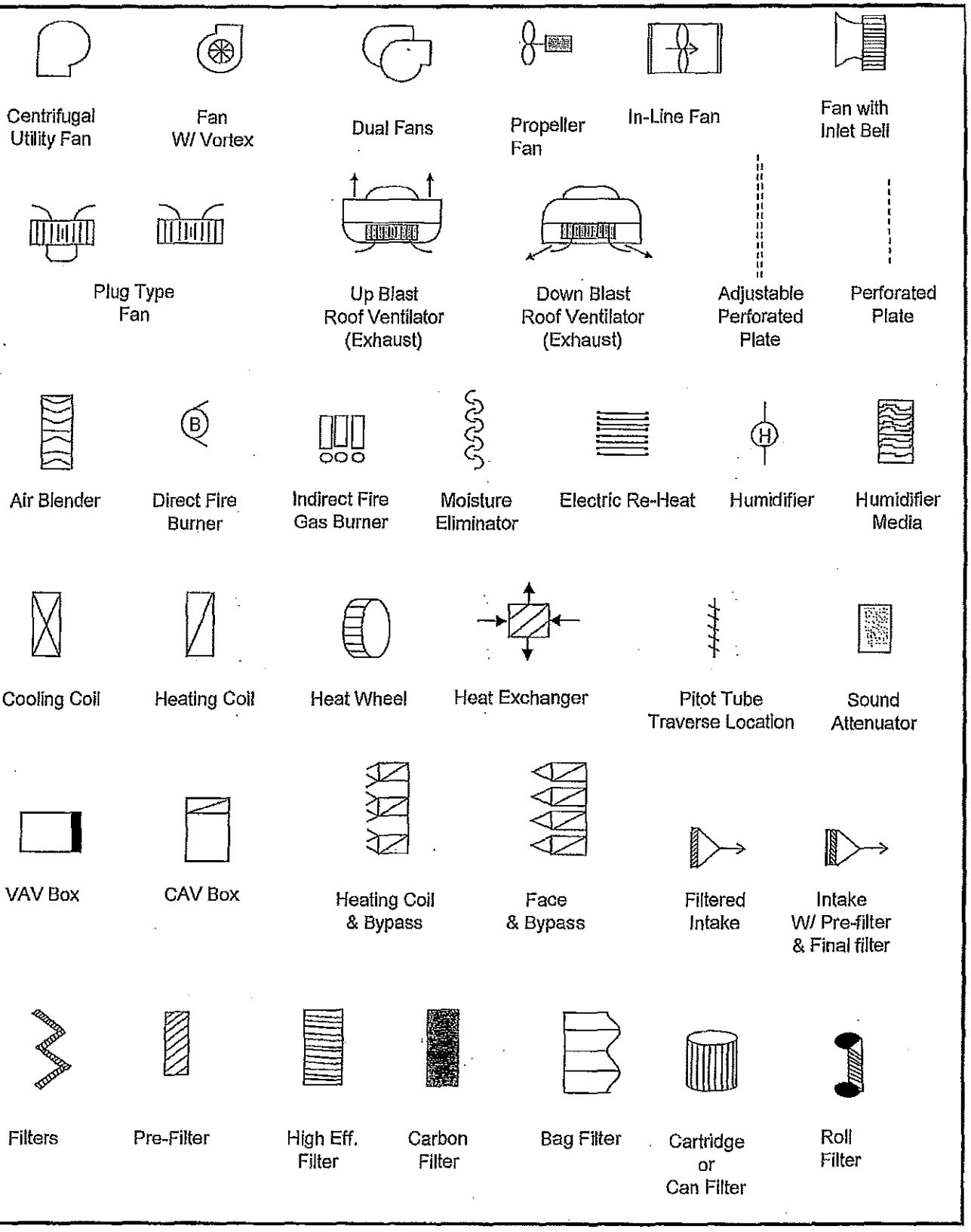
Enviro-Aire, Inc.

Schematic Symbols
Components / Fans



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Schematic Symbols
Dampers / Hydro

Gravity Damper

AutomaticDamper (Opposed Blade)

AutomaticDamper (Parallel Blade)

Motorized Automatic Damper (Opposed Blade)

Barometric Backdraft Damper

Manual Opposed Blade Damper

Manual Damper

Single Damper

Fire Damper

Smoke Damper

Balance Valve

3-Way Valve

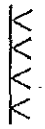
2-Way Valve

Check Valve

Flow Meter

Auto-Flow Balancing Valve

Triple Duty Valve


Evaporative Cooler

Valve Handle

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Enviro-Aire, Inc.

Schematic Symbols
Dampers / Hydro

The following is a list of abbreviations that *may* be used throughout our balance report.

ACPH:	*Air Changes Per Hour*
AFC:	*Almost Fully Closed (Damper)*
AK:	*Area Correction*
ATMOS:	*Discharging to Atmosphere*
CAV:	*Constant Air Volume (Typically used to describe a Terminal Box)*
CC:	*Cooling Coil (Chilled Water or DX-Refrigerant)*
Connected Load:	*The combined total of all inlets / outlets connected to the system.*
Damper % :	*Percent Open*
D/D:	*Direct Drive*
DP / ΔP:	*Differential Pressure*
DSP	*Duct Static Pressure*
DT / ΔT:	*Differential Temperature*
F&B:	*Face and Bypass damper*
FA:	*Fresh Air*
FC:	*Fully Closed (Damper)*
FH / Flow Hood :	*An instrument used to "funnel" velocity through a 1.0SqFt area for a direct reading in CFM*
FO:	*Fully Open (Damper)*
FPB:	*Fan Powered Box (a VAV or CAV with Secondary air capabilities)*
GRD:	*Grille/ Register/ Diffuser*
HC:	*Heating Coils (Hot Water or Steam)*
HEF:	*High Efficiency Filter*
HX:	*Heat Exchanger*
K:	*Correction Factor for Terminal inlet / outlet*
MD:	*Motorized Damper*
NK:	*Neck, Commonly used in the diffuser neck size.*
NM:	*Not Measured*
OA / OSA:	*Outside Air*
OBD:	*Opposed Blade Damper*
OED:	*Open End Duct*
RA:	*Return Air*
RHC:	*Reheat Coil*
SA:	*Supply Air*
SP:	*Static Pressure*
SqFt:	*Square Foot Area*
TP:	Traverse Point
TSP:	*Total Static Pressure*
VAV:	*Varible Air Volume (Typically used to describe a Terminal Box)*
VD:	*Volume Damper (Manual)*
VFD:	*Varible Frequency Drive (Motor)*
VP:	*Velocity Pressure*

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Electrical Requirements for the Electrical Service at the City of Flint Water Treatment Plant

In accordance with the Ten State Standards, The State of Michigan requires that water plants be supplied with two sources of power to assure a backup power source is in place in the event of an outage to the primary source.

The City of Flint Water Treatment Plant Service Entrance Substation switchgear is currently served by two separate dedicated services from Consumers Energy.

For distinction, the service that enters the Plant from the North shall be referenced as the North Service and the service that enters the Plant from the South shall be referred as the South Service.

Using the Utility maps and a physical drive-by survey of the South Service route, the South Service originates from the N. Dort Hwy and E. Stanley Road Transmission and Distribution Center. The North Service also originates from the N. Dort Hwy and E. Stanley Road Transmission and Distribution center. Within the N. Dort Hwy and E. Stanley Road Transmission and Distribution Center, each one of these services comes from a different buss and substation transformer. Additionally, each service has one back up service as well as the means to be interconnected. This means that each service has two alternate sources of power should there be a failure. (Please see attached sketch.)

Each service is routed independently (on separate dedicated poles) to the site. The North Service is routed to the Buick City Distribution Center and then to the Plant from the North. The South Service is routed from the east to the Plant. The only current connection point for the two services at the Water Plant is at the Plant's Service Entrance Substation transformer yard at the primary of the transformer buss. We plan to remove this interconnect in our work.

We have discussed our approach with Consumers Energy. Consumers Energy presently considers both services as dedicated to the Water Plant. Consumers Energy cannot guarantee that both services will always be dedicated in the future. If Consumers Energy were to consider allowing other customers to share either of the services, they would give adequate notice to the City of Flint (12-18 months) to allow the City to make additional plans for a secondary power source. Based on this understanding, LAN would recommend considering the two services as two dedicated utility feeds to the Plant. This scheme would allow the design to only provide the provisions for a future generator and not actually purchase the generator under this present project. All of the provisions for the installation of the generator, to the new plant switchgear would be included in the design, such as additional main and tie breakers. The actual purchase of the generator would not occur until Consumers Energy allows other customers to share a service.

Antia Lood

2310

STATE OF MICHIGAN
DEPARTMENT OF ENVIRONMENTAL QUALITY
LANSING DISTRICT OFFICE

RICK SNYDER
GOVERNOR

DAN WYANT
DIRECTOR

April 29, 2014

Mr. Daugherty Johnson, Utilities Administrator
City of Flint
1101 South Saginaw Street
Flint, Michigan 48502

WSSN: 02310

Dear: Mr. Johnson

Subject: Act 399 Capacity and Reliability Requirements

This letter, per your request, is being written as verification that the City of Flint water system is currently in compliance with required capacity and power service reliability requirements under the Michigan Safe Drinking Water Act and Administrative Rules, Supplying Water to the Public.

The required capacity of a waterworks system as established in Rule 1204 (R 325.11204) required sufficient capacity to meet approved finished water supply requirements, and is based upon the combination of the following options:

a. Rated capacity of an approved surface water supply or complete treatment system;
b. Firm capacity of approved groundwater supply;
c. Available contracted capacity that can be delivered from another public water supply;
d. Excess finished water storage capacity.

Under the first option listed above, the City's baseline water withdrawal capacity from the Flint River, and rated capacity of the City's water treatment plant (WTP), both exceed its finished water supply requirements. The rated capacity of a complete treatment system is established under Rule 1006 (R 325.11006). In accordance with this rule, the Department of Environmental Quality (DEQ) has established a rated capacity of 36 million gallons per day for the City's WTP, which again far exceeds current and future finished water supply requirements for the City's service area.

In addition, while capacity under item d above for excess finished water storage has not been established, the City currently has enough finished water storage to supply more than 2 days of normal finished water supply requirements

Rule 1206 (R 325.11206) requires water systems to provide a means to continuously supply fully finished water during normal power service interruption. The City's WTP is now equipped with a redundant electrical system that includes provisions for stand-by power generation; thus meeting this requirement.

While additional means to meet the above requirements for capacity and power interruption can be provided through contracted interconnections with other water systems, the City has demonstrated compliance with these requirements without such means. However, the DEQ still supports and encourages such interconnections be maintained for emergency purposes as an additional barrier to help maintain public health protections. While these emergency

interconnections have no requirement to establish an available or contracted capacity, the DEQ encourages the corresponding utilities to establish mutual aid agreements where possible. Such agreements can be developed through the Michigan Water/Wastewater Agency Response Network (MiWARN). For more information, please visit miwarn.org. A MiWARN brochure is also enclosed for your information.

If you have any questions, feel free to contact me at (517) 290-8817; prysbym@michigan.gov; or Department of Environmental Quality, Office of Drinking Water and Municipal Assistance, Lansing District Office, 525 West Allegan Street, 1st Floor South, P.O. Box 30242, Lansing, Michigan 48909-7742.

Sincerely,

Michael F. Prysby, P.E.
District Engineer
Field Operations Section
Office of Drinking Water and
Municipal Assistance

mfp/jlr
Enclosure

cc: Mr. Howard Kroft, Utilities Director, City of Flint

~~232C~~ 231C

STATE OF MICHIGAN
DEPARTMENT OF ENVIRONMENTAL QUALITY
LANSING

RICK SNYDER
GOVERNOR

DAN WYANT
DIRECTOR

May 7, 2012

Mr. Howard Kroft, City Administrator
City of Flint
1101 South Saginaw Street
Flint, Michigan 48502-1416

WSSN: 2320

Dear Mr. Kroft:

SUBJECT: Flint Water Treatment Plant – Future Operation

This letter confirms our May 1, 2012, meeting with you, Mr. Daugherty Johnson III, Utilities Administrator, Mr. Brent Wright, Water Plant Superintendent, and other water utility operators. Mr. Patrick Cook, Treatment Specialist, from the Department of Environmental Quality (DEQ), also attended the meeting.

The purpose of the meeting was to discuss options for blending treated water from the Flint River with water purchased from the Detroit Water and Sewerage Department (DWSD) or blending Flint River water with raw water purchased from the Karegnondi Water Authority (KWA) and subsequent treatment at the Flint Water Treatment Plant (WTP).

The city of Flint may elect to utilize their WTP for the blending of treated water from the Flint River with water purchased from DWSD or KWA provided that all applicable drinking water standards are maintained. Also, the city is encouraged to produce and distribute treated water that is comparable to the aesthetic quality of water purchased from DWSD. Various treatment parameters discussed in the meeting that the Flint WTP will be required to meet are listed in the bulleted items below.

- CT (disinfectant concentration times total contact time through the treatment process) must be maintained to provide not less than 99.9% (3-log) removal of giardia and not less than 99.99% (4-log) removal viruses.

- The residual disinfectant concentration in the water entering the distribution system shall not be less than 0.2 milligrams per liter for more than 4 hours.

- Filter effluent turbidity (combined filter effluent); Not less than 95% of the measurements taken each month shall be less than or equal to 0.3 ntu. Also, at no time shall the turbidity level exceed 1 ntu.

- The fluoride concentration in Flint's finished water must remain comparable to the fluoride concentration in DWSD's water.

- Suggested Practices recommends, and we fully endorse, monitoring WTP filters and plant tap for total colifom bacteria on a daily basis. In addition to plant tap monitoring, a protocol should be established for monitoring both treated water components prior to blending.

- Finished water must meet all other applicable Maximum Contaminant Levels for organic and inorganic parameters.

Based upon the 2007 Water Treatment Plant Sanitary Survey and the results of the most recent WTP test runs, we are confident that the WTP can meet the operational parameters discussed above. Given the installation of intermediate chlorination and improved ozone residuals, Flint's CT calculation will need to be updated.

Since Flint was not required to conduct the initial round of source water monitoring for cryptosporidium, treatment classification as part of the Long Term 2 Enhanced Surface Water Treatment Rule requirements has not been determined for the WTP. The next round of cryptosporidium monitoring begins in 2015 and subsequent bin treatment classification for Flint will be determined by 2017 (after completing 24 months of monitoring). Additional treatment for cryptosporidium may be required depending on the monitoring results.

Also, since DWSD would no longer be Flint's sole source of water, various water distribution system programs including Flint's Bacteriological Monitoring, Lead and Copper, and the Stage 2 Disinfectants and Disinfection Byproducts monitoring programs will change. Specific changes to these monitoring programs will be discussed in more detail after the city identifies the future operation of the Flint WTP.

The DEQ has no objection to blending Flint River water with water purchased either from DWSD or the KWA. This type of operation will place Flint's WTP into service on a full-time basis and be of benefit in several ways. Fulltime operation will help to ensure proper function and optimization of treatment while allowing WTP operators to accrue additional experience at operating and monitoring all unit processes. Fulltime operation also helps to keep treatment equipment and their components in a reliable state of operation.

Finally, a question was raised as to the extent that the city of Flint will be required to provide a full-time back-up water supply to the city and Genesee County. As we discussed, the average day demand (with restrictions on nonessential water use) for the combined needs of Flint and Genesee County will need to be met. Both capacity and hydraulics (transmission capabilities to Genesee County) need to be determined, as part of a basis of design towards proposing a full back-up water supply for both Flint and Genesee County.

Should you require further information, please contact me at the telephone number below; via e-mail at prysbym@michigan.gov; or Department of Environmental Quality, P.O. Box 30242, Lansing, Michigan 48909.

Sincerely,

Michael F. Prysby, P.E.,
District Engineer
Resource Management Division
Lansing District Office
517-335-6122

mfp:jir

cc: Mr. Daugherty Johnson III, City of Flint, Utilities Administrator
Mr. Brent Wright, City of Flint, Water Treatment Plant
Mr. Lonnie Lee, DEQ
Mr. Patrick Cook, DEQ

2310

STATE OF MICHIGAN
DEPARTMENT OF ENVIRONMENTAL QUALITY
LANSING

RICK SNYDER
GOVERNOR

DAN WYANT
DIRECTOR

June 20, 2011

Mr. Brent Wright, Plant Supervisor
City of Flint, Water Plant
4500 North Dort Highway
Flint, Michigan 48505

Dear Mr. Wright:

SUBJECT: City of Flint Water System

This letter confirms my visit you and Mr. Michael Glaskow on June 9, 2011. The purpose of the visit was to conduct routine water system surveillance and to observe a routine water treatment plant (WTP) test-run. The status of various water related concerns were discussed during the visit and these are discussed in more detail below.

1. A routine WTP test-run was being conducted and, based upon the site visit, finished water turbidity and total coliform treatment objectives were being achieved. Specific operating parameters along with an overall summary of the test-run will be provided to us in the test-run report. Finally, we have not received the reports for the WTP test-runs completed since 2010. It is our understanding that three test runs were performed in 2010 and two (including the current test run) in 2011. Please provide us with a copy of these WTP test run reports. Finally, we are pleased with the commitment put forth to conduct routine WTP test-runs and we encourage the city to maintain this level of commitment.

2. WTP staff are continuing to work on the WTP Standard Operating Procedure (SOP) for routine test-runs and pipeline emergencies. Please provide us with a copy of the SOP after it is completed.

   Next, WTP staff and Water Service Center (WSC) staff are working to complete the water system Emergency Response Plan (ERP). Again, please provide us with a copy of the ERP for our review and approval.

   Finally, a mock Improved Explosive Device (IED) Attack on the Flint WTP was conducted on May 12, 2011. The mock exercise tested the response, coordination and communications between the City of Flint, Genesee County first responders, and state departments. The DEQ, however, was not notified of the mock incident due to a breakdown in communication during changes in

emergency oversight at the WTP. It is our understanding that WTP staff are making further changes to the water system ERP to include specific instructions confirming that all critical contacts have been notified.

3. Based upon our discussion, Phase II of the reliability study is nearly complete. We look forward to reviewing the second phase of Flint's reliability study when it becomes available. Finally, it is also our understanding that the amended Phase I report will be included with the Phase II report.

4. The 2011 Drinking Water Infrastructure Needs Survey was sent to the city in March 2011. It is our understanding that WTP and WSC staff are working to complete the survey by the end of June. We encourage the city to complete and return the survey to our office within the next several weeks.

Finally, the city of Flint continues to investigate its long-term source for drinking water. Options for future water supply source include; continued service from Detroit, establishing a new surface water source from Lake Huron – Karegnondi project (as a joint venture with other communities), or utilization of Flint's existing resources. As we discussed in our previous letter, each option will require a certain level of WTP and pumping station operation. Please keep us updated concerning the city's progress towards identifying the most practical alternative for its long-term source for drinking water. We will also to continue to meet with you and your water department staff on a quarterly basis to review the issues and the efforts concerning the city's water system.

Should you require further information, please contact me at the telephone number below; via e-mail at prysbym@michigan.gov; or Department of Environmental Quality, P.O. Box 30242, Lansing, Michigan 48909.

Sincerely,

Michael Prysby

Michael F. Prysby, P.E., District Engineer
Environmental Resource Management Division
Lansing District Office
517-335-6122

mfp:jir

cc: Mr. Gregory Eason, City of Flint
Mr. Mike Brown, City of Flint

2310

STATE OF MICHIGAN
DEPARTMENT OF NATURAL RESOURCES & ENVIRONMENT
LANSING

RICK SNYDER
GOVERNOR

February 17, 2011

Mr. Gregory A. Eason, City Administrator
City of Flint
1101 South Saginaw Street
Flint, Michigan 48502-1416

Dear Mr. Eason:

SUBJECT: City of Flint Water System

This letter confirms our meeting on February 10, 2011, with Mr. Mike Brown, Mr. Brent Wright, Mr. Rick Freeman from Rowe Incorporated, and yourself at the Flint Water Treatment Plant (WTP). The purpose of the meeting was to conduct routine water system surveillance. The status of various water related concerns discussed in our meeting and further actions necessary to correct them are discussed in more detail below.

- **Water system Emergency Response Plan (ERP)/WTP Standard Operating Procedure (SOP)** – A draft copy of the city's water distribution system contingency plan and the WTP SOP for routine test-runs and pipeline emergencies was provided to us. Several questions/comments were noted during our review of each plan and were discussed during the meeting. The questions/comments were noted on each document and provided to Mr. Wright. The questions/comments should be answered as part of preparing final versions of each plan.

  Next, changes to the Administrative Rules of the Michigan Safe Drinking Water Act, 1976 PA 399, as amended, now require an ERP in place of the contingency plan. The ERP provides an outline to follow in the event of a water related emergency (loss of pressure, contamination, etc.). The ERP is similar to a water system contingency plan; however, various types of programs/plans pertaining to water utility operation need to be referenced in the ERP. An electronic copy of the ERP template was sent to Mr. Wright and can be used for preparing Flint's ERP. We will review the completed ERP during our next routine surveillance visit.

  Finally, we concur with the idea of dividing the WTP SOP into two separate SOPs for each mode of WTP operation. Specifically, a separate SOP will be established for routine test-run operation and emergency plant production. Please provide us with a copy of each SOP when they are completed.

- **Reliability study** – Based upon our discussion, Phase II of the reliability study is nearly complete. Phase II is to include various alternatives for recommended capital improvements. Asset management principals will also be included. We look forward

to reviewing the second phase of Flint's reliability study when it becomes available. It is also our understanding that the Phase I report was amended following our review comments. Please provide us with a copy of the amended Phase I study.

- **Booster pumping station deficiencies** – Based upon our discussion, improvements to the Torrey Road and Cedar Street pumping stations will be resubmitted as part of Flint's 2011 Drinking Water Revolving Fund (DWRF) application. A revised project plan that clearly identifies the need for the station upgrades, along with all of Flint's other 20-year water system needs, will need to be prepared. The project plan will also include some distribution system improvements. The city should also take the opportunity to utilize the reliability study for additional documentation in support of the projects that are included in the project plan. Finally, given the uncertainty of Flint's long-term pumping needs at Pump Station No. 4, no immediate improvements are planned for this facility.

  While there is uncertainty over the degree of long-term use of Pump Station No. 4, this station is critical for today's water supply operations. Continued effort is needed now to ensure adequate reliability of Pump Station No. 4 and its respective storage reservoirs, especially during emergency operation.

- **WTP Test Runs** - Routine WTP test runs continue to be conducted on a quarterly basis. Each test run increases the experience and confidence of plant operators to further assure that plant production water meets all applicable drinking water standards. Based upon our discussion, treatment continues to improve with each test run. Given the importance of maintaining the familiarity with treatment plant operation, and the potential of needing to place the WTP into emergency operation to distribute treated water to the public, WTP test runs need to continue on a quarterly basis. Finally, please provide us with copies of the 2010 WTP test run reports

- **Operator Certification** – WTP operator Mr. Mike Glaskow has obtained the F-1 certification and has been designated as the Operator-In-Charge (OIC). As OIC, Mr. Glaskow will be responsible for reviewing and signing the following monthly/annual reports:

  - Monthly Operation Reports
  - Consumer Confidence Report and Certification Form
  - Lead/Copper Reporting Form
  - Annual Pumpage Report

  Next, with Mr. Glaskow obtaining the F-1 certification, the city has achieved full compliance with the F-1 certification requirement. It is also our understanding that the city has discontinued their mutual aid agreement with Genesee County for operator assistance during routine test runs; however, the county is available to assist, as needed, during emergency operation. We encourage the city to maintain the availability of assistance from Genesee County during emergency operation.

- **Infrastructure Needs Survey** - The 2011 Drinking Water Infrastructure Needs Survey will be sent to Flint in March 2011. We encourage the city to complete and return the survey to our office. As always, we are available to meet with you to discuss various water related projects that could be included in the survey as part of

Flint's overall 20-year needs. The city should also take the opportunity to utilize the reliability study for additional documentation in support of the projects that are included in the needs survey. Finally, our department will be providing several training sessions to assist in completion of the 2011 survey. The city will be provided with additional information pertaining to the training sessions when it becomes available

- **Future Water Source** – The city of Flint is faced with the challenge of determining its long-term source for drinking water. Options for future water supply source include; continued service from Detroit, establishing a new surface water source from Lake Huron – Karegnondi project (as a joint venture with other communities), or utilization of Flint's existing resources. Each option will require a certain level of WTP operation. The level of treatment and scope of improvements at the WTP will need to be carefully evaluated as part of selecting the most suitable option. Other important factors include; short-term source(s) of supply, residuals management (correcting the violations at the Bray Road sludge lagoons vs. on-site treatment), and available source capacity (Lake Huron supply and Flint River watershed).

We appreciate having the opportunity to meet with you to discuss the status of Flint's water system and the challenges that lie ahead. Finally, we will to continue to meet with you and your water department staff on a quarterly basis to review the issues and the efforts concerning the city's water system.

Should you require further information, please contact me at the telephone number below; via e-mail at prysbym@michigan.gov; or Department of Natural Resources and Environment, P.O. Box 30242, Lansing, Michigan 48909.

Sincerely,

Michael F. Prysby, P.E., District Engineer
Environmental Resource Management Division
Lansing District Office
517-335-6122

mfp:jir

cc: Mr. Mike Brown, City of Flint
Mr. Brent Wright, Flint Water Plant
Mr. Rick Freeman, P.E., Rowe Incorporated
Mr. Brian McKenzie, Genesee County Health Department

Thelen, Mary Beth (DEQ)

From: Dillon, Andy (Treasury)
Sent: Thursday, March 28, 2013 6:18 PM
To: Snyder, Rick (GOV); Muchmore, Dennis (GOV); Roberts, John (GOV); Wyant, Dan (DEQ)
Cc: Stibitz, Brom (Treasury); Fraser, Roger (Treasury); Saxton, Thomas (Treasury)
Subject: KWA

Governor, based upon today's presentations to the DEQ by the City of Flint, KWA and the engineering firm (Tucker Young) Treasury hired to vet the options as to whether Flint should stay with DWSD or join KWA, I am recommending we support the City of Flint's decision to join KWA. The City's EM, Mayor and City Council all support this decision. Dan Wyant likewise concurs and will confirm via email.

We have a briefing call tomorrow morning with Dennis and John to provide more background as to why we reached this conclusion. Flint's EM wants to sign the resolution asap as the project is moving forward with or without them and their participation affects the design and the construction season is upon them.

I assume DWSD will make a last ditch effort to save the customer but I will not advise them of my recommendation until we brief Dennis and John.

Regards,

Andy

Sent from my iPad

Thelen, Mary Beth (DEQ)

From: Stibitz, Brom (Treasury)
Sent: Tuesday, March 26, 2013 9:52 AM
To: Wyant, Dan (DEQ)
Cc: Dillon, Andy (Treasury)
Subject: Fwd: City of Flint Water Supply Assessment--from Rowe Professional Services Co
Attachments: DOC[2].PDF; ATT00001.htm

Additional follow up information on te KWA issue.

Begin forwarded message:

> **From:** "Hichez, Amy (Treasury)" <HichezA@michigan.gov>
> **To:** "Dillon, Andy (Treasury)" <DillonA2@michigan.gov>, "Stibitz, Brom (Treasury)" <StibitzB@michigan.gov>
> **Cc:** "Cousineau, Sara (Treasury)" <CousineauS@michigan.gov>, "Hichez, Amy (Treasury)" <HichezA@michigan.gov>
> **Subject: City of Flint Water Supply Assessment--from Rowe Professional Services Co**

ROWE PROFESSIONAL SERVICES COMPANY

Large Firm Resources. Personal Attention.℠

January 7, 2013

Mr. Edward Kurtz, Emergency Financial Manager
City of Flint
1101 S. Saginaw Street
Flint, MI 48502

Subject: Review of December 21, 2012 Presentation – City of Flint Water Supply Assessment

Dear Mr. Kurtz:

As requested, we have reviewed the analysis of water supply alternatives for the City of Flint which was presented to the State Department of Treasury by Tucker, Young, Jackson, and Tull, Inc. (TYJT) on December 21, 2012. Our review is attached and summarizes the primary differences between the TYJT assessment and our previous studies and provides explanations of why we believe there are differences.

We have also reviewed the options for continued DWSD supply included in the TYJT presentation. It is not clear whether these are presented as specific offers on behalf of DWSD or included as examples for analysis, but we have noted some items which we believe should be addressed and considered as these options are compared.

If there are questions, please contact me.

Sincerely,
ROWE Professional Services Company

James E. Redding, P.E.
Vice President / Director of Engineering

Attachment

R:\Projects\04C0105\Docs\Correspondence Out\January 7 Kurtz.docx

Review of TYJT December 21, 2012 Presentation
City of Flint Water Supply Assessment
Prepared by Rowe Professional Services Company

DWSD Supply (Slides 7 through 9)

1. The 8 mgd maximum day supply by DWSD options can result in periods during the summer when most of the water to meet demands will be supplied by the City from the river. To aid in maintaining a consistent water quality, softening of the water from the river should be provided with this option, greatly increasing the City's costs.

2. Upgrades to Flint's WTP and dams will be needed for options requiring blending, since the WTP will be required to provide continuous, reliable service and compliance with recent surface water treatment regulations.

3. The rates for the options analyzed are shown on Slide 9 as "TYJT Estimates". Options and rates shown are different than presented by DWSD previously.

	DWSD 11/29/2012	TYJT Estimates
18 mgd Maximum Day - P&B	$16.24	$16.37
12 mgd Maximum Day - P&B	$16.30	$16.31
8 mgd Maximum Day -P&B		$12.68
12 mgd Maximum Day - Imlay	$14.38	$14.38
8 mgd Maximum Day - Imlay		$11.11

4. Since the rates used in the analyses are shown as estimates, are they actual offers or just presented as "what if" scenarios?

5. We assume that the Imlay options are based on transfer of the 72" main through Lapeer County to Flint. The analyses show a capital cost of $4.7 million; we assume that this is the proposed purchase / lease cost to Flint. This should be clarified along with pertinent details.

6. If the transmission main is transferred to Flint, what are Flint's responsibilities regarding service to the Lapeer County customers? If they remain DWSD customers, then Flint should receive some revenue for the use the main. It does not appear this is included in the TYJT analyses.

7. If the transmission main is transferred to Flint, we assume that the city will be responsible for the maintenance of the 50 year old main. The TYJT analysis did not include this.

8. Do the rates shown include the credit for "reliability" which had been discussed with DWSD?

9. If the point of commerce is changed from Baxter and Potter to Imlay, a new meter pit will be required. The cost of this does not appear to be included in the TYJT cost analyses.

Flint River Supply (Slide 10)

1. If any of the "blending" options are chosen, it will be necessary to upgrade the Flint WTP and dams to provide reliable, continuous service and compliance with recent surface water treatment regulations.

Data Collected (Slide 14)

1. The slide notes that Flint blending is based on DWSD supplying 2/3 and Flint supplying 1/3 of 12 MGD ADD. For the maximum day demand (18 mgd), if DWSD supplies a maximum of 8 mgd, Flint will supply 10 mgd or 56% of the total. However, such a large portion will make it more difficult to blend and achieve consistent water quality. Flint will need to soften water for these options.

Benchmarking Comparisons (Slide 16)

1. The slide subtitles are "KWA O&M Inflation Factor" and "DWSD and Flint Rate Inflation Factor". It seems appropriate to benchmark O&M costs for the KWA, because future costs of service will be dependent on how operating costs are impacted by inflation. For Flint, it does not seem appropriate that "rate inflation" from other utilities be used to determine the impact of inflation on future cost of service. Rates are impacted by inflation, but also by other factors such as debt and customer base. O&M expenses and rates are different and care should be exercised not to mix the two during analyses. The TYJT analyses apply an inflation factor (based on rates from other utilities) to the Flint WTP operating expenses, which does not seem to be consistent.

2. The KWA will supply raw water; SOCWA and YUCA both supply finished water. Regulations impact the O&M for finished water suppliers but should not impact the KWA O&M. The use of data from SOCWA and YUCA does not seem like a comparable comparison with the KWA. Finished water suppliers will have increased costs due to regulatory compliance, which really are not due to "inflation" of the costs of wages, power, chemicals, etc.

3. DWSD has a history of rates to Flint and other suburban wholesale customers. Rates tend to be quite specific to each utility, based on much more than just the costs of operating and maintenance. It appears that DWSD historical rates have not been considered in projecting future DWSD rate increases.

Capital Financing (Slide 17)

1. KWA bonds are planned to be general obligation bonds, backed by member counties.

O&M Inflation Factor (Slide 20)

1. SOCWA and YUCA are finished water suppliers; ever-changing regulatory requirements will impact their operating costs more than a raw water supplier, such as KWA.
2. KWA will be a supplier of raw water. O&M costs should primarily be limited to power and labor, with a little chemical use for zebra mussel control. KWA will not provide treatment of the water.

3. The KWA study assumed power, labor, and chemical costs increase at an annual average of 3%. TYJT indicated this is too low and suggested 5%.

4. Following are examples of historical inflation, which support the 3% as a reasonable assumption for O&M expenses (not rates)
    a. Labor- GCDC-WWS labor costs have increased at an annual average rate of 2.5% since 2003
    b. Electricity Rates in Michigan (per U.S. Energy Information Administration) have increased an average of 3.2% since 1999.
    c. The U.S. Bureau of Labor Statistics indicates that the inflation rate over the last 30 years has been an average of 2.8%.

Finished Water Rate Inflation (Slide 21)

1. TYJT bases their assumptions for rate inflation on a survey of rates from three other water suppliers, but ignored the actual rate history of DWSD. TYJT assumed DWSD rate increases of 4.4% annually (if water is purchased from P&B) and 2.9% annually (if water is purchased from Imlay). Based on the actual charges by DWSD to Flint, DWSD historical rates are as follows:
    a. 10 year increase in DWSD rates to Flint:: 10.5% annually
    b. Average annual increase through 45 year history: 6.7%

2. Note that for the KWA analyses, an inflation factor has just been applied to power, labor, and chemicals. Although higher prices for labor, power, and chemicals impacts utility rates; rates are impacted by many other factors, many of which are not related to inflation. Rate inflation will likely be different than O&M inflation. Other factors impacting rates:
    a. Debt – the amount of debt varies widely between utilities
    b. Number of customers / quantity of water sold – there are many fixed expenses with a utility, that if are distributed amongst more users/more gallons sold will result in lower rates. Conversely, if there are fewer users or less water sold, the rates are higher. Assumptions regarding future water consumption will have a great impact on "rate inflation".

3. Unlike KWA and Flint operating expenses which will increase over time based on inflation, the cost of continued DWSD service should be based on the inflation of DWSD rates, to include the increasing cost of other DWSD expenses such as debt and the impact of reduced customers / demands in addition to increasing O&M expenses.

4. Even though there could be a one-time reduction in DWSD rates through adopting the model contract, limiting peak demands, and or changing the point of commerce; it doesn't seem reasonable to assume that subsequent annual increases will only average 4.4% through the 30 year period of analysis. This is significantly less than historical performance (yet TYJT suggests that inflation for KWA O&M expenses will increase at almost double the rate of historical indicators).

Capital Financing with Revenue Bonds (Slide 24)

1. Note that the KWA bonds will be general obligation bonds backed by the member counties.

2. The 2009 KWA Study assumed 6%, 25 year financing. The interest rate for planning was reduced in the 2012 Study update to 5%, which is still higher than if bonds were sold today.

3. Financial consultants determined the charges for purchasing capacity in the KWA supply based on the estimated project cost plus appropriate financing costs. Based on 60 units of capacity, $538,764,000 will be generated for repayment of debt and project costs using the capacity charges in the KWA capacity agreement.

25 years * 60 units * $355,300 / unit =	$532,950,000
3 years * 60 units * $32,300 / unit =	$ 5,814,000
	$538,764,000

4. For a KWA project cost of $272,421,558, total P&I is $483 million. The difference of $55,500,000 is available for financing expenses (capitalized interest, bond issuance costs, etc.) and additional contingencies.

5. Bond holder reserve is not a requirement for general obligation bonds.

6. TYJT assumed that 3% interest would be earned on the bond holder reserve during the 25 year bond period. Current interest rates are less than 1% and it seems inappropriate to assume such a high rate will be earned on retained funds.

7. Bondholder reserve, if provided, should be applied against the last couple of P&I payments. The TYJT did not apply it. This will reduce their project costs.

KWA Construction (Slides 26 through 29)

TYJT has indicated that the KWA construction cost estimate is too low. The primary differences in cost estimates for the project appear to be the following components:

1. Pump Stations (Slide 27) – The TYJT estimate for the pump stations is more than double that used by the KWA ($54,573,314 vs. $24,618,080). KWA estimates were based on actual construction costs from recent projectd completed by Genesee County within the last eight years.
   a. 32mgd water pump station including two-10 MG ground storage tanks - $13.4 million
   b. 80 mgd wastewater pump station, 50 feet deep wetwell – $8.3 million
   c. 30 mgd wastewater pump station, 50 feet deep wetwell – $9.4 million

   The KWA budgeted amount seems reasonable for two pumping stations as currently planned and to be constructed in rural areas (not southeast Michigan).

2. Redundant Power – There is no need for redundant power; other provisions will provide reliability of supply.

3. Land – Preliminary engineering has continued so earlier budgets established for planning for land acquisition can be greatly reduced. Options have been obtained on all properties which must be

purchased, so purchase prices are known. It will be necessary to obtain easements for only two miles of pipeline construction. All land costs are now estimated at $1.25 million.

4. Engineering, Legal, Administration & Contingencies
   a. The October 2012 KWA estimate provided an allowance of 25% of construction cost to cover engineering, legal, administration, and contingencies (ELAC). This was reduced from the 38% allowance used in the 2009 Study because ongoing planning and design have firmed up many of the details of the project, including:
      i. The intake design has been completed and all regulatory permits obtained.
      ii. The transmission main route has been determined. Meetings with road agencies have firmed up the requirements for construction and restoration within rights-of-way. Environmental review and permitting are in process.

   b. TYJT costs for Intake Crib, Pump Stations, and Transmission Mains (Slide 30) include a 30% allowance for ELAC. These allowances (from Slides 26 through 28) total $72,139,566. In addition, Slide 30 provides the following additional ELAC costs in the project total:

Design Engineering / Pump Stations	$16,939,581
Construction Management	$14,434,410
Administration	$ 349,440
Legal	$ 831,000
Total	$32,554,431

   c. Combining this with the $72,139,566 totals $104,693,997 or 43% of the estimated construction cost. We believe that such a high allowance for ELAC is not appropriate for a project of this magnitude where preliminary engineering and some design have already been completed.

Cost Comparison (Slide 30)

1. The TYJT pump station price is too high based on costs of similar projects; costs used by KWA are based on costs of recent local projects. The KWA estimate is believed to be sufficient for the proposed pumping stations.

2. Redundant power is not required; this does not need to be included in the TYJT estimate.

3. Land for LHPS – actual price is $360,000

4. Design Engineering / PS and Transmission – KWA included engineering in the 25% ELAC allowance included in the $207,752,895 estimated cost of transmission mains; TYJT included engineering in their 30% ELAC allowance included in the $218,811,559 estimated cost. By adding $16,939,581 for design engineering, $14,434,609 for construction administration, $349,440 for administration, and $831,000; it seems that ELAC is being "double-counted". The TYJT 43% allowance for ELAC seems unwarranted for a project with a great deal of preliminary and design engineering completed. The 25% KWA allowance is believed to be sufficient.

5. Easements and land (other than LHPS) should total $1,140,000, based on current options and specific needs for easements.

Other Considerations – Redundancy / Reliability (Slide 33)

1. Unfunded Mandates/ Future Regulations
   a. The proposed KWA supply will deliver raw water; it is not anticipated to be affected by future changes to regulations. Regulations will impact the City of Flint with respect to treatment and/or distribution of finished water. The City will be subject to these requirements with any of the DWSD blending options, just as they will be responsible for them if supplied by KWA. Some compliance costs may actually be less with the higher quality Lake Huron water rather than Flint River water as the source.

2. State Goals
   a. The TYJT presentation indicates that creation of a new raw water supply is contrary to the governor's goals as suggested. However, the development of a new raw water supply provides new opportunities. Communities in Sanilac, St. Clair, and Lapeer counties will have the option to join a regional water supply and replace their small local supplies where limited supplies and high concentrations of arsenic have been a concern. The new water supply also provides great economic development opportunities. The raw water supplied by KWA will make a new commodity, raw water, available to the region. A large, low-cost supply of raw water can be a valuable resource for industries and agri-businesses. The development of a new water supply will also create construction jobs through the short term period of building the new water supply and subsequently over a longer period as new businesses and industries are developed in the area.
   b. The City of Flint and area communities will benefit as permanent jobs are created for operating and maintaining the local treatment facilities.

3. Redundancy
   a. We agree that the KWA and DWSD options are similar with respect to redundancy. Both provide the primary water supply; customers are responsible for their backup supply.

Other Considerations – Cost Slide 34

1. TYJT indicates that the DWSD 8 mgd supply option is the least cost alternative.
   a. The TYJT analysis does not include the cost of needed upgrades to the City's WTP or increased operating costs in their analysis. During summer months, water from the river will need to be softened before blending. More than half of the water supplied will be provided from the river. When the cost of upgrades to the WTP and the increased operating costs (for softening) are added to the TYJT analysis, the KWA option is less than the DWSD 8 mgd option.

2. For any of the DWSD "blending" options, upgrades will need to be made at the WTP to provide for continuous, reliable operation and compliance with new surface water treatment rules. Increased capital and operating costs for treating water from the river should be added to the TYJT costs for comparison with the other options.

3. Water from the river will require greater effort to treat than water from Lake Huron (more chemicals, power, and residuals). The TYJT analysis shows about the same O&M costs for the Flint WTP, regardless of water source. It seems that the WTP O&M costs for the KWA options should be reduced to reflect the savings from treating Lake Huron water.

4. The TYJT presentation noted that the KWA analysis did not include allowances for mechanical and process improvements within the planning period. The KWA will supply raw water. The facilities consist of pipe, pumps, and a tank. There are no treatment facilities which would be susceptible to future regulatory changes. The only improvements that seem likely would be the need to provide additional capacity. Capacity expansion is planned to be financed through capacity charges to new users.

5. The provision for redundant connections between the City's water system and the GCDC system was included in the most recent water supply agreement between the two, in 2011. Although not a KWA cost, the cost of the redundant connections should be considered with all options.

6. The $2.3 million budgeted for land by KWA was intended to cover all land requirements. Since the October update, options have been obtained on all land to be purchased and the locations of easements needed has been finalized. Total land costs are now estimated to be about $1.5 million.

7. The 2004 study included a 47% allowance for engineering, legal, administration, and contingencies (ELAC). The 2009 study reduced the allowance for ELAC to 37% because many of the details since the 2004 conceptual study had been better defined. For the October 2012 update, the allowance for ELAC was reduced to 25% because continued planning and preliminary engineering further addressed details from the earlier concepts.
    a. The detailed design (plans and specifications) and permitting have been completed.
    b. The transmission main route has been finalized. Meetings with road agencies have established requirements for construction and restoration within road rights-of-way. Environmental permitting is in process. The primary remaining unknown is pipe sizing, which is largely dependent on Flint's participation.

    It is our experience that the 25% ELAC allowance is appropriate for a project of this magnitude at this stage in the planning / design stage. The 43% ELAC allowance recommended by TYJT is excessive for a project in the design phase.

8. Flint's WTP as a backup to the KWA will be less difficult to provide for than the current arrangement as a backup to DWSD. We believe there is potential for challenges with chemistry and treatment for the proposed DWSD blending options, too.

9. It doesn't seem that oversizing the KWA capacity is a good solution for the city's water loss problems, if that is what is being suggested.

10. Yes, it would be nice if the KWA system could be constructed to firmly determine its cost and time to complete before making a decision about water supply alternatives. However, a decision is needed regarding Flint's participation so that the sizing and design can be completed, before it can be built.

Project Costs - TYJT Slides 26 through 30

	KWA	TYJT
Intake and Crib		
Construction	$22,076,850	$22,076,850
ELAC	$5,519,213	$5,519,213
Property	$2,300,000	$2,300,000
Pumping Stations		
Construction	$24,618,080	$54,573,314
Land		$75,000
ELAC	$6,154,520	$16,394,494
Transmission Mains		
Construction	$166,202,316	$167,419,530
ELAC	$41,550,579	$50,225,859
Easements		$1,166,170
Engineering		
Design Engineering		$16,939,581
Construction Management		$14,434,609
Administration		$349,440
Legal / Easements / Contracts		$831,000
Power	$4,000,000	$4,000,000
Redundant Power		$1,273,200
Total Construction	$212,897,246	$244,069,694
Total ELAC	$53,224,312	$104,694,196
Total Land / Property / Easements	$2,300,000	$3,541,170
Total Power	$4,000,000	$4,000,000
Total Redundant Power	$0	$1,273,200
Total	$272,421,558	$357,578,260
ELAC as % of Construction	25.0%	42.9%

Option	TYJT Total Cost	TYJT minus additional costs of river treatment	TYJT minus additional costs of river treatment plus redundant Flint-GCDC connections	TYJT minus additional costs of river treatment plus redundant connections less KWA reserve	TYJT minus additional costs of river treatment plus redundant connections less TYJT financing	TYJT plus Flint WTP		Adjusted Total Cost	Ranking
1 Flint WTP Only	$590,441,893							$590,441,893	3
2 DWSD 8 MGD Max Day at Imlay	$621,211,298					$771,289,948		$771,289,948	5
3 KWA 10/31/12 Update	$649,775,166	$534,615,996	$554,555,960					$554,555,960	1
4 DWSD 8 MGD Max Day at P&B	$657,167,877					$807,246,527		$807,246,527	6
5 KWA-1	$707,279,715	$592,120,545	$612,060,509		$572,731,459			$572,731,459	2
6 DWSD 12 MGD Max Day at Imlay	$707,994,386					$858,073,036		$858,073,036	8
7 DWSD 12 MGD Max Day at P&B	$742,168,081					$892,246,731		$892,246,731	9
8 KWA - 2	$766,784,313	$651,625,143	$671,565,107	$654,706,341				$654,706,341	4
9 DWSD 18 MGD Max Day at P&B	$791,202,885						$812,337,848	$812,337,848	7

b

Option for Water Supply	TYJT Projected 30 Year Total Cost	30 Year O&M Reduction for Treating Lake Huron Water	25 Year Bond Cost for Redundant Connections	Eliminate KWA Reserve	Use KWA 25 Year Capital Charge $385,300 / MGD	25 Year Bond Cost for Flint WTP Upgrades	Adjusted 30 Year Total Cost	Rank (Least to Highest Cost)
1 Flint WTP Only	$590,441,893		Included				$590,441,893	3
2 DWSD 8 MGD Max Day at Imlay	$621,211,298		Note 1			$150,078,650	$771,289,948	5
3 KWA 10/31/12 Update	$649,775,166	-$115,159,170	$21,134,963				$555,750,960	1
4 DWSD 8 MGD Max Day at P&B	$657,167,877		Note 1			$150,078,650	$807,246,527	6
5 KWA-1	$707,279,715	-$115,159,170	$21,134,963		-$39,329,050		$573,926,459	2
6 DWSD 12 MGD Max Day at Imlay	$707,994,386		Note 1			$150,078,650	$858,073,036	8
7 DWSD 12 MGD Max Day at P&B	$742,168,081		Note 1			$150,078,650	$892,246,731	9
8 KWA - 2	$766,784,313	-$115,159,170	$21,134,963	-$16,858,766			$655,901,341	4
9 DWSD 18 MGD Max Day at P&B	$791,202,885		$21,134,963				$812,337,848	7

Thelen, Mary Beth (DEQ)

From: Creal, William (DEQ)
Sent: Wednesday, March 27, 2013 1:27 PM
To: Sygo, Jim (DEQ); Wyant, Dan (DEQ)
Cc: Busch, Stephen (DEQ); Argiroff, Phil (DEQ); Alexander, Christine (DEQ)
Subject: FW: Flint Scenarios
Attachments: Flint Scenarios FY 2013-14.pdf; Recent DWSD Flint Supply Cost Options.pdf; TYJT Recommendaton DWSD vs Flint.pdf; flint water supply assessment final report 2-6-13.pdf; KWA - DWSD for WRD.docx

Importance: High

The attached word document includes WRD review of this situation, including what a withdrawal from the Flint River of 10 mgd would mean to NPDES dischargers.

From: Argiroff, Phil (DEQ)
Sent: Wednesday, March 27, 2013 12:27 PM
To: Creal, William (DEQ)
Cc: Alexander, Christine (DEQ)
Subject: FW: Flint Scenarios
Importance: High

Bill:

Please see the attached Word write-up. It also includes the information you requested of Chris. Thanks.

-Phil

From: Creal, William (DEQ)
Sent: Friday, March 22, 2013 12:24 PM
To: Argiroff, Phil (DEQ)
Subject: FW: Flint Scenarios
Importance: High

Please take a look at this from a financial impact on DWSD – can we figure out if this will be a major hit for them?

From: Sygo, Jim (DEQ)
Sent: Thursday, March 21, 2013 6:07 PM
To: Shekter Smith, Liane (DEQ); Creal, William (DEQ)
Cc: Willard, Veronica (DEQ); Smith, Laura (DEQ)
Subject: FW: Flint Scenarios
Importance: High

Bill and Liane,

Please have the attached documents reviewed and comments provided relative to the City of Flint water supply needs and relative to the impacts that are possible to the Detroit System.

Treasury needs an assessment as to the need for the alternative water supply and it's impacts so they can provide input to the financial managers.

We need comments by next week and will likely meet with the Director on Thursday.

Bring in whatever staff you need for the review and ple3ase try to have your assessments by Wednesday morning.

Sorry for the tight time frame but this one is out of my hands. I will also be looking at the report.

From: Wyant, Dan (DEQ)
Sent: Thursday, March 21, 2013 5:10 PM
To: Sygo, Jim (DEQ)
Cc: Shaler, Karen (DEQ); Thelen, Mary Beth (DEQ); Wyant, Dan (DEQ)
Subject: FW: Flint Scenarios
Importance: High

Jim,

Director asked that you reivew and coordinate this with with Liane Shekter Smith and/or Bill Creal and their appropirate staff. Director also asked that I schedule an internal meeting with you and staff on this for next week. After your review, please let me know who you want in the meeting. It needs to happen on Tuesday, Wednesday or Thursday of next week.

Thank you.

Mlary Beth

From: Stibitz, Brom (Treasury)
Sent: Thursday, March 21, 2013 5:00 PM
To: Wyant, Dan (DEQ)
Cc: Dillon, Andy (Treasury)
Subject: FW: Flint Scenarios

Andy asked that I pass this information along to you.

City of Flint Water Supply Assessment (TYJT; for Treasury)

DEQ-Drinking Water engineers are responsible for this review. WRD offers one comment however. The KWA pump stations are not supplied with a secondary power source. It would appear that we should ask if this meets "10 States" for drinking water facilities. If power is lost to the pump stations, the Flint WTP would have to be used to supply finished water (with Flint River as the raw source, apparently). It would seem that independent secondary power sources should be provided to the KWA pumping stations to more reliably ensure Lake Huron as the source water.

Potential Financial Impacts on the DWSD (Sewerage Fund):

It is difficult to quantify the potential financial impact of lost drinking water customers in Flint on the Sewerage Fund. Flint is supplied currently with DWSD drinking water but provides their own wastewater treatment. However, the following is offered:

- Some common functions in DWSD serve both Water and Sewerage. These include HR, purchasing, IT, legal, and top administration (including the Water Board). Further, under the proposed EMA organizational approach it appears that some services units would serve both water and sewer. It would follow that lost revenue to the Water Fund would have some incremental effect on the Sewerage Fund to make up for fixed costs.
- Lost revenue to the Water Fund would not translate to less outstanding water system debt. Would an increased level of water debt service to revenue result in a lower credit rating of an independent DWSD? The rating applies to DWSD as a whole. A lower rating would potentially increase costs to borrow on the sewerage side; for such items as CSO correction and WWTP improvements.
- Some have suggested that financial impact on residents consider both water rates and sewerage rates, combined. Although this is not what WRD currently does, should this type of assessment be presented in the future then lost revenue on the water side will increase costs to those remaining in DWSD (to cover the fixed costs). This could potentially increase the residential financial costs as a % of MHI for City residents, and thus further lengthen the time needed to completed non-core CSO corrections as described in the new permit.

Effects on NPDES Dischargers:

1) Which NPDES permits would be affected?
Flint WWTP, Flushing WWTP, and Genesee Co-Ragnone WWTP are in the Flint River model/WLA, so all of these and no others are potentially affected (at least in this immediately d/s WLA).

2) Would we expect permit limits would be modified as a result of this proposal (and decreased background flows)?
Since it appears the withdrawal would be near the head of or upstream of the modeled reaches, it would be assumed that all three facilities' limits would become more restrictive, depending on how we approach any load reductions to meet the DO std.

3) What would be the percent reduction in flow coming out of Holloway Reservoir?

A 1988 WRC 'ruling' requires that Holloway Reservoir release 85 cfs minimum in the summer, fall, and winter seasons. 232.4 cfs was used in spring modeling. 10 MGD = 15.5 cfs, so

15.5 cfs / 85 cfs = 18.2% reduction
69.5 cfs would remain

The withdrawal is below Holloway Reservoir, so the flow out of the reservoir itself wouldn't have to change, but the flow at the first WLA facility (Flint WWTP) is reduced. Maybe the Holloway release flow could be increased 10 MGD. Erik believes that the 85 cfs minimum was to protect the fishery.

Thelen, Mary Beth (DEQ)

From: Stibitz, Brom (Treasury)
Sent: Thursday, March 21, 2013 5:00 PM
To: Wyant, Dan (DEQ)
Cc: Dillon, Andy (Treasury)
Subject: FW: Flint Scenarios
Attachments: Flint Scenarios FY 2013-14.pdf; Recent DWSD Flint Supply Cost Options.pdf; TYJT Recommendaton DWSD vs Flint.pdf; flint water supply assessment final report 2-6-13.pdf

Andy asked that I pass this information along to you.

Summary of FY 2013-14 DWSD Cost Allocations to Flint Under Various Scenarios

Flint Only

		Revenue Requirement	Rates and Charges		
			Fixed	Commodity	*Avg Unit Cost*
1	**Status Quo *(Flint Portion)***	12,574,900	379,304	13.01	*20.39*
2	**Suggested Cct *(Flint Portion)***	11,281,100	351,661	12.06	*19.27*
3	Change	(1,293,800)	(27,643)	(0.95)	*(1.12)*
4	% Change	-10.3%	-7.3%	-7.3%	*-5.5%*
5	**Max Day Only**	9,904,300	294,542	10.87	*16.91*
6	Change	(1,376,800)	(57,119)	(1.19)	*(2.36)*
7	% Change	-13.9%	-19.4%	-10.9%	*-14.0%*
8	**Add CTA Line to BP**	10,093,100	310,271	10.87	*17.23*
9	Change	188,800	15,729	0.00	*0.32*
10	% Change	1.9%	5.1%	0.0%	*1.9%*
11	**CTA to BP / Flint only to FWTP**	12,446,300	506,371	10.87	*21.25*
12	Change	2,353,200	196,100	0.00	*4.02*
13	% Change	18.9%	38.7%	0.0%	*18.9%*
14	**Add CTA Line to FWTP**	10,191,200	318,450	10.87	*17.40*
15	Change	(2,255,100)	(187,921)	0.00	*(3.85)*
16	% Change	-22.1%	-59.0%	0.0%	*-22.1%*
17	**CTA to FWTP / Buy existing 72**	10,009,600	303,315	10.87	*17.08*
18	Change	(181,600)	(15,135)	0.00	*(0.32)*
19	% Change	-1.8%	-5.0%	0.0%	*-1.9%*
20	Cumulative Change	(2,565,300)	(75,989)	(2.14)	*(3.31)*
21	Cumulative % Change	-20.4%	-20.0%	-16.4%	-16.2%

		Assumptions			DWSD Investment	
		Avg Day *mgd*	Max Day *mgd*	Peak Hour *mgd*	CTA *$*	Flint Only *$*
1	**Status Quo**	24.6	45.6	47.7	0	0
2	**Suggested Contract**	23.4	**40.6**	**42.4**	0	0
3	**Max Day Only**	**12.0**	**18.0**	**18.0**	0	0
4	**Add CTA Line to BP**	12.0	18.0	18.0	62,290,800	0
5	**CTA to BP / Flint only to FWTP**	12.0	18.0	18.0	62,290,800	32,391,300
6	**Add CTA Line to FWTP**	12.0	18.0	18.0	94,682,100	0
7	**CTA to FWTP / Buy existing 72**	12.0	18.0	18.0	94,682,100	(2,500,000)

DWSD Worksheet : 18 MGD Maximum Day Customer with Model Contract Twinning Line and Owning both to the Flint WTP

Capacity

Flint ADD:	0.00 MGD	- MCF/Day
DWSD ADD:	12 MGD	1,604 MCF/Day

Annual Volume

Flint:	- MCF
DWSD:	585,561 MCF

2013 Cost of Supply

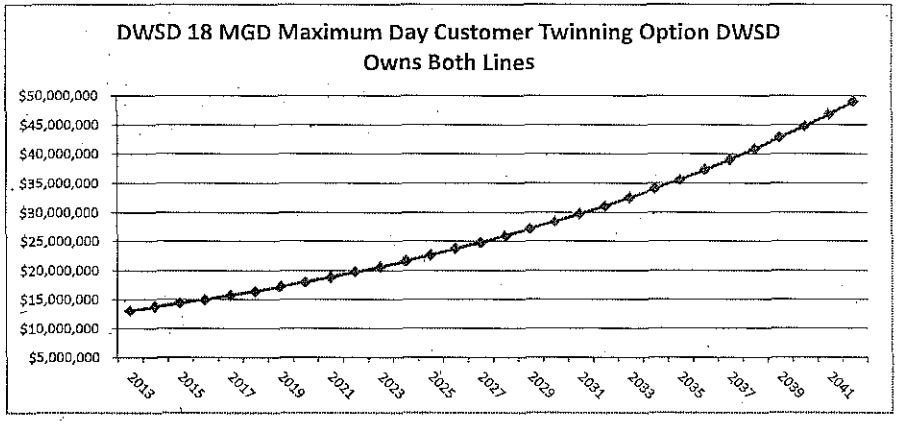
Flint WTP O&M:	- /MCF	$ -	/Yr
DWSD:	$ 17.08 /MCF	$ 10,001,390	/Yr

Escalation/Inflation Rate

Flint:	4.51% /Yr
DWSD:	4.7% /Yr

Capital Expenditure

Amount:	$ -		
Reserve:	$ -	0%	Reserve Rate: 0.00%
Amount plus Reserve:	$ -		
Revenue Bond Rate:	5%		
Number of Years:	25		
Annual Cost:	$0		



	Year	Flint WTP O&M	Water Purchase	Revenue Bond Payment	Interest on Reserve	TOTAL
1	2013	$ -	10,001,390		-	$ 10,001,390
2	2014	$ -	10,471,456		-	$ 10,471,456
3	2015	$ -	10,963,614		-	$ 10,963,614
4	2016	$ -	11,478,904	-	-	$ 11,478,904
5	2017	$ -	12,018,412	-	-	$ 12,018,412
6	2018	$ -	12,583,278	-	-	$ 12,583,278
7	2019	$ -	13,174,692	-	-	$ 13,174,692
8	2020	$ -	13,793,902	-	-	$ 13,793,902
9	2021	$ -	14,442,216	-	-	$ 14,442,216
10	2022	$ -	15,121,000	-	-	$ 15,121,000
11	2023	$ -	15,831,687	-	-	$ 15,831,687
12	2024	$ -	16,575,776	-	-	$ 16,575,776
13	2025	$ -	17,354,838	-	-	$ 17,354,838
14	2026	$ -	18,170,515	-	-	$ 18,170,515
15	2027	$ -	19,024,529	-	-	$ 19,024,529
16	2028	$ -	19,918,682	-	-	$ 19,918,682
17	2029	$ -	20,854,860	-	-	$ 20,854,860
18	2030	$ -	21,835,039	-	-	$ 21,835,039
19	2031	$ -	22,861,286	-	-	$ 22,861,286
20	2032	$ -	23,935,766	-	-	$ 23,935,766
21	2033	$ -	25,060,747	-	-	$ 25,060,747
22	2034	$ -	26,238,602	-	-	$ 26,238,602
23	2035	$ -	27,471,816	-	-	$ 27,471,816
24	2036	$ -	28,762,992	-	-	$ 28,762,992
25	2037	$ -	30,114,852	-	-	$ 30,114,852
	2038	$ -	31,530,250	-	-	$ 31,530,250
	2039	$ -	33,012,172	-	-	$ 33,012,172
	2040	$ -	34,563,744	-	-	$ 34,563,744
	2041	$ -	36,188,240	-	-	$ 36,188,240
	2042	$ -	37,889,088	-	-	$ 37,889,088
		$ -				

25 Yrs Cummulative
$ 458,060,853

30 Yrs Cummulative
$ 631,244,349

DWSD Worksheet : 18 MGD Maximum Day Customer with Model Contract Twinning Line and Owning Only New Line to the Flint WTP

Capacity

Flint ADD:	0.00	MGD	- MCF/Day
DWSD ADD:	12	MGD	1,604 MCF/Day

Annual Volume

Flint:	-	MCF
DWSD:	585,561	MCF

2013 Cost of Supply

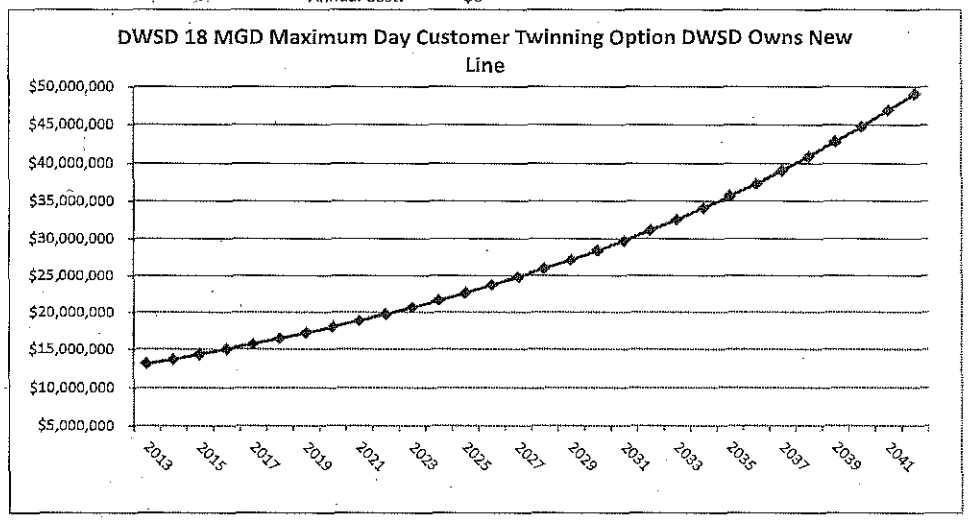
Flint WTP O&M:	-	/MCF	$ -	/Yr
DWSD:	$ 17.40	/MCF	$ 10,188,770	/Yr

Escalation/Inflation Rate

Flint:	4.51% /Yr
DWSD:	4.7% /Yr

Capital Expenditure

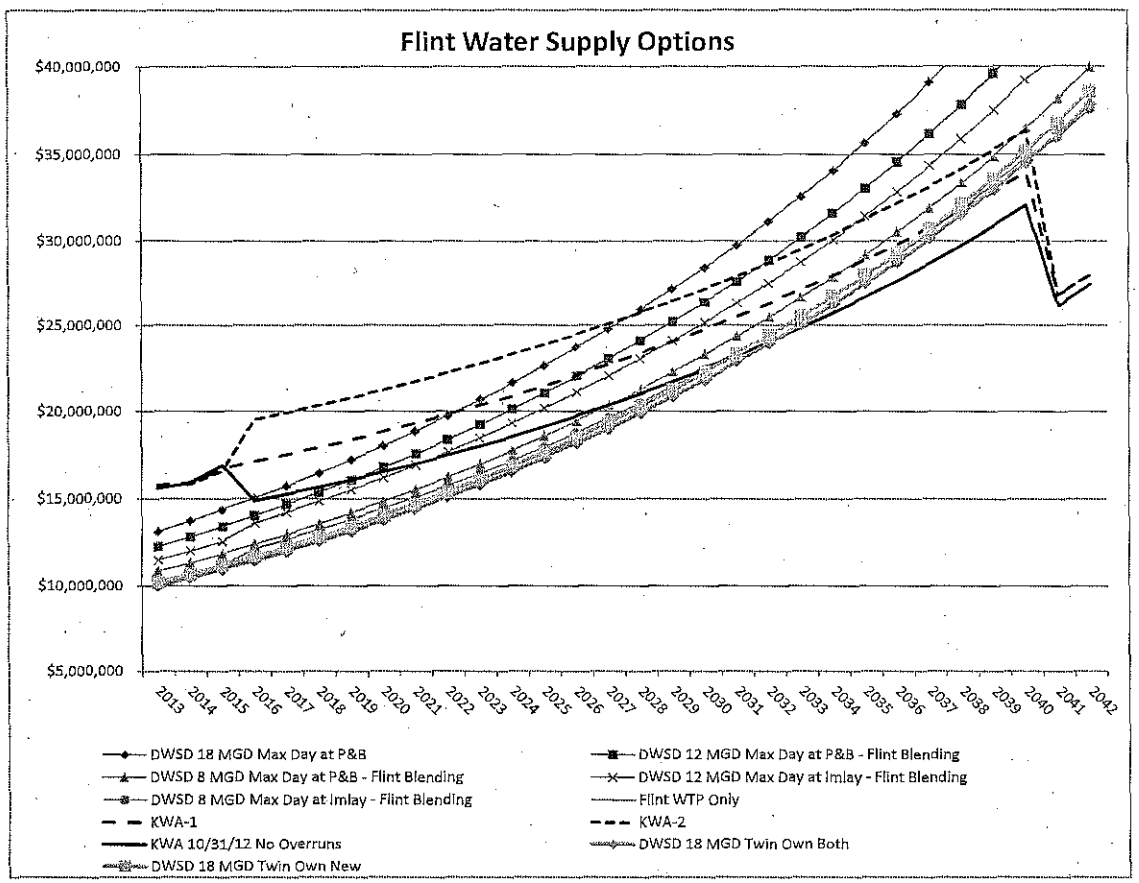
Amount:	$ -		
Reserve:	$ -	0%	Reserve Rate: 0.00%
Amount plus Reserve:	$ -		
Revenue Bond Rate:	5%		
Number of Years:	25		
Annual Cost:	$0		



	Year	Flint WTP O&M	Water Purchase	Revenue Bond Payment	Interest on Reserve	TOTAL
1	2013	$ -	10,188,770		-	$ 10,188,770
2	2014	$ -	10,667,642		-	$ 10,667,642
3	2015	$ -	11,169,021		-	$ 11,169,021
4	2016	$ -	11,693,965	-	-	$ 11,693,965
5	2017	$ -	12,243,582	-	-	$ 12,243,582
6	2018	$ -	12,819,030	-	-	$ 12,819,030
7	2019	$ -	13,421,525	-	-	$ 13,421,525
8	2020	$ -	14,052,336	-	-	$ 14,052,336
9	2021	$ -	14,712,796	-	-	$ 14,712,796
10	2022	$ -	15,404,297	-	-	$ 15,404,297
11	2023	$ -	16,128,299	-	-	$ 16,128,299
12	2024	$ -	16,886,330	-	-	$ 16,886,330
13	2025	$ -	17,679,987	-	-	$ 17,679,987
14	2026	$ -	18,510,946	-	-	$ 18,510,946
15	2027	$ -	19,380,961	-	-	$ 19,380,961
16	2028	$ -	20,291,866	-	-	$ 20,291,866
17	2029	$ -	21,245,584	-	-	$ 21,245,584
18	2030	$ -	22,244,126	-	-	$ 22,244,126
19	2031	$ -	23,289,600	-	-	$ 23,289,600
20	2032	$ -	24,384,211	-	-	$ 24,384,211
21	2033	$ -	25,530,269	-	-	$ 25,530,269
22	2034	$ -	26,730,192	-	-	$ 26,730,192
23	2035	$ -	27,986,511	-	-	$ 27,986,511
24	2036	$ -	29,301,877	-	-	$ 29,301,877
25	2037	$ -	30,679,065	-	-	$ 30,679,065
	2038	$ -	32,120,981	-	-	$ 32,120,981
	2039	$ -	33,630,667	-	-	$ 33,630,667
	2040	$ -	35,211,309	-	-	$ 35,211,309
	2041	$ -	36,866,240	-	-	$ 36,866,240
	2042	$ -	38,598,953	-	-	$ 38,598,953
		$ -				

25 Yrs Cummulative
$ 466,642,790

30 Yrs Cummulative
$ 643,070,941



Option	Costs through 2042	Ranking
Flint WTP Only	$ 590,441,893	1
DWSD 8 MGD Max Day at Imlay	$ 634,795,488	2
KWA 10/31/12 Update	$ 649,775,166	3
DWSD 8 MGD Max Day at P&B	$ 672,671,705	4
KWA-1	$ 707,279,715	5
DWSD 12 MGD Max Day at Imlay	$ 725,576,803	6
DWSD 12 MGD Max Day at P&B	$ 762,110,308	7
KWA-2	$ 766,784,313	8
DWSD 18 MGD Max Day at P&B	$ 821,226,268	9
DWSD 18 MGD Max Twin Own Both	$ 631,244,349	
DWSD 18 MGD Max Own New Line	$ 643,070,941	

STATE OF MICHIGAN CONTRACT NO. 271N3200089

CITY OF FLINT WATER SUPPLY ASSESSMENT

At the request of the Treasurer, Tucker, Young, Jackson, Tull, Inc. (TYJT) makes the following recommendation to the Department of Treasury concerning Flint's water supply alternatives. Based on the financial analysis performed of the various options presented by DWSD to continue treated water service to Flint compared to Flint being supplied by the new KWA untreated water system, TYJT believes that several of the options presented by DWSD are lower in cost currently and over the long run than the one offered by KWA. TYJT also believes that DWSD's most recent offer (subsequent to the submittal of our report) to build a smaller parallel water main from Imlay to Flint, funded by the entire DWSD base of customers, is the best solution offering the least cost alternative and the required redundancy by MDEQ.

Furthermore, since a majority of the KWA system has not been designed and none of the system has been constructed, there is an additional risk that the cost of the KWA system may actually be higher than estimated due to potential construction delays and unforeseen conditions. This risk to Flint could be substantial since the city is responsible for 30 percent of the KWA design and construction costs while still having to purchase water from DWSD during the construction period.

Finally, there are other issues that were identified in our report that may result in risks to Flint if it were to join KWA that should be considered by the Treasury in determining how Flint's potable water should be supplied. These issues are related to redundancy and reliability, other items affecting cost, and Flint's desire to control its own destiny related to its water supply. These are described further below.

- DWSD's supply to Flint is via a 72-inch water main from Imlay City. This main also supplies Imlay City, Mayfield and the Greater Lapeer County Utilities Authority (GLCUA). The volume of water contained within the 72-inch main is approximately 30 million gallons. If Genesee and Flint move to KWA then the three remaining communities' consumption would most likely not be large enough to maintain fresh water in DWSD's pipeline (due to loss of chlorine residual). DWSD may consider shutting down the 72-inch line completely due to the water quality concerns, which would then create an additional burden for Imlay, Mayfield and GLCUA to finance treated water supplies.
- The KWA supply option is counter to the Treasury's Competitive Grant Assistance Program (Formerly EVIP Grant). This program has been put in place to allow for communities to consolidate their services and save money. Two existing customers of DWSD (Flint and Genesee County) along with the potential of others customers (GLCUA, Mayfield, Imlay City) separating from another water system is in contradiction to the program.
- There is a concern over the ability of smaller systems (KWA) over larger systems (DWSD) to pay for future unfunded mandates and regulations. Obviously, identifying regulation requirements over 30 years is hard to determine. However, it is widely accepted that a large system has greater ability to respond to unfunded mandates because the cost can be distributed over a large customer base.
- Although Flint will be responsible for 30 percent of the construction cost, they will only have a minority vote on the KWA board. Furthermore, there are other communities (Lapeer County, the City of Lapeer, and Sanilac County) that sit on the board and vote. However, they are not purchasing water nor contributing to the construction costs. Their position on the KWA Board will not provide them an ability to "control their own destiny," as they have stated to the Treasury.

STATE OF MICHIGAN CONTRACT NO. 271N3200089

CITY OF FLINT WATER SUPPLY ASSESSMENT

February 2013

For Submittal to:

State of Michigan, Department of Treasury

Submitted by:

TUCKER, YOUNG,
JACKSON, TULL INC.
CONSULTING ENGINEERS-PLANNERS
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Table of Contents

Table of Contents i
Figures ii
Tables ii
Appendices ii
1. Introduction 1
Report Organization 1
2. Flint Water Supply Options 2
Karegnondi Water Authority (KWA) Lake Huron Water Supply 2
DWSD Water System 3
3. Data Collection 6
4. Cost of Service 8
DWSD Water Supply 8
KWA Water Supply 10
Flint WTP 11
5. Capital Requirements 12
KWA Supply System 12
Lake Intake 12
Pumping Stations 13
Transmission Main 13
Other KWA Costs 14
Summary 14
Flint WTP Improvements 15
DWSD Imlay Station Supply Options 15
Financing 15
6. Findings 17
7. Other Considerations 19
Redundancy/Reliability 19
Additional Cost Considerations 20
Flint's Autonomy 20

Figures

Figure 2-1: KWA Raw Water System 5

Figure 2-2: DWSD Water System 4

Figure 6-1: Flint Water Supply Options through 2042 18

Tables

Table 2-1: DWSD Supply Options 5

Table 4-1: Cost of DWSD Supply Options 8

Table 4-2: Recent DWSD Water Rates 9

Table 4-3: O&M Inflation Rates of Other Large Water Systems 10

Table 4-4: O&M Inflation Rates of Other Comparable Systems to KWA 11

Table 4-5: FY 13 O&M Costs for Year-round Operations 11

Table 5-1: KWA Intake Cost Estimate 12

Table 5-2: Pumping Stations Cost Estimate 13

Table 5-3: Transmission Pipeline Cost Estimate 14

Table 5-4: Other Costs 14

Table 5-5: Total Cost Comparison 15

Table 6-1: Total Cost of Options through 2042 17

Appendices

Appendices A – Meeting Minutes

Appendix B – Cost Worksheets

1. INTRODUCTION

Tucker, Young, Jackson, Tull, Inc. (TYJT), at the request of the State Treasurer performed an analysis of the water supply options being considered by the City of Flint. The City of Flint is presently supplied potable water from the Detroit Water and Sewerage Department (DWSD). This supply is from a single 72-inch water main that terminates at a master meter located at Potter and Baxter. Additionally, downstream of the DWSD master meter, Flint supplies its customer Genesee County. The City of Flint also operates a water treatment plant that uses the Flint River as its source of supply to provide back up and redundancy to the DWSD supply as required by MDEQ

The Karegnondi Water Authority (KWA) is planning on constructing a raw water supply system that could provide Lake Huron water to the Flint Water Treatment Plant. Flint's existing plant would be upgraded to treat the new raw water source.

The State Treasurer has appointed an emergency financial manager for the City of Flint. As such the Treasurer has requested TYJT to provide an analysis of the water supply options to assist the Treasurer in determining any potential risk and the best course going forward for supplying potable water to the City of Flint.

Report Organization

The following sections of this report are described below:

Section 2 – The basis of the analysis is described in this section. The options include the KWA option and several options offered by DWSD.

Section 3 – A significant amount of information and data was collected including memorandums, reports, drawings, financial reports, and other documents. This section summarizes the information used in the analysis.

Section 4 – This section describes the evaluation of the cost of supply for the Flint options. The costs are comprised of the initial cost of operations plus the annual rate of escalation/inflation.

Section 5 – The evaluation process used to analyze the construction costs associated with the KWA supply system is described in this section. Additionally, the cost of financing the capital requirements is described.

Section 6 – This section presents the financial review of the options considered to supply potable water to Flint. A summary of these options is also provided.

Section 7 – In addition to the financial analysis other considerations were identified that should be considered in understanding the risks and determining the best option to supply Flint. They include items related to cost, redundancy and reliability, and Flint's ability to control their future cost of water supply.

2. FLINT WATER SUPPLY OPTIONS

Two water purveyor options were evaluated; the KWA water supply system and continued supply from DWSD. Both suppliers would provide water from Lake Huron as the source. The KWA system is a raw water supply, which means that the water would have to be treated by Flint before distributing the potable water to its customers. The DWSD supply is potable or "finished" water and would not need additional treatment.

Additionally, an option for the Flint WTP to supply the City of Flint without being supplied from either DWSD or KWA was initially considered. The preliminary investigation evaluated the cost associated with the required improvements to the plant and to the Flint River dam system. Although it appeared that this was a viable option, Flint in a meeting on December 20, 2012 with the Treasury, stated that the City did not want to pursue the option and it is no longer being considered.

Karegnondi Water Authority (KWA) Lake Huron Water Supply

The KWA water supply system schematic is shown in Figure 2-1. The system is comprised of an intake in Lake Huron that supplies water to the Lake Huron Pump Station (LHPS). The LHPS lifts the water and pumps it through an approximately 22 mile long 60-inch pipeline. The pipeline terminates at a 5 MG reservoir and is then pumped from the Intermediate Pump Station (IPS) through approximately 26 miles of 60-inch and 18 miles of 30-inch pipeline to the existing Flint WTP. Downstream of the IPS, approximately half way to the Flint WTP, the 60-inch line would also supply a new Genesee County WTP.

The raw water transmission system has a 60 MGD capacity and is sized to deliver a maximum of 18 MGD to the Flint WTP with an average day supply of 12 MGD. Improvements at the Flint WTP would also be required to treat the lake water as the plant is currently designed to treat the Flint River water.

The term of the KWA contract for Flint is 40 years.

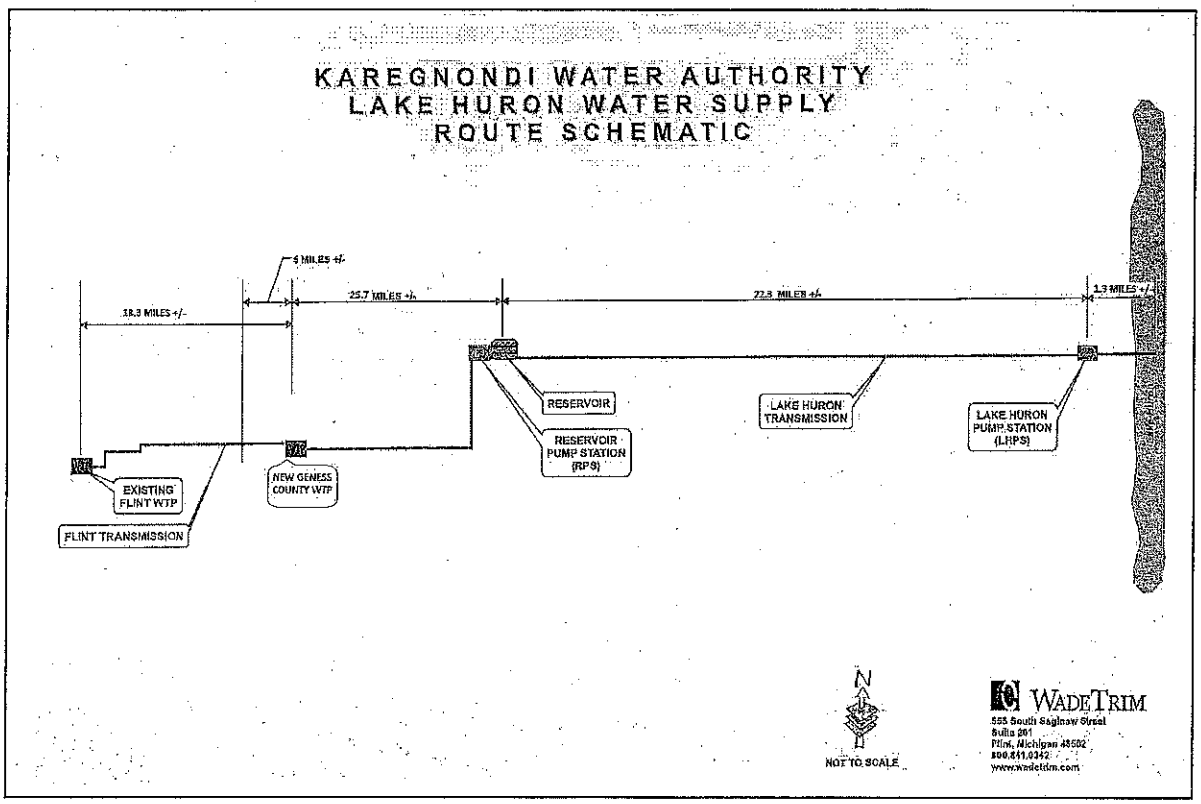

Figure 2-1: KWA Raw Water System

DWSD Water System

The DWSD system schematic is shown in Figure 2-2. Flint is currently supplied by DWSD at Master Meter FL-1, located at Potter and Baxter. Flint typically gets its water from the Lake Huron WTP, located in Fort Gratiot, Michigan; near the Lake Huron shoreline. Water is treated and pumped at the Lake Huron WTP and supplied through a 120-inch pipeline to an intermediate pump station called the Imlay Pump Station. The Imlay Pump Station has 20 MG of reservoir capacity. Depending on the time of year and the DWSD system demand, water is either bypassed directly to Flint or it is re-pumped at Imlay. It should be noted that the DWSD supply to Flint is part of a very large water system and during emergencies or outages water can be supplied from the south up to Flint in lieu of the Lake Huron facility.

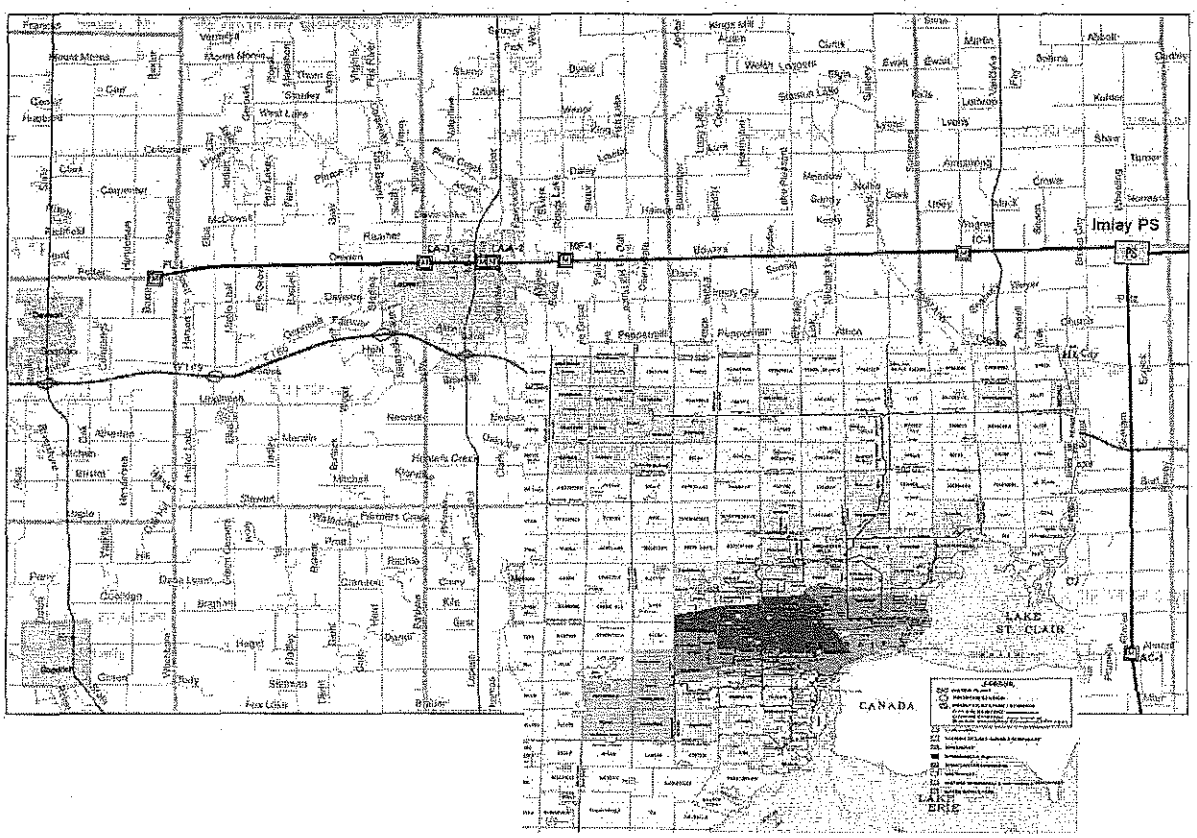

Figure 2-2: DWSD Water System

The pipeline from Imlay to FL-1 is a 72-inch pipeline. It has been estimated that the 72-inch line serving Flint has a capacity in excess of 90 MGD.

DWSD has presented several contractual options to Flint and all of them are based on Flint signing a new 30 year contract. The options shown in Table 2-1 are based on two different supply points; one at the current master meter location FL-1 at Potter and Baxter (P&B) and the other at the location of the Imlay Pump Station. The reason for the varying options is to provide a lower water rate at the Imlay Station, since the DWSD rate formula is based on distance and elevation factors related to the supply location.

The rates are also dependent on the maximum amount of water DWSD supplies. As example, if DWSD supplies a maximum day demand of 18 MGD that would equal the entire amount of water required by Flint.

For the options less than the maximum of 18 MGD means that the Flint WTP would supplement the difference by supplying water treated from the Flint River. These options are known as "blending" and would allow for Flint to blend two sources of water to supply its customers; the Flint River using the Flint WTP and Lake Huron from DWSD system.

Description	Average Day Demand
18 MGD Maximum Day Customer – FL-1	12 MGD
12 MGD Maximum Day Customer – FL-1	8 MGD
8 MGD Maximum Day Customer – FL-1	8 MGD
12 MGD Maximum Day Customer - Imlay	12 MGD
8 MGD Maximum Day Customer - Imlay	12 MGD

Table 2-1: DWSD Supply Options

3. DATA COLLECTION

During the course of the investigation several documents were used to perform the analysis. The names of the documents are listed below for reference.

KWA and Flint

- Preliminary Engineering Report, Lake Huron Water Supply Karegnondi Water Authority, September 2009;
- Analysis of the Flint River as a Permanent Water Supply for the City of Flint, July 2011;
- Cost Comparison, KWA vs. DWSD, Letter to Mr. Kurtz, October 31, 2012;
- Lake Huron Supply Study, KWA, Appendix 20, October 2012 Preliminary Report Update, Final Report (DRAFT), October 4, 2012;
- Articles of Incorporation of Karegnondi Water Authority, endorsed in 2010;
- Karegnondi Water Authority Bylaws, October 26, 2010;
- KWA Raw Water Supply Contract;
- Flint WTP Statement of Revenues and Expenditures 09' – 12';
- GCDC Division of Water and Waste Services Financial Statements 03' – 11'; and
- Assorted emails with further clarification of questions and documentation.

DWSD

- Historical Rates and Charges to Flint 04' – 13';
- Historical Rates and Charges to Flint with Hypothetical Model Contract 10' – 13';
- 2013 Rates and Charges for the following options:
  - 18 MGD Maximum Day Customer at FL-1;
  - 12 MGD Maximum Day Customer at FL-1 (Flint blending*);
  - 8 MGD Maximum Day Customer at FL-1 (Flint blending*);
  - 12 MGD Maximum Day Customer at Imlay (Flint blending*);
  - 8 MGD Maximum Day Customer at Imlay (Flint blending*); and
- Assorted emails with further clarification of questions and documentation.

* Flint blending based on DWSD supplying two-thirds and Flint one-third of 12 MGD average day demand.

Two meetings were also held; one with DWSD and one with Flint and Genesee County representing KWA. The meetings were held on November 19, 2012 and November 20, 2012, respectively. Minutes from these meetings are included in Appendix A.

4. COST OF SERVICE

Information provided by DWSD, Flint, and representatives of the KWA were used in the cost of service evaluation. To evaluate the annual escalation/inflation rate over the planning period, the rate adjustment for DWSD was estimated based on the recent rate adjustment history. For the KWA system both the estimated cost of operations when the system begins supplying water and the annual rate adjustment or inflation was evaluated. The existing cost of operations and escalation for the Flint WTP was based on actual costs provided and then adjusted depending on the scenario considered. This section describes the evaluation process and the rates used in the analysis.

DWSD Water Supply

The City of Flint has been a customer of DWSD since 1967. The Flint WTP has been maintained as a backup to the DWSD system. As indicated previously, several options were provided by DWSD depending on the type of service Flint was to select. The unit cost of water for each of these options is shown in Table 4-1. These rates are based on DWSD's FY13, which are current until July 2013.

Description	Average Day Demand (MGD)	Unit Rate ($/MCF)
18 MGD Maximum Day Customer – FL-1	12	16.37
12 MGD Maximum Day Customer – FL-1	8	16.31
8 MGD Maximum Day Customer – FL-1	8	12.68
12 MGD Maximum Day Customer - Imlay	12	14.38
8 MGD Maximum Day Customer - Imlay	12	11.11

Table 4-1: Cost of DWSD Supply Options

To determine annual escalation rate, DWSD's last 10 years of history was used along with other large urban water systems in Michigan. The water systems used for benchmarking comparison were: Lansing, Grand Rapids, and Saginaw.

Table 4-2 identifies the annual and average rate of increase to Flint based on supplying water either to the current FL-1 at Potter and Baxter or Imlay. Note the last three years of the rates (FY 2011 through FY 2013) assumes that Flint's cost would be based on the new 30 year contract; FY 2011 being the first year that the new contract was available.

Fiscal Year	Average Unit Cost ($/Mcf)	Annual Change (%)
2004	11.06	
2005	10.24	-7.4
2006	10.56	3.1
2007	11.09	5.0
2008	11.35	2.3
2009	13.07	15.2
2010	11.73	-10.3
2011	13.89	18.4
2012	15.08	8.6
2013	16.24	7.7
Average		4.4%

From FL-1

Fiscal Year	Average Unit Cost ($/Mcf)	Annual Change (%)
2004	11.06	
2005	10.24	-7.4
2006	10.56	3.1
2007	11.09	5.0
2008	11.35	2.3
2009	13.07	15.2
2010	11.16	-14.6
2011	12.23	9.6
2012	13.28	8.6
2013	14.32	7.8
Average		2.9%

From Imlay

Table 4-2: Recent DWSD Water Rates

Audited financial reports were used to determine the rate of inflation associated with other three large municipal systems. The results are shown in Table 4-3.

Water Systems	Years Evaluated	Average Rate (%)
Lansing	05'-12'	4.6
Grand Rapids	04'-11'	1.6
Saginaw	04'-11'	7.0

Table 4-3: O&M Inflation Rates of Other Large Water Systems

Based on the information analyzed from DWSD and the other communities, it was determined that a fair annual rate of inflation for operations and maintenance cost for the analysis should be 4.4%. The 4.4% has historical significance from Flint's current water supplier and falls within the range of the other communities.

KWA Water Supply

The initial projected O&M cost for the KWA supply would be comprised of KWA's O&M costs as well as Flint's O&M costs. Because there was limited information provided, the initial estimated rate of $1.50/MCF was used. This rate is based on information from the cost comparison analysis attached to the letter to Mr. Kurtz, dated October 31, 2012.

The KWA cost evaluation used an annual O&M inflation rate of 5%. To validate this rate a similar analysis to DWSD's operations and maintenance annual rate of inflation was used. First, in discussions with Flint and the Genesee County Drain Commission (GCDC), they believed that the annual rate of inflation for the new KWA system would be similar to the GCDC Water & Waste Services (WWS). Additionally, two large transmission systems were used to benchmark the inflation rates: the Southeastern Oakland County Water Authority (SOCWA) and the Ypsilanti Utility Community Authority (YUCA). Although both of these systems transmit finished water opposed to raw water, they were considered similar enough for comparison as they are comprised of only large water mains, pumping facilities and storage.

Once again audited financial statements were used to calculate the inflation rates. A summary of the findings are shown in Table 4-4. Based on the fact that the information analyzed showed a large difference between the two systems, it was determined that the KWA assumption of 5% was a good rate of inflation to use in the financial analysis. This rate is almost equally between the GCDC rate and the other two transmission systems.

Systems	Years Evaluated	Average Rate (%)
GCDC WWS	03' – 11'	10.5
SOCWA	04'-12'	--
YUCA	04'-12'	0.7

Table 4-4: O&M Inflation Rates of Other Comparable Systems to KWA

Flint WTP

The Flint WTP currently serves as a backup supply to the DWSD service to Flint. To maintain backup operations, the City of Flint operates the plant approximately 20 days each year. Flint indicated that the average production rate when they operate is 11 MGD.

For the blending options and the KWA supply considered, Flint would be required to operate its plant all year around. Therefore, their operating and maintenance costs were evaluated and adjusted to determine an annual cost associated with year-round operations.

The Flint WTP provided three years of operating costs for the assessment. Additionally, reports listed in Section 3 were also used as reference to determine both operating costs for the plant processing Flint River water (blending options) and Lake Huron raw water (KWA option).

Major cost centers were analyzed to estimate annual operation and maintenance. They included: labor, utilities, chemicals and residual management. In general, as recommended by the Flint plant staff, labor and overhead were increased from the current costs by two-thirds. Additionally, variable costs for power, chemicals and residual cost were increased to estimate full time treatment at the Flint WTP. Data from the KWA Preliminary Report and annual operating data for the Flint WTP (provided separately) were analyzed to make these forecasts.

The annual operating and maintenance costs developed for Flint WTP used are shown in Table 4-5.

Source of Supply	Average Daily Production (MGD)	Estimated Annual O&M Cost
Flint River (Blending with DWSD)	4	$5,895,097
Lake Huron (Supplied by KWA)	12	$7,913,118

Table 4-5: FY 13 O&M Costs for Year-round Operations

It was determined that a fair annual rate of inflation for operations and maintenance cost for the Flint WTP plant should be 4.51%. The 4.51% is an average of Lansing, Grand Rapids and Saginaw facilities.

5. CAPITAL REQUIREMENTS

Large capital investments would be required by Flint and GCDC to construct the KWA supply system. Furthermore, some of the options presented by DWSD (supply point from Imlay) would require the purchase by Flint of DWSD's 72-inch water main. Performing the financial analysis; therefore, required an analysis of the KWA construction cost estimate for the transmission system and Flint WTP improvements.

Revenue bonds were also identified as the source of financing the new supply system and associated improvements. This section describes the assumptions made and the interest used for financing the improvements.

KWA Supply System

The most current cost estimate of the KWA system was presented in the document titled; Lake Huron Supply Study, KWA, Appendix 20, October 2012 Preliminary Report Update, Final Report (DRAFT), October 4, 2012. The cost of construction is estimated at $272,421,558. Flint's portion would be 30% or $81,726,467.

Due to the significance of this expenditure, a detailed review of the cost was performed and is presented in this section. The analysis was performed based on the main elements of the supply system: the lake intake, the two pumping stations, and the transmission pipeline. Additionally, an analysis was performed related to construction contingencies and other costs such as engineering, legal, and administration.

Lake Intake

KWA representatives indicated in a meeting in November that the design documents for the intake were at 90% and that it was planned for advertisement in January 2013. A summary of the estimate is shown in Table 5-1.

Description	Estimate
Intake and Crib	$22,076,850
ELAC at 25%	5,519,213
Property	2,300,000
Total	**$29,896,063**

Table 5-1: KWA Intake Cost Estimate

Based on the evaluation, it appeared that the cost estimate was reasonable. Given that the design was nearly complete, the engineering, legal, administration, and construction contingencies (ELAC) at 25% were also found to be appropriate.

Pumping Stations

KWA representatives indicated that the pump stations were estimated at a level of design less than 15%. Therefore, in addition to an evaluation of their cost estimate, other water pumping station costs were used for comparison. Additionally, contractors were also contacted for costs. Table 5-2 summarizes the KWA cost estimate compared to our cost estimate performed for the Treasury.

Description	KWA	Estimate	TVAL	Estimate
Pumping Stations		$24,618,080		$54,573,314
Land for Intermediate Pump Station and Reservoir		--		75,000
Subtotal		$24,618,080		$54,648,314
ELAC for Construction	25%	6,154,520	30%	16,394,494
Total		**$30,772,600**		**$71,042,808**

Table 5-2: Pumping Stations Cost Estimate

Two things to note regarding the difference in the cost estimates; firstly, there is a large difference in the cost estimates of the pumping stations. The estimate developed for the Treasury used several other pumping stations construction costs from Southeastern Michigan and discussions with contractors. These costs were then computed on a $/MG's for comparison.

Secondly, our estimate for the Treasury is based on an ELAC of 30% instead of KWA's 25%. Although 25% was acceptable for the intake, it is believed to be too low for the pumping station estimate given that the engineering effort is less than 15%.

Transmission Main

Although the specific route for the transmission main was not provided, an estimate was calculated based on the general information provided. Once again, the KWA estimate was based on a level of design less than 15%. The estimate performed for the Treasury used the line items provided by KWA for the pipeline and also consulted with contractors to evaluate the cost of construction. The comparison is shown in Table 5-3.

Although the cost of construction of the pipeline is similar, a value of 30% was used for ELAC due to the level of design. Additionally, KWA did not believe there would be any additional costs for easements; however, this did not seem practical. Therefore an estimate for acquiring the easements was added to the Treasury estimate and is based on the 277 easements identified by KWA. The cost shown includes surveying, legal, engineering, administration, etc.

Description	KWA	Estimate	TYJT	Estimate
Transmission Mains		$166,202,316		$167,419,530
ELAC for Construction	25%	41,550,579	30%	50,225,859
Subtotal		$207,752,895		$217,645,389
Easements		-		1,166,170
Total		**$207,752,895**		**$218,811,559**

Table 5-3: Transmission Pipeline Cost Estimate

Other KWA Costs

In prior estimates of the construction cost, KWA used an ELAC of 37%. In this case it could be considered that the engineering effort associated with the design would have been included. However, it is believed that KWA's reduced ELAC of 25%, does not include the design effort. Additionally, it would be prudent to assume that the owner would want a construction manager during construction of this large project. A summary of these costs are shown in Table 5-4.

Description	Estimate
Design Engineering for Pumping Stations and the Transmission Pipeline	$16,939,581
Construction Management at 5%of Project Cost Estimate of $217,645,389	14,434,609
Administration	349,440
Legal, Easements, Contract Documents	831,000
Total	**$32,554,630**

Table 5-4: Other Costs

Summary Comparison

A summary of the two cost estimates are shown in Table 5-5. Based on the comparison, the estimate performed by TYJT shows a higher cost to Flint by approximately $25,000,000.

Note that there are two other costs shown in the summary that were not previously addressed; power and backup power. Regarding the cost of providing power to the pumping facilities, the cost of $4,000,000 appears reasonable.

The KWA has repeatedly indicated that backup power is not needed. Backup power is a standard practice in the water industry. Furthermore, a loss of power at either pumping facility will prevent the supply of water to both Flint and Genesee County. For these reasons, the cost of providing backup power was included in our estimate for the Treasury.

Description	KWA Estimate	TVA Estimate
Intake/Crib	$ 27,596,063	$ 27,596,063
Pump Stations	30,772,600	71,042,808
Transmission Mains	207,752,895	217,645,389
Power	4,000,000	4,000,000
Redundant Power for PS		1,273,200
Land for Lake Huron Pumping Station	2,300,000	2,300,000
Design Engineering/PS and Transmission		16,939,581
Construction Management		14,434,410
Administration		349,440
Legal/Easement/Contract Documents		831,000
Easements		1,166,170
Total	**$ 272,421,558**	**$ 357,578,060**
Flint Share at 30%	**$81,726,467**	**$107,273,418**

Table 5-5: Total Cost Comparison

Flint WTP Improvements

The KWA analysis identified capital costs required to convert the existing WTP from river water treatment to treating lake water. The cost estimate was identified as $7,100,000 in the 2009 report. This number was used in the our analysis, since additional information was not provided. For the purpose of the financial analysis; however, the $7,100,000 was increased by 3% each year for three years to account for inflation.

DWSD Imlay Station Supply Options

The options identified by DWSD to supply service to Flint at the Imlay Pump Station would require Flint to purchase the 72-inch water main from Imlay to Master Meter, FL-1. The pipeline is approximately 25 miles long. The estimated cost provided by DWSD for estimating purposes is $4,700,000.

Financing

The cost of financing the revenue bonds for the capital work was investigated. Based on conversations with local financial advisors knowledgeable in bond financing, an interest rate of 5% for the 25 year

period was considered acceptable. This is based on a Standard and Poor's bond rating of A without insurance.

Additional costs associated with the bond include the reserve and bond issuance fee. The bond holders will require a reserve of approximately 10% of the loan to be held for the 25 year payment period. The cost associated with the bond issuance has been estimated at 2.25% of the principal borrowed for the KWA project and 3% for the smaller loan associated with the Flint WTP improvements or the purchase of the 72-inch main.

Furthermore, since no revenue will be generated to pay on the bonds for the first three years that the system is being constructed, the cost associated with capitalizing the interest was also included.

Finally, interest on the reserve will be provided back to KWA and Flint. Although the interest is currently less than 1%, it was determined that a 3% rate would be more prudent long-term.

6. FINDINGS

Using the information described in the previous sections, a cost evaluation was conducted for the KWA supply and the DWSD options. Individual worksheets for each option are provided in Appendix B. For the purpose of comparison a 30 year period was used. This period includes the 3 year construction period, the 25 loan period and an additional two years to get a sense of the cost of operation after the loans have been paid.

There were three separate cost sheets prepared for the KWA option. The first cost sheet (KWA) is based on the cost estimate provided by KWA. The costs provided assumed no overruns or delay in construction. With KWA's own assumptions of an overrun in construction of 15% and a one year delay in operations, the KWA estimated cost becomes $686,375,920 through Year 2042.

Since this cost estimate did not appear to include the financing of revenue bonds, another cost sheet (KWA-1) was developed that included KWA's cost estimate without overruns with the additional finance costs associated with the revenue bonds. A final cost sheet (KWA-2) includes the cost associated with the revenue bonds based on the estimate provided by TYJT for the Treasury.

A summary of the cost sheets provided in Appendix B are shown in Table 6-1. Figure 6-1 shows the cumulative annual costs associated with each option.

Option	Costs through 2042 ($)	Ranking by Cost
DWSD 8 MGD Maximum Day at Imlay Station	634,795,488	1
KWA *(10/31/12 No Overruns, As Provided)**	649,775,166	2
DWSD 8 MGD Maximum Day at FL-1	672,671,705	3
KWA-1 *(10/31/12 No Overruns with Cost of Financing)*	707,279,715	4
DWSD 12 MGD Maximum Day at Imlay Station	725,576,803	5
DWSD 12 MGD Maximum Day at FL-1	762,110,308	6
KWA-2 *(Treasury Estimate)*	766,784,313	7
DWSD 18 MGD Maximum Day at FL-1	821,226,268	8

* $686,375,920 with 15% overrun in construction and a one year delay in operations

Table 6-1: Total Cost of Options through 2042

Based on the analysis, it is prudent to assume the KWA water supply option costs would be somewhere between the KWA-1 and KWA-2 options. Therefore, the analysis indicates that the two DWSD options of supplying 8 MGD on a maximum day and up to 8 MGD on average are the least cost options for Flint. These options allow Flint to maximize the use of existing assets; the City of Flint's (the Flint WTP) and DWSD's (the existing 72-inch main).

Additionally, in recent conversations with the Treasury another option was discussed that could potentially be the most cost-effective solution. Currently the Flint WTP serves as a backup if service is

lost through either the DWSD or KWA pipeline. If the a twin pipe paralleling the DWSD 72-inch water main were constructed with interconnects with the 72-inch line, then the new water main could serve as the backup to Flint and the Flint WTP could be abandoned or potentially sold to Genesee County for their use.

The construction of the parallel pipeline would be considered in the DWSD capital expenditure as a Common to All (CTA) cost. This means that the capital cost of the pipeline would be shared by all DWSD customers and not just by Flint. Preliminary analysis of this option appears to be the most cost-effective of all the options discussed. However, a more thorough cost analysis is warranted and this approach would require an agreement between Flint and DWSD.

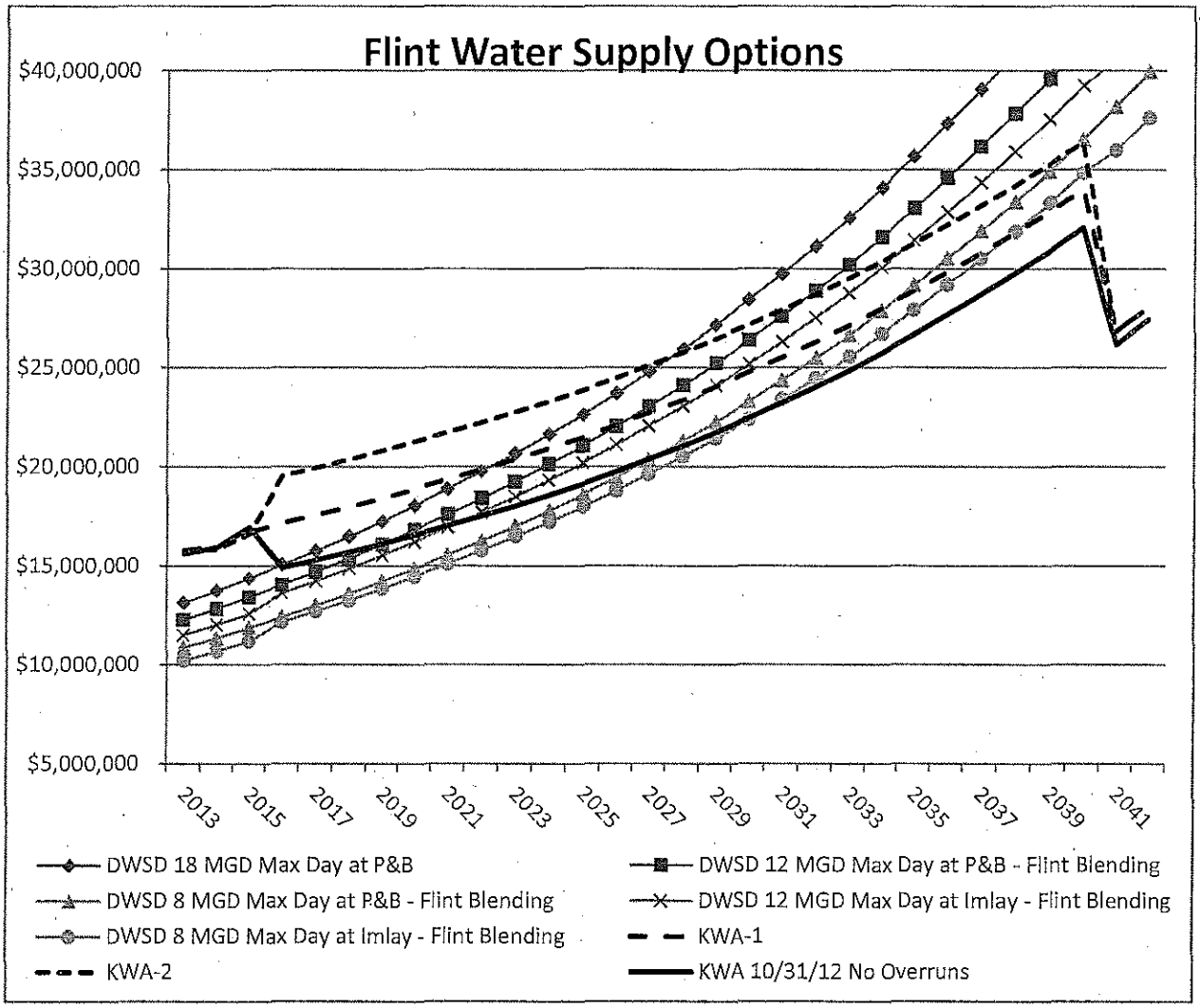

Figure 6-1: Flint Water Supply Options through 2042

7. OTHER CONSIDERATIONS

As part of the investigation other issues were identified that may result in risks to Flint that should be considered by the Treasury in determining how Flint's potable water should be supplied. These issues are related to redundancy and reliability, other items affecting cost, and Flint's desire to control its own destiny related to its water supply. These are described further below.

Redundancy/Reliability

In one of the first meetings related to this task assessment, which was held on November 1, 2012, the Genesee County Drain Commissioner, Mr. Jeff Wright, stated that one of the main reasons for pursuing the KWA supply option related to the lack of reliability of the DWSD system. He pointed to the Northeast blackout of 2003; a widespread power outage that occurred throughout parts of the Northeastern and Midwestern United States and Ontario, Canada, on Thursday, August 14, 2003. He stated that Flint and Genesee County were out of water for several days.

It is worth noting that this was a power outage of historic proportions that affected millions of Americans. However, DWSD did begin supplying water again relatively quickly in comparison to other major cities impacted by the same power outage.

Furthermore, the KWA supply system offers less redundancy to Flint than the current DWSD system. Under both options, Flint is supplied by a single pipeline; however, DWSD has backup power at all of its major facilities supplying Flint. The KWA system will not have a redundant power at its pumping facilities. This would be a major risk.

Currently, backup to the DWSD system for Flint is Flint's WTP using the Flint River as the source of supply. KWA has stated that the Flint River source would also be used as backup to Flint if the KWA supply through its pipeline was lost. However, since the Flint WTP would be upgraded to treat Lake Huron water under the KWA option, using the Flint River as a backup source would require the Flint WTP to maintain two process treatment streams.

In addition to Flint and Genesee County, the DWSD's 72-inch main supplies Imlay City, Mayfield and the Greater Lapeer County Utilities Authority (GLCUA). The volume of water contained within the 72-inch main is approximately 30 MG. Only supplying these three remaining communities would cause the water age to increase dramatically; somewhere in excess of three weeks old, before reaching the customers' master meters. Since the half-life of chlorine in the DWSD system is approximately 5 days, the chlorine would most probably be near zero requiring re-chlorination of the finished water upstream of the master meters.

Re-chlorinating is a costly and risky process due to the instability of chlorine gas. It is unknown whether DWSD would pursue this improvement or possibly abandoned the 72-inch pipeline.

If Flint is supplied by the KWA system, then DWSD supplying their other customers along the 72-inch water main may be reconsidered. Since the KWA system is a raw water supply, the communities would

either have to build a treatment facility to treat the water from KWA or find another water source for their communities.

Additional Cost and Risk Considerations

The design of the KWA supply and the construction of the system have not been completed; therefore, final costs and time to complete are unknown. Cost overruns and delays in completion will both negatively impact Flint's final cost. As example, if the project is not completed within the three year period, payment on the bonds will be due, but the revenue source needed from the sale of water could not be provided.

Furthermore, there is always a risk with large water system construction; especially those including an intake in the Great Lakes, pumping stations and rehabilitation of older water treatment plants. These risks include the potential of explosive gases in tunneling below Lake Huron, changing site conditions associated with the large number of miles of pipe installation and rehabilitating an older WTP, and the startup and debugging of the entire pumping system.

Flint has indicated that they have a high water loss. Not addressing this issue prior to sizing the Flint supply pipeline from KWA could cause the water main to be oversized along with its incremental cost in construction.

Also, the KWA supply option appears to run counter to the Treasury's Competitive Grant Assistance Program (Formerly EVIP Grant). This program has been put in place to allow for communities to consolidate their services and save money. Two existing customers of DWSD (Flint and Genesee County) along with the potential of others customers (GLCUA, Mayfield, Imlay City) separating to from another water system is in contradiction to the program.

Finally, there is a concern over the ability of smaller systems (KWA) over larger systems (DWSD) to pay for future unfunded mandates and regulations. Obviously, identifying regulation requirements over 30 years is hard to determine. However, it is widely accepted that a large system has greater ability to respond to unfunded mandates because the cost can be distributed over a large customer base.

Flint's Autonomy

Flint has indicated that a major point of consideration is that they have no control over the rate increases issued to Flint by DWSD. All other counties supplied by DWSD have representatives on the Board of Water Commissioners (BOWC). The BOWC is one of the governing bodies that approve the water rates. Since Flint and Genesee County do not have a representative on the BOWC, Flint believes they are held "hostage" to DWSD's rates and cost of service.

This issue was stated in Flint's handout at the November 1, 2012 meeting. The handout is titled, "Flint Water Supply Future." However, it is worth noting in the same handout, Flint also identifies similar concerns with the governing board of the KWA system. Notably, that although Flint and Genesee County will be the only customers and Flint will be responsible for 30 percent of the construction cost,

they will have a minority vote on the KWA board. Furthermore, there are other communities (Lapeer County, the City of Lapeer, and Sanilac County) that sit on the board and vote. However, they are not purchasing water nor contributing to the construction costs.

STATE OF MICHIGAN CONTRACT NO. 271N3200089

CITY OF FLINT WATER SUPPLY ASSESSMENT

State of Michigan, Department of Treasury

Appendix A: Meeting Minutes

TUCKER, YOUNG,
JACKSON, TULL INC.
CONSULTING ENGINEERS-PLANNERS
565 E. Larned Suite 300
Detroit, Michigan 48226
(313)963-0612 FAX (313)963-2156

MEETING MINUTES

IN ATTENDANCE:	Sue McCormick, DWSD Director Darryl Latimer, DWSD Deputy Director George Karmo, TYJT Awni Qaqish, TYJT Dave Guastella, TYJT
DATE:	November 24, 2012
PURPOSE OF MEETING:	Meeting with DWSD for the Indefinite-scope, Indefinite-delivery Contract Number 00383, 2012 Professional General Architectural/Engineering Services – City of Flint Water Supply Assessment
PREPARED BY:	Dave Guastella

A meeting was held at the DWSD Main Office Building on November 19, 2012 to discuss the water supply options being presented by DWSD to the City of Flint. The main items discussed generally followed the attached DWSD Discussion/Questions that were provided to the Department prior to the meeting. A summary of the key points discussed are provided below.

DISCUSSION ITEMS

1. Question/Discussion Item: Verify that the four options presented at the November 1, 2012 meeting are still available for consideration:

    a. Supplied from Potter & Baxter using the new model contract (assume a Maximum Day Customer),

    b. Supplied from Imlay Station,

    c. Finished un-pumped supply from Lake Huron WTP, and

    d. Raw un-pumped supply from Lake Huron WTP.

    DWSD prefers to focus on the first two supply point listed; from the current location at Potter & Baxter and at the Imlay Pump Station as these apply specifically to Flint.

    DWSD provided the attached summary regarding the current costs to Flint based on the various options that DWSD is offering. The savings associated with each option is provided as well. As example, if Flint were to purchase water from the supply point located at Imlay Station, the current cost to Flint would be $5,661,000 and it would be a savings of nearly 50%

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compared to Flint's current rate.

2. Question/Discussion Item: What additional capital improvements will be required for each option?

   If Imlay Pump Station is selected as the supply point then Flint would need to purchase the 72-inch water main and an agreement to supply Lapeer would need to be worked out. DWSD believes that this could be worked out through a "wheeling" charge over the 72-inch main or possibly moving the supply point downstream of the Lapeer connection.. DWSD estimates the value of the water main at $4.7M. Flint could bond for this amount or DWSD could include the cost into Flint's rate.

3. Question/Discussion Item: Are there other options being presented that should be considered (e.g., blending)?

   Only the two options indicated above are currently being considered and both would include blending; DWSD providing 2/3 of the supply and the Flint WTP providing the other 1/3.

4. Question/Discussion Item: To evaluate each option over the 25 year planning period, provide:

   a. Annual water rate for Flint for 2002 through 2012, and the

   b. Projected annual rate adjustment for each option. What are the proposed measures to keep the rate adjustments down in the future?

   DWSD provided the attached historical rates from 2002 through 2012 for the existing water contract with Flint. The attachment also includes what the rates would have been if Flint had signed the new model contract or had taken service from Imlay. These rates were provided back to 2010.

   DWSD believes that 5% would be a good estimation to assume for their annual escalation in rates over the 25 year planning period.

5. Question/Discussion Item: Flint stated a 10% increase in the capacity charge. What number did DWSD provide Flint?

   It was unclear to DWSD where the 10% increase in capacity charge stated by Flint came from. DWSD's information provided shows an average of 6.3%. DWSD offered a meeting with TYJT to discuss how the fixed and commodity charges are allocated.

6. Question/Discussion Item: Flint financial comparison is based on the initial Cost of $14,413,858, which includes $2,725,538 for Flint WTP operating cost; i.e, DWSD charge is $11,688,320. How good is this number?

   DWSD indicated that the charge of $11,638,320 is good through 6/30/13.based on their existing contract with DWSD.

7. Question/Discussion Item: KWA's initial charge to Flint is based on 12 MGD. Is DWSD charge

based on 12 MGD?

Yes, 12 MGD from DWSD would be a maximum with Flint supplying 6 MGD for a total of 18 MGD (2/3 vs. 1/3).

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Indefinite-scope, Indefinite-delivery Contract Number 00383
2012 Professional General Architectural/Engineering Services

CITY OF FLINT WATER SUPPLY ASSESSMENT

DWSD Discussion/Questions for the November 19, 2012 Meeting

1. Verify that the four options presented at the November 1, 2012 meeting are still available for consideration:
    c. Supplied from Potter & Baxter using the new model contract (assume a Maximum Day Customer),
    d. Supplied from Imlay Station,
    e. Finished un-pumped supply from Lake Huron WTP, and
    f. Raw un-pumped supply from Lake Huron WTP.
2. What additional capital improvements will be required for each option?
3. Are there other options being presented that should be considered (e.g., blending)?
4. To evaluate each option over the 25 year planning period, provide:
    g. Annual water rate for Flint for 2002 through 2012, and the
    h. Projected annual rate adjustment for each option. What are the proposed measures to keep the rate adjustments down in the future?
5. Flint stated a 10% increase in the capacity charge. What number did DWSD provide Flint?
6. Flint financial comparison is based on the initial Cost of $14,413,858, which includes $2,725,538 for Flint WTP operating cost, i.e DWSD charge is $11,688,320. How good is this number?
7. KWA's initial charge to Flint is based on 12 MGD. Is DWSD charge based on 12 MGD?

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Summary of DWSD Cost Allocations to Flint Under Various Scenarios

Flint Only

	Revenue Requirement	Rates and Charges		
		Fixed	Commodity	Avg Unit Cost
1 **Status Quo**	11,461,700	357,271	12.46	19.91
2 **Model Contract**	9,732,100	275,517	11.16	16.90
3 Change	(1,729,600)	(81,754)	(1.30)	(3.00)
4 % Change	*-15.1%*	*-22.9%*	*-10.4%*	*-15.1%*
5 **Max Day Only**	9,424,700	271,010	10.72	16.37
6 Change	(307,400)	(4,507)	(0.44)	(0.53)
7 % Change	*-3.3%*	*-1.7%*	*-4.1%*	*-3.3%*
8 **Allow Blending**	6,302,800	182,369	10.72	16.42
9 Change	(3,121,900)	(88,641)	0.00	0.05
10 % Change	*-49.5%*	*-48.6%*	*0.0%*	*0.3%*
11 **Imlay City Connections**	5,800,700	170,912	9.77	15.11
12 Change	(502,100)	(11,457)	(0.95)	(1.31)
13 % Change	*-8.7%*	*-6.7%*	*-9.7%*	*-8.7%*
14 Cumulative Change	(5,661,000)	(186,359)	(2.69)	(4.80)
15 Cumulative %Change	*-49.4%*	*-52.2%*	*-21.6%*	*-24.1%*

	Assumptions					
	Avg Day	Max Day	Peak Hour	Distance	Elevation	Sales
	mgd	*mgd*	*mgd*	*miles*	*feet*	*mgd*
1 **Status Quo**	11.8	21.6	22.6	52.0	866	**11.8**
2 **Model Contract**	11.8	**17.9**	**18.8**	52.0	866	11.8
3 **Max Day Only**	11.8	17.9	**17.9**	52.0	866	11.8
4 **Allow Blending**	7.9	**11.9**	**11.9**	52.0	866	7.9
5 **Imlay City Connections**	7.9	11.9	11.9	**45.2**	**866**	7.9

Recent DWSD Water Rates to Flint

	Rates and Charges			Annual Change			Average
FY	Fixed	Commodity	Avg Unit Cost	Fixed	Commodity	Avg Unit Cost	Annual Change
	$/mo	*$/Mcf*	*$/Mcf*	*$/mo*	*$/Mcf*	*$/Mcf*	
As Charged							
2004		11.06	11.06				
2005		10.24	10.24			-7.4%	
2006		10.56	10.56			3.1%	
2007		11.09	11.09			5.0%	
2008		11.35	11.35			2.3%	
2009		13.07	13.07			15.2%	
2010		14.32	14.32			9.6%	
2011	182,301	14.29	16.01		-0.2%	11.8%	
2012	443,096	13.36	17.53	143.1%	-6.5%	9.5%	
2013	707,000	12.46	19.12	59.6%	-6.7%	9.1%	**6.3%**
Hypothetical Model Contract							
2004		11.06	11.06				
2005		10.24	10.24			-7.4%	
2006		10.56	10.56			3.1%	
2007		11.09	11.09			5.0%	
2008		11.35	11.35			2.3%	
2009		13.07	13.07			15.2%	
2010		***13.96***	***13.96***			6.8%	
2011	***145,918***	***13.74***	***15.28***		-1.6%	9.5%	
2012	***378,968***	***12.58***	***16.57***	159.7%	-8.4%	8.4%	
2013	***597,323***	***11.63***	***17.93***	57.6%	-7.6%	8.2%	**5.5%**

Recent DWSD Water Rates to Flint

FY	Rates and Charges			Annual Change			*Average*
	Fixed	Commodity	Avg Unit Cost	Fixed	Commodity	Avg Unit Cost	*Annual Change*
	$/mo	*$/Mcf*	*$/Mcf*	*$/mo*	*$/Mcf*	*$/Mcf*	
As Charged							
2004		11.06	11.06				
2005		10.24	10.24			-7.4%	
2006		10.56	10.56			3.1%	
2007		11.09	11.09			5.0%	
2008		11.35	11.35			2.3%	
2009		13.07	13.07			15.2%	
2010		14.32	14.32			9.6%	
2011	182,301	14.29	16.01		-0.2%	11.8%	
2012	443,096	13.36	17.53	143.1%	-6.5%	9.5%	
2013	707,000	12.46	19.12	59.6%	-6.7%	9.1%	**6.3%**
*Hypothetical Model Contract - **Flint Only***							
2004		11.06	11.06				
2005		10.24	10.24			-7.4%	
2006		10.56	10.56			3.1%	
2007		11.09	11.09			5.0%	
2008		11.35	11.35			2.3%	
2009		13.07	13.07			15.2%	
2010		*11.73*	*11.73*			-10.3%	
2011	*70,060*	*12.45*	*13.89*		6.1%	18.4%	
2012	*175,882*	*11.47*	*15.08*	151.0%	-7.9%	8.6%	
2013	*272,923*	*10.65*	*16.24*	55.2%	-7.1%	7.7%	**4.4%**

Recent DWSD Water Rates to Flint

FY	Rates and Charges			Annual Change			Average Annual Change
	Fixed $/mo	Commodity $/Mcf	Avg Unit Cost $/Mcf	Fixed $/mo	Commodity $/Mcf	Avg Unit Cost $/Mcf	
As Charged							
2004		11.06	11.06				
2005		10.24	10.24			-7.4%	
2006		10.56	10.56			3.1%	
2007		11.09	11.09			5.0%	
2008		11.35	11.35			2.3%	
2009		13.07	13.07			15.2%	
2010		14.32	14.32			9.6%	
2011	182,301	14.29	16.01		-0.2%	11.8%	
2012	443,096	13.36	17.53	143.1%	-6.5%	9.5%	
2013	707,000	12.46	19.12	59.6%	-6.7%	9.1%	6.3%
*Hypothetical Model Contract - **Flint Only @ Imlay***							
2004		11.06	11.06				
2005		10.24	10.24			-7.4%	
2006		10.56	10.56			3.1%	
2007		11.09	11.09			5.0%	
2008		11.35	11.35			2.3%	
2009		13.07	13.07			15.2%	
2010		***11.16***	***11.16***			-14.6%	
2011	***65,919***	***10.88***	***12.23***		-2.5%	9.6%	
2012	***165,275***	***9.89***	***13.28***	150.7%	-9.1%	8.6%	
2013	***255,580***	***9.09***	***14.32***	54.6%	-8.1%	7.8%	2.9%

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MEETING MINUTES

IN ATTENDANCE:	Ed Kurtz; Flint Emergency Financial Manager, City of Flint Dayne Walling; Mayor, City of Flint Mike Brown, City of Flint John O'Brien, Genesee County Howard Croft, City of Flint Dwayne "Duffy" Johnson, City of Flint Brent Wright, City of Flint Awni Qaqish, TYJT Dave Guastella, TYJT
DATE:	November 24, 2012
PURPOSE OF MEETING:	Meeting with the City of Flint for the Indefinite-scope, Indefinite-delivery Contract Number 00383, 2012 Professional General Architectural/Engineering Services – City of Flint Water Supply Assessment
PREPARED BY:	Dave Guastella

A meeting was held at the City of Flint Municipal Center on November 20, 2012 to discuss the water supply option being presented by the Karegnondi Water Authority (KWA) to the City of Flint. The main items discussed generally followed the attached KWA Discussion/Questions that were provided to City prior to the meeting. A summary of the key points discussed are provided below.

The questions submitted are repeated in the Discussion Items for easy reference. A summary of the action items generated from the meeting follow the Discussion Items.

DISCUSSION ITEMS

1. Question/Discussion Item: Is the maximum day demand of 18 MGD for Flint the maximum day demand (MDD) throughout the 25 year planning period? If not, what is the 25 year projected MDD?

   KWA would supply up to 18 MGD. 18 MGD has been assumed as the maximum day demand and 12 MGD is assumed as the average day demand throughout the 25 year planning period.

2. Question/Discussion Item: Copy of the intake contract documents and engineer's estimate.

   The intake contract documents are approximately 90% complete and are not available for distribution. However, the updated Appendix 20, dated October 4, 2012 includes the most recent cost estimate of the intake based on the current design in process.

Comments: Meeting minutes were recorded based on the understanding of the author. Please contact the author within three days if you have any different understanding of the meeting. These minutes will be considered approved unless comments are provided within three days.

3. Question/Discussion Item: Documentation of the Flint WTP improvements required and cost estimate.

   The costs are approximately $7M as presented in the September 2009 Preliminary Engineering Report. However, this estimate has been updated. Some processes have been eliminated. John O'Brien will provide the updated costs and the description of the planned improvements to the plant.

4. Question/Discussion Item: Confirm Flint's allocated percentage of the KWA capital improvements (30%?).

   Yes, the allocation is based on 18 MGD/60 MGD total capacity.

5. Question/Discussion Item: Copy of the proposed KWA operating agreement for Flint.

   John O'Brien will provide the operating agreement as well as the Capacity Contract and Articles of Incorporation.

6. Question/Discussion Item: What is the annual operating agreement adjustment projected for the 25 year planning period?

   This information is provided in Appendix 14, Table 14.2 of the September 2009 Preliminary Engineering Report. Operating cost based on Table 1. Used 12 MGD as average day demand (ADD). Assumed 5% as the annual increase in operating costs. John O'Brien indicated that these operating costs were based on Genesee County's operating costs. John O'Brien will provide the last 10 years of audited financial statements for the water fund.

   To assess operating and maintenance costs for the Flint WTP, Duffy will provide multiple years of financial statements for the water fund. Duffy did not believe they had 10 years, but they will provide what they have.

   Regarding operation and maintenance costs, Flint believes that these costs will increase by 2/3 of what they are now.

7. Question/Discussion Item: Need the route of the pipelines and the locations of the facilities proposed. Purpose is to identify constraints that impact costs (i.e., utilities, environmental (e.g. wetlands), easements, etc.).

   KWA will not release the route due to concerns regarding speculation of land and easements. John O'Brien did indicate that the Lake Huron pump station would be at Fisher and M-25. The intermediate pump station site is near a location of the Lapeer/Sanilac/St. Clair border; where all three meet.

8. Question/Discussion Item: KWA's initial charge to Flint is based on a 12 MGD average day demand. What is the basis of this number? Are there population projections and water use figures available that were used to determine the Flint demand for the 25 year planning period?

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This was answered in Question No. 1 above.

9. Question/Discussion Item: Is there a transition plan and cost during construction of the KWA system identified?

   Flint is looking for an agreement with DWSD for back-up supply from the 72-inch main at the Genesee border.

10. Question/Discussion Item: The October 4, 2012 Preliminary Engineering Report Update states: "no backup power is planned for the pumps" (LHPS) and "No backup power is planned for pumping" (IPS). In case of power loss, how would Flint supply its customers?

    Flint indicated that they have adequate storage to supply the system for 6 to 7 days. Flint has 55 MG of storage and Genesee County has 65 MG for 2.5 days.

11. Question/Discussion Item: The latest plan shows only a 5 million gallon ground reservoir is planned for balancing between LHPS and IPS. How is redundancy maintained?

    In cases of emergency, Flint indicated that the back-up for the KWA system will be the same as it is now with DWSD; they will use the Flint River as the source water. Flint currently operates their plant four times a year.

    When questioned as to whether the WTP will be able to treat both lake water from the KWA system and river water Flint indicated that once the improvements identified in the September 2009 Preliminary Engineering Report are completed they will be able to accomplish both treatment processes. Flint will provide a schematic of the treatment trains at the WTP and a copy of the Flint transmission system.

    Genesee County indicated that additional redundancy would also be provided from the new Genesee County WTP.

    Regarding hydraulic transients; Genesee County indicated that a model analysis has not been included, but capital costs for mitigating transients have been included.

12. Question/Discussion Item: Related to the construction cost:

    a. Does it include an additional traffic lane since the construction will occupy half the right of way? *Not required, all roads are county roads; however, there are a few State road crossings.*

    b. Does it include costs/fees for permit requirements such as inspection cost by the jurisdictional authorities? As a point of reference, the permit fee costs for the Flint Transmission System came out to be $5.8 million. *Not required; all of the counties have waived any fees.*

    c. Does the cost of the steel pipe segments include corrosion protection measures such as

anode stations and related O&M? *Yes; however, the KWA has not settled on using steel pipe. PCCP pipe may be used. Steel shown in estimate because it is highest in cost and therefore the pricing is conservative.*

d. SCADA monitoring stations require power. Is the cost of bring power to the SCADA stations included? Again, as a point of reference for the Flint Transmission System we estimated $800,000 for power to SCADA and valve operators. *Yes, Genesee County did emphasize that the SCADA system will be simple and straightforward because a lot of controls are not required.*

e. Other items discussed at the meeting included:

- The 2009 plant improvement cost is still good; however, there will be some reduction, such as a sulfuric chloride feed system that was eliminated. Plant capacity now is 36MGD, but will be 18 MGD.
- The KWA Lake Huron Pumping Station (LHPS) is now only high lift pump station.
- Genesee County will provide the distance of the intake pipe from the crib to the LHPS.
- The intake project is almost ready to bid; waiting for the COE permit.
- Genesee County is estimating the construction for the pipe lines and pump stations will begin July 2013.
- The route has been flown for survey.
- Genesee County is estimating construction will be complete and the project will be placed in service by Jan 2016.
- Genesee County to provide a list of assumptions that the $272 million cost estimate is based on since the route is now known.

13. The Flint River is identified as a backup: At what capacity? MDD or emergency supply?

The Flint River would serve as a back up supply.

14. Where did the 40 years come from (Flint hostage to Detroit)? DWSD's new contracts are 30 years with openers to revise terms of supply (volume and pressure) after the first two years, then three years, and then in five year increments thereafter.

The 40 years was stated in error. The reference was to DWSD's requirement to sign a 30 year contract.

After 40 years Flint will own 30% of the project and can sell their share of ownership if they want. Conversely, with DWSD, they continue to pay for the capital projects but have no ownership. Flint believes they will know what they will be charged for the next 25 years versus DWSD that can't commit to a fixed escalation.

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Action Items for Follow-up		
Items:	*Assigned To:*	*Date to Complete*
1. Updated Costs for the Flint WTP Improvements and a description of the improvements.	John O'Brien	11/21/12
2. KWA Operating Agreement, Capacity Contract and Articles of Incorporation.	John O'Brien	11/20/12
3. Provide the last 10 years of audited financial statements for the Genesee water fund.	John O'Brien	11/20/12
4. Provide multiple years of financial statements for the City of Flint water fund.	Duffy Johnson	11/26/12
5. Provide schematic of the Flint WTP and a map of the Flint transmission system.	Brent Wright	11/26/12
6. Provide the length of the intake pipe from the crib to the pump station.	John O'Brien	11/20/12
7. Provide a list of assumptions that the $272 million cost estimate is based on since the route is now known.	John O'Brien	11/26/12

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CITY OF FLINT WATER SUPPLY ASSESSMENT

KWA Discussion/Questions for the November 20, 2012 Meeting

1. Is the maximum day demand of 18 MGD for Flint the maximum day demand (MDD) throughout the 25 year planning period? If not, what is the 25 year projected MDD?
2. Copy of the intake contract documents and engineer's estimate.
3. Documentation of the Flint WTP improvements required and cost estimate.
4. Confirm Flint's allocated percentage of the KWA capital improvements (30%?).
5. Copy of the proposed KWA operating agreement for Flint.
6. What is the annual operating agreement adjustment projected for the 25 year planning period?
7. Need the route of the pipelines and the locations of the facilities proposed. Purpose is to identify constraints that impact costs (i.e., utilities, environmental (e.g. wetlands), easements, etc.).
8. KWA's initial charge to Flint is based on a 12 MGD maximum day demand. What is the basis of this number? Are there population projections and water use figures available that were used to determine the Flint demand for the 25 year planning period?
9. Is there a transition plan and cost during construction of the KWA system identified?
10. The October 4, 2012 Preliminary Engineering Report Update states: "no backup power is planned for the pumps" (LHPS) and "No backup power is planned for pumping" (IPS). In case of power loss, how would Flint supply its customers?
11. The latest plan shows only a 5 million gallon ground reservoir is planned for balancing between LHPS and IPS. How is redundancy maintained?
12. Related to the construction cost:
    a. Does it include an additional traffic lane since the construction will occupy half the right of way?
    b. Does it include costs/fees for permit requirements such as inspection cost by the jurisdictional authorities? As a point of reference, the permit fee costs for the Flint Transmission System came out to be $5.8 million.

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c. Does the cost of the steel pipe segments include corrosion protection measures such as anode stations and related O&M?
d. SCADA monitoring stations require power. Is the cost of bring power to the SCADA stations included? Again, as a point of reference the for the Flint Transmission System we estimated $800,000 for power to SCADA and valve operators.

13. The Flint River is identified as a backup: At what capacity? MDD or emergency supply?
14. Where did the 40 years come from (Flint hostage to Detroit)? DWSD's new contracts are 30 years with openers to revise terms of supply (volume and pressure) after the first two years, then three years, and then in five year increments thereafter.

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STATE OF MICHIGAN CONTRACT NO. 271N3200089

CITY OF FLINT WATER SUPPLY ASSESSMENT

State of Michigan, Department of Treasury

Appendix B: Cost Worksheets

DWSD Worksheet : 18 MGD Maximum Day Customer with Model Contract at Potter & Baxter

Capacity

Flint ADD:	0.60	MGD	81	MCF/Day
DWSD ADD:	12	MGD	1,604	MCF/Day

Annual Volume

Flint:	29,412	MCF
DWSD:	585,561	MCF

2013 Cost of Supply

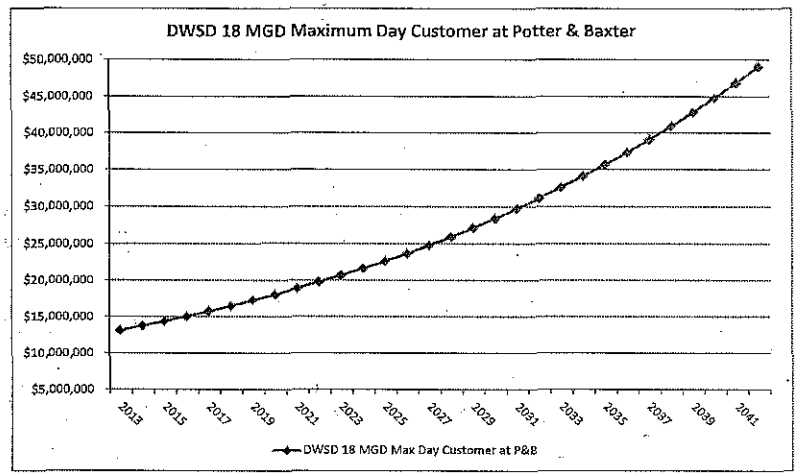
Flint WTP O&M:	120.30	/MCF	$ 3,538,214	/Yr
DWSD:	$ 16.37	/MCF	$ 9,585,642	/Yr

Escalation/Inflation Rate

Flint:	4.51% /Yr
DWSD:	4.7% /Yr

Capital Expenditure

Amount:	$ -			
Reserve:	$ -	0%	Reserve Rate:	0.00%
Amount plus Reserve:	$ -			
Revenue Bond Rate:	5%			
Number of Years:	25			
Annual Cost:	$0			



	Year	Flint WTP O&M	Water Purchase	Revenue Bond Payment	Interest on Reserve	TOTAL
1	2013	$ 3,538,214	9,585,642		-	$ 13,123,856
2	2014	$ 3,697,788	10,036,167		-	$ 13,733,955
3	2015	$ 3,864,558	10,507,867		-	$ 14,372,425
4	2016	$ 4,038,850	11,001,736	-	-	$ 15,040,586
5	2017	$ 4,221,002	11,518,818	-	-	$ 15,739,820
6	2018	$ 4,411,369	12,060,203	-	-	$ 16,471,571
7	2019	$ 4,610,322	12,627,032	-	-	$ 17,237,354
8	2020	$ 4,818,247	13,220,503	-	-	$ 18,038,750
9	2021	$ 5,035,550	13,841,866	-	-	$ 18,877,416
10	2022	$ 5,262,653	14,492,434	-	-	$ 19,755,087
11	2023	$ 5,499,999	15,173,578	-	-	$ 20,673,577
12	2024	$ 5,748,049	15,886,736	-	-	$ 21,634,785
13	2025	$ 6,007,286	16,633,413	-	-	$ 22,640,699
14	2026	$ 6,278,215	17,415,183	-	-	$ 23,693,398
15	2027	$ 6,561,362	18,233,697	-	-	$ 24,795,059
16	2028	$ 6,857,279	19,090,681	-	-	$ 25,947,960
17	2029	$ 7,166,543	19,987,943	-	-	$ 27,154,486
18	2030	$ 7,489,754	20,927,376	-	-	$ 28,417,130
19	2031	$ 7,827,542	21,910,963	-	-	$ 29,738,505
20	2032	$ 8,180,564	22,940,778	-	-	$ 31,121,342
21	2033	$ 8,549,507	24,018,995	-	-	$ 32,568,502
22	2034	$ 8,935,090	25,147,887	-	-	$ 34,082,977
23	2035	$ 9,338,063	26,329,838	-	-	$ 35,667,901
24	2036	$ 9,759,209	27,567,341	-	-	$ 37,326,550
25	2037	$ 10,199,350	28,863,006	-	-	$ 39,062,355
	2038	$ 10,659,340	30,219,567	-	-	$ 40,878,907
	2039	$ 11,140,076	31,639,886	-	-	$ 42,779,963
	2040	$ 11,642,494	33,126,961	-	-	$ 44,769,455
	2041	$ 12,167,570	34,683,928	-	-	$ 46,851,499
	2042	$ 12,716,328	36,314,073	-	-	$ 49,030,401
		$ 216,222,171				

25 Yrs Cummulative	
$	596,916,044

30 Yrs Cummulative	
$	821,226,268

DWSD Worksheet : 12 MGD Maximum Day Customer with Model Contract at Potter & Baxter/Blending with Flint

Capacity

Flint ADD:	4	MGD	535	MCF/Day
DWSD ADD:	8	MGD	1,070	MCF/Day

Annual Volume

Flint:	195,187	MCF	195187.1658
DWSD:	390,374	MCF	
			5895097.471

2013 Cost of Supply

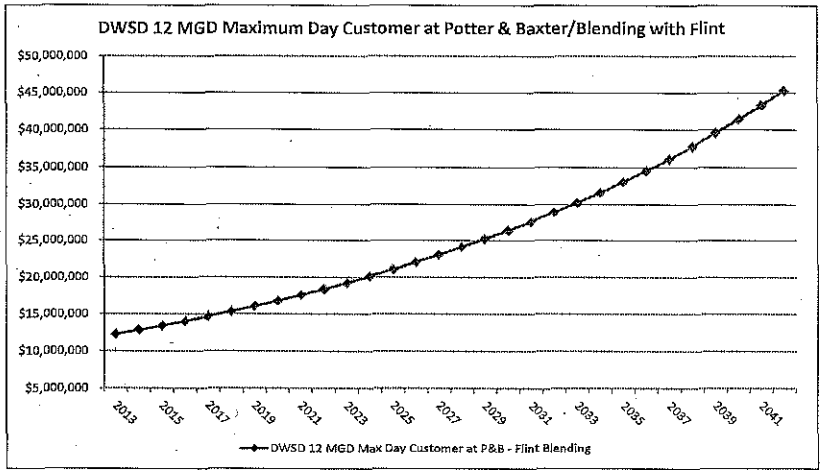
Flint WTP O&M:	$	30.20	/MCF	$ 5,895,097	/Yr
DWSD:	$	16.31	/MCF	$ 6,367,005	/Yr

Escalation/Inflation Rate

Flint:	4.51%	/Yr
DWSD:	4.7%	/Yr

Capital Expenditure

Amount:	$	-			
Reserve:	$	-	0%	Reserve Rate:	0.00%
Amount plus Reserve:	$	-			
Revenue Bond Rate:		5%			
Number of Years:		25			
Annual Cost:	$0				



	Year	Flint WTP O&M	Water Purchase	Revenue Bond Payment	Interest on Reserve	TOTAL
1	2013	$ 5,895,097	6,367,005		-	$ 12,262,103
2	2014	$ 6,160,966	6,666,255		-	$ 12,827,221
3	2015	$ 6,438,826	6,979,569		-	$ 13,418,395
4	2016	$ 6,729,217	7,307,608	-	-	$ 14,036,825
5	2017	$ 7,032,705	7,651,066	-	-	$ 14,683,771
6	2018	$ 7,349,880	8,010,666	-	-	$ 15,360,546
7	2019	$ 7,681,359	8,387,167	-	-	$ 16,068,527
8	2020	$ 8,027,789	8,781,364	-	-	$ 16,809,153
9	2021	$ 8,389,842	9,194,088	-	-	$ 17,583,930
10	2022	$ 8,768,224	9,626,210	-	-	$ 18,394,434
11	2023	$ 9,163,671	10,078,642	-	-	$ 19,242,313
12	2024	$ 9,576,952	10,552,338	-	-	$ 20,129,291
13	2025	$ 10,008,873	11,048,298	-	-	$ 21,057,171
14	2026	$ 10,460,273	11,567,568	-	-	$ 22,027,841
15	2027	$ 10,932,031	12,111,244	-	-	$ 23,043,275
16	2028	$ 11,425,066	12,680,473	-	-	$ 24,105,538
17	2029	$ 11,940,336	13,276,455	-	-	$ 25,216,791
18	2030	$ 12,478,845	13,900,448	-	-	$ 26,379,294
19	2031	$ 13,041,641	14,553,769	-	-	$ 27,595,410
20	2032	$ 13,629,819	15,237,796	-	-	$ 28,867,616
21	2033	$ 14,244,524	15,953,973	-	-	$ 30,198,497
22	2034	$ 14,886,952	16,703,810	-	-	$ 31,590,762
23	2035	$ 15,558,354	17,488,889	-	-	$ 33,047,242
24	2036	$ 16,260,035	18,310,866	-	-	$ 34,570,902
25	2037	$ 16,993,363	19,171,477	-	-	$ 36,164,840
	2038	$ 17,759,764	20,072,537	-	-	$ 37,832,300
	2039	$ 18,560,729	21,015,946	-	-	$ 39,576,675
	2040	$ 19,397,818	22,003,695	-	-	$ 41,401,513
	2041	$ 20,272,660	23,037,869			$ 43,310,528
	2042	$ 21,186,956	24,120,649			$ 45,307,605

25 Yrs Cummulative	
$	554,681,686

30 Yrs Cummulative	
$	762,110,308

DWSD Worksheet : 8 MGD Maximum Day Customer with Model Contract at Potter & Baxter/Blending with Flint

Capacity

Flint ADD:	4	MGD	535	MCF/Day
DWSD ADD:	8	MGD	1,070	MCF/Day

Annual Volume

Flint:	195,187	MCF
DWSD:	390,374	MCF

2013 Cost of Supply

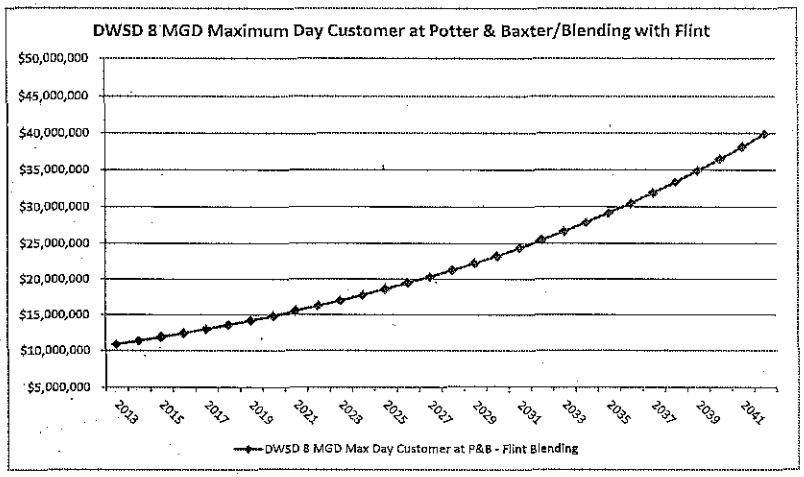
Flint WTP O&M:	$ 30.20	/MCF	$ 5,895,097	/Yr
DWSD:	$ 12.68	/MCF	$ 4,949,947	/Yr

Escalation/Inflation Rate

Flint:	4.51% /Yr
DWSD:	4.7% /Yr

Capital Expenditure

Amount:	$ -			
Reserve:	$ -	0%	Reserve Rate:	0.00%
Amount plus Reserve:	$ -			
Revenue Bond Rate:	5%			
Number of Years:	25			
Annual Cost:	$0			



	Year	Flint WTP O&M	Water Purchase	Revenue Bond Payment	Interest on Reserve	TOTAL
1	2013	$ 5,895,097	4,949,947		-	$ 10,845,044
2	2014	$ 6,160,966	5,182,594		-	$ 11,343,560
3	2015	$ 6,438,826	5,426,176		-	$ 11,865,002
4	2016	$ 6,729,217	5,681,206	-	-	$ 12,410,423
5	2017	$ 7,032,705	5,948,223	-	-	$ 12,980,928
6	2018	$ 7,349,880	6,227,789	-	-	$ 13,577,669
7	2019	$ 7,681,359	6,520,495	-	-	$ 14,201,855
8	2020	$ 8,027,789	6,826,959	-	-	$ 14,854,747
9	2021	$ 8,389,842	7,147,826	-	-	$ 15,537,668
10	2022	$ 8,768,224	7,483,774	-	-	$ 16,251,997
11	2023	$ 9,163,671	7,835,511	-	-	$ 16,999,182
12	2024	$ 9,576,952	8,203,780	-	-	$ 17,780,732
13	2025	$ 10,008,873	8,589,358	-	-	$ 18,598,230
14	2026	$ 10,460,273	8,993,057	-	-	$ 19,453,330
15	2027	$ 10,932,031	9,415,731	-	-	$ 20,347,762
16	2028	$ 11,425,066	9,858,271	-	-	$ 21,283,336
17	2029	$ 11,940,336	10,321,609	-	-	$ 22,261,945
18	2030	$ 12,478,845	10,806,725	-	-	$ 23,285,570
19	2031	$ 13,041,641	11,314,641	-	-	$ 24,356,282
20	2032	$ 13,629,819	11,846,429	-	-	$ 25,476,248
21	2033	$ 14,244,524	12,403,211	-	-	$ 26,647,735
22	2034	$ 14,886,952	12,986,162	-	-	$ 27,873,114
23	2035	$ 15,558,354	13,596,512	-	-	$ 29,154,866
24	2036	$ 16,260,035	14,235,548	-	-	$ 30,495,583
25	2037	$ 16,993,363	14,904,619	-	-	$ 31,897,982
	2038	$ 17,759,764	15,605,136	-	-	$ 33,364,899
	2039	$ 18,560,729	16,338,577	-	-	$ 34,899,306
	2040	$ 19,397,818	17,106,490	-	-	$ 36,504,308
	2041	$ 20,272,660	17,910,495			$ 38,183,155
	2042	$ 21,186,956	18,752,288			$ 39,939,245

25 Yrs Cummulative	
$	489,780,792

30 Yrs Cummulative	
$	672,671,705

DWSD Worksheet : 12 MGD Maximum Day Customer with Model Contract at Imlay/Blending with Flint

Capacity

Flint ADD:	4	MGD	535	MCF/Day
DWSD ADD:	8	MGD	1,070	MCF/Day

Annual Volume

Flint:	195,187	MCF
DWSD:	390,374	MCF

2013 Cost of Supply

Flint WTP O&M:	$ 30.20	/MCF	$ 5,895,097	/Yr
DWSD:	$ 14.38	/MCF	$ 5,613,583	/Yr

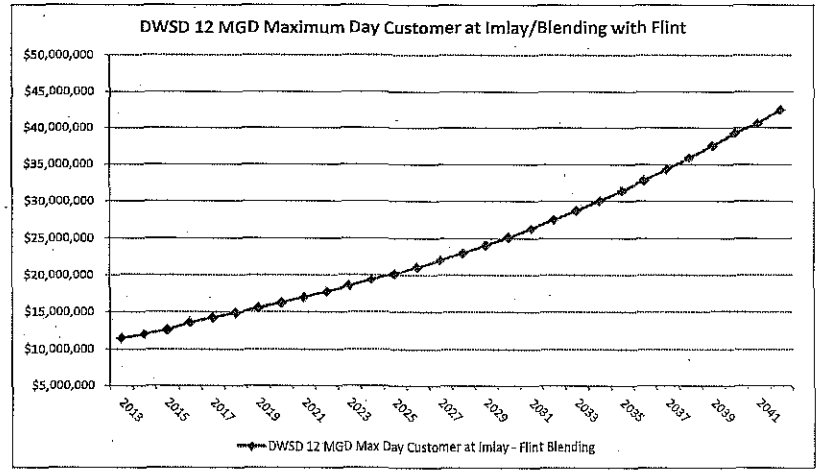
Escalation/Inflation Rate

Flint:	4.51% /Yr
DWSD:	4.7% /Yr

Capital Expenditure

Capital:	$ 4,700,000		
Bond Issuance (3% of Total):	195,000	Check:	3.0%
3 Years of Capitalized Interest:	975,000	Check:	5.0% /Yr (Bond Interest on Total)
Reserve (10% of Total):	650,000	Check:	10.0%
Total:	$ 6,520,000		

Revenue Bond Rate:	5%
Number of Years:	25
Annual Cost:	$462,610
Interest on Reserve:	3%



	Year	Flint WTP O&M	Water Purchase	Revenue Bond Payment	Interest on Reserve	TOTAL
1	2013	$ 5,895,097	5,613,583		19,500	$ 11,489,180
2	2014	$ 6,160,966	5,877,421		19,500	$ 12,018,888
3	2015	$ 6,438,826	6,153,660		19,500	$ 12,572,986
4	2016	$ 6,729,217	6,442,882	462,610	19,500	$ 13,615,209
5	2017	$ 7,032,705	6,745,698	462,610	19,500	$ 14,221,512
6	2018	$ 7,349,880	7,062,745	462,610	19,500	$ 14,855,735
7	2019	$ 7,681,359	7,394,694	462,610	19,500	$ 15,519,164
8	2020	$ 8,027,789	7,742,245	462,610	19,500	$ 16,213,144
9	2021	$ 8,389,842	8,106,131	462,610	19,500	$ 16,939,082
10	2022	$ 8,768,224	8,487,119	462,610	19,500	$ 17,698,452
11	2023	$ 9,163,671	8,886,013	462,610	19,500	$ 18,492,794
12	2024	$ 9,576,952	9,303,656	462,610	19,500	$ 19,323,718
13	2025	$ 10,008,873	9,740,928	462,610	19,500	$ 20,192,910
14	2026	$ 10,460,273	10,198,751	462,610	19,500	$ 21,102,134
15	2027	$ 10,932,031	10,678,093	462,610	19,500	$ 22,053,234
16	2028	$ 11,425,066	11,179,963	462,610	19,500	$ 23,048,139
17	2029	$ 11,940,336	11,705,421	462,610	19,500	$ 24,088,867
18	2030	$ 12,478,845	12,255,576	462,610	19,500	$ 25,177,531
19	2031	$ 13,041,641	12,831,588	462,610	19,500	$ 26,316,339
20	2032	$ 13,629,819	13,434,673	462,610	19,500	$ 27,507,602
21	2033	$ 14,244,524	14,066,102	462,610	19,500	$ 28,753,736
22	2034	$ 14,886,952	14,727,209	462,610	19,500	$ 30,057,271
23	2035	$ 15,558,354	15,419,388	462,610	19,500	$ 31,420,852
24	2036	$ 16,260,035	16,144,099	462,610	19,500	$ 32,847,245
25	2037	$ 16,993,363	16,902,872	462,610	19,500	$ 34,339,345
	2038	$ 17,759,764	17,697,307	462,610	19,500	$ 35,900,181
	2039	$ 18,560,729	18,529,080	462,610	19,500	$ 37,532,919
	2040	$ 19,397,818	19,399,947	462,610	19,500	$ 39,240,875
	2041	$ 20,272,660	20,311,745			$ 40,584,404
	2042	$ 21,186,956	21,266,397			$ 42,453,353

25 Yrs Cummulative
$ 529,865,071

30 Yrs Cummulative
$ 725,576,803

DWSD Worksheet : 8 MGD Maximum Day Customer with Model Contract at Imlay/Blending with Flint

Capacity

Flint ADD:	4	MGD	535	MCF/Day
DWSD ADD:	8	MGD	1,070	MCF/Day

Annual Volume

Flint:	195,187 MCF
DWSD:	390,374 MCF

2013 Cost of Supply

Flint WTP O&M:	$ 30.20	/MCF	$ 5,895,097	/Yr
DWSD:	$ 11.11	/MCF	$ 4,337,059	/Yr

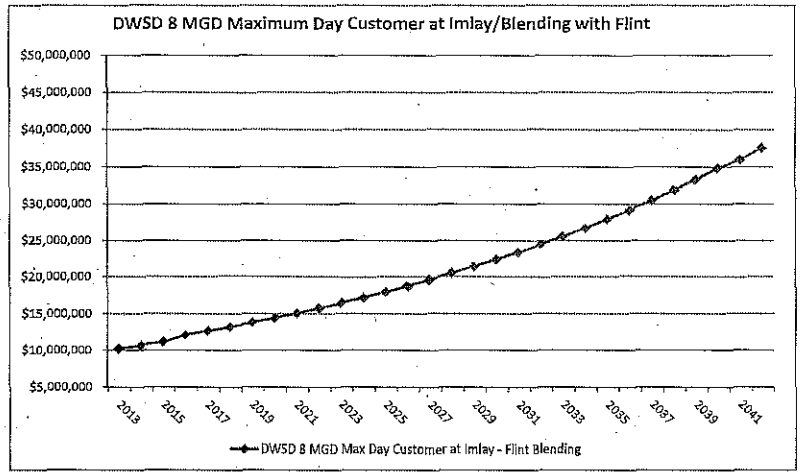
Escalation/Inflation Rate

Flint:	4.51% /Yr
DWSD:	4.7% /Yr

Capital Expenditure

Capital:	$ 4,700,000		
Bond Issuance (3% of Total):	195,000	Check:	3.0%
3 Years of Capitalized Interest:	975,000	Check:	5.0% /Yr (Bond Interest on Total)
Reserve (10% of Total):	650,000	Check:	10.0%
Total:	$ 6,520,000		

Revenue Bond Rate:	5%
Number of Years:	25
Annual Cost:	$462,610
Interest on Reserve:	3%



	Year	Flint WTP O&M	Water Purchase	Revenue Bond Payment	Interest on Reserve	TOTAL
1	2013	$ 5,895,097	4,337,059		19,500	$ 10,212,656
2	2014	$ 6,160,966	4,540,901		19,500	$ 10,682,367
3	2015	$ 6,438,826	4,754,323		19,500	$ 11,173,649
4	2016	$ 6,729,217	4,977,776	462,610	19,500	$ 12,150,103
5	2017	$ 7,032,705	5,211,732	462,610	19,500	$ 12,687,546
6	2018	$ 7,349,880	5,456,683	462,610	19,500	$ 13,249,673
7	2019	$ 7,681,359	5,713,147	462,610	19,500	$ 13,837,616
8	2020	$ 8,027,789	5,981,665	462,610	19,500	$ 14,452,564
9	2021	$ 8,389,842	6,262,803	462,610	19,500	$ 15,085,755
10	2022	$ 8,768,224	6,557,155	462,610	19,500	$ 15,758,489
11	2023	$ 9,163,671	6,865,341	462,610	19,500	$ 16,472,122
12	2024	$ 9,576,952	7,188,012	462,610	19,500	$ 17,208,074
13	2025	$ 10,008,873	7,525,849	462,610	19,500	$ 17,977,832
14	2026	$ 10,460,273	7,879,564	462,610	19,500	$ 18,782,947
15	2027	$ 10,932,031	8,249,903	462,610	19,500	$ 19,625,044
16	2028	$ 11,425,066	8,637,649	462,610	19,500	$ 20,505,824
17	2029	$ 11,940,336	9,043,618	462,610	19,500	$ 21,427,064
18	2030	$ 12,478,845	9,468,668	462,610	19,500	$ 22,390,624
19	2031	$ 13,041,641	9,913,696	462,610	19,500	$ 23,398,447
20	2032	$ 13,629,819	10,379,639	462,610	19,500	$ 24,452,569
21	2033	$ 14,244,524	10,867,482	462,610	19,500	$ 25,555,117
22	2034	$ 14,886,952	11,378,254	462,610	19,500	$ 26,708,316
23	2035	$ 15,558,354	11,913,032	462,610	19,500	$ 27,914,496
24	2036	$ 16,260,035	12,472,945	462,610	19,500	$ 29,176,090
25	2037	$ 16,993,363	13,059,173	462,610	19,500	$ 30,495,646
	2038	$ 17,759,764	13,672,954	462,610	19,500	$ 31,875,828
	2039	$ 18,560,729	14,315,583	462,610	19,500	$ 33,319,422
	2040	$ 19,397,818	14,988,415	462,610	19,500	$ 34,829,343
	2041	$ 20,272,660	15,692,871			$ 35,965,530
	2042	$ 21,186,956	16,430,436			$ 37,617,392

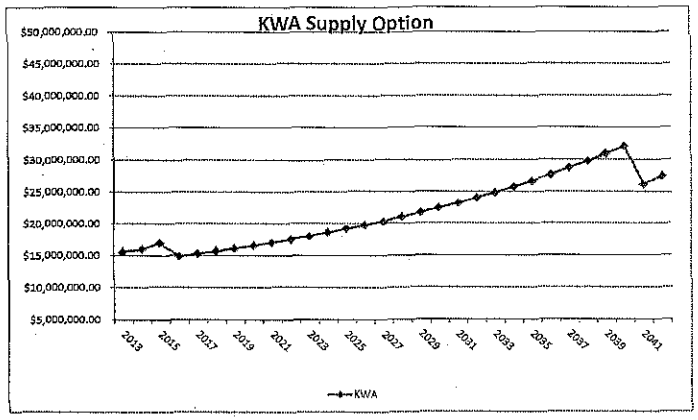
25 Yrs Cummulative	
$	493,063,801

30 Yrs Cummulative	
$	534,795,488

KWA Supply Option Worksheet
KWA 10/31/12 No Overruns

	Year	DWSD & Flint WTP Costs	KWA Entry Fee	KWA Debt service	Flint WTP Debt Service	KWA Operations	Flint WTP Operations with KWA	TOTAL
1	2013	$ 14,413,858	1,162,800					$ 15,576,658
2	2014	$ 15,355,135	581,400					$ 15,936,535
3	2015	$ 16,365,534	581,400					$ 16,946,934
4	2016			6,593,155	572,781	878,869	6,843,344	$ 14,888,149
5	2017			6,593,155	572,781	922,812	7,185,511	$ 15,274,260
6	2018			6,593,155	572,781	968,953	7,544,787	$ 15,679,676
7	2019			6,593,155	572,781	1,017,401	7,922,026	$ 16,105,363
8	2020			6,593,155	572,781	1,068,271	8,318,127	$ 16,552,334
9	2021			6,593,155	572,781	1,121,684	8,734,034	$ 17,021,654
10	2022			6,593,155	572,781	1,177,769	9,170,735	$ 17,514,440
11	2023			6,593,155	572,781	1,236,657	9,629,272	$ 18,031,865
12	2024			6,593,155	572,781	1,298,490	10,110,736	$ 18,575,162
13	2025			6,593,155	572,781	1,363,414	10,616,273	$ 19,145,623
14	2026			6,593,155	572,781	1,431,585	11,147,086	$ 19,744,607
15	2027			6,593,155	572,781	1,503,164	11,704,441	$ 20,373,541
16	2028			6,593,155	572,781	1,578,322	12,289,663	$ 21,033,921
17	2029			6,593,155	572,781	1,657,239	12,904,146	$ 21,727,320
18	2030			6,593,155	572,781	1,740,101	13,549,353	$ 22,455,390
19	2031			6,593,155	572,781	1,827,106	14,226,821	$ 23,219,862
20	2032			6,593,155	572,781	1,918,461	14,938,162	$ 24,022,559
21	2033			6,593,155	572,781	2,014,384	15,685,070	$ 24,865,390
22	2034			6,593,155	572,781	2,115,103	16,469,323	$ 25,750,362
23	2035			6,593,155	572,781	2,220,858	17,292,789	$ 26,679,584
24	2036			6,593,155	572,781	2,331,901	18,157,429	$ 27,655,266
25	2037			6,593,155	572,781	2,448,496	19,065,300	$ 28,679,733
	2038			6,593,155	572,781	2,570,921	20,018,565	$ 29,755,422
	2039			6,593,155	572,781	2,699,467	21,019,494	$ 30,884,897
	2040			6,593,155	572,781	2,834,440	22,070,468	$ 32,070,845
	2041					2,976,162	23,173,992	$ 26,150,154
	2042					3,124,970	24,332,691	$ 27,457,662

25 Yrs Cummulative	30 Yrs Cummulative
$ 503,456,186	$ 649,775,165



KWA Supply Option Worksheet
KWA-1

David Gunstella:
Flint buys water from DWSD for three years during KWA construction at current rate (assume 5% increase each year)

David Gunstella:
Highlighted portion is Flint's Entry Fee to KWA

Capacity

Flint ADD:	12	MGD	1,604 MCF/Day
KWA ADD:	12	MGD	1,604 MCF/Day

Annual Volume

Flint:	585,561	MCF
KWA:	585,561	MCF

2016 Cost of Supply

Flint WTP O&M:	13.51	/MCF	$ 7,913,118	/Yr
KWA:	$ 1.50	/MCF	$ 878,869	/Yr

Escalation/Inflation Rate

Flint:	4.51% /Yr
KWA:	5.0% /Yr

Capital Expenditure

David Gunstella:
Assumes Bond Issuance and Reserves are not included

Capital:	$ 272,421,558		
Bond Issuance (2.25% of Total):	8,440,000	Check:	2.25%
3 Years of Capitalized Interest:	56,000,000	Check:	5.0% /Yr (Bond Interest on Total)
Reserve (10% of Total):	37,500,000	Check:	10.0%
Total:	$ 374,361,558		
Flint's Share (30%)	$ 112,308,467		

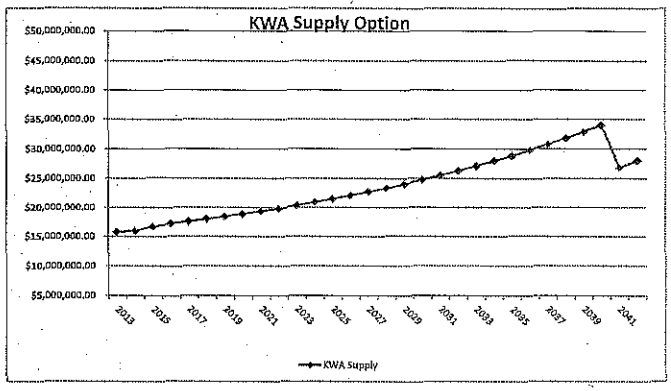
Revenue Bond Rate:	5%
Number of Years:	25
Annual Cost:	$7,968,562
Interest on Reserve:	3%

David Gunstella:
Increased by 3%/Yr to 2012 $'s

Capital:	$ 7,756,362		
Bond Issuance (3% of Total):	240,000	Check:	2.25%
3 Years of Capitalized Interest:	1,600,000	Check:	5.0% /Yr (Bond Interest on Total)
Reserve (10% of Total):	1,070,000	Check:	10.0%
Total:	$ 10,666,362		

Revenue Bond Rate:	5%
Number of Years:	25
Annual Cost:	$756,946
Interest on Reserve:	3%

	Year	Flint WTP O&M	Water Purchase	KWA Revenue Pre-bond Entry Fee & Bond Payment	Flint Revenue Bond Payment	Interest on Reserve	TOTAL
1	2013	$ *3,538,214*	*11,461,700*	1,162,800		369,600	$ 15,793,114
2	2014	$ *3,697,788*	*12,034,785*	581,400		369,600	$ 15,944,373
3	2015	$ *3,864,558*	*12,636,524*	581,400		369,600	$ 16,712,882
4	2016	$ 7,913,118	878,869	7,968,562		369,600	$ 17,147,896
5	2017	$ 8,270,000	922,812	7,968,562	756,946	369,600	$ 17,548,721
6	2018	$ 8,642,577	968,953	7,968,562	756,946	369,600	$ 17,967,838
7	2019	$ 9,032,775	1,017,401	7,968,562	756,946	369,600	$ 18,406,084
8	2020	$ 9,440,153	1,068,271	7,968,562	756,946	369,600	$ 18,864,332
9	2021	$ 9,865,904	1,121,684	7,968,562	756,946	369,600	$ 19,343,497
10	2022	$ 10,310,857	1,177,769	7,968,562	756,946	369,600	$ 19,844,533
11	2023	$ 10,775,876	1,236,657	7,968,562	756,946	369,600	$ 20,368,441
12	2024	$ 11,261,868	1,298,490	7,968,562	756,946	369,600	$ 20,916,266
13	2025	$ 11,769,779	1,363,414	7,968,562	756,946	369,600	$ 21,489,101
14	2026	$ 12,300,596	1,431,585	7,968,562	756,946	369,600	$ 22,088,089
15	2027	$ 12,855,352	1,503,164	7,968,562	756,946	369,600	$ 22,714,425
16	2028	$ 13,435,129	1,578,322	7,968,562	756,946	369,600	$ 23,359,359
17	2029	$ 14,041,059	1,657,239	7,968,562	756,946	369,600	$ 24,054,200
18	2030	$ 14,674,305	1,740,101	7,968,562	756,946	369,600	$ 24,770,813
19	2031	$ 15,336,116	1,827,106	7,968,562	756,946	369,600	$ 25,519,130
20	2032	$ 16,027,775	1,918,461	7,968,562	756,946	369,600	$ 26,302,144
21	2033	$ 16,750,627	2,014,384	7,968,562	756,946	369,600	$ 27,120,919
22	2034	$ 17,506,080	2,115,103	7,968,562	756,946	369,600	$ 27,977,092
23	2035	$ 18,295,605	2,220,858	7,968,562	756,946	369,600	$ 28,872,371
24	2036	$ 19,120,737	2,331,901	7,968,562	756,946	369,600	$ 29,808,546
25	2037	$ 19,983,082	2,448,496	7,968,562	756,946	369,600	$ 30,787,486
	2038	$ 20,884,319	2,570,921	7,968,562	756,946	369,600	$ 31,811,148
	2039	$ 21,826,201	2,699,467	7,968,562	756,946	369,600	$ 32,881,577
	2040	$ 22,810,563	2,834,440	7,968,562	756,946	369,600	$ 34,000,912
	2041	$ 23,839,320	2,976,162				$ 26,815,482
	2042	$ 24,914,473	3,124,970				$ 28,039,443



25 Yrs Cummulative
$ 553,731,153

30 Yrs Cummulative
$ 707,279,715

KWA Supply Option Worksheet
KWA-2

Capacity

Flint ADD:	12	MGD	1,604	MCF/Day
KWA ADD:	12	MGD	1,604	MCF/Day

Annual Volume

Flint:	585,561	MCF
KWA:	585,561	MCF

2016 Cost of Supply

Flint WTP O&M:	$ 13.51	/MCF	$ 7,913,118	/Yr
KWA:	$ 1.50	/MCF	$ 878,869	/Yr

Escalation/Inflation Rate

Flint:	4.51% /Yr
KWA:	5.0% /Yr

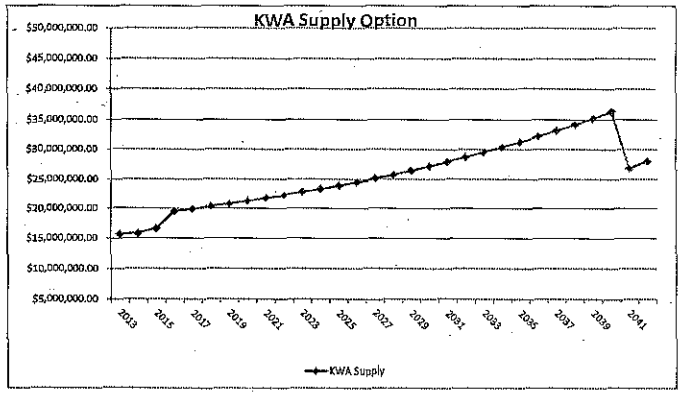
Capital Expenditure

Capital:	$ 357,578,060		
Bond Issuance (2.25% of Total):	11,050,000	Check:	2.25%
3 Years of Capitalized Interest:	74,000,000	Check:	5.0% /Yr (Bond Interest on Total)
Reserve (10% of Total):	49,000,000	Check:	10.0%
Total:	$ 491,628,060		
Flint's Share (30%)	$ 147,488,418		

Revenue Bond Rate:	5%
Number of Years:	25
Annual Cost:	$10,464,666
Interest on Reserve:	3%

Capital:	$ 7,768,362		
Bond Issuance (3% of Total):	240,000	Check:	2.25%
3 Years of Capitalized Interest:	1,600,000	Check:	5.0% /Yr (Bond Interest on Total)
Reserve (10% of Total):	1,070,000	Check:	10.0%
Total:	$ 10,668,362		

Revenue Bond Rate:	5%
Number of Years:	25
Annual Cost:	$756,946
Interest on Reserve:	3%



	Year	Flint WTP O&M	Water Purchase	KWA Revenue Pre-bond Entry Fee & Bond Payment	Flint Revenue Bond Payment	Interest on Reserve	TOTAL
1	2013	$ 3,538,214	11,461,700	1,162,300		473,100	$ 15,689,614
2	2014	$ 3,697,788	12,084,785	581,400		473,100	$ 15,840,873
3	2015	$ 3,864,558	12,636,524	581,400		473,100	$ 16,609,382
4	2016	$ 7,913,118	878,869	10,464,666	756,946	473,100	$ 19,540,500
5	2017	$ 8,270,000	922,812	10,464,666	756,946	473,100	$ 19,941,325
6	2018	$ 8,642,977	968,953	10,464,666	756,946	473,100	$ 20,360,442
7	2019	$ 9,032,775	1,017,401	10,464,666	756,946	473,100	$ 20,798,688
8	2020	$ 9,440,153	1,068,271	10,464,666	756,946	473,100	$ 21,256,936
9	2021	$ 9,865,904	1,121,684	10,464,666	756,946	473,100	$ 21,736,101
10	2022	$ 10,310,857	1,177,769	10,464,666	756,946	473,100	$ 22,237,137
11	2023	$ 10,775,876	1,236,657	10,464,666	756,946	473,100	$ 22,761,045
12	2024	$ 11,261,868	1,298,490	10,464,666	756,946	473,100	$ 23,308,870
13	2025	$ 11,769,779	1,363,414	10,464,666	756,946	473,100	$ 23,881,705
14	2026	$ 12,300,596	1,431,585	10,464,666	756,946	473,100	$ 24,480,593
15	2027	$ 12,855,352	1,503,164	10,464,666	756,946	473,100	$ 25,107,029
16	2028	$ 13,435,129	1,578,322	10,464,666	756,946	473,100	$ 25,761,963
17	2029	$ 14,041,053	1,657,239	10,464,666	756,946	473,100	$ 26,446,804
18	2030	$ 14,674,305	1,740,101	10,464,666	756,946	473,100	$ 27,162,917
19	2031	$ 15,336,116	1,827,106	10,464,666	756,946	473,100	$ 27,911,733
20	2032	$ 16,027,775	1,918,461	10,464,666	756,946	473,100	$ 28,694,748
21	2033	$ 16,750,627	2,014,384	10,464,666	756,946	473,100	$ 29,513,523
22	2034	$ 17,506,080	2,115,103	10,464,666	756,946	473,100	$ 30,369,696
23	2035	$ 18,295,605	2,220,858	10,464,666	756,946	473,100	$ 31,264,975
24	2036	$ 19,120,787	2,331,901	10,464,666	756,946	473,100	$ 32,201,150
25	2037	$ 19,983,082	2,448,496	10,464,666	756,946	473,100	$ 33,180,090
	2038	$ 20,884,319	2,570,921	10,464,666	756,946	473,100	$ 34,203,752
	2039	$ 21,826,201	2,699,467	10,464,666	756,946	473,100	$ 35,274,181
	2040	$ 22,810,563	2,834,440	10,464,666	756,946	473,100	$ 36,393,516
	2041	$ 23,839,320	2,976,162				$ 26,815,482
	2042	$ 24,914,473	3,124,970				$ 28,039,443

25 Yrs Cummulative	
$	606,057,940

30 Yrs Cummulative	
$	766,784,313

Thelen, Mary Beth (DEQ)

From: Busch, Stephen (DEQ)
Sent: Wednesday, March 27, 2013 1:39 PM
To: Thelen, Mary Beth (DEQ); Wyant, Dan (DEQ); Sygo, Jim (DEQ); Shekter Smith, Liane (DEQ)
Cc: Willard, Veronica (DEQ); Benzie, Richard (DEQ); Prysby, Mike (DEQ); Bloemker, Jon (DEQ); Donaldson, Kristina (DEQ); Creal, William (DEQ)
Subject: ODWMA Response - Flint KWA-DWSD Report
Attachments: deq-wb-dwehs-wwciu-gcdclqwwpermitresponsepubliccomment_290345_7.pdf; Rowe Review of Tucker Young Report.pdf

Importance: High

Director Wyant, and Deputy Director Sygo,

Addendums to ODWMA comments provided yesterday regarding the City of Flint water system and comments on the reports from Tucker, Young, Jackson, Tull, Inc. (TYJT) can be found below in red. Additional comments are as follows:

With regards to regulatory authority for DEQ to allow or prevent the breakup of water utilities, and State vs. local decisions about cost effectiveness, it is important to note that when the DEQ permitted the water withdrawal for KWA (permit 2009-001) part of the decision making process (copy attached) included reasonable use and the balance of Economic Development, Social Development, and Environmental Protection. As part of the public participation process general comments were received (pages 6 & 7) regarding impacts on DWSD and rates to remaining customers. The Department's response to those comments stated:

"The DEQ is specifically precluded from using part 327 to "...diminish or create any existing authority of municipalities to require persons to connect to municipal water supply systems as authorized by law" (MCL 324.32726)."

And

"It is appropriately an issue for water service contract negotiations between the regional water system and its customers. To do otherwise invites unwanted intervention of the state into local decision making."

ODWMA cannot on its own assess an actual dollar value to any regional benefit for the City of Flint to remain a full customer of DWSD, but the following should be included in any additional analysis:

- The cost estimates provided in the TYJT report show a cost difference between full KWA and full DWSD participation of $172 million over 30 years.
- The formation of KWA would itself be considered one of the largest regional drinking water authorities in the State in terms of capacity, and as such any regional benefits provided by DWSD may only be marginal in comparison.

Finally, we have additional questions for TYJT regarding the various DWSD supply options and the considerations they made in the operations of the Flint WTP. These considerations will have an impact on the cost estimates for DWSD options.

We look forward to further discussion of these comments during our meetings tomorrow, and please let us know if you have any additional questions for us between now and then.

Stephen Busch, P.E.

Lansing and Jackson District Supervisor
Office of Drinking Water and Municipal Assistance
MDEQ
517-643-2314

From: Busch, Stephen (DEQ)
Sent: Tuesday, March 26, 2013 3:58 PM
To: Wyant, Dan (DEQ); Thelen, Mary Beth (DEQ); Sygo, Jim (DEQ)
Cc: Willard, Veronica (DEQ); Shekter Smith, Liane (DEQ)
Subject: RE: Flint Draft Response

I will provide additional follow up by tomorrow (Wed.) afternoon to my previous email below based on our discussion and the conference call with Andy Dillon earlier today.

Stephen Busch, P.E.
Lansing and Jackson District Supervisor
Office of Drinking Water and Municipal Assistance
MDEQ
517-643-2314

From: Busch, Stephen (DEQ)
Sent: Tuesday, March 26, 2013 12:37 PM
To: Wyant, Dan (DEQ); Thelen, Mary Beth (DEQ); Sygo, Jim (DEQ)
Cc: Willard, Veronica (DEQ); Shekter Smith, Liane (DEQ)
Subject: Flint Draft Response

Director Wyant,

In preparation for our call today with Treasurer Dillon's office, ODWMA has developed the following for consideration. We can provide any additional info you require during the meeting.

ODWMA has reviewed the materials developed by the consultant Tucker, Young, Jackson, Tull, Inc. (TYJT) for Treasury regarding the City of Flint and potential alternatives for public water supply. Based on our reviews, we have developed the following comments to this point in our analysis:

1. The TYJT report does not contain the full scope of the Karegnondi Water Authority (KWA) raw water supply system. TYJT concerns over raw water supply redundancy and reliability are addressed to the satisfaction of ODWMA under the full KWA proposal. Please note some portions of the overall project are being financed independently by the Genesee County Drain Commission.

2. There are significant differences in contract language between KWA and Detroit Water and Sewerage Department (DWSD) with respect to the contracted maximum day demand capacity.
    a. Under a KWA contract, a "maximum day" capacity of 18 million gallons per day (MGD) would fully satisfy current demands of the City of Flint, <u>without</u> the need to supplement raw water capacity using the Flint River. (18 MGD, average over a 30 day period).
    b. Under a DWSD model contract, a "maximum day" capacity, even at 18 MGD, would not satisfy the current demands for the City of Flint. (18 MGD, over any 24 hour period).

3. Restrictions in contracted capacity that would prevent the City of Flint from meeting peak demand requirements present potential limits to economic development within the City of Flint, including possible connection bans and water system extension bans. This information was previously conveyed to the City of Flint by ODWMA staff.

4. All contract options with DWSD that are considered semi-competitive with the KWA contract do not fully supply the City of Flint, and would require the City of Flint to meet a significant, if not majority, of its water demands by treating water from the Flint River. Continuous use of the Flint River at such demand rates would:
    a. Pose an increased microbial risk to public health (Flint River vs. Lake Huron source water)
    b. Pose an increased risk of disinfection by-product (carcinogen) exposure to public health (Flint River vs. Lake Huron source water)
    c. Trigger additional regulatory requirements under the Michigan Safe Drinking Water Act (LT2ESWTR)
    d. Require significant enhancements to treatment at the Flint WTP, beyond those identified in the TYJT report (see item 5 below).
    e. Water Resource Division is evaluating potential impacts to NPDES wastewater discharge permits in downstream segments of the Flint River, as a result of decreased river baseflow caused by Flint WTP use.

5. The TYJT report does not adequately address increased requirements and costs associated with using the Flint River as a significant source for the Flint WTP, which are not necessary under a Lake Huron source water scenario. This includes:
    a. The need to provide softening treatment
    b. Limitations on disposal options for lime softening sludge
    c. Increased ozone capacity, UV disinfection
    d. Additional backup power, more power required for Flint River operation

6. The Flint WTP must operate at some minimum level and within a range of flow rates to maintain treatment effectiveness. Currently that minimum level is 9 MGD. This level may be reduced with additional capital costs to modify the WTP, not addressed in the TYJT report.

7. Allowing Flint WTP to blend water with DWSD sets a new precedent that could pose future consequences with other DWSD customers.

8. Costs impacts to remaining DWSD customers would be similar under the proposed scenarios, only retaining 8 MGD of 30+ MGD total Flint/Genesee Co. demands, based on the following:
    a. Genesee County distribution system demands are pulling out of DWSD regardless of the decisions by Flint WTP
    b. Flint's need to utilize the Flint River as a source

9. ODWMA anticipates cost savings under the KWA proposal will be leveraged to provide additional improvements to the City of Flint water distribution system, improving efficiency and providing additional cost benefits. The KWA water withdrawal permit (2009-001) includes the required implementation of conservation measures that would also drive these distribution system improvements.

10. Major cost discrepancies in TYJT analysis
    a. Engineering, Legal, Administration, Contingency – TYJT appears to have effectively double charged for these costs in their KWA estimates without adequate justification
    b. Pumping facilities – TYJT cost estimate methodology does not appear to address localized market costs and does not distinguish fixed and variable costs in its comparison analysis.

11. Remaining DWSD customers in Lapeer County could potentially see water quality impacts as a result of Flint joining KWA, if they remain with DWSD. However, indications to ODWMA are that these communities are currently in final negotiations with KWA for service, which would make this a non-issue.
    a. City Lapeer
    b. City of Imlay City

Additional response to the TYJT report has also been provided by Rowe Engineering to Flint EFM, Mr. Ed Kurtz. (Copy Attached)

ODWMA has continued to meet on a regular basis with KWA, Genesee County, and the City of Flint regarding these water supply proposals.

ODWMA will continue to provide any additional detailed analysis requested by Treasury or the DEQ Executive Office.

Stephen Busch, P.E.
Lansing and Jackson District Supervisor
Office of Drinking Water and Municipal Assistance
MDEQ
517-643-2314

GENESEE COUNTY DRAIN COMMISSION
APPLICATION FOR A WATER WITHDRAWAL FROM LAKE HURON

PERMIT DECISION
And
RESPONSE TO PUBLIC COMMENTS

August 28, 2009

Michigan Department of Environmental Quality
Constitution Hall, 525 West Allegan
P.O. Box 30273
Lansing, Michigan 48909-7773

EXECUTIVE SUMMARY

GENESEE COUNTY DRAIN COMMISSION
APPLICATION FOR A WATER WITHDRAWAL FROM LAKE HURON

On February 12, 2009, the Department of Environmental Quality (DEQ) received from the Genesee County Drain Commission (GCDC) a permit application submitted under Section 32723 of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended (NREPA). The permit application included a request that the DEQ begin the required evaluation and public notice under Part 327, Great Lakes Preservation, of NREPA for a proposed water withdrawal from Lake Huron.

Section 32723(4) of Part 327 requires that the DEQ provide for a public comment period of not less than 45 days before a permit application is acted upon. The DEQ invited public comment on the permit application via press release, public notice and website posting. The DEQ issued the press release on the permit application on May 27, 2009, and posted the public notice on the DEQ internet website the following day. A copy of the public notice was transmitted to the GCDC on May 28, 2009 for posting at the entrance to their premises and at the shoreline parcel where a "shore well and pumping station" are to be constructed. The press release and public notice announced the public comment period and requested that comment be submitted to the DEQ by July 15, 2009.

After considering the information submitted relevant to the factors used in determining the acceptability of a permit application and the comments received, the DEQ determined that the proposed GCDC withdrawal is in compliance with the applicable standards and should be issued.

On August 28, 2009, the DEQ rendered a decision in favor of issuing the permit concluding the GCDC proposed withdrawal would not likely cause an adverse resource impact and that all other factors in rendering a permit decision had been met.

This document includes the basis of decision for issuance of a permit to the GCDC for the future withdrawal of 85 MGD from Lake Huron. Responses are provided to comments received on the permit application during the public comment period that including concerns relating to the permit process, the environmental impact of the proposed water withdrawal, the legality of the proposed water use, and the applicability of laws and regulations to the proposed withdrawal.

Many of the early comments were critical of the public notice and comment period duration regarding the permit application. The DEQ is limited in its ability to provide public comment by a Part 327 statutorily required time frame for responding to the permit application. The DEQ recognizes that this is the first application for a permit to withdraw water from a Great Lake that is subject to the standards of Part 327, the Great Lakes Charter process, the standards-of-decision in the Great Lakes-St. Lawrence River Basin Water Resources Compact, and the Great Lakes-St. Lawrence River Basin Sustainable Water Resources Agreement. Therefore, the DEQ reviewed additional comments received after the public comment period for consideration in application and functionality of the administrative process on this and future permit applications.

TABLE OF CONTENTS

I. BACKGROUND - Proposed Withdrawal 1

II. STATUTORY STANDARD 1
Application Submittal 1
Administrative Requirements 1
Conditions Required for Issuance of Permit 2

III. DECISION MAKING PROCESS 3
Consumptive Use Considerations 3
Adverse Resource Impact 3
Applicable Local, State and Federal Laws 4
Reasonable Use 4
Environmentally Sound and Economically Feasible Water Conservation Measures 5
Public and Private Rights, Limitations and Common Law 5

IV. PUBLIC PARTICIPATION PROCESS 6
General Comments 6
Applicability of Laws and Regulations 7
New Withdrawal and Consumptive Use 7
Conservation Measures 8
Reasonableness of Proposed Withdrawal 9
Adverse Impact and Requirements for Ecological Improvement 10
Diversion or Intra-Basin Transfer 10
Inadequate Information 11

V. SUMMARY OF DEQ POSITION 12

I. BACKGROUND

Proposed Withdrawal

The proposed 85 million gallons per day (MGD) water withdrawal is from a Lake Huron water intake. The permit applicant, Genesee County Drain Commission (GCDC), proposes to use the withdrawal water for a community public water supply system, to be owned and operated by a collection of municipalities organized as the Karegnondi Water Authority (KWA). The proposed withdrawal will be via a Lake Huron water intake located approximately 3.5 miles offshore and a shore well and pumping facilities located in the south of section 31 and 32, Worth Township, T.9N, R.17E, Sanilac County, Michigan. The maximum proposed withdrawal of 85 MGD, corresponds to a maximum pumping rate of ~59,000 gallons per minute (gpm).

Public water supply is a use that the DEQ estimates to be 10 percent consumptive. While 90 percent of the water will remain in the Lake Huron watershed, the consumptive use estimate places the loss from the Great Lakes hydrologic system at 8.5 MGD.

II. STATUTORY STANDARD

A person who proposes to develop a new withdrawal of 2 MGD or more from the waters of the state to supply a common distribution system, is required to obtain a water withdrawal permit prior to making the withdrawal (MCL 324.32723[1]).

Application Submittal

A person proposing a withdrawal from the surface waters of the state is required to apply for a permit by submitting an application for the withdrawal to the DEQ containing the following information (MCL 324.32723[2]):

- Capacity of equipment used to make the withdrawal,
- Location of the withdrawal,
- Withdrawal source,
- Amount and rate of withdrawal,
- Intended maximum monthly and annual volumes and rates, if different from the capacity of equipment used to make the withdrawal,
- Relevant information related to seasonal use,
- Description of how the water will be used and location, amount and rate of return flow,
- Any other information the person would like the DEQ to consider.

The application is required to include an evaluation of existing hydrological and hydrogeological conditions and a detailed description of proposed preventative measures where relevant. In addition, the applicant is required to submit an application fee in the amount of $2000.00

Administrative Requirements

MCL 324.32723 requires the department to determine whether a permit application is administratively complete. The DEQ has 30 days to make this determination, unless the applicant is notified of deficiencies in the application requiring additional information. Once an application is determined to be administratively complete, the DEQ is required to provide a public comment period of not less than 45 days and render a decision on the permit application within 120 days from the completeness determination.

The DEQ received the original permit application from the GCDC on February 12, 2009. The information was submitted in accordance with Part 327, and "proposals subject to prior notice and consultation" of The Great Lakes Charter, Principles for the Management of Great Lakes Water Resources (The Charter). On March 4, 2009 the DEQ requested additional information to better fulfill the information requirements of The Charter essential to the administrative

process. Upon receipt of the additional information the DEQ sent a letter to the GCDC dated April 24, 2009 notifying them of the completeness of the application package.

The DEQ invited public comment on the permit application via press release, public notice and website posting. The press release was issued on May 27, 2009, and the posting of the public notice on the DEQ internet website on May 28, 2009. The GCDC was provided a copy of the public notice on May 28, 2009 for posting at the entrance to their premises and at the shoreline parcel where the proposed shore well and pumping station are to be constructed. The press release and public notice announced the 45-day public comment period and requested that comments be submitted to the DEQ by July 15, 2009.

The consumptive use estimate of 8.5 MGD exceeds the 5 MGD threshold established in the Charter for proposed withdrawals requiring Prior Notice and Consultation with the other Great Lakes states and provinces. In the spirit of the companion legislation adopted by the state of Michigan in conjunction with the Great Lakes-St. Lawrence River Basin Water Resources Compact (Compact), and pursuant to the Great Lakes-St. Lawrence River Basin Sustainable Water Resources Agreement (Agreement), the DEQ's Office of the Great Lakes provided notice of the proposed withdrawal on May 26, 2009. The complete application packet was transmitted to the other Great Lakes states, the Canadian provinces of Ontario and Quebec, and the Great Lakes first nation and federally recognized tribes, with a request that comments be provided by July 20, 2009 in order for the DEQ to meet the statutory obligations of Part 327.

Conditions Required for Issuance of a Permit

The DEQ is required to issue a permit for a water withdrawal if all of the following conditions are met (MCL 324.32723[6]):

- All water withdrawn, less any consumptive use, is returned to the source watershed;
- The withdrawal is implemented to insure there is no individual or cumulative adverse resource impact (ARI). Cumulative impacts are to be evaluated based upon available information gathered by the DEQ;
- The withdrawal will be implemented in compliance with all applicable local, state, and federal laws, as well as all legally binding regional interstate and international agreements;
- The proposed use is reasonable;
- The permit applicant certifies compliance with the environmentally sound and economically feasible water conservation measures for the applicable water use sector; and
- The proposed withdrawal does not violate public or private rights and limitations imposed by Michigan water law or other common law duties.

Parallel requirements for approval are spelled out in Section 4.11, Decision Making Standard, of the Compact. Section 4.11(5) of the Compact provides greater specificity on reasonable use conditions and requires the parties to consider efficient use of the water; efficient use of existing water supplies; the balance between economic and social development and environmental protection as they relate to other planned withdrawals and uses sharing the same source; supply potential; the degree and duration of likely adverse impacts and the restoration of hydrologic conditions.

III. DECISION MAKING PROCESS

Consumptive Use Considerations

The consumptive use calculation was based upon a consumptive use coefficient of 10 percent. The DEQ relied primarily upon the United State Geological Survey publication "Consumptive Water-Use Coefficients for the Great Lakes Basin and Climatically Similar Areas," Scientific Investigation Report 2007-5197. There is a relatively narrow range of coefficients for public water supplies in comparison with many of the other types of uses. Further, it is generally conceded the range is 10 to 15 percent as identified in Table 3-1, Consumptive-use coefficient used by Great Lakes jurisdictions, by water use category of the report. Upon review of the aforementioned report, the DEQ ultimately decided that 10 percent was the best estimate of consumptive use. This is the published value for the public water supply sector in Table 3-2, Total water use by category for the Great Lakes Basin, by year, from the Great Lakes Commission annual reports, 1998-2002. Based upon the 10 percent coefficient for consumptive use, the proposed withdrawal is projected to have a maximum consumptive use of 8.5 MGD.

Adverse Resource Impacts

Section 32721(1) of Part 327 prohibits a person from making a "...new or increased large quantity withdrawal from the waters of the state that causes an adverse resource impact." Section 32701(1)(a)(vii) defines an adverse resource impact (ARI) for a surface water body as "decreasing the level of a lake or pond with a surface area of 5 acres or more through a direct withdrawal from the lake or pond in a manner that would impair or destroy the lake or pond or the uses made of the lake or pond, including the ability of the lake or pond to support characteristic fish populations, or such that the ability of the lake or pond to support characteristic fish populations is functionally impaired." For flowing streams and rivers an ARI is defined as decreasing the flow by part of the index flow such that the ability of the stream to support the characteristic fish population is functionally impaired.

Part 327 establishes specific flow reduction as constituting an ARI for some stream types. No specific flow reductions are established for the Great Lakes or their connecting channels. In that case, a comparison of the proposed withdrawal to the water availability from the GL or connecting channel from which the withdrawal originates is one means of assessing the likelihood of an ARI. The proposed withdrawal of 85 MGD corresponds to a daily withdrawal of 1.136×10^7 cubic feet per day (ft^3/day) or 4.148×10^9 cubic feet per year (ft^3/year). The area of Lake Huron and Lake Michigan, which hydraulically act as a single source at the same elevation, possess a combined surface area of 45,300 square miles, or 1.263×10^{12} ft^2. Based upon a consumptive use of 10 percent a withdrawal of 4.148×10^9 cubic feet per year (ft^3/year) would result in a projected loss of water from the Great Lakes Basin of 4.148×10^8 ft^3/year. Assuming no recharge to lakes Michigan and Huron the consumptive use loss is projected to cause a reduction in lake levels of 0.0003284 feet (0.004 inches or 0.01 centimeter). Accordingly, the DEQ concludes the impact of the proposed 85 MGD withdrawal on lake levels and the corresponding impact to the characteristic fish population would not result in an ARI as defined in Part 327.

A comparison of the proposed withdrawal to flows immediately down stream of the proposed intake in the St. Clair River provides another reasonable measure of water availability and the potential for impact. The United States Geological Survey has published average flows for the St. Clair River in excess of 183,000 cubic feet per second, corresponding to a daily flow of ~118,268 MGD. When consideration is given to return flows and consumptive use, the water theoretically lost from Lake Huron of 8.5 MGD corresponds to 0.0072 percent of the total flow.

The DEQ concludes from this comparison that the proposed withdrawal would be insufficient to cause an ARI as defined in Part 327.

Applicable Local, State and Federal Laws

To be approved, the proposed withdrawal must be in compliance with all applicable local, state, and federal laws as well as legally binding interstate and international agreements, including the boundary waters treaty of 1909. Section 32726 governing local ordinances, specifically prohibits a local unit of government from enacting, or enforcing an ordinance that regulates a large quantity withdrawal. The information contained within the permit application indicates the withdrawal would be implemented in compliance with applicable state and federal laws (Part 327) and applicable international agreements. The Boundary Waters Treaty of 1909 was agreed to by the U.S. and Canada to provide a mechanism for the resolution of disputes over waters bordering the two countries and to insure the waters of the Great Lakes remain navigable. Nothing related to the GCDC proposed withdrawal volumes would be in violation of the treaty.

Reasonable Use

Part 327 requires that a proposed use be reasonable. As noted above the specific criteria for consideration the efficient use of the water and the efficient use of existing water supplies; a consideration of the balance between economic development, social development and environmental protect, supply potential; the degree and duration of likely adverse impacts and the restoration of hydrologic conditions. These considerations are consistent with Michigan's test for determining a reasonable use as set forth in Michigan Citizen for Water Conservation V. Nestle Waters of North America, Inc. [Michigan Citizens for Water Conservation v Nestlé Waters N America Inc, 269 Mich App 25; 709 NW2d 174 (2005)]. The considerations are addressed as follows:

Efficient Use of the Water: This requirement is directly tied to the user's commitment to Environmentally Sound and Economically Feasible Water Conservation Measures. (Conservation Measures) In the application the GCDC identified the Conservation Measures applicable to the public water supply sector that they are currently employing. A more comprehensive discussion is provided in the section entitled Conservation Measures on page 6.

Efficient Use of Existing Water Supplies: The language of the Compact specifies efficient use as a consideration when an increased withdrawal is proposed. The Compact language is intended to assure that water from various sources is being efficiently used by a large quantity user before they are granted approval for an increased withdrawal. Since the GCDC proposal is for a new withdrawal, this criterion does not apply.

Balance between Economic Development, Social Development and Environmental Protection: Reasonableness of a water use as it relates to the balance between economic development, social development and environmental protection is an important consideration in the acceptability of a proposed withdrawal.

Creation of a water authority and construction of the pipeline and treatment plants would enhance economic development in a variety of ways. During the 5-year construction period there project would provide an estimated $100 million in skilled trades work, $200 million in manufacturing of pipe and other equipment and 30 million in engineering and design services. Once on line the new pipeline and associated facilities is estimated to create over 50 new jobs necessary to the operation and maintenance treatment facilities, the Great Lakes intake, pipeline, and pump stations. Improving system reliability, as discussed below will also encourage economic development in the affected communities.

From a social standpoint, the proposed withdrawal and related facilities would benefit the area by enhancing the health, safety and security of area residents. The DEQ, Water Bureau (WB)

has identified deficiencies in the GCDC system primarily related to reliability. Significant effort will be placed on improving current system reliability in the design of system components associated with the proposed withdrawal. These efforts will meet with the requirements of the Safe Drinking Water Act. With the construction of new facilities the GCDC would also be improving system reliability for surrounding public water supply systems by offering emergency inter-connects and entering into mutual aid agreements.

Lastly, given the net effect of the withdrawal on the water resources as described above, these economic and social benefits to the area would be obtained without a perceptible impact on the environment.

Supply Potential: Supply potential consideration requires the DEQ look at the impact of the withdrawal on the quantity, quality, reliability, and safe yield of hydrologically interconnected water sources. The proposed withdrawal does not present any known or anticipated threat to the quantity or quality of Lake Huron as a water source. Also, the proposed withdrawal would have no impact on the reliability or the safe yield of the source as it relates to others using Lake Huron or hydrologically connected sources, such as the St. Clair/Detroit river systems.

Degree and Duration of Likely Adverse Impacts: The DEQ concluded the proposed withdrawal would not cause an ARI.

Restoration of Hydrologic Conditions: The water withdrawn by the GCDC, less consumptive use, would all be returned to the source watershed via treated wastewater discharges to the Flint River. The consumptive use losses for inside Great Lakes Basin uses are considered reasonable. Under Part 327 the restoration of hydrologic conditions does not apply to the proposed withdrawal.

Conservation Measures

For permit applications received on or after January 1, 2009, the applicant must self-certify that they are in compliance with Conservation Measures. More specifically they must certify that they are in compliance with the Conservation Measures developed by the applicable water user's sector or developed for the water use associated with that specific withdrawal (MCL 324.32723[6(e)]).

The GCDC has certified that they are in compliance with the accepted practices as developed and submitted to the DEQ for the public water supply sector by the Michigan Section of the American Water Works Association and set a goal of a less than 5 percent system wide water loss. GCDC further certifies to the promotion of educational programs related to lawn sprinkling and other outside uses, and the implementation of programs to promote water re-use and other water conservation measures by commercial and industrial facilities. The GCDC also practices "flat rate water billing," meaning large users do not pay proportionally less as their water use goes up. All water uses served by the GCDC are metered and billing is commensurate with the metered water usage. Lastly, the GCDC employs a local ordinance restricting outdoor water use during periods of peak use.

Public or Private Rights, Limitations and Common Law

The issuance of a permit on the proposed withdrawal must not violate public or private rights or interfere with limitations imposed on the use of the resource by Michigan water law or other common law decisions. Specifically, the DEQ must ascertain if the issuance of the permit would interfere with the principle that certain natural resources, which in this case is Lake Huron, are preserved for public use, and that the state is required to maintain the resource for the public's reasonable use. The issuance of a permit for the proposed withdrawal would not interfere with the public's access to Lake Huron, the public interest in Lake Huron as a natural resource, or maintenance of Lake Huron for drinking and recreational purposes.

VI. PUBLIC PARTICIPATION PROCESS

The DEQ invited public comment on the permit application via press release, public notice and website posting. The press release was issued on May 27, 2009, and the posting of the public notice on the DEQ internet website on May 28, 2009. The web posting included the permit application packet for the proposed withdrawal and the public notice announcement. The press release and public notice announced the public comment period and requested comments be submitted to the DEQ by July 15, 2009.

The Office of the Great Lakes provided notice of the proposed withdrawal on May 26, 2009, to the other Great Lakes states, provinces and federally recognized tribes and first nations. The notice included a request that comments be provided by July 20, 2009.

The remainder of this document summarizes the comments received based on the proposed 85 MGD withdrawal by the GCDC and the DEQ response to the comments on the basis of applicable rule, policy, and procedure in administration of the permit application and review process under Part 327, Great Lakes Preservation, of NREPA.

General Comments

Many of the comments were specific to ongoing negotiations between the GCDC and the City of Detroit relative to the continued provisions for water supply service from the Detroit Water and Sewer Department (DWSD).

It was expressed by some commenters that the GCDC proposal underestimates the reliability of the DWSD public water supply system noting that DWSD possesses sufficient capacity and has an approved proposal to provide the GCDC the desired redundancy. Conversely, it was claimed the request for redundancy was made in 1965 with reciprocal commitment to construct the necessary infrastructure over the past 30 years.

A comment was made that constructing a new intake does not appropriately address deficiencies in either the GCDC or DWSD systems. As an example, there was a reference to ongoing system losses for the GCDC and DWSD of 5 percent versus 20 percent of water pumped.

Multiple comments were received with regards to the impact on water rates for DWSD customers if the KWA member municipalities were to withdraw from the DWSD system. Rate increases for the remaining DWSD customers was estimated at approximately 6 percent. A counter argument was made that the loss of a customer should not affect remaining customer rates as costs are presumably based on "cost of service."

There was a claim that the cost of the intake structure, transmission line, and separate treatment facilities for the KWA would be much greater than provided in the preliminary estimates. Conversely, The GCDC claims that all potential KWA members are aware of the cost estimates. The intake and pipeline costs are estimated at 75 percent of costs, including plans for redundancy while the treatment costs will be 25 percent of costs. GCDC also noted that separate studies on the cost of various water supply alternatives should have no bearing on the permit decision.

Response to Comments: The DEQ does not consider any comments on the relative position of the DWSD and GCDC water supply system to be legally relevant to a decision as to whether or not a permit should be issued to the GCDC for the proposed 85 MGD withdrawal from Lake Huron. Part 327 specifically requires the DEQ to issue a permit if on the basis of the submitted material the proposed water withdrawal meets the decision making criteria. The DEQ is specifically precluded from using part 327 to "...diminish or create any existing authority of municipalities to require persons to connect to municipal water supply systems as authorized by law" (MCL 324.32726).

Any addition or loss of a major customer of a regional public water system has the likelihood of affecting water rates – clearly a major addition or loss affects both the revenues and costs of operation. Water rates and the basis for establishing water rates are not an issue under Part 327. It is appropriately an issue for water service contract negotiations between the regional water system and its customers. To do otherwise invites unwanted intervention of the state into local decision making. There is nothing in Part 327 or any provisions of the Agreement and Compact that would either mandate connection to a regional water system or bind a customer permanently to a regional water system.

Applicability of Law and Regulations

Comments criticized the GCDC's application under Part 327. As a community public water supply the commenter believes the application would have been more appropriately made under the Michigan Safe Drinking Water Act, Act 399, as amended and rules. A submittal of plans and specifications under Act 399 would have provided greater clarity as to the reasonableness of the water use and the applicant's intent relative to applicable Conservation Measures.

Other comments cited the application of requirements in the Compact and expressed the opinion that the GCDC proposal did not meet the applicable standards. Most frequently referenced were the standards identified in *Section 4.11, Decision Making Standard* and *Section 4.12, Applicability* of the Compact. Relative to the former, comments suggested the proposed use is not reasonable based on efficient use of existing water supplies, balance between economic and social development, environmental protection, use of same source by multiple users, and the probable degree of adverse impacts. Relative to the latter requirements, it was implied that the Compact provides the Originating Party (i.e. Michigan) with the power to apply a much more stringent standard.

Response to Comments: Part 327 and the companion amendments to Act 399 do not provide any restrictions as to who may apply for a permit to make a large quantity water withdrawal nor specify how one must go about obtaining a permit. GCDC stated that they submitted their request for approval through Part 327 in large part to obtain the appropriate authorization of the withdrawal before investing a significant amount of money in developing plans and specification for the water works systems. Conformity with the Decision Making Standard of the Compact is, in part, the basis for the DEQ's decision on the permit application.

New Withdrawal and Consumptive Use

A number of comments focused on the fact that approval of the GCDC proposal would not result in a decrease in Detroit's ability to pump water and solicit new customers to maintain their current rate of use. As a result commenters concluded that the GCDC proposal should be treated as a new withdrawal. A corollary to this criticism was the observation that the total water withdrawal from the Great Lakes Basin would increase and that approval of the proposal would encourage other users to pursue similar use of Great Lakes waters. Some comments questioned the water use projections by the GCDC for the years 2014 to 2039. GCDC projected water use to increase by 42 percent. There was also concern that projected demand was 78.7 MGD, yet the request is for 85 MGD. There were requests that the proposed new withdrawal should be considered unacceptable unless the Detroit withdrawal was reduced by a corresponding amount.

Concern was also expressed over an increase in consumptive use. The fact that there would be an increase in use would result in additional consumptive use loss from the Great Lakes Basin. Numerous comments, particularly from other states questioned the use of 10 percent as the consumptive use coefficient indicating it should be higher. USGS publications cite consumptive use on public water supply systems in the range of 10 to 15 percent.

Response to Comments: Comments on the increased use must be addressed within the context of public water supply system operation, in particular when the increase in use is based upon population projections over a period of years. GCDC conducted a study to obtain the projected use of 78.7 MGD by 2039 based upon population and water use trends for the area currently served by the GCDC system. The GCDC explains that the request for 85 MGD provides a slight buffer over that which would be needed to account for water use in KWA member water treatment plants for such things as filter backwash. Additional buffer is provided to account for system losses. The GCDC as previously noted has set a goal of 5 percent for system losses. The DEQ determined the 85 MGD request is appropriate relative to the projected use, system operation and system water losses.

The DEQ has projected an increase in consumptive use of 8.5 MGD because the GCDC proposal is a new withdrawal. The GCDC proposed withdrawal does not affect the baseline capacity of the DWSD system or DWSD's future use of their existing baseline capacity. In the short term, the combined use of water for both the DWSD and GCDC systems will not significantly increase, because GCDC presently receives their water from DWSD. The proposed withdrawal was evaluated by the DEQ on the basis of DWSD maintaining their existing baseline capacity and evaluating the impact of a new 85 MGD withdrawal by GCDC from Lake Huron.

The consumptive use coefficient of 10 percent was obtained from *Table 3-2. Total water use by category for the Great Lakes Basin, by year, from the Great Lakes Commission annual reports, 1998-2002* in the USGS publication Consumptive Water-Use Coefficients for the Great Lakes Basin and Climatically Similar Areas, Scientific Investigations Report 2007-5197. Consumptive use coefficients for public supply over the years cited (1998-2002) were 10 and 11 percent, with 10 percent cited as the consumptive use over the entire period in question. The DEQ deemed this reference to be the most reasonable estimate of consumptive use.

Conservation Measures

There were multiple criticisms of the GCDC's commitment to water conservation. Specifically, that the GCDC identified no measures aimed at water use reduction noting that water conservation on new systems should be aggressive. Comments cited the published water conservation measures applicable to the public water supply sector noting that the GCDC has not made a commitment to each and every conservation measure. Specifically, their description of conservation measures did not include measures that promote water use conservation and the reduction of system leaks. Lastly, none of GCDC proposed wholesale or municipal customers provided information on compliance with Conservation Measures.

Commenters also expressed concern that the conservation measures identified by the GCDC were not consistent with the requirements of the Agreement and/or Compact. Plans for water use reduction or conservation were characterized as inadequate as nothing was mentioned relative to targeting system leaks and the promotion of efficient water use, in particular those leaks mentioned for the Detroit system. It was expressed that no new withdrawals should be approved until Detroit's leak problems are addressed. Some indicate there should be no approval of the withdrawal without a "water master plan" including impacts of current conservation and efficient use measures that have reduced total use and consumption. Commenters questioned whether there would be a continuation of conservation efforts made to date or whether there efforts would be improved upon. It was noted that a projected increase in population does not necessarily correspond to a projected increase in use, if one assumes more efficient use and conservation. Some commented that additional documentation is needed on water conservation measures including clear goals, targets and means of assessment.

Response to Comments: After January 1, 2009 permit applicant's are required to "self-certify" that they are in compliance with conservation measures developed by the applicable water

user's sector or developed for the water use associated with that specific withdrawal. The GCDC certified to the promotion of educational programs related to lawn sprinkling and other outside water uses, implementation of programs to promote water re-use and promotion of other water conservation measures by commercial and industrial facilities, and has set a goal of a less than 5 percent for system wide water losses. The GCDC practices "flat rate water billing," meters all water uses and bills commensurate with the metered water usage. The GCDC employs a local ordinance restriction on outdoor water use during periods of peak use.

The DEQ acknowledges the GCDC has not certified as to employing each and every water conservation measure identified for the public water supply sector, and notes there is not a requirement in Part 327 that they do so. The DEQ does commit to working with public water supplies to further water conservation efforts and will do so with the GCDC. Relative to the GCDC customers, the GCDC is making application on behalf of member communities of the KWA. All KWA members would participate in the implementation of the identified conservation measures. References to fixing deficiencies in the DWSD system are not germane to the GCDC permit application.

Reasonableness of Proposed Withdrawal

A number of comments were received relative to the reasonableness of the proposed withdrawal noting that any proposal must be considered on the basis of its purpose, suitability of use to location, the extent and amount of harm, benefits, necessity and manner of use, and other factors. The Agreement and Compact also require consideration of the economic and social value relative to potential environmental impacts and other factors. Generally, comments on the reasonableness of the proposed withdrawal focused on:

- The environmental harm that might be caused by the return of treated wastewater, and
- The necessity and amount of the withdrawal given the availability of Detroit system.

Specifically, on the issue of return flow there is a concern that points of discharge and downstream segments would be incapable of absorbing the projected 42 percent increase in discharge (based on future growth projection) without adverse impact. Commenter's claim numerous combined sewer overflows have occurred and requested verification that discharges are operating in compliance with existing laws.

Regarding the availability of the Detroit system, many comments made reference to the fact that the efficient use of existing systems is a required demonstration of reasonableness. There were claims the GCDC application should be rejected since the GCDC failed to rule out the option of using the existing DWSD system. Comments indicated that DWSW currently has the capacity to meet the needs of the GCDC and its customer municipalities, is already providing service to the proposed service area, and alleges to having made a commitment to providing reliability.

A few comments related to the economic and social value criteria of the Agreement and Compact, which requires consideration of the balance between economic development and social development and environmental protection on planned withdrawals from the same source

Response to Comments: There are four wastewater discharges by the City of Flushing, City of Flint, Genesee County's "Ragnone Plant" and the City of Lapeer. The four wastewater treatment plants are in the process of reducing infiltration and inflow from their collection systems. The National Pollutant Discharge Elimination System (NPDES) permits for the Flint and Genesee Ragnone plants discharges require treatment facility and collection system capacity analyses. The City of Lapeer proposes to rehabilitate their plant to increase the treatment capacity and accommodate an increase in population and service area. All are operating and are in compliance with the parameters stipulated by their respective NPDES permits. If the GCDC service area demands increase in the future, or if the service area expands, the DEQ will use the standard NPDES permit review/reissuance cycle (5-years) to

evaluate any impacts from increases in wastewater flow. That process will include public participation.

The efficient use of existing systems is an applicable consideration when a proposal for an increased withdrawal and consumptive use is before the DEQ for approval. That is to say, an existing system must demonstrate that it is not wasteful of its water before is request for an increase in use can be approved. Because this is a new withdrawal the requirement for efficient use of existing systems, specifically the efficient use of a system owned and operated by another party (DWSD), is not germane to the permit decision.

As a consideration on the reasonableness of a water use, social and economic development considerations must be balanced against environmental impact of the proposed withdrawal. The GCDC outlined the potential benefits including enhanced public safety, security and health that would be provided to area communities served by the proposed withdrawal. Many of the social benefits would arise as a direct outcome of the new intake, pipeline, shore well and treatment facilities correcting existing system deficiencies identified by the DEQ. The GCDC projects the proposed construction of facilities would provide a direct infusion of money, jobs and manufacturing opportunities to the area. The DEQ determined there would likely be no ARI to the commonly shared water source as the withdrawal is not of sufficient magnitude to perceptibly lower the levels of Lake Michigan and Lake Huron. Accordingly, the DEQ concludes the GCDC proposal meets the reasonableness criteria relative to social development, economic development, and environmental impact.

Adverse Impact and Requirements for Ecological Improvement

Comments pointed out that the Great Lakes states and provinces have agreed to protect, conserve, restore and improve the Great Lakes resources. Some additional analysis recommended that the DEQ ascertain if there might be a cumulative ARI and questioned why the DEQ has not required the submittal of proposed restorative measures as part of the application packet. Comment pointed out that the application packet included no information as to whether Detroit will reduce its water use, whether GCDC will remain a DWSD customer for backup, and whether DWSD will seek additional customers. Commenters indicated that if there is no net reduction in use cumulative impacts need to be addressed. Some believe what was referred to as a diversion could have a significant impact on the levels of the Great Lakes and set precedent for other large scale diversions. Eleven comments focused solely on the impact the withdrawal would have on lake levels.

Response to Comments: The DEQ has determined there would be no ARI caused by the impact of the proposed withdrawal, and no perceptible impact on the levels of the Great Lakes or connecting channels. Given the likely near term affect of the proposed withdrawal on the volume of the DWSD withdrawal, there is no identifiable issue of cumulative impacts. Part 327, ~~which is~~ the guiding legislation in the issuance of the permit, requires "preventative measures" be submitted as part of a permit application only when necessary to preclude an otherwise prohibited environmental impact. As a proposed new withdrawal, the DEQ evaluated the GCDC withdrawal without assuming there would necessarily be any change to DWSD capacity to withdraw~~al~~ water from the Great Lakes.

Diversion or Intra-Basin Transfer

A number of comments assumed that the proposed withdrawal constitutes a diversion, or intra-basin transfer, precluding DEQ approval under Part 327, the Agreement and Compact. Comments indicated the need for the GCDC to better identify the current and proposed service area. This was especially true in dealing with service to Shiawassee County as portions of the county are in both the Lake Michigan and Lake Huron watersheds. There was also concern that some of the service area and return flow might be to the St. Clair/Detroit River watershed, or discharged to the Lake Erie watershed resulting in an intra-basin transfer. There was concern

that approval of the withdrawal would set a dangerous precedent for the review of diversion and intra-basin transfers in the future.

Response to Comments: In accordance with Part 327, the Agreement and Compact, the DEQ has determined the proposed withdrawal would not constitute a diversion or intra-basin transfer. Portions of Shiawassee County lie in both the Lake Michigan and Lake Huron watersheds. However, Section 4.12.9 of the Compact states that Lake Michigan and Lake Huron are to be considered a single hydrologic unit and watershed. And therefore the transfer of water between Lake Michigan and Lake Huron watersheds is not considered a diversion under the Compact. None of the proposed service area lies within the watershed of the connecting channel or Lake Erie. Connecting channels are those waters and associated watershed that lie between any two of the Great Lakes. Section 4.12.7 of the Compact treats connecting channels as though they are part of both the Great Lake watersheds above and below the connecting channel.

In summary, within the applicable definitions of Part 327, the Agreement, and Compact the proposed withdrawal would not constitute a diversion or intra-basin transfer. It is a proposal potentially subject to Prior Notice and Consultation under the Charter because it is proposed as an in basin use with the only loss of Great Lakes waters due to the associated consumptive use.

Inadequate Information

A number of comments criticized the adequacy of the submitted information. Some suggested more information was needed on the movement of ground water and surface water to determine if the proposal will result in an intra-basin transfer or cause an adverse impact to the quantity and quality of Great Lakes basin waters. There were claims the proposal did not meet the requirements, spirit or intent of Agreement or Compact. The presumed inadequacy of information led to concern over consumptive use, service area information and water loss. There was also concern over inconsistencies in the information such as references to the new capacity of 85 MGD, a maximum capacity of 110 MGD and a firm capacity of 88 MGD. There were questions as to the relationship between the various cited capacities.

Others acknowledged the effort made to demonstrate consistency with the Agreement and/or Compact while noting information deficiencies. In a few instances commenter's requested information concurrent with a request for extension of the public comment period.

Response to Comments: A permit applicant under Part 327 is required to submit information including pumping capacity; location of withdrawal; withdrawal source; amount and rate of withdrawal; the maximum monthly and annual volumes and rates; relevant information related to seasonal use; a description of how the water will be used; the location, amount and rate of return flow; and an evaluation of existing hydrological and hydrogeological conditions. Other information may be provided at the discretion of the applicant with a description of preventative measures required where relevant.

Due to the magnitude of the withdrawal and its qualifying as a proposal potentially subject to Prior Notice and Consultation under the Charter, the DEQ requested the submittal of additional information. Extensive information was provided to meet information requirements in accordance with the Charter, the Agreement and Compact. The DEQ deemed the information sufficient and notified the GCDC of such on April 24, 2009.

Regarding the request for an extension of the public comment period, Part 327 contains a statutory limit on the time the DEQ may give to the consideration of a permit application. Once the applicant is notified of the completeness of application the DEQ has 120 days in which to render a decision. Given the time constraints and the adequacy of the application packet, the DEQ denied requests to grant an extension to the public comment period.

V. Summary of DEQ Position

The DEQ has determined the application for the GCDC proposed withdrawal of water from Lake Huron was submitted in accordance with the permit requirements of Part 327. Further, the proposed withdrawal is deemed not likely to cause an ARI and, as proposed, meets the intent of the Great Lakes Charter and the decision making standards of the Agreement and Compact. The DEQ based this determination on a review of the information and data pertinent to the factors used in making a decision on a permit application which included a thoughtful consideration of the comments received from the public, the other Great Lakes states, the Canadian provinces of Ontario and Quebec, and federally recognized tribes and first nations on the permit application, as made available for public review.

The authorized withdrawal capacity is 85 million gallons per day (maximum withdrawal in any single day). The DEQ will assure that capacity is not exceeded in the issuance of the required Michigan Safe Drinking Water Act construction permits (1976 P.A. 399, as amended). In addition, the DEQ will require as a condition of this Part 327 authorization that the participating members of the Karegnondi Water Authority be committed to a water conservation/water use efficiency program consistent with the water sector guidelines accepted by the state under Part 327, and posted on the DEQ website.

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January 7, 2013

Mr. Edward Kurtz, Emergency Financial Manager
City of Flint
1101 S. Saginaw Street
Flint, MI 48502

Subject: Review of December 21, 2012 Presentation – City of Flint Water Supply Assessment

Dear Mr. Kurtz:

As requested, we have reviewed the analysis of water supply alternatives for the City of Flint which was presented to the State Department of Treasury by Tucker, Young, Jackson, and Tull, Inc. (TYJT) on December 21, 2012. Our review is attached and summarizes the primary differences between the TYJT assessment and our previous studies and provides explanations of why we believe there are differences.

We have also reviewed the options for continued DWSD supply included in the TYJT presentation. It is not clear whether these are presented as specific offers on behalf of DWSD or included as examples for analysis, but we have noted some items which we believe should be addressed and considered as these options are compared.

If there are questions, please contact me.

Sincerely,
ROWE Professional Services Company

James E. Redding, P.E.
Vice President / Director of Engineering

Attachment

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Review of TYJT December 21, 2012 Presentation
City of Flint Water Supply Assessment
Prepared by Rowe Professional Services Company

DWSD Supply (Slides 7 through 9)

1. The 8 mgd maximum day supply by DWSD options can result in periods during the summer when most of the water to meet demands will be supplied by the City from the river. To aid in maintaining a consistent water quality, softening of the water from the river should be provided with this option, greatly increasing the City's costs.

2. Upgrades to Flint's WTP and dams will be needed for options requiring blending, since the WTP will be required to provide continuous, reliable service and compliance with recent surface water treatment regulations.

3. The rates for the options analyzed are shown on Slide 9 as "TYJT Estimates". Options and rates shown are different than presented by DWSD previously.

	DWSD 11/29/2012	TYJT Estimates
18 mgd Maximum Day - P&B	$16.24	$16.37
12 mgd Maximum Day - P&B	$16.30	$16.31
8 mgd Maximum Day -P&B		$12.68
12 mgd Maximum Day - Imlay	$14.38	$14.38
8 mgd Maximum Day - Imlay		$11.11

4. Since the rates used in the analyses are shown as estimates, are they actual offers or just presented as "what if" scenarios?

5. We assume that the Imlay options are based on transfer of the 72" main through Lapeer County to Flint. The analyses show a capital cost of $4.7 million; we assume that this is the proposed purchase / lease cost to Flint. This should be clarified along with pertinent details.

6. If the transmission main is transferred to Flint, what are Flint's responsibilities regarding service to the Lapeer County customers? If they remain DWSD customers, then Flint should receive some revenue for the use the main. It does not appear this is included in the TYJT analyses.

7. If the transmission main is transferred to Flint, we assume that the city will be responsible for the maintenance of the 50 year old main. The TYJT analysis did not include this.

8. Do the rates shown include the credit for "reliability" which had been discussed with DWSD?

9. If the point of commerce is changed from Baxter and Potter to Imlay, a new meter pit will be required. The cost of this does not appear to be included in the TYJT cost analyses.

Flint River Supply (Slide 10)

1. If any of the "blending" options are chosen, it will be necessary to upgrade the Flint WTP and dams to provide reliable, continuous service and compliance with recent surface water treatment regulations.

Data Collected (Slide 14)

1. The slide notes that Flint blending is based on DWSD supplying 2/3 and Flint supplying 1/3 of 12 MGD ADD. For the maximum day demand (18 mgd), if DWSD supplies a maximum of 8 mgd, Flint will supply 10 mgd or 56% of the total. However, such a large portion will make it more difficult to blend and achieve consistent water quality. Flint will need to soften water for these options.

Benchmarking Comparisons (Slide 16)

1. The slide subtitles are "KWA O&M Inflation Factor" and "DWSD and Flint Rate Inflation Factor". It seems appropriate to benchmark O&M costs for the KWA, because future costs of service will be dependent on how operating costs are impacted by inflation. For Flint, it does not seem appropriate that "rate inflation" from other utilities be used to determine the impact of inflation on future cost of service. Rates are impacted by inflation, but also by other factors such as debt and customer base. O&M expenses and rates are different and care should be exercised not to mix the two during analyses. The TYJT analyses apply an inflation factor (based on rates from other utilities) to the Flint WTP operating expenses, which does not seem to be consistent.

2. The KWA will supply raw water; SOCWA and YUCA both supply finished water. Regulations impact the O&M for finished water suppliers but should not impact the KWA O&M. The use of data from SOCWA and YUCA does not seem like a comparable comparison with the KWA. Finished water suppliers will have increased costs due to regulatory compliance, which really are not due to "inflation" of the costs of wages, power, chemicals, etc.

3. DWSD has a history of rates to Flint and other suburban wholesale customers. Rates tend to be quite specific to each utility, based on much more than just the costs of operating and maintenance. It appears that DWSD historical rates have not been considered in projecting future DWSD rate increases.

Capital Financing (Slide 17)

1. KWA bonds are planned to be general obligation bonds, backed by member counties.

O&M Inflation Factor (Slide 20)

1. SOCWA and YUCA are finished water suppliers; ever-changing regulatory requirements will impact their operating costs more than a raw water supplier, such as KWA.
2. KWA will be a supplier of raw water. O&M costs should primarily be limited to power and labor, with a little chemical use for zebra mussel control. KWA will not provide treatment of the water.

3. The KWA study assumed power, labor, and chemical costs increase at an annual average of 3%. TYJT indicated this is too low and suggested 5%.

4. Following are examples of historical inflation, which support the 3% as a reasonable assumption for O&M expenses (not rates)
    a. Labor- GCDC-WWS labor costs have increased at an annual average rate of 2.5% since 2003
    b. Electricity Rates in Michigan (per U.S. Energy Information Administration) have increased an average of 3.2% since 1999.
    c. The U.S. Bureau of Labor Statistics indicates that the inflation rate over the last 30 years has been an average of 2.8%.

Finished Water Rate Inflation (Slide 21)

1. TYJT bases their assumptions for rate inflation on a survey of rates from three other water suppliers, but ignored the actual rate history of DWSD. TYJT assumed DWSD rate increases of 4.4% annually (if water is purchased from P&B) and 2.9% annually (if water is purchased from Imlay). Based on the actual charges by DWSD to Flint, DWSD historical rates are as follows:
    a. 10 year increase in DWSD rates to Flint:: 10.5% annually
    b. Average annual increase through 45 year history: 6.7%

2. Note that for the KWA analyses, an inflation factor has just been applied to power, labor, and chemicals. Although higher prices for labor, power, and chemicals impacts utility rates; rates are impacted by many other factors, many of which are not related to inflation. Rate inflation will likely be different than O&M inflation. Other factors impacting rates:
    a. Debt – the amount of debt varies widely between utilities
    b. Number of customers / quantity of water sold – there are many fixed expenses with a utility, that if are distributed amongst more users/more gallons sold will result in lower rates. Conversely, if there are fewer users or less water sold, the rates are higher. Assumptions regarding future water consumption will have a great impact on "rate inflation".

3. Unlike KWA and Flint operating expenses which will increase over time based on inflation, the cost of continued DWSD service should be based on the inflation of DWSD rates, to include the increasing cost of other DWSD expenses such as debt and the impact of reduced customers / demands in addition to increasing O&M expenses.

4. Even though there could be a one-time reduction in DWSD rates through adopting the model contract, limiting peak demands, and or changing the point of commerce; it doesn't seem reasonable to assume that subsequent annual increases will only average 4.4% through the 30 year period of analysis. This is significantly less than historical performance (yet TYJT suggests that inflation for KWA O&M expenses will increase at almost double the rate of historical indicators).

Capital Financing with Revenue Bonds (Slide 24)

1. Note that the KWA bonds will be general obligation bonds backed by the member counties.

2. The 2009 KWA Study assumed 6%, 25 year financing. The interest rate for planning was reduced in the 2012 Study update to 5%, which is still higher than if bonds were sold today.

3. Financial consultants determined the charges for purchasing capacity in the KWA supply based on the estimated project cost plus appropriate financing costs. Based on 60 units of capacity, $538,764,000 will be generated for repayment of debt and project costs using the capacity charges in the KWA capacity agreement.

25 years * 60 units * $355,300 / unit =	$532,950,000
3 years * 60 units * $32,300 / unit =	$ 5,814,000
	$538,764,000

4. For a KWA project cost of $272,421,558, total P&I is $483 million. The difference of $55,500,000 is available for financing expenses (capitalized interest, bond issuance costs, etc.) and additional contingencies.

5. Bond holder reserve is not a requirement for general obligation bonds.

6. TYJT assumed that 3% interest would be earned on the bond holder reserve during the 25 year bond period. Current interest rates are less than 1% and it seems inappropriate to assume such a high rate will be earned on retained funds.

7. Bondholder reserve, if provided, should be applied against the last couple of P&I payments. The TYJT did not apply it. This will reduce their project costs.

KWA Construction (Slides 26 through 29)

TYJT has indicated that the KWA construction cost estimate is too low. The primary differences in cost estimates for the project appear to be the following components:

1. Pump Stations (Slide 27) – The TYJT estimate for the pump stations is more than double that used by the KWA ($54,573,314 vs. $24,618,080). KWA estimates were based on actual construction costs from recent projectd completed by Genesee County within the last eight years.
   a. 32mgd water pump station including two-10 MG ground storage tanks - $13.4 million
   b. 80 mgd wastewater pump station, 50 feet deep wetwell – $8.3 million
   c. 30 mgd wastewater pump station, 50 feet deep wetwell – $9.4 million

   The KWA budgeted amount seems reasonable for two pumping stations as currently planned and to be constructed in rural areas (not southeast Michigan).

2. Redundant Power – There is no need for redundant power; other provisions will provide reliability of supply.

3. Land – Preliminary engineering has continued so earlier budgets established for planning for land acquisition can be greatly reduced. Options have been obtained on all properties which must be

purchased, so purchase prices are known. It will be necessary to obtain easements for only two miles of pipeline construction. All land costs are now estimated at $1.25 million.

4. Engineering, Legal, Administration & Contingencies
   a. The October 2012 KWA estimate provided an allowance of 25% of construction cost to cover engineering, legal, administration, and contingencies (ELAC). This was reduced from the 38% allowance used in the 2009 Study because ongoing planning and design have firmed up many of the details of the project, including:
      i. The intake design has been completed and all regulatory permits obtained.
      ii. The transmission main route has been determined. Meetings with road agencies have firmed up the requirements for construction and restoration within rights-of-way. Environmental review and permitting are in process.

   b. TYJT costs for Intake Crib, Pump Stations, and Transmission Mains (Slide 30) include a 30% allowance for ELAC. These allowances (from Slides 26 through 28) total $72,139,566. In addition, Slide 30 provides the following additional ELAC costs in the project total:

Design Engineering / Pump Stations	$16,939,581
Construction Management	$14,434,410
Administration	$ 349,440
Legal	$ 831,000
Total	$32,554,431

   c. Combining this with the $72,139,566 totals $104,693,997 or 43% of the estimated construction cost. We believe that such a high allowance for ELAC is not appropriate for a project of this magnitude where preliminary engineering and some design have already been completed.

Cost Comparison (Slide 30)

1. The TYJT pump station price is too high based on costs of similar projects; costs used by KWA are based on costs of recent local projects. The KWA estimate is believed to be sufficient for the proposed pumping stations.

2. Redundant power is not required; this does not need to be included in the TYJT estimate.

3. Land for LHPS – actual price is $360,000

4. Design Engineering / PS and Transmission – KWA included engineering in the 25% ELAC allowance included in the $207,752,895 estimated cost of transmission mains; TYJT included engineering in their 30% ELAC allowance included in the $218,811,559 estimated cost. By adding $16,939,581 for design engineering, $14,434,609 for construction administration, $349,440 for administration, and $831,000; it seems that ELAC is being "double-counted". The TYJT 43% allowance for ELAC seems unwarranted for a project with a great deal of preliminary and design engineering completed. The 25% KWA allowance is believed to be sufficient.

5. Easements and land (other than LHPS) should total $1,140,000, based on current options and specific needs for easements.

Other Considerations – Redundancy / Reliability (Slide 33)

1. Unfunded Mandates/ Future Regulations
    a. The proposed KWA supply will deliver raw water; it is not anticipated to be affected by future changes to regulations. Regulations will impact the City of Flint with respect to treatment and/or distribution of finished water. The City will be subject to these requirements with any of the DWSD blending options, just as they will be responsible for them if supplied by KWA. Some compliance costs may actually be less with the higher quality Lake Huron water rather than Flint River water as the source.

2. State Goals
    a. The TYJT presentation indicates that creation of a new raw water supply is contrary to the governor's goals as suggested. However, the development of a new raw water supply provides new opportunities. Communities in Sanilac, St. Clair, and Lapeer counties will have the option to join a regional water supply and replace their small local supplies where limited supplies and high concentrations of arsenic have been a concern. The new water supply also provides great economic development opportunities. The raw water supplied by KWA will make a new commodity, raw water, available to the region. A large, low-cost supply of raw water can be a valuable resource for industries and agri-businesses. The development of a new water supply will also create construction jobs through the short term period of building the new water supply and subsequently over a longer period as new businesses and industries are developed in the area.
    b. The City of Flint and area communities will benefit as permanent jobs are created for operating and maintaining the local treatment facilities.

3. Redundancy
    a. We agree that the KWA and DWSD options are similar with respect to redundancy. Both provide the primary water supply; customers are responsible for their backup supply.

Other Considerations – Cost Slide 34

1. TYJT indicates that the DWSD 8 mgd supply option is the least cost alternative.
    a. The TYJT analysis does not include the cost of needed upgrades to the City's WTP or increased operating costs in their analysis. During summer months, water from the river will need to be softened before blending. More than half of the water supplied will be provided from the river. When the cost of upgrades to the WTP and the increased operating costs (for softening) are added to the TYJT analysis, the KWA option is less than the DWSD 8 mgd option.

2. For any of the DWSD "blending" options, upgrades will need to be made at the WTP to provide for continuous, reliable operation and compliance with new surface water treatment rules. Increased capital and operating costs for treating water from the river should be added to the TYJT costs for comparison with the other options.

3. Water from the river will require greater effort to treat than water from Lake Huron (more chemicals, power, and residuals). The TYJT analysis shows about the same O&M costs for the Flint WTP, regardless of water source. It seems that the WTP O&M costs for the KWA options should be reduced to reflect the savings from treating Lake Huron water.

4. The TYJT presentation noted that the KWA analysis did not include allowances for mechanical and process improvements within the planning period. The KWA will supply raw water. The facilities consist of pipe, pumps, and a tank. There are no treatment facilities which would be susceptible to future regulatory changes. The only improvements that seem likely would be the need to provide additional capacity. Capacity expansion is planned to be financed through capacity charges to new users.

5. The provision for redundant connections between the City's water system and the GCDC system was included in the most recent water supply agreement between the two, in 2011. Although not a KWA cost, the cost of the redundant connections should be considered with all options.

6. The $2.3 million budgeted for land by KWA was intended to cover all land requirements. Since the October update, options have been obtained on all land to be purchased and the locations of easements needed has been finalized. Total land costs are now estimated to be about $1.5 million.

7. The 2004 study included a 47% allowance for engineering, legal, administration, and contingencies (ELAC). The 2009 study reduced the allowance for ELAC to 37% because many of the details since the 2004 conceptual study had been better defined. For the October 2012 update, the allowance for ELAC was reduced to 25% because continued planning and preliminary engineering further addressed details from the earlier concepts.
    a. The detailed design (plans and specifications) and permitting have been completed.
    b. The transmission main route has been finalized. Meetings with road agencies have established requirements for construction and restoration within road rights-of-way. Environmental permitting is in process. The primary remaining unknown is pipe sizing, which is largely dependent on Flint's participation.

    It is our experience that the 25% ELAC allowance is appropriate for a project of this magnitude at this stage in the planning / design stage. The 43% ELAC allowance recommended by TYJT is excessive for a project in the design phase.

8. Flint's WTP as a backup to the KWA will be less difficult to provide for than the current arrangement as a backup to DWSD. We believe there is potential for challenges with chemistry and treatment for the proposed DWSD blending options, too.

9. It doesn't seem that oversizing the KWA capacity is a good solution for the city's water loss problems, if that is what is being suggested.

10. Yes, it would be nice if the KWA system could be constructed to firmly determine its cost and time to complete before making a decision about water supply alternatives. However, a decision is needed regarding Flint's participation so that the sizing and design can be completed, before it can be built.

Project Costs - TYJT Slides 26 through 30

	KWA	TYJT
Intake and Crib		
Construction	$22,076,850	$22,076,850
ELAC	$5,519,213	$5,519,213
Property	$2,300,000	$2,300,000
Pumping Stations		
Construction	$24,618,080	$54,573,314
Land		$75,000
ELAC	$6,154,520	$16,394,494
Transmission Mains		
Construction	$166,202,316	$167,419,530
ELAC	$41,550,579	$50,225,859
Easements		$1,166,170
Engineering		
Design Engineering		$16,939,581
Construction Management		$14,434,609
Administration		$349,440
Legal / Easements / Contracts		$831,000
Power	$4,000,000	$4,000,000
Redundant Power		$1,273,200
Total Construction	$212,897,246	$244,069,694
Total ELAC	$53,224,312	$104,694,196
Total Land / Property / Easements	$2,300,000	$3,541,170
Total Power	$4,000,000	$4,000,000
Total Redundant Power	$0	$1,273,200
Total	$272,421,558	$357,578,260
ELAC as % of Construction	25.0%	42.9%

Option	TYJT Total Cost	TYJT minus additional costs of river treatment	TYJT minus additional costs of river treatment plus redundant Flint-GCDC connections	TYJT minus additional costs of river treatment plus redundant connections less KWA reserve	TYJT minus additional costs of river treatment plus redundant connections less TYJT financing	TYJT plus Flint WTP		Adjusted Total Cost	Ranking
1 Flint WTP Only	$590,441,893							$590,441,893	3
2 DWSD 8 MGD Max Day at Imlay	$621,211,298					$771,289,948		$771,289,948	5
3 KWA 10/31/12 Update	$649,775,166	$534,615,996	$554,555,960					$554,555,960	1
4 DWSD 8 MGD Max Day at P&B	$657,167,877					$807,246,527		$807,246,527	6
5 KWA-1	$707,279,715	$592,120,545	$612,060,509		$572,731,459			$572,731,459	2
6 DWSD 12 MGD Max Day at Imlay	$707,994,386					$858,073,036		$858,073,036	8
7 DWSD 12 MGD Max Day at P&B	$742,168,081					$892,246,731		$892,246,731	9
8 KWA - 2	$766,784,313	$651,625,143	$671,565,107	$654,706,341				$654,706,341	4
9 DWSD 18 MGD Max Day at P&B	$791,202,885						$812,337,848	$812,337,848	7

b

Option for Water Supply	TYJT Projected 30 Year Total Cost	30 Year O&M Reduction for Treating Lake Huron Water	25 Year Bond Cost for Redundant Connections	Eliminate KWA Reserve	Use KWA 25 Year Capital Charge $355,300 / MGD	25 Year Bond Cost for Flint WTP Upgrades	Adjusted 30 Year Total Cost	Rank (Least to Highest Cost)
1 Flint WTP Only	$590,441,893		Included				$590,441,893	3
2 DWSD 8 MGD Max Day at Imlay	$621,211,298		Note 1			$150,078,650	$771,289,948	5
3 KWA 10/31/12 Update	$649,775,166	-$115,159,170	$21,134,963				$555,750,960	1
4 DWSD 8 MGD Max Day at P&B	$657,167,877		Note 1			$150,078,650	$807,246,527	6
5 KWA-1	$707,279,715	-$115,159,170	$21,134,963		-$39,329,050		$573,926,459	2
6 DWSD 12 MGD Max Day at Imlay	$707,994,386		Note 1			$150,078,650	$858,073,036	8
7 DWSD 12 MGD Max Day at P&B	$742,168,081		Note 1			$150,078,650	$892,246,731	9
8 KWA - 2	$766,784,313	-$115,159,170	$21,134,963	-$16,858,766			$655,901,341	4
9 DWSD 18 MGD Max Day at P&B	$791,202,885		$21,134,963				$812,337,848	7

Representative Genesee County Water and Wastewater Projects

Project	Description	All Engineering Fees	Engineer's Estimate	Bid Price	Final Construction Cost	Engineering & Contingency %
Fox Pump Station	30 mgd wastewater pump station & forcemain	$1,829,259		$12,394,273	$12,074,223	
		15.2%				
NEES Project	60" Relief Sewer - included tunneled sections		$54,707,212	$55,985,672	$69,999,429	
					28.0%	
North Water Loop	23 miles 36" and 48" transmission main, pump station, & 20 MG Reservoir	$4,102,610	$29,200,000	$23,570,110	$25,798,529	2.4%
		15.9%			-11.6%	
Henderson Road PS	32 MGD Water Pump Station & Two-10 MG Tanks		$12,046,368	$12,846,077	$13,517,582	
					12.2%	
Pump Station #1	80 MGD wastewater pump station	$1,735,063	$10,269,000	$8,225,400	$8,292,277	-2.4%
		20.9%			-19.2%	

Notes:

Engineering Fees include all planning, soils investigation, design, construction inspection & testing, and construction management costs

Engineering Fees % is based on final construction cost

Engineering and Contengency % is based on engineering fees + amount final construction cost exceeds estimate

Final Construction Cost % is based on difference between final construction cost and engineer's estimate

NEES Project Contractor went out of business during project - increasing cost to finish project

Projects constructed within last ten years