

APPENDIX D

**MECHANICAL DEWATERING EVALUATION
(ADDENDUM 4)**

TREATABILITY REPORT

ONONDAGA LAKE MECHANICAL DEWATERING EVALUATION

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Treatability Study Report
Parsons- Onondaga Lake Project

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1.0 Scope of Work

The goal of this treatability study is to evaluate the feasibility of various technologies to mechanically dewater dredged sediment from Onondaga Lake. Samples were collected from SMU 1 (ILWD Area A and ILWD Area B) and SMU 6 (OL-STA-60098 and OL-STA-60100) and received in July 2007 for geotextile tube testing. Samples not utilized for geotextile tube testing, along with site water, were stored in a refrigerator at 4°C upon receipt and were used for bench-scale mechanical dewatering tests. This treatability study focuses on dewatering through centrifugation, recessed-chamber filter press and belt press technologies, and investigates the use of pretreatment chemicals in enhancing mechanical dewatering while maximizing solids recovery. The ultimate aim of this research is to maximize solids recovery in the remedial end product.

2.0 Facility Description

Sevenson Environmental Services, Inc., has significant experience in the operation of dewatering equipment for the volume reduction of solid, semi-solid, and sludge matrices. Sevenson's equipment includes recessed chamber filter presses, belt presses, and centrifuges. Sevenson has successfully dewatered river sediments, materials from industrial ponds, pits, and lagoons, as well as waste streams generated by petroleum refiners, petrochemical plants, and wastewater treatment plants.

Sevenson's treatability laboratory is located at Waste Steam Technology, Inc., (WST) Buffalo, New York. WST, a wholly owned subsidiary of Sevenson, contains a fully staffed environmental laboratory, including Ph.D. scientists, microbiologists, and analytical chemists. In addition, WST has an analytical laboratory that is certified by the New York State Department of Health (#11179), the New Jersey Department of Environmental Protection and Energy (#73977), and the United States Army Corps of Engineers. Sevenson is able to keep treatability costs low and get rapid turn around time on results since all analyses are performed in house.

3.0 Sediment Preparation

As-received samples were homogenized and percent solids by weight (SM 2540 G) and density (SM 2710 F) analyses were performed on each sample for initial characterization, and the results are provided in Attachment A. The samples were then passed through a #4 and #200 sieve. The percent of the total sample that passed through each sieve was recorded and is noted in Table 1. Percent solids and densities were then taken on the sieved material and are provided in Attachment A.

**Table 1:
Percent of Total Sample Passing**

Sample ID	% Passed through #4 sieve	% Passed through #200 sieve
OL-STA-60098	97%	46%
OL-STA-60100	94%	46%
ILWD Area A	86%	75%
ILWD Area B	93%	86%

4.0 Dewatering

In this treatability study, dewatering technologies were evaluated in order to determine an appropriate remedial approach for sediments dredged from Onondaga Lake. Specifically, centrifugation, belt press, and filter press technologies were investigated and assessed based on their efficiency and applicability to the sediment received. Dewatering tests were performed only with sediment passing the #200 sieve. Sediment containing only fine solids (< 75 µm) duplicates material that would be fed to a press or centrifuge after desanding operations in the field. Desanding of dredged sediment is typically accomplished with a hydrocyclone. Polymer screening was performed on the OL-STA-60100 and ILWD Area B samples. Polymers were judged on floc and filtrate quality. The floc size and quality helps in determining polymers that are suitable for each dewatering technology. Polymer screening results are reported in Attachment B.

4.1 Centrifuge

Centrifugation technology was evaluated using an IEC Laboratory Tube Centrifuge. A total of twelve centrifuge tests were performed in this study. Individual test results are presented in Attachment C.

For each centrifuge test, 90 milliliters of diluted sediment was pretreated with polymer at a dosage that resulted in an acceptable floc, which can be defined as the point where solid particles bind together forming a tight agglomeration, and free water is released. A control sample without polymer was also run on each sample. Samples were centrifuged for five minutes at a speed of 3000 revolutions per minute. The resulting centrifuge cakes were evaluated for solids content and centrate clarity. Total suspended solids (SM 160.2) analysis was performed on the centrate.

Cake solids for polymer treated samples from SMU 1 and SMU 6 ranged from 47-52% and 55-63%, respectively. Cake solids from the untreated, control samples were lower. Centrifuge cake solids were relatively low compared with those obtained through the use of filter press technology (see Section 4.3). As indicated in the results presented in Attachment C, the centrate was clear for the polymer treated samples, and the centrate was slightly cloudy or cloudy when the samples were not treated with polymer. Therefore, centrifugation was eliminated from further investigation in this study.

4.2 Belt Press

Dewatering through belt press technology was evaluated using a Crown Press™ Belt Press Simulator. Sample preparation for belt press testing was similar to that necessary for centrifuge testing. For each test, 250 milliliters of diluted sediment was pretreated with polymer until an acceptable floc was achieved. Samples were tested on the belt press simulator for four consecutive 15-second intervals at a tension of 25 pounds per square inch.

While, polymers provided flocculation and free drainage, they resulted in a fine, weak floc that is not a suitable characteristic for this dewatering technology due to cloth

blinding and sediment migration. Cloth blinding occurs when particles in the slurry are driven (with excessive force) into the filter cloth of the filter plates, thus clogging the filter cloth. Once the cloth is clogged, the ability to dewater the slurry is significantly reduced. Sediment migration refers to what happens when a weak floc breaks apart, thus leading to sediment migration. This results in particles going through the filter cloth as opposed to being retained behind the filter cloth. Polymer treatments that resulted in a weak floc, or no floc at all were still tested. However, poor quality cakes and filtrate were not analyzed for percent solids or total suspended solids.

Cake solids obtained with the belt press were generally in the 46-53% range for SMU 1 and in the 51-58% range for SMU 6. Individual test data are provided in Attachment D. The percent solids of the cakes for the belt were lower than solids obtained from centrifugation. Also, the cakes were very thin and much of the slurry was squeezed out beyond the belt limits with particle retention in and on the belts. Particle retention was more severe for samples from SMU 6. An above average volume of belt wash water would be required, which still might not remove all the particulates. Depending on the size of the press, the wash water could range from 100 GPM to over 250 GPM and require downstream removal of fines.

4.3 Filter Press

A bench top recessed-chamber filter press was utilized to evaluate filter press technology for sediment dewatering. Various parameters were evaluated, such as press time, pressure, feed solids, and cake ring diameter. Typically one-liter of diluted sediment is filter pressed. Test volume is increased as press time is increased or as feed solids are decreased. The resultant filter cake and filtrate are then evaluated for quality. Over fifty filter press tests were performed in this study. Detailed results of the individual tests are provided in Attachment E.

An excellent filter cake can be defined as one that has a high solids recovery and good handling characteristics – more specifically, is solid and dry but does not crumble, releases easily from the filter cloths, and does not have a sticky consistency. A high

quality filtrate is one that has few suspended solids, no visible oil, and requires minimal additional treatment.

Initial filter press testing showed that high quality filter cakes could be achieved without the use of polymer. Several presses were run with polymer to investigate the potential to improve filter cake and filtrate quality. However, cake or filtrate quality was not significantly enhanced with polymer use, as seen Figure 1 of Attachment F. Further testing focused on press time, pressure, feed solids, and cake ring diameter.

Increasing the pressure on a filter press can often increase the percent solids of the resulting filter cake. Filter presses were run for 60 minutes, at approximately 10% feed solids, at low pressure, 100 PSI, and high pressure, 225 PSI, to assess any differences in cake quality. Filter cakes from the low and high-pressure press runs were all of excellent quality. However, cake solids were increased by about two percent for tests run at higher pressure, as seen in Table 2.

Table 2:
The Effect of Pressure on Filter Cake Solids

Sample ID	Low Pressure (100 PSI)		High Pressure (225 PSI)	
	Filter Press #	Percent Solids of Filter Cake	Filter Press #	Percent Solids of Filter Cake
OL-STA-60098	23	70.32	1	72.96
OL-STA-60100	24	67.10	2	69.94
ILWD Area A	25	54.74	3	56.54
ILWD Area B	26	59.10	4	61.54

Filter press time is another factor that can affect filter cake quality. There are several factors that can influence press time. One factor is the percent solids of the filter press feed. Generally, lower feed solids require a longer press time to achieve the same results that are seen with higher feed solids. Another factor that can affect test time is the thickness of the cake ring. Most of the filter press tests were run using 1” thick cake ring. Filter presses were also run using a 1.5” cake ring. The press times for the thicker 1.5” ring were generally longer than the press times for the standard 1” rings.

One way to evaluate the need to adjust press time is by the quality of the resulting filter cake. If press time is too short, the filter cake may not be fully formed or can have a soft top, and therefore is of lesser quality. On the other hand, if a press is run for too long the neck of the feed chamber can become clogged. While this does not adversely affect the quality of the filter cake, it is a sign that test time can be reduced. It is unnecessary to run a press for a longer period of time if an excellent quality cake can be produced in less time.

Another way to judge the time of a press is by monitoring filtrate. The filtrate monitoring results for individual press runs are provided in Attachment G. When filtrate is slowly dripping or has ceased to drip, a filter press run could be considered complete. At this point the cake chamber is full of solids and the resulting cake is generally of high quality. If filtrate is still flowing at a significant rate at the completion of the test, the press may need more time to produce a full or excellent cake. This can be seen in filter press tests (FP) 31 and 35. The tests were run on a sample from OL-STA-60100 at low feed solids. FP 35 was run for 60 minutes and was still significantly dripping at the end of the test. FP 31 was run on the same sample for 75 minutes and had ceased dripping at the end of the test. The filter cake from FP 31 was higher in quality and solids than the filter cake from FP 35.

5.0 Summary and Conclusions

Based on the treatability study results presented herein, various options are feasible for the remediation of sediments from Onondaga Lake, in Onondaga County, New York. In addition, based on these results and past experience, mechanical dewatering through recessed-chamber filter press technology appears to be the most effective. While other dewatering technologies such as centrifugation and belt pressing are available, preliminary testing indicated lower solids capture and potential workability (geotechnical) issues associated with placing large volumes of the dewatered material into a consolidation area. If the filter press method is selected, Severson recommends additional treatability studies are performed that concentrate on desanding, wastewater

treatment, odor generation, and additional filter press testing of a greater variety of anticipated dredge material.

ATTACHMENT A

Initial Characterization

Onondaga Lake Treatability Study

Syracuse, New York

August 2008

Parsons- Onondaga Lake

Rec'd 07/18/07 & 07/20/07

Sample ID	As Received		<#200			
	% Solids	Density (g/mL)	% Solids	Density (g/mL)	Density @ 10% solids (g/mL)	Density @ 5% solids (g/mL)
OL-STA-60098	55.29	1.47	17.09	1.15	1.08	1.03
OL-STA-60100	55.88	1.53	15.50	1.19	1.12	1.06
ILWD Area A	37.50	1.27	29.02	1.16	1.07	1.05
ILWD Area B	37.08	1.28	30.92	1.21	1.12	1.03

ATTACHMENT B

Polymer Screening

Onondaga Lake Treatability Study

Syracuse, New York

August 2008

Parsons- Onondaga Lake

Rec'd 07/18/07 & 07/20/07

Sample ID	Polymer ID	Dose (ppm)	Floc Size	Settling Rate	Suspended Particles	Floating Particles	Other Observations
OL-STA-60100 (<#200)	7803	50 to 200	1	1	1	1	Soft floc
	7809	200	2	2	2	2	Weak Floc
	7814	200	1	1	1	1	
	7824	200	1	1	1	1	Sheen
	7834	50 to 200	1	1	1	1	Acceptable for belt press
	7823	50 to 200	3	3	3	3	
	7843	50 to 200	2	2	2	2	
	7853	50 to 200	2.5	2.5	2.5	2.5	Charge too high
ILWD Area A (<#200)	7809	10 to 300	2	2	2	1.5	Weak Floc
	7814	50	1	1	1	1	Better than 7824
	7824	50 to 150	2	2	2	3	Soft floc, shears. Good for centrifuge test.
	7844	10 to 50	3	2	3	3	Charge too high
	7854	10 to 50	3	2	2	2	Weak Floc
	7823	25 to 200	1	1	4	4	Very soft floc
	7843	10 to 300	2	2	2	1.5	Weak Floc
	7853	10 to 300	2	2	2	1.5	Weak Floc
	7758	50 to 300	2	2	2	2	Filter press only
	7626	50 to 500	3	2	3	3	Not as good as 7758
7626 + 7758	25 to 100 + 50 to 100	2	2	2	2	Filter press only	

Rating Scale:
 1: Excellent
 2: Good
 3: Fair
 4: Poor

Polymer screening was not performed on samples OL-STA-60098 and ILWD Area B at this time, since previous tests indicated that these areas test similarly to OL-STA-60100 and ILWD Area A, respectively.

ATTACHMENT C

Centrifuge Data

Onondaga Lake Treatability Study

Syracuse, New York

August 2008

Polymers from 2008 Mechanical Dewatering Study

Polymer ID	Polymer Name	Type	Manufacture
7626	CP 626	Cationic solution	Hychem
7757	CP 757	Cationic solution	Hychem
7758	CP 758	Cationic solution	Hychem
7803	CE 803	Cationic emulsion	Hychem
7807	CE 807	Cationic emulsion	Hychem
7809	CE 809	Cationic emulsion	Hychem
7814	CE 814	Cationic emulsion	Hychem
7824	CE 824	Cationic emulsion	Hychem
7834	CE 834	Cationic emulsion	Hychem
7844	CE 844	Cationic emulsion	Hychem
7854	CP 854	Cationic emulsion	Hychem
72044	Krysalis FC 2044	Dry cationic	Ciba
7823	NE 823	Nonionic emulsion	Hychem
7843	AE 843	Anionic emulsion	Hychem
7852	AE 852	Anionic emulsion	Hychem
7853	AE 853	Anionic emulsion	Hychem

Parsons- Onondaga Lake

Rec'd 07/18/07 & 07/20/07

Centrifuge Data

Test Number	Sample Number	% Feed Solids	Additive and Dosage	Sample Volume	Spin Time and Speed	Centrate Volume (ml)/ TSS (ppm)	Cake Solids (%)	Comments
CF 1	ILWD Area A (<#200)	12.46	--	90mL	5 min @ 3500rpm	66 / 62	42.46	Slightly cloudy centrate, well defined cake.
CF 2	ILWD Area A (<#200)	12.46	50 ppm 7814	90mL	5 min @ 3500rpm	71 / 52	47.33	Clear centrate, well defined cake.
CF 3	ILWD Area A (<#200)	12.46	100 ppm 7824	90mL	5 min @ 3500rpm	68 / 68	48.10	Clear centrate, well defined cake.
CF 4	OL-STA-60100 (<#200)	12.94	--	90mL	5 min @ 3500rpm	78 / 98	50.25	Slightly cloudy centrate, well defined cake.
CF 5	OL-STA-60100 (<#200)	12.94	100 ppm 7814	90mL	5 min @ 3500rpm	80 / 68	57.82	Clear centrate, well defined cake.
CF 6	OL-STA-60100 (<#200)	12.94	50 ppm 7824	90mL	5 min @ 3500rpm	82 / 56	55.40	Clear centrate, well defined cake.
CF 7	ILWD Area B (<#200)	10.48	--	90mL	5 min @ 3500rpm	74 / 78	46.15	Slightly cloudy centrate, well defined cake.
CF 8	ILWD Area B (<#200)	10.48	100 ppm 7814	90mL	5 min @ 3500rpm	74 / 66	51.96	Clear centrate, well defined cake.
CF 9	ILWD Area B (<#200)	10.48	50 ppm 7824	90mL	5 min @ 3500rpm	77 / 70	51.64	Clear centrate, well defined cake.
CF 10	OL-STA-60098 (<#200)	9.98	--	90mL	5 min @ 3500rpm	82 / 94	56.08	Cloudy centrate, well defined cake.

CF 11	OL-STA-60098 (<#200)	9.98	50 ppm 7814	90mL	5 min @ 3500rpm	85 / 72	62.68	Clear centrate, well defined cake.
CF 12	OL-STA-60098 (<#200)	9.98	50 ppm 7824	90mL	5 min @ 3500rpm	83 / 68	63.37	Clear centrate, well defined cake.

All samples were passed through a #4 sieve followed by a #200 sieve before testing.

ATTACHMENT D

Belt Press Data

Onondaga Lake Treatability Study

Syracuse, New York

August 2008

Parsons- Onondaga Lake

Rec'd 07/18/07 & 07/20/07

Belt Press Data

Each test involves 4 cycles of 15 seconds at 25 PSI

Test Number	Slurry ID	Feed Solids	Additive/ Dosage	Cake Solids (%)	Sample Volume	mLs of Filtrate/ TSS (ppm)	Comments
BP 1	ILWD Area B (<#200)	10.48	100 ppm 7824	51.91	250mL	--	Dirty filtrate. Some residue on cloth. Thin cake
BP 2	ILWD Area B (<#200)	10.48	150 ppm 7814	53.23	250mL	175 / 41	Filtrate not clear, slightly yellow. Some blinding of cloth. Thin cake
BP 3	ILWD Area B (<#200)	10.48	--	NA	250mL	NA / NA	No body, solids flow out the side. Not applicable.
BP 4	ILWD Area B (<#200)	10.48	100 ppm 7824	50.53	250mL	181 / 158	Thin cake that spreads under pressure.
BP 5	ILWD Area B (<#200)	10.48	125 ppm 7834	NA	250mL	170 / NA	Thin, tacky, blinds cloth
BP 6	ILWD Area B (<#200)	10.48	200 ppm 7843	51.84	250mL	181 / 58	Spreads, good drainage, fragile, thin cake.
BP 7	ILWD Area B (<#200)	10.48	225 ppm 7853	49.47	250mL	180 / NA	Spreads, good drainage, fragile, thin cake.
BP 8	ILWD Area B (<#200)	10.48	225 ppm 7809	NA	250mL	174 / NA	Spreads, good drainage, fragile, thin cake.
BP 9	ILWD Area B (<#200)	10.48	200 ppm 7852	53.81	250mL	176 / NA	Good cake, but thin. Minor blinding.
BP 10	OL-STA-60100 (<#200)	12.94	--	NA	250mL	NA / NA	Not applicable. Flows over.

BP 11	OL-STA-60100 (<#200)	12.94	210 ppm 7824	54.39	250mL	161 / 54	Good floc, slight carry over, thin cake.
BP 12	OL-STA-60100 (<#200)	12.94	200 ppm 7834	50.91	250mL	173 / 54	Good floc, slight carry over, thin cake.
BP 13	ILWD Area A (<#200)	12.46	--	NA	250mL	NA / NA	Unacceptable for belt press; flows over.
BP 14	ILWD Area A (<#200)	12.46	200 ppm 7824	NA	250mL	NA / NA	Thin cake, soft on contact.
BP 15	ILWD Area A (<#200)	12.46	250 ppm 7843	NA	250mL	NA / NA	Thin cake that is soft and flows over.
BP 16	ILWD Area A (<#200)	12.46	250 ppm 7853	NA	250mL	NA / NA	Thin cake that is soft and flows over.
BP 17	ILWD Area A (<#200)	12.46	200 ppm 7834	NA	250mL	NA / NA	Thin cake that is soft and flows over.
BP 18	ILWD Area A (<#200)	12.46	250 ppm 7814	NA	250mL	NA / NA	Thin cake that is soft and flows over.
BP 19	ILWD Area A (<#200)	12.46	250 ppm 7809	NA	250mL	NA / NA	Thin cake that is soft and flows over.
BP 20	ILWD Area A (<#200)	12.46	250 ppm 7807	NA	250mL	NA / NA	Thin cake that is soft and flows over.
BP 21	ILWD Area A (<#200)	12.46	220 ppm 7814	47.1	250mL	178 / 782	Thin cake that is soft and flows over.
BP 22	ILWD Area A (<#200)	12.46	220 ppm 7853/ 100 ppm 7824	47.14	250mL	151 / 368	Thin cake that is soft and flows over.
BP 23	ILWD Area A (<#200)	12.46	220 ppm 7843/ 75 ppm 7624	46.36	250mL	152 / 186	Thin cake that is soft and flows over.
BP 24	OL-STA-60098 (<#200)	9.98	225 ppm 7824	58.25	250mL	189 / 242	Good floc size, breaks under pressure
BP 25	OL-STA-60098 (<#200)	9.98	200 ppm 7824	58.23	250mL	191 / 102	Good floc size, breaks under pressure

BP 26	OL-STA-60100 (<#200)	12.94	300 ppm 7814	57.43	100mL	58 / 330	Good floc size. Cake is soft and spreads.
BP 27	OL-STA-60100 (<#200)	12.94	250 ppm 7824	50.99	100mL	71 / 198	Floc is good. Cake is tacky. Slight blinding.
BP 28	OL-STA-60100 (<#200)	6.74	150 ppm Dev E/ 100 ppm 7853	NA	100mL	63 / NA	Cake spreads. Filtrate is cloudy and heavy in solids.
BP 29	OL-STA-60100 (<#200)	6.74	150 ppm/ 7824	57.55	100mL	80 / NA	Good floc. Cake spreads and has fair release. Some blinding.
BP 30	OL-STA-60098 (<#200)	5.70	200 ppm/ 7824	NA	100mL	81 / 99	Floc is good. Fair release, some blinding. Sheen on filtrate.
BP 31	OL-STA-60098 (<#200)	5.70	120 ppm/ 72044	65.76	100mL	69 / 5488	Good floc. Soft cake. Squeezes through dirty filtrate.

All samples were passed through a #4 sieve followed by a #200 sieve before testing.

Not applicable (NA) indicates that analysis was not performed due to poor belt press results.

ATTACHMENT E

Filter Press Data

Onondaga Lake Treatability Study

Syracuse, New York

August 2008

Parsons- Onondaga Lake

Rec'd 07/18/07 & 07/20/07

Filter Press Data by Sample Location

Filter Press #	Sample ID	% Feed Solids	Additive and Dosage	Press Time/ Pressure	mLs Filtrate / TSS (ppm)	Release/ Blinding	% Cake Solids	Cake Density (g/mL)	Comments
FP 30	OL-STA-60098 (<#200)	6.66	--	75 min/ 225 PSI	809 / 44	Good, cake slightly stuck to cloths	70.98	1.71	Good cake, soft top. 1.5L feed used.
FP 34	OL-STA-60098 (<#200)	4.00	--	90 min/ 225 PSI	920 / 47	Excellent/ no apparent	71.79	1.78	Good cake, soft top and middle. 1.5L feed used.
FP 47	OL-STA-60098 (<#200)	4.02	--	90 min/ 225 PSI	553 / 47	Excellent/ no apparent	72.47	1.84	Excellent, hard throughout. 1.5 L feed used.
FP 42	OL-STA-60098 (<#200)	5.70	--	120 min/ 225 PSI	1329 / 39	Excellent/ no apparent	--	--	Poor cake, incomplete. Soft top and middle. 1.25" cake ring. 1.5L feed used.
FP 41	OL-STA-60098 (<#200)	3.34	--	120 min/ 225 PSI	1664 / 48	Excellent/ no apparent	71.70	1.85	Very good cake, slightly soft top. 1.5" cake ring. 2.5L feed.
FP 51	OL-STA-60098 (<#200)	5.46	--	120 min/ 225 PSI	1347 / 30	Excellent/ no apparent	72.24	1.77	Excellent, hard throughout. 2.5 L feed used. 1.5" cake ring.
FP 23	OL-STA-60098 (<#200)	9.98	--	60 min/ 100 PSI	313 / 59	Excellent/ no apparent	70.32	1.78	Excellent cake, hard throughout
FP 19	OL-STA-60098 (<#200)	9.98	--	45 min/ 225 PSI	344 / 73	Excellent/ no apparent	72.78	1.79	Excellent cake, hard throughout
FP 1	OL-STA-60098 (<#200)	9.98	--	60 min/ 225 PSI	357 / 43	Excellent/ no apparent	72.96	1.84	Excellent cake, hard throughout. Significant clog neck.
FP 14	OL-STA-60098 (<#200)	9.98	--	60 min/ 225 PSI	577 / 51	Excellent/ no apparent	69.14	1.70	Excellent cake, hard throughout. Used 1.5" cake ring.
FP 9	OL-STA-60098 (<#200)	9.98	50 ppm 7824	60 min/ 225 PSI	740 / 58	Excellent/ no apparent	74.74	1.67	Excellent cake, hard throughout. Good pack in neck of feed chamber.
FP 35	OL-STA-60100 (<#200)	6.53	--	60 min/ 225 PSI	1043 / 23	Good/ possible slight blinding	64.77	1.65	Good cake, soft top. 1.5L feed used.

FP 43	OL-STA-60100 (<#200)	6.74	75 ppm 7757	60 min/ 225 PSI	493 / 27	Excellent/ no apparent	68.42	1.75	Excellent, hard throughout. 1.5 L feed used.
FP 31	OL-STA-60100 (<#200)	6.03	--	75 min/ 225 PSI	704 / 37	Excellent/ no apparent	68.87	1.67	Excellent cake, hard throughout. 1.5L feed used.
FP 40	OL-STA-60100 (<#200)	6.77	--	75 min/ 225 PSI	1102 / 24	Excellent/ no apparent	65.29	1.58	Good cake, soft top and middle. 1.5" cake ring. 2.5L feed used.
FP 53	OL-STA-60100 (<#200)	7.23	--	75 min/ 225 PSI	1217 / 38	Good/ no apparent	63.05	1.68	Excellent, hard throughout. Significant pack in neck. 1.5 L feed used. 1.5" cake ring.
FP 43	OL-STA-60100 (<#200)	6.74	75 ppm 7757	60 min/ 225 PSI	493 / 27	Excellent/ no apparent	68.42	1.75	Excellent, hard throughout. 1.5 L feed used.
FP 44	OL-STA-60100 (<#200)	6.74	--	90 min/ 225 PSI	463 / 64	Excellent/ no apparent	69.59	1.74	Excellent, hard throughout. 1.5 L feed used.
FP 52	OL-STA-60100 (<#200)	7.41	--	90 min/ 225 PSI	862 / 37	Excellent/ no apparent	68.72	1.72	Excellent, hard throughout. Significant pack in neck. 2.5 L feed used. 1.5" cake ring.
FP 24	OL-STA-60100 (<#200)	12.94	--	60 min/ 100 PSI	357 / 47	Excellent/ no apparent	67.10	1.73	Excellent cake, hard throughout
FP 20	OL-STA-60100 (<#200)	12.94	--	45 min/ 225 PSI	398 / 46	Excellent/ no apparent	69.51	1.73	Excellent cake, hard throughout
FP 2	OL-STA-60100 (<#200)	12.94	--	60 min/ 225 PSI	345 / 36	Excellent/ no apparent	69.64	1.68	Excellent cake, hard throughout
FP 18	OL-STA-60100 (<#200)	12.94	--	60 min/ 225 PSI	721 / 49	Excellent/ no apparent	61.42	1.66	Excellent cake, hard throughout. Used 1.5" cake ring.
FP 8	OL-STA-60100 (<#200)	12.94	--	90 min/ 225 PSI	730 / 55	Excellent/ no apparent	69.12	1.57	Excellent cake, hard throughout. Used 1.5" cake ring
FP 11	OL-STA-60100 (<#200)	12.94	50 ppm 7824	60 min/ 225 PSI	NA	Excellent/ no apparent	NA	NA	Press blowout @ 35 minutes. See FP 13
FP 13	OL-STA-60100 (<#200)	12.94	75 ppm 7824	60 min/ 225 PSI	258 / 56	Excellent/ no apparent	67.16	1.62	Excellent cake, hard throughout. 1.5L feed used.
FP 12	OL-STA-60100 (<#200)	12.94	100 ppm 7758	60 min/ 225 PSI	385 / 47	Excellent/ no apparent	69.12	1.63	Excellent cake, hard throughout
FP 38	ILWD Area A (<#200)	5.29	--	45 min/ 225 PSI	493 / 64	Excellent/ no apparent	54.99	1.51	Very good cake, hard throughout. 1.5L feed used.
FP 54	ILWD Area A (<#200)	7.66	--	45 min/ 225 PSI	733 / 43	Excellent/ no apparent	58.01	1.65	Excellent, hard throughout. 1.5 L feed used.

FP 36	ILWD Area A (<#200)	5.29	--	60 min/ 225 PSI	940 / 21	Good/ no apparent	57.97	1.53	Excellent cake, hard throughout. 1.5" cake ring. 1.5L feed used.
FP 45	ILWD Area A (<#200)	6.24	--	90 min/ 225 PSI	564 / 25	Excellent/ no apparent	58.78	1.57	Excellent, hard throughout. 1.5 L feed used.
FP 48	ILWD Area A (<#200)	3.31	--	90 min/ 225 PSI	771 / 54	Excellent/ no apparent	58.12	1.57	Excellent, hard throughout. 1.5 L feed used. 1.5" cake ring.
FP 25	ILWD Area A (<#200)	12.46	--	60 min/ 100 PSI	343 / 63	Excellent/ no apparent	54.74	1.52	Excellent cake, hard throughout. Significant pack in neck.
FP 29	ILWD Area A (<#200)	10.40	--	45 min/ 225 PSI	452 / 25	Excellent/ no apparent	59.04	1.55	Excellent cake, hard throughout.
FP 21	ILWD Area A (<#200)	12.46	--	45 min/ 225 PSI	404 / 53	Excellent/ no apparent	58.05	1.51	Excellent cake, hard throughout
FP 3	ILWD Area A (<#200)	12.46	--	60 min/ 225 PSI	333 / 92	Excellent/ no apparent	56.54	1.56	Excellent cake, hard throughout. Significant clog neck.
FP 15	ILWD Area A (<#200)	12.46	--	60 min/ 225 PSI	558 / 25	Excellent/ no apparent	57.17	1.56	Excellent cake, hard throughout. Used 1.5" cake ring. Significant pack in neck.
FP 16	ILWD Area A (<#200)	12.46	75 ppm 7758	60 min/ 225 PSI	399 / 51	Excellent/ no apparent	57.97	1.53	Excellent cake, hard throughout
FP 17	ILWD Area A (<#200)	12.46	75 ppm 7824	60 min/ 225 PSI	214 / 97	Excellent/ no apparent	55.58	1.56	Excellent cake, hard throughout. Significant pack in neck.
FP 32	ILWD Area B (<#200)	7.26	--	45 min/ 225 PSI	547 / 53	Excellent/ no apparent	60.59	1.62	Excellent cake, hard throughout.
FP 50	ILWD Area B (<#200)	8.33	--	45 min/ 225 PSI	797 / 26	Excellent/ no apparent	62.26	1.63	Excellent, hard throughout. Significant pack in neck. 1.5 L feed used. 1.5" cake ring.
FP 37	ILWD Area B (<#200)	7.26	--	60 min/ 225 PSI	544 / 19	Excellent/ no apparent	60.91	1.59	Excellent cake, hard throughout, significant pack in neck. 1.5L feed used.
FP 39	ILWD Area B (<#200)	7.26	--	60 min/ 225 PSI	719 / 22	Excellent/ no apparent	62.24	1.65	Excellent cake, hard throughout, significant pack in neck. 1.5" cake ring. 1.5L feed used.
FP 46	ILWD Area B (<#200)	7.26	--	90 min/ 225 PSI	587 / 50	Excellent/ no apparent	62.61	1.58	Excellent, hard throughout. 1.5 L feed used.
FP 49	ILWD Area B (<#200)	7.11	--	90 min/ 225 PSI	846 / 23	Excellent/ no apparent	62.42	1.60	Excellent, hard throughout. Significant pack in neck. 1.5 L feed used. 1.5" cake ring.

FP 26	ILWD Area B (<#200)	12.72	--	60 min/ 100 PSI	372 / 61	Excellent/ no apparent	59.10	1.60	Excellent cake, hard throughout. Significant pack in neck.
FP 22	ILWD Area B (<#200)	12.72	--	45 min/ 225 PSI	485 / 91	Excellent/ no apparent	63.09	1.60	Excellent cake, hard throughout. Significant pack in neck.
FP 4	ILWD Area B (<#200)	10.48	--	60 min/ 225 PSI	475 / 44	Excellent/ no apparent	61.54	1.64	Excellent cake, hard throughout
FP 10	ILWD Area B (<#200)	12.72	--	60 min/ 225 PSI	569 / 71	Excellent/ no apparent	62.54	1.62	Excellent cake, hard throughout. Used 1.5" cake ring. Significant pack in neck of feed chamber.
FP 5	ILWD Area B (<#200)	13.44	100 ppm 7824	60 min/ 225 PSI	185 / 32	Excellent/ no apparent	59.06	1.59	Excellent cake, hard throughout. Significant clog neck.
FP 6	ILWD Area B (<#200)	12.72	75 ppm 7758	60 min/ 225 PSI	402 / 51	Excellent/ no apparent	59.61	1.66	Excellent cake, hard throughout

All samples were passed through a #4 sieve followed by a #200 sieve before testing.

Parsons- Onondaga Lake

Rec'd 07/18/07 & 07/20/07

Filter Press Data using 1.5" cake ring Grouped by Sample Location

Filter Press #	Sample ID	% Feed Solids	Additive and Dosage	Press Time/ Pressure	mLs Filtrate / TSS (ppm)	Release/ Blinding	% Cake Solids	Cake Density	Comments
FP 42	OL-STA-60098 (<#200)	5.70	--	120 min/ 225 PSI	1329 / 39	Excellent/ no apparent	--	--	Poor cake, incomplete. Soft top and middle. 1.25" cake ring. 1.5L feed used.
FP 41	OL-STA-60098 (<#200)	3.34	--	120 min/ 225 PSI	1664 / 48	Excellent/ no apparent	71.70	1.85	Very good cake, slightly soft top. 1.5" cake ring. 2.5L feed.
FP 51	OL-STA-60098 (<#200)	5.46	--	120 min/ 225 PSI	1347 / 30	Excellent/ no apparent	72.24	1.77	Excellent, hard throughout. 2.5 L feed used. 1.5" cake ring.
FP 14	OL-STA-60098 (<#200)	9.98	--	60 min/ 225 PSI	577 / 51	Excellent/ no apparent	69.14	1.70	Excellent cake, hard throughout. Used 1.5" cake ring.
FP 40	OL-STA-60100 (<#200)	6.77	--	75 min/ 225 PSI	1102 / 24	Excellent/ no apparent	65.29	1.58	Good cake, soft top and middle. 1.5" cake ring. 2.5L feed used.
FP 53	OL-STA-60100 (<#200)	7.23	--	75 min/ 225 PSI	1217 / 38	Good/ no apparent	63.05	1.68	Excellent, hard throughout. 1.5 L feed used. 1.5" cake ring.
FP 52	OL-STA-60100 (<#200)	7.41	--	90 min/ 225 PSI	862 / 37	Excellent/ no apparent	68.72	1.72	Excellent, hard throughout. Significant pack in neck. 2.5 L feed used. 1.5" cake ring.
FP 18	OL-STA-60100 (<#200)	12.94	--	60 min/ 225 PSI	721 / 49	Excellent/ no apparent	61.42	1.66	Excellent cake, hard throughout. Used 1.5" cake ring.
FP 8	OL-STA-60100 (<#200)	12.94	--	90 min/ 225 PSI	730 / 55	Excellent/ no apparent	69.12	1.57	Excellent cake, hard throughout. Used 1.5" cake ring.
FP 54	ILWD Area A (<#200)	7.66	--	45 min/ 225 PSI	733 / 43	Excellent/ no apparent	58.01	1.65	Excellent, hard throughout. 1.5 L feed used. 1.5" cake ring.
FP 36	ILWD Area A (<#200)	5.29	--	60 min/ 225 PSI	940 / 21	Good/ no apparent	57.97	1.53	Excellent cake, hard throughout. 1.5" cake ring. 1.5L feed used.

FP 15	ILWD Area A (<#200)	12.46	--	60 min/ 225 PSI	558 / 25	Excellent/ no apparent	57.17	1.56	Excellent cake, hard throughout. Used 1.5" cake ring. Significant pack in neck.
FP 48	ILWD Area A (<#200)	3.31	--	90 min/ 225 PSI	771 / 54	Excellent/ no apparent	58.12	1.57	Excellent, hard throughout. 1.5 L feed used. 1.5" cake ring.
FP 39	ILWD Area B (<#200)	7.26	--	60 min/ 225 PSI	719 / 22	Excellent/ no apparent	62.24	1.65	Excellent cake, hard throughout, significant pack in neck. 1.5" cake ring. 1.5L feed used.
FP 10	ILWD Area B (<#200)	12.72	--	60 min/ 225 PSI	569 / 71	Excellent/ no apparent	62.54	1.62	Excellent cake, hard throughout. Used 1.5" cake ring. Significant pack in neck of feed chamber.
FP 50	ILWD Area B (<#200)	8.33	--	45 min/ 225 PSI	797 / 26	Excellent/ no apparent	62.26	1.63	Excellent, hard throughout. Significant pack in neck. 1.5 L feed used. 1.5" cake ring.

All samples were passed through a #4 sieve followed by a #200 sieve before testing.

Parsons- Onondaga Lake

Rec'd 07/18/07 & 07/20/07

Filter Press Data- Blinding Study

Filter Press #	Sample ID	% Feed Solids	Additive and Dosage	Press Time/ Pressure	Filtrate Amount (mLs)	Release/ Blinding	% Cake Solids	Comments
1	OL-STA-60100 (<#200)	14.91	--	60 min/ 225 PSI	420	Excellent/ no apparent	67.88	Excellent, hard throughout.
2		14.91	--	60 min/ 225 PSI	320	Excellent/ no apparent	71.91	Excellent, hard throughout.
3		14.91	--	60 min/ 225 PSI	360	Excellent/ possible, slight blinding	70.55	Excellent, hard throughout.
4		14.91	--	60 min/ 225 PSI	372	Excellent/ possible, slight blinding	70.53	Excellent, hard throughout.
5		14.91	--	60 min/ 225 PSI	320	Excellent/ possible, slight blinding	71.28	Excellent, hard throughout.
6		14.91	--	60 min/ 225 PSI	380	Excellent/ possible, slight blinding	70.15	Excellent, hard throughout.

Filter Press #	Sample ID	% Feed Solids	Additive and Dosage	Press Time/ Pressure	Filtrate Quality	Release/ Blinding	% Cake Solids	Comments
1	ILWD Area-A (<#200)	12.25	--	60 min/ 225 PSI	360	Excellent/ no apparent	58.25	Excellent, hard throughout. Significant pack in neck.
2		12.25	--	60 min/ 225 PSI	387	Excellent/ no apparent	58.15	Excellent, hard throughout. Significant pack in neck.
3		12.25	--	60 min/ 225 PSI	390	Excellent/ no apparent	58.63	Excellent, hard throughout.
4		12.25	--	60 min/ 225 PSI	400	Excellent/ no apparent	58.32	Excellent, hard throughout.
5		12.25	--	60 min/ 225 PSI	360	Excellent/ no apparent	58.62	Excellent, hard throughout.
6		12.25	--	60 min/ 225 PSI	460	Excellent/ no apparent	55.2	Excellent, hard throughout. Significant pack in neck.

Filter presses were run consecutively on the same set off cloths in order to see any possible blinding. The first filter press for each sample was run on new cloths. Each run after was run on the same unwashed cloth.

These tests were for blinding tests only and are not reported with other filter press data.

Parsons- Onondaga Lake

Rec'd 07/18/07 & 07/20/07

60100

mLs filtrate

Time (minutes)	FP 2	FP 8	FP 12	FP 13	FP 18	FP 20	FP 24	FP 31	FP 35	FP 40	FP 43	FP 52	FP 53
5	220	275	266	195	255	--	225	331	387	340	295	340	325
10	55	106	83	25	--	255	59	119	100	65	143	105	156
15	32	79	18	14	148	110	34	59	84	74	18	110	122
20	11	55	5	5	64	10	10	47	58	105	6	80	82
25	6	55	--	--	51	6	8	55	57	74	6	50	65
30	5	43	5	6	38	8	5	25	55	57	5	25	45
35	--	25	--	--	--	--	4	25	49	40	4	38	51
40	7	21	4	5	60	--	4	10	52	51	3	27	47
45	--	19	--	--	30	9	6	7	48	54	5	19	59
50	5	14	3	5	31		--	5	49	40	2	12	35
55	--	14	--	--	19		--	4	56	50	3	10	46
60	40	8	1	3	25		2	4	48	42	3	15	49
65		8						8		36		6	39
70		5						5		44		11	50
75		3						0		30		5	46
80												5	
85												2	
90												2	
95													
100													
105													
110													
115													
120													
Total	381	730	385	258	721	398	357	704	1043	1102	493	862	1217

ATTACHMENT F

Report Figure

Onondaga Lake Treatability Study

Syracuse, New York

August 2008

Parsons- Onondaga Lake

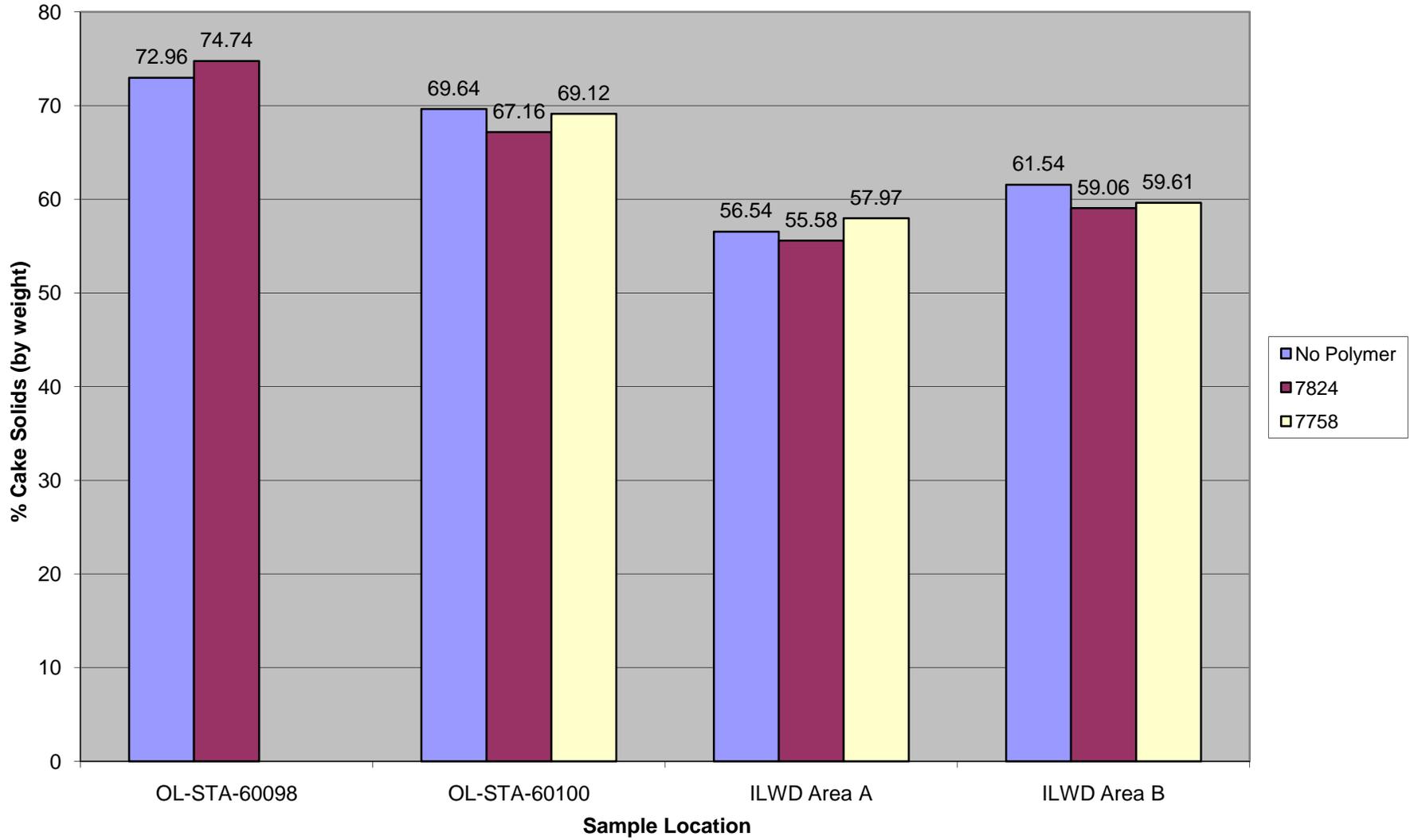
Rec'd 07/18/07 & 07/20/07

ILWD A

mLs filtrate

Time (minutes)	FP 3	FP 15	FP 16	FP 17	FP 21	FP 25	FP 29	FP 36	FP 38	FP 45	FP 48	FP 54
5	270	351	340	155	349	260	340	467	333	405	454	465
10	15	158	18	10	13	35	61	219	114	80	200	176
15	5	16	14	10	9	10	13	46	14	10	35	51
20	5	--	4	7	8	8	8	26	7	7	14	15
25	--	--	5	5	6	5	8	25	6	5	8	8
30	11	14	2	--	5	4	5	--	4	6	6	5
35	--	--	4	5	5	--	75	55	5	5	5	4
40	10	10	4	8	5	6	5	22	5	5	5	5
45	-	--	--	--	4	--	5	20	5	5	5	4
50	8	--	5	7		7		20		5	4	
55	--	--	3	--		--		22		4	5	
60	9	9	0	7		8		18		2	4	
65										6	4	
70										5	4	
75										5	4	
80										6	6	
85										5	4	
90										3	4	
95												
100												
105												
110												
115												
120												
Total	333	558	399	214	404	343	520	940	493	569	771	733

Filter Presses Ran With and Without Polymer



ATTACHMENT G

Filter Press Filtrate Data

Onondaga Lake Treatability Study

Syracuse, New York

August 2008

Parsons- Onondaga Lake

Rec'd 07/18/07 & 07/20/07

60100

mLs filtrate

Time (minutes)	FP 2	FP 8	FP 12	FP 13	FP 18	FP 20	FP 24	FP 31	FP 35	FP 40	FP 43	FP 52	FP 53
5	220	275	266	195	255	--	225	331	387	340	295	340	325
10	55	106	83	25	--	255	59	119	100	65	143	105	156
15	32	79	18	14	148	110	34	59	84	74	18	110	122
20	11	55	5	5	64	10	10	47	58	105	6	80	82
25	6	55	--	--	51	6	8	55	57	74	6	50	65
30	5	43	5	6	38	8	5	25	55	57	5	25	45
35	--	25	--	--	--	--	4	25	49	40	4	38	51
40	7	21	4	5	60	--	4	10	52	51	3	27	47
45	--	19	--	--	30	9	6	7	48	54	5	19	59
50	5	14	3	5	31		--	5	49	40	2	12	35
55	--	14	--	--	19		--	4	56	50	3	10	46
60	40	8	1	3	25		2	4	48	42	3	15	49
65		8						8		36		6	39
70		5						5		44		11	50
75		3						0		30		5	46
80												5	
85												2	
90												2	
95													
100													
105													
110													
115													
120													
Total	381	730	385	258	721	398	357	704	1043	1102	493	862	1217

Parsons- Onondaga Lake

Rec'd 07/18/07 & 07/20/07

ILWD A

mLs filtrate

Time (minutes)	FP 3	FP 15	FP 16	FP 17	FP 21	FP 25	FP 29	FP 36	FP 38	FP 45	FP 48	FP 54
5	270	351	340	155	349	260	340	467	333	405	454	465
10	15	158	18	10	13	35	61	219	114	80	200	176
15	5	16	14	10	9	10	13	46	14	10	35	51
20	5	--	4	7	8	8	8	26	7	7	14	15
25	--	--	5	5	6	5	8	25	6	5	8	8
30	11	14	2	--	5	4	5	--	4	6	6	5
35	--	--	4	5	5	--	75	55	5	5	5	4
40	10	10	4	8	5	6	5	22	5	5	5	5
45	-	--	--	--	4	--	5	20	5	5	5	4
50	8	--	5	7		7		20		5	4	
55	--	--	3	--		--		22		4	5	
60	9	9	0	7		8		18		2	4	
65										6	4	
70										5	4	
75										5	4	
80										6	6	
85										5	4	
90										3	4	
95												
100												
105												
110												
115												
120												
Total	333	558	399	214	404	343	520	940	493	569	771	733

Parsons- Onondaga Lake

Rec'd 07/18/07 & 07/20/07

ILWD B

mLs filtrate

Time (minutes)	FP 4	FP 5	FP 6	FP 10	FP 22	FP 26	FP 32	FP 37	FP 39	FP 46	FP 49	FP 50
5	420	140	365	447	405	310	460	490	575	453	512	450
10	6	11	8	64	32	13	33	10	62	20	185	250
15	6	6	5	14	11	9	10	8	22	7	46	51
20	7	3	4	9	7	6	5	6	13	10	20	13
25	6	--	4	8	9	6	8	4	9	8	18	10
30	7	10	4	5	5	6	9	5	6	7	10	8
35	5	--	4	5	6	--	8	2	7	10	4	5
40	4	9.5	4	--	6	11	9	5	6	7	4	6
45	4	--	--	12	4	--	5	2	6	7	3	4
50	4	5	7	--	--	11	--	3	5	12	4	--
55	--	--	--	--	--	--	--	4	3	6	4	--
60	6	0	1	5	--	11	--	5	5	3	5	--
65	--	--	--	--	--	--	--	--	--	15	5	--
70	--	--	--	--	--	--	--	--	--	5	5	--
75	--	--	--	--	--	--	--	--	--	--	5	--
80	--	--	--	--	--	--	--	--	--	8	8	--
85	--	--	--	--	--	--	--	--	--	4	4	--
90	--	--	--	--	--	--	--	--	--	5	4	--
95	--	--	--	--	--	--	--	--	--	--	--	--
100	--	--	--	--	--	--	--	--	--	--	--	--
105	--	--	--	--	--	--	--	--	--	--	--	--
110	--	--	--	--	--	--	--	--	--	--	--	--
115	--	--	--	--	--	--	--	--	--	--	--	--
120	--	--	--	--	--	--	--	--	--	--	--	--
Total	475	184.5	406	569	485	383	547	544	719	587	846	797