

**The attached document contains the results of tests of the  
Marsh-McBirney 'Flo-Dar' Open Channel Flowmeter**

**as performed by:  
Alden Research Laboratory, Inc.  
Holden, Massachusetts USA  
July 2003**

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TESTS OF  
OPEN CHANNEL FLOW METERS IN 36" PIPE  
MARSH McBIRNEY, INC.  
PURCHASE ORDER NUMBER QPO001299  
JULY 2003 - ARL NO.160B-03/C780

CERTIFIED BY  
James B. Nystrom

ALDEN RESEARCH LABORATORY, INC.  
30 SHREWSBURY STREET  
HOLDEN, MASSACHUSETTS 01520

## INTRODUCTION

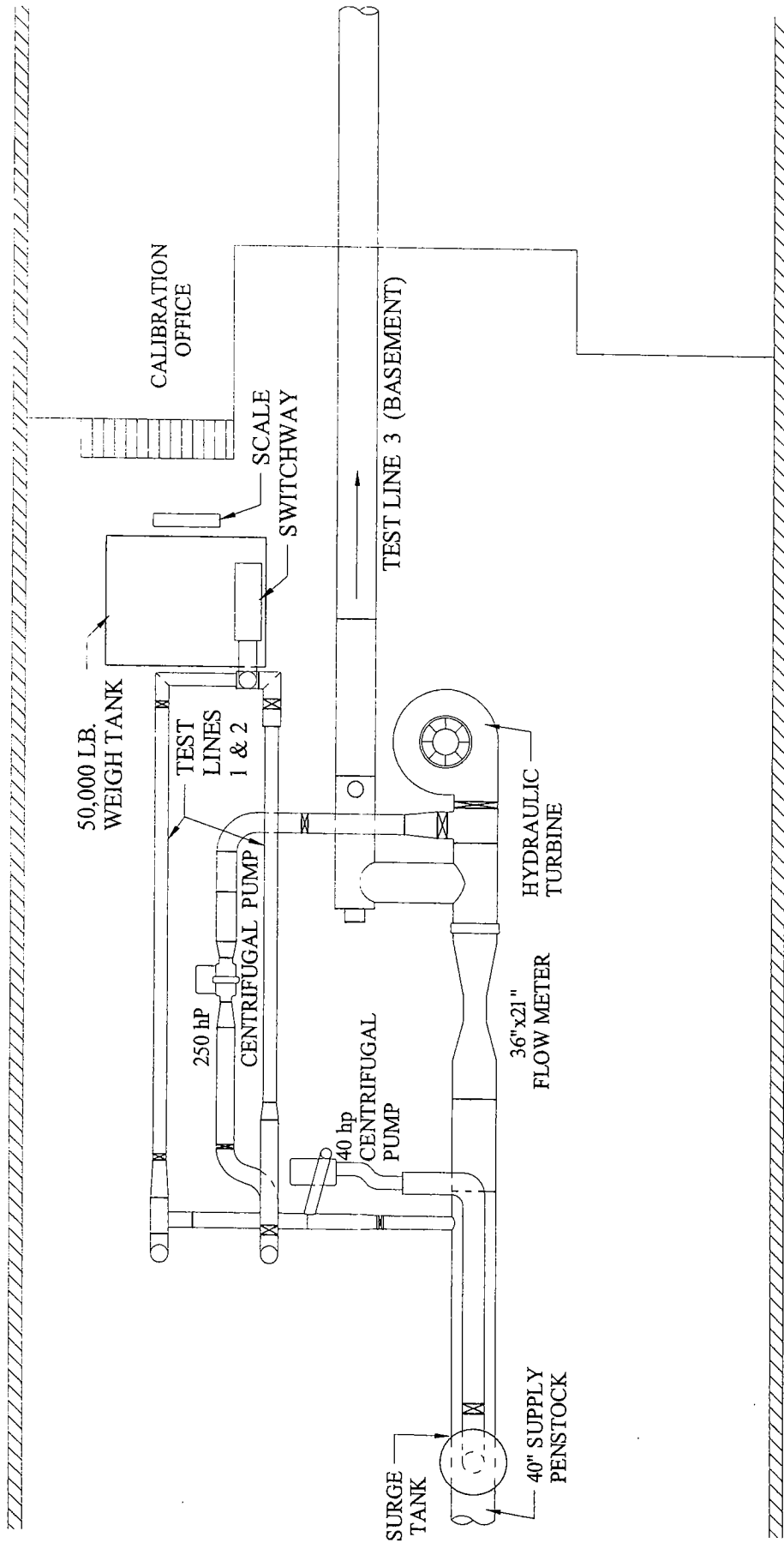
An open channel flow meter, Flo-Dar Serial Number BA-0921, was tested in 36" pipe at Alden Research Laboratory, Inc. (Alden) for Marsh McBirney, Inc. under their Purchase Order Number QPO001299, using Alden's standard test procedures, QA-AGF-7-86 Revision 6. Flow meter performance is presented as deviation of meter output for flow from actual in percent of reading versus depth, in both tabular and graphical format.

## FLOW METER INSTALLATION

The flow meter was installed in Test Line 3 in Building 2 shown in plan view on Figure 1. Water was provided through a 40" penstock from the main Laboratory pond resulting in a gross gravity head of approximately 28 feet. A calibrated 36" by 21" master Venturi measured flows greater than about 2,000 GPM and lower flows were measured with a 12" by 6" Venturi, which had been calibrated immediately before and after testing versus a 50,000 lb capacity weigh tank. The detailed piping arrangement, immediately upstream and downstream of the flow meter installation location, is shown in Figure 2 including all significant fittings and pipe lengths. A downstream butterfly valve, installed with the shaft vertical, was normally in the fully open position such that the flow control was the free discharge. An upstream control valve was used to set each flow. The 12" by 6" Venturi discharge was piped from test line 1 to Line 3 through a 12" line discharging vertically downward upstream of the flow straightener in Line 3. For some tests the valve was used as a control to obtain lower velocities.

A piezometer was installed 2 feet upstream of the entrance to the tee in which the meters were installed. A pressure transducer was used to read the water level at the piezometer.

Figure 1

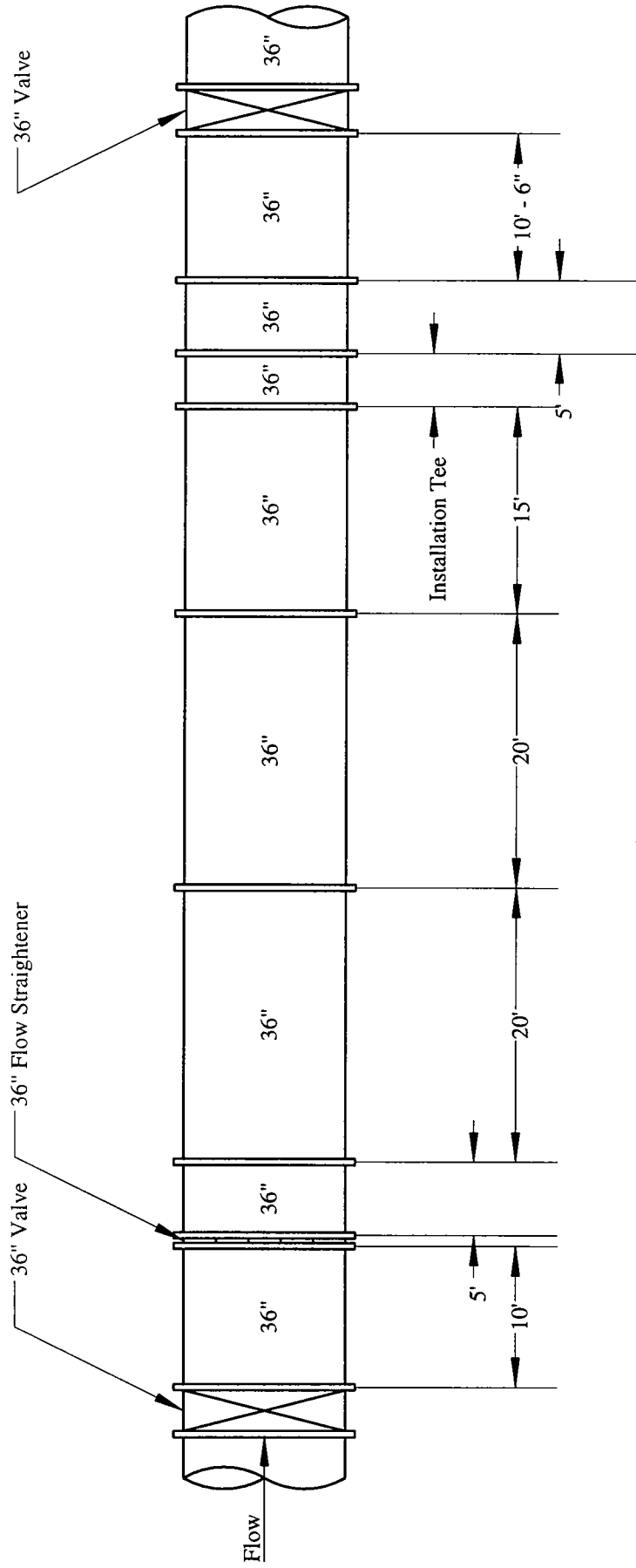


Hooper Low Reynolds Number Facility

Test Line 1, 2 & 3

ALDEN

Figure 2 Plan View Hooper Facility Line 3



Marsh McBirney, Inc.  
Purchase Order Number: QPO001299  
OPEN CHANNEL TEST

July 2003



## FLOW MEASUREMENT METHOD

Flow was measured using Alden's 36" by 21" Master Venturi in the 40" supply penstock and a specially installed 12" by 8" Venturi in test line 1, both of which were calibrated using the gravimetric method (50,000 lb weigh tank) and a transfer standard venturi. The Master Venturi performance is characterized by plotting the discharge coefficient versus pipe Reynolds number. Flow is calculated by Equation (1).

$$q_a = C_{mV} K_m \sqrt{\Delta h_m} \quad (1)$$

where

$q_a$	=	actual flow, $\frac{\text{ft}^3}{\text{sec}}$
$C_{mV}$	=	Master Venturi discharge coefficient, dimensionless
$K_m$	=	Master Venturi constant, $20.6091 \frac{\text{ft}^{2.5}}{\text{sec}}$
$\Delta h_m$	=	Master Venturi differential head, ft

The same equation with a different Venturi constant was used with a different meter coefficient, which was used to calculate flow for the 12" by 8" Venturi. The Venturi was calibrated in place versus the 50,000 lb capacity weigh tank in the Hooper Facility before and after testing.

## TEST PROCEDURE

Marsh McBirney personnel installed their own equipment using the tee for access. A calibration flow was set up using about half full depth so that the equipment could be properly set up. That flow and level, measured by Alden equipment, was supplied to Marsh McBirney. Typically, the downstream control valve was left wide open and the upstream control valve was used to set the

water level. For accuracy testing after the system was allowed to stabilize, typically five average readings with a two minute duration were recorded by a computer based data acquisition system to determine flow and level for Alden data. The test equipment was set to log one minute of depth, flow, and velocity with a time stamp. The average Master Venturi flow, water level, and water temperature were recorded on a data sheet with the time of day. The control valve was then adjusted to the next flow and the procedure repeated.

### FLOW METER SIGNAL RECORDING

The Master Venturi and 12" by 6" Venturi flow meter output was recorded by one of several "Smart" differential pressure transmitters having ranges of 25" W.C., 250" W.C., and 1000" W.C.. Each transmitter was calibrated with a pneumatic or a hydraulic dead weight tester having an accuracy of 0.02% of reading. Transmitter signals were recorded by a PC based data acquisition system having a 16 bit A to D board. Transmitter calibrations were conducted with the PC system such that an end to end calibration was achieved. Transmitter output was read simultaneously with the diversion of flow into the weigh tank at a rate of about 34 Hz for each test run (flow) and averaged to obtain a precise differential head. A similar transmitter with a range of 250" WC was used to measure the water level in the pipe using a pressure tap at the bottom of the pipe just upstream of the tee and a reference water level pot filled to the level of the invert. The level and Venturi meter outputs were measured and averaged simultaneously.

### TEST RESULTS

The flow meter data logged outputs of level, velocity and flow over the entire test period and a data file was provided at the end of testing. The Appendix includes a printout of the data supplied. The raw data was averaged over the time period Alden averaged flow and depth and the averaged data is outlined by a box. Alden data, including the time of day, measured master meter flow, line temperature, and the water level at the piezometer are shown the table. For comparison to the test flow meter readings, the two Alden readings were averaged for each test depth. Initially, a setup

test at about half full pipe was recorded and flow and depth data was provided to Marsh McBirney personnel.

Test results are summarized for each test depth as a table of time of day, Alden flow and depth and the meter flow averaged over the same time period as the Alden average. The deviation the flow from the Alden average of two readings is shown as a percent of reading in a table. Deviation of flow is plotted versus depth with the average deviation shown.

Analysis indicates that the flow measurement uncertainty is within 0.50% of the true value for each test run. Calibrations of the test instrumentation (temperature, time, weight, and length measurements) are traceable to the National Institute of Standards and Technology (formerly the National Bureau of Standards) and Alden's Quality Assurance Program is designed to meet ANSI/NCSL Z540-1-1994 "Calibration Laboratories and Test Equipment-General Requirements" (supercedes MIL-STD-45662A).



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# MARSH MCBIRNEY, INC.

Purchase Order Number: QPO001299  
 OPEN CHANNEL TEST #2 FLO-DAR W/SURCHARGE VEL. SEN  
 Serial Number: BA-0921

CALIBRATION  
 DATE: July 17, 2003  
 PIPE DIAMETER = 35.3070

Run #	Time of Day	Line Temp Deg F	Air Temp Deg F	Output [see note]	Flow GPM	H Line FT H2O	Flo - Dar Reading GPM	Deviation Percent
1	12:18	75	68	2.604~	4874.0	1.568	4988.9	2.4
2	12:20	75	68	2.604~	4874.7	1.568		
3	12:40	75	68	2.195~	304.2	0.505	314.5	3.4
4	12:44	75	68	2.194~	303.3	0.503		
5	13:03	75	68	2.365~	1524.4	0.948	1556.2	2.1
6	13:07	75	68	2.365~	1523.9	0.948		
7	13:24	75	68	2.591~	4668.2	1.536	4716.1	1.0
8	13:28	75	68	2.592~	4667.5	1.537		
9	13:41	75	68	2.786~	8422.8	2.043	8494.6	0.9
10	13:45	75	68	2.786~	8419.9	2.042		
11	13:59	75	68	2.961~	12463.5	2.497	12558.5	0.8
12	14:02	75	68	2.960~	12462.1	2.496		
13	14:13	75	68	3.139~	16949.7	2.959	17424.4	2.8
14	14:17	75	68	3.138~	16940.1	2.958		

~ dp transmitter volts

The data reported on herein was obtained by measuring equipment the calibration of which is traceable to NIST, following the installation and test procedures referenced in this report, resulting in a flow measurement uncertainty of +/- 0.25% or less.

CALIBRATED BY: GRK

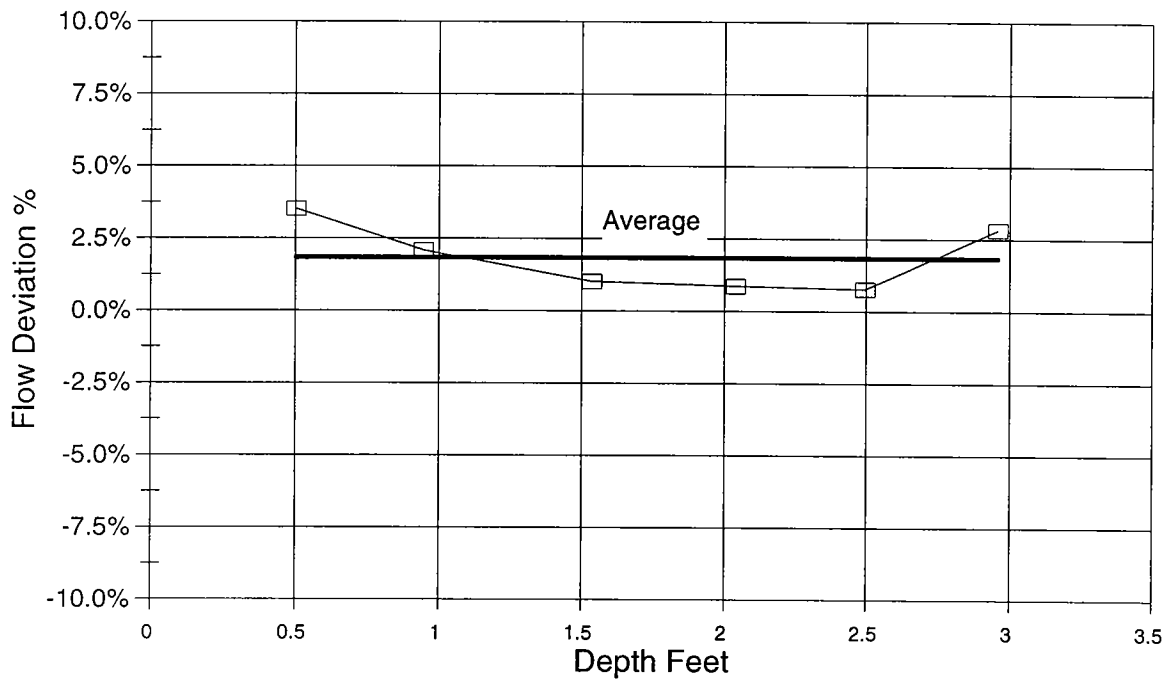
CERTIFIED BY: 



### Marsh McBirney Flo-Dar

Tested 7/17/03

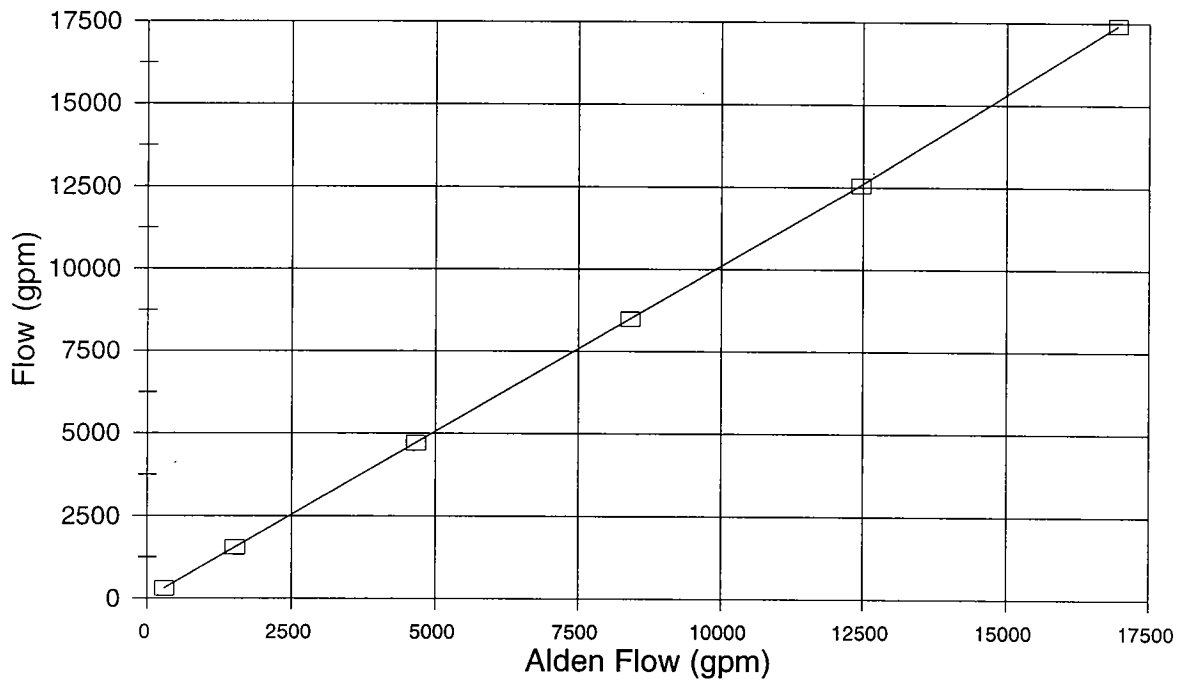
Flow Deviation(%) vs Depth



**Marsh McBirney Flo-Dar**

Tested 7/17/03

Flow (gpm) vs Alden Flow (gpm)



APPENDIX  
DATA LOG FILE WITH AVERAGES

Marsh McBirney Flo-Dar 7/17/03

Avg Ve	Level	Flow	Surch Avg	Surch_Fl	Time			
1.969	12.32	1873.2	0	0	12:01:20 PM			
2.447	14.57	2918.0	0	0	12:01:54 PM			
2.426	15.21	3062.4	0	0	12:02:27 PM			
2.647	16.79	3801.6	0	0	12:03:00 PM			
2.987	18.36	4809.4	0	0	12:03:33 PM			
2.963	18.62	4854.9	0	0	12:04:07 PM			
2.911	18.87	4850.0	0	0	12:04:40 PM			
2.912	19.02	4900.8	0	0	12:05:13 PM			
2.947	18.92	4927.8	0	0	12:05:47 PM			
2.903	19.02	4885.5	0	0	12:06:20 PM			
2.894	19	4863.4	0	0	12:06:53 PM			
2.965	18.87	4941.0	0	0	12:07:26 PM			
2.901	18.87	4834.9	0	0	12:08:00 PM			
2.995	19.08	5059.5	0	0	12:08:33 PM			
2.92	18.89	4872.0	0	0	12:09:06 PM			
2.957	18.99	4967.1	0	0	12:09:39 PM			
2.949	19.12	4996.3	0	0	12:10:13 PM			
3.039	18.94	5086.9	0	0	12:10:46 PM			
2.913	19.11	4931.3	0	0	12:11:20 PM			
2.902	18.96	4865.2	0	0	12:11:53 PM			
2.94	19.09	4970.7	0	0	12:12:26 PM			
2.996	19.17	5090.9	0	0	12:12:59 PM	2.966	19.012	4988.94
2.967	19.03	4996.1	0	0	12:13:33 PM	2.966	19.012	4988.94
2.956	18.9	4936.1	0	0	12:14:06 PM	2.966	19.012	4988.94
2.947	18.84	4900.4	0	0	12:14:39 PM	2.966	19.012	4988.94
2.958	19.07	4994.6	0	0	12:15:12 PM	2.966	19.012	4988.94
2.993	18.92	5003.8	0	0	12:15:46 PM	2.966	19.012	4988.94
2.912	19.06	4914.3	0	0	12:16:19 PM	2.966	19.012	4988.94
2.93	19.04	4938.2	0	0	12:16:53 PM	2.966	19.012	4988.94
2.922	19.07	4933.1	0	0	12:17:26 PM	2.966	19.012	4988.94
2.985	19.04	5030.3	0	0	12:17:59 PM	2.966	19.012	4988.94
3.021	19	5077.5	0	0	12:18:33 PM	2.966	19.012	4988.94
3.03	19.01	5096.4	0	0	12:19:06 PM	2.966	19.012	4988.94
2.995	19.09	5063.0	0	0	12:19:39 PM	2.966	19.012	4988.94
2.911	18.95	4877.1	0	0	12:20:12 PM	2.966	19.012	4988.94
2.966	18.99	4982.3	0	0	12:20:46 PM	2.966	19.012	4988.94
2.966	18.96	4972.0	0	0	12:21:19 PM			
2.896	19.2	4930.8	0	0	12:21:52 PM			
2.93	19.01	4928.0	0	0	12:22:25 PM			
2.976	19.08	5028.8	0	0	12:22:59 PM			
2.967	19.03	4996.1	0	0	12:23:32 PM			
2.977	19.17	5059.9	0	0	12:24:05 PM			
2.985	19.01	5019.8	0	0	12:24:38 PM			
2.938	18.93	4916.0	0	0	12:25:12 PM			
2.958	19.07	4994.6	0	0	12:25:45 PM			
2.904	19.09	4909.1	0	0	12:26:18 PM			
2.939	19.03	4950.2	0	0	12:26:52 PM			
2.958	19.08	4998.0	0	0	12:27:25 PM			
2.942	18.77	4870.8	0	0	12:27:58 PM			
2.972	19.02	5001.8	0	0	12:28:31 PM			
2.988	18.83	4966.1	0	0	12:29:05 PM			
2.882	19.02	4850.3	0	0	12:29:38 PM			

2.892	19.07	4882.2	0	0	12:30:11 PM			
1.448	11.22	1211.3	0	0	12:30:45 PM			
1.182	8.84	708.7	0	0	12:31:18 PM			
1.093	7.8	549.1	0	0	12:31:51 PM			
1.019	7.2	456.5	0	0	12:32:24 PM			
1.006	6.86	420.8	0	0	12:32:57 PM			
0.996	6.69	401.7	0	0	12:33:30 PM			
0.961	6.55	375.9	0	0	12:34:04 PM			
0.926	6.45	354.5	0	0	12:34:37 PM			
0.934	6.37	351.0	0	0	12:35:10 PM			
0.908	6.31	336.7	0	0	12:35:43 PM			
0.882	6.2	318.8	0	0	12:36:16 PM			
0.898	6.21	325.6	0	0	12:36:50 PM			
0.898	6.21	325.6	0	0	12:37:23 PM			
0.881	6.17	316.5	0	0	12:37:56 PM			
0.898	6.15	320.8	0	0	12:38:29 PM			
0.897	6.12	318.5	0	0	12:39:03 PM	0.888	6.112	314.5
0.889	6.15	317.9	0	0	12:39:36 PM	0.888	6.112	314.5
0.889	6.12	315.5	0	0	12:40:09 PM	0.888	6.112	314.5
0.889	6.15	317.9	0	0	12:40:42 PM	0.888	6.112	314.5
0.889	6.14	317.1	0	0	12:41:16 PM	0.888	6.112	314.5
0.881	6.11	311.8	0	0	12:41:49 PM	0.888	6.112	314.5
0.889	6.09	313.2	0	0	12:42:22 PM	0.888	6.112	314.5
0.881	6.09	310.2	0	0	12:42:55 PM	0.888	6.112	314.5
0.889	6.11	314.7	0	0	12:43:29 PM	0.888	6.112	314.5
0.897	6.09	316.1	0	0	12:44:02 PM	0.888	6.112	314.5
0.881	6.11	311.8	0	0	12:44:35 PM	0.888	6.112	314.5
0.889	6.11	314.7	0	0	12:45:08 PM	0.888	6.112	314.5
0.889	6.09	313.2	0	0	12:45:42 PM	0.888	6.112	314.5
0.881	6.09	310.2	0	0	12:46:15 PM	0.888	6.112	314.5
0.872	6.11	308.9	0	0	12:46:48 PM			
0.889	6.1	314.0	0	0	12:47:21 PM			
0.889	6.11	314.7	0	0	12:47:54 PM			
0.897	6.08	315.3	0	0	12:48:27 PM			
0.898	6.13	319.3	0	0	12:49:01 PM			
0.889	6.13	316.3	0	0	12:49:34 PM			
0.897	6.12	318.5	0	0	12:50:07 PM			
1.813	8.22	981.0	0	0	12:50:40 PM			
1.607	9.23	1024.0	0	0	12:51:13 PM			
1.762	10.48	1340.9	0	0	12:51:46 PM			
1.752	11.11	1445.8	0	0	12:52:19 PM			
1.798	11.34	1526.6	0	0	12:52:52 PM			
1.782	11.46	1535.0	0	0	12:53:25 PM			
1.791	11.51	1552.3	0	0	12:53:58 PM			
1.8	11.49	1555.9	0	0	12:54:32 PM			
1.8	11.55	1567.7	0	0	12:55:05 PM			
1.809	11.53	1571.3	0	0	12:55:38 PM			
1.783	11.55	1552.5	0	0	12:56:12 PM			
1.818	11.54	1580.9	0	0	12:56:45 PM			
1.809	11.51	1567.4	0	0	12:57:18 PM			
1.791	11.51	1552.3	0	0	12:57:51 PM			
1.791	11.49	1548.4	0	0	12:58:25 PM			
1.782	11.48	1538.9	0	0	12:58:58 PM			
1.809	11.51	1567.4	0	0	12:59:31 PM			

1.817	11.49	1571.0	0	0	1:00:04 PM			
1.774	11.5	1535.2	0	0	1:00:38 PM			
1.8	11.52	1561.8	0	0	1:01:11 PM	1.796	11.508	1556.2
1.783	11.56	1554.4	0	0	1:01:44 PM	1.796	11.508	1556.2
1.792	11.54	1558.1	0	0	1:02:17 PM	1.796	11.508	1556.2
1.8	11.52	1561.8	0	0	1:02:50 PM	1.796	11.508	1556.2
1.809	11.52	1569.4	0	0	1:03:24 PM	1.796	11.508	1556.2
1.8	11.54	1565.7	0	0	1:03:57 PM	1.796	11.508	1556.2
1.791	11.49	1548.4	0	0	1:04:30 PM	1.796	11.508	1556.2
1.782	11.48	1538.9	0	0	1:05:03 PM	1.796	11.508	1556.2
1.8	11.5	1557.9	0	0	1:05:36 PM	1.796	11.508	1556.2
1.8	11.48	1554.0	0	0	1:06:10 PM	1.796	11.508	1556.2
1.799	11.44	1546.1	0	0	1:06:43 PM	1.796	11.508	1556.2
1.8	11.5	1557.9	0	0	1:07:16 PM	1.796	11.508	1556.2
1.808	11.44	1553.6	0	0	1:07:49 PM			
1.808	11.44	1553.6	0	0	1:08:23 PM			
1.791	11.47	1544.5	0	0	1:08:56 PM			
1.8	11.48	1554.0	0	0	1:09:29 PM			
1.782	11.46	1535.0	0	0	1:10:02 PM			
1.791	11.48	1546.4	0	0	1:10:35 PM			
1.799	11.46	1550.0	0	0	1:11:08 PM			
1.8	11.5	1557.9	0	0	1:11:41 PM			
1.1	8.38	611.6	0	0	1:12:15 PM			
0.924	7	397.7	0	0	1:12:48 PM			
1.974	9.12	1237.3	0	0	1:13:21 PM			
2.261	12.7	2241.2	0	0	1:13:54 PM			
2.101	13.48	2258.4	0	0	1:14:27 PM			
2.597	16.26	3578.3	0	0	1:15:01 PM			
2.682	16.76	3843.0	0	0	1:15:34 PM			
2.876	18.36	4629.6	0	0	1:16:08 PM			
2.923	18.6	4783.3	0	0	1:16:41 PM			
2.922	18.56	4769.8	0	0	1:17:14 PM			
2.905	18.58	4747.2	0	0	1:17:47 PM			
2.895	18.53	4715.7	0	0	1:18:21 PM			
2.914	18.63	4778.8	0	0	1:18:54 PM			
2.859	18.56	4667.0	0	0	1:19:27 PM			
2.897	18.76	4793.0	0	0	1:20:00 PM			
2.825	18.72	4660.8	0	0	1:20:33 PM			
2.844	18.77	4707.0	0	0	1:21:07 PM			
2.852	18.67	4688.8	0	0	1:21:40 PM			
2.896	18.59	4735.8	0	0	1:22:14 PM	2.876	18.630	4716.1
2.843	18.67	4674.0	0	0	1:22:47 PM	2.876	18.630	4716.1
2.878	18.62	4716.4	0	0	1:23:20 PM	2.876	18.630	4716.1
2.905	18.64	4767.4	0	0	1:23:54 PM	2.876	18.630	4716.1
2.923	18.63	4793.5	0	0	1:24:27 PM	2.876	18.630	4716.1
2.904	18.56	4740.4	0	0	1:25:00 PM	2.876	18.630	4716.1
2.878	18.63	4719.8	0	0	1:25:34 PM	2.876	18.630	4716.1
2.88	18.82	4783.3	0	0	1:26:07 PM	2.876	18.630	4716.1
2.834	18.68	4662.5	0	0	1:26:40 PM	2.876	18.630	4716.1
2.842	18.65	4667.4	0	0	1:27:14 PM	2.876	18.630	4716.1
2.841	18.49	4614.6	0	0	1:27:47 PM	2.876	18.630	4716.1
2.887	18.58	4717.8	0	0	1:28:20 PM	2.876	18.630	4716.1
2.861	18.71	4716.8	0	0	1:28:54 PM			
2.806	18.56	4579.0	0	0	1:29:27 PM			



2.868	18.54	4675.1	0	0	1:30:00 PM			
2.859	18.54	4660.4	0	0	1:30:34 PM			
3.892	23.97	9216.4	0	0	1:31:07 PM			
3.606	25.09	8917.8	0	0	1:31:40 PM			
3.615	25.42	9042.7	0	0	1:32:13 PM			
3.581	24.83	8772.1	0	0	1:32:47 PM			
3.553	24.84	8707.8	0	0	1:33:20 PM			
3.401	24.67	8281.2	0	0	1:33:53 PM			
3.449	24.73	8416.5	0	0	1:34:26 PM			
3.505	24.78	8571.3	0	0	1:34:59 PM			
3.472	24.93	8536.7	0	0	1:35:32 PM			
3.427	24.97	8437.3	0	0	1:36:06 PM			
3.411	24.71	8318.6	0	0	1:36:39 PM			
3.414	24.85	8370.4	0	0	1:37:13 PM			
3.419	25.02	8432.7	0	0	1:37:46 PM			
3.651	24.66	8886.4	0	0	1:38:19 PM			
3.461	24.84	8480.4	0	0	1:38:52 PM	3.462	24.878	8494.6
3.354	24.64	8157.3	0	0	1:39:26 PM	3.462	24.878	8494.6
3.341	24.87	8195.6	0	0	1:39:59 PM	3.462	24.878	8494.6
3.463	24.95	8521.3	0	0	1:40:32 PM	3.462	24.878	8494.6
3.285	24.89	8066.1	0	0	1:41:05 PM	3.462	24.878	8494.6
3.416	24.93	8399.8	0	0	1:41:38 PM	3.462	24.878	8494.6
3.451	24.81	8446.5	0	0	1:42:11 PM	3.462	24.878	8494.6
3.609	24.83	8840.3	0	0	1:42:45 PM	3.462	24.878	8494.6
3.574	24.91	8780.1	0	0	1:43:18 PM	3.462	24.878	8494.6
3.405	24.84	8344.0	0	0	1:43:51 PM	3.462	24.878	8494.6
3.599	24.83	8817.5	0	0	1:44:25 PM	3.462	24.878	8494.6
3.581	25.19	8886.7	0	0	1:44:58 PM	3.462	24.878	8494.6
3.418	24.98	8418.1	0	0	1:45:31 PM			
3.386	24.82	8291.2	0	0	1:46:04 PM			
3.571	24.81	8741.6	0	0	1:46:37 PM			
3.444	24.54	8344.8	0	0	1:47:10 PM			
3.415	24.87	8377.8	0	0	1:47:44 PM			
3.586	25.03	8849.0	0	0	1:48:17 PM			
3.383	24.71	8250.8	0	0	1:48:50 PM			
3.479	24.83	8522.1	0	0	1:49:24 PM			
3.358	24.84	8230.3	0	0	1:49:57 PM			
3.95	27.59	10515.8	0	0	1:50:31 PM			
4.033	28.51	10969.4	0	0	1:51:04 PM			
4.432	30.09	12442.4	0	0	1:51:37 PM			
4.487	30.23	12631.1	0	0	1:52:11 PM			
4.562	30.37	12876.0	0	0	1:52:44 PM			
4.482	30.32	12637.0	0	0	1:53:17 PM			
4.481	30.1	12582.8	0	0	1:53:50 PM			
4.379	30.21	12321.8	0	0	1:54:24 PM			
4.501	30.31	12688.3	0	0	1:54:57 PM			
4.339	30.6	12296.5	0	0	1:55:30 PM			
4.538	30.48	12834.5	0	0	1:56:04 PM			
4.394	30.32	12389.2	0	0	1:56:37 PM			
4.612	30.58	13066.1	0	0	1:57:10 PM	4.449	30.376	12558.5
4.389	30.43	12401.5	0	0	1:57:43 PM	4.449	30.376	12558.5
4.454	30.35	12565.4	0	0	1:58:17 PM	4.449	30.376	12558.5
4.407	30.4	12445.8	0	0	1:58:50 PM	4.449	30.376	12558.5
4.459	30.45	12602.2	0	0	1:59:23 PM	4.449	30.376	12558.5

4.488	30.05	12591.6	0	0	1:59:57 PM	4.449	30.376	12558.5
4.435	30.36	12513.9	0	0	2:00:30 PM	4.449	30.376	12558.5
4.408	30.42	12453.1	0	0	2:01:03 PM	4.449	30.376	12558.5
4.458	30.43	12594.8	0	0	2:01:37 PM	4.449	30.376	12558.5
4.383	30.29	12350.8	0	0	2:02:10 PM	4.449	30.376	12558.5
4.452	30.71	12642.1	0	0	2:02:43 PM			
4.561	30.54	12912.3	0	0	2:03:16 PM			
4.38	30.23	12329.1	0	0	2:03:50 PM			
4.694	30.47	13273.2	0	0	2:04:23 PM			
4.357	30.36	12293.4	0	0	2:04:56 PM			
4.4	30.46	12440.0	0	0	2:05:30 PM			
4.4	30.46	12396.8	0	0	2:05:30 PM			
0.615	35.03	3785.5	1.544	4761.8	2:06:03 PM			
0.736	34.68	6770.1	4.935	15224.9	2:06:36 PM			
0.974	35.01	11983.2	6.268	19338.9	2:07:09 PM			
1.538	35.06	23670.9	4.316	13313.7	2:07:43 PM			
0.938	35.66	ERR	5.218	16099.5	2:08:16 PM			
0.276	34.73	5929.7	6.216	19176.9	2:08:52 PM			
0.731	35.61	ERR	5.628	17362.9	2:09:25 PM			
1.317	35.52	ERR	5.996	18496.6	2:09:58 PM			
0.952	34.87	29255.0	6.121	18885.3	2:10:31 PM			
0.857	34.5	28854.1	5.408	16682.6	2:11:04 PM			
1.046	35.04	38618.1	5.46	16844.6	2:11:38 PM			
0.848	34.66	33805.7	5.261	16229.1	2:12:11 PM	5.6	35.149	17424.4
1.233	35.27	53193.2	6.079	18755.8	2:12:47 PM	5.648	35.149	17424.4
0.915	35.33	42304.0	5.439	16779.8	2:13:26 PM	5.648	35.149	17424.4
1.361	35.71		5.282	16293.9	2:13:59 PM	5.648	35.149	17424.4
1.007	35.36	52813.1	6.636	20472.6	2:14:32 PM	5.648	35.149	17424.4
0.702	34.26	38580.0	6.038	18626.2	2:15:05 PM	5.648	35.149	17424.4
0.79	35.11	46211.5	5.471	16877.0	2:15:39 PM	5.648	35.149	17424.4
1.89	35.24	116469.0	4.442	13702.4	2:16:15 PM	5.648	35.149	17424.4
1.147	34.92	74053.7	5.418	16715.0	2:16:48 PM	5.648	35.149	17424.4
0.659	35.63		6.416	19792.4	2:17:22 PM	5.648	35.149	17424.4
1.427	35.23	101167.8	4.946	15257.3	2:17:55 PM			
0.85	34.89	62685.1	5.408	16682.6	2:18:28 PM			