

*Protecting Our Water Environment*



*Metropolitan Water Reclamation District of Greater Chicago*

***MONITORING AND RESEARCH  
DEPARTMENT***

***REPORT NO. 17-30***

***TUNNEL AND RESERVOIR PLAN***

***MAINSTREAM TUNNEL SYSTEM***

***ANNUAL GROUNDWATER MONITORING REPORT***

***FOR 2016***

***August 2017***

## Protecting Our Water Environment

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Edward W. Podczerwinski, P.E.  
Acting Director of Monitoring and Research

July 26, 2017

Chief  
Bureau of Water  
Illinois Environmental Protection Agency  
P. O. Box 19276  
Springfield, IL 62794-9276

Dear Sir or Madam:

Subject: Tunnel and Reservoir Plan, Mainstream Tunnel System, Annual  
Groundwater Monitoring Report for 2016

Attached are three copies of the "Tunnel and Reservoir Plan, Mainstream Tunnel System,  
Annual Groundwater Monitoring Report for 2016."

Very truly yours,

Albert E. Cox  
Environmental Monitoring and Research Manager  
Monitoring and Research Department

AC:PL:cm  
Attachment

cc w/att: Ms. Sally K. Swanson (USEPA Region 5 - WC15J) - (2)  
Mr. Podczerwinski  
Dr. Zhang  
Dr. Cox  
Dr. Tian  
Dr. Lindo  
cc w/o att: Mr. St. Pierre  
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**TUNNEL AND RESERVOIR PLAN MAINSTREAM TUNNEL SYSTEM**  
**ANNUAL GROUNDWATER MONITORING**  
**REPORT FOR 2016**

**Monitoring and Research Department**  
**Edward W. Podczewinski, Acting Director**

**August 2017**

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## LIST OF ABBREVIATIONS

°C	degrees Celsius
CFU	colony forming units
Cl <sup>-</sup>	chloride
EC	electrical conductivity
FC	fecal coliform
ft	feet
hr	hour
L	liter
m	meter
mg	milligram
mS	millisiemens
NH <sub>3</sub> -N	ammonia nitrogen
SO <sub>4</sub> <sup>2-</sup>	sulfate
TDS	total dissolved solids
TOC	total organic carbon

## ANNUAL DATA FOR MONITORING AND OBSERVATION WELLS

### Introduction

The monitoring and observation wells are located along the length of the Mainstream Tunnel System between Morton Grove and Hodgkins, Illinois (Figures 1 and 2). The elevations for the observation wells are measured approximately 12 times per year, while the monitoring wells are sampled at various frequencies. Monitoring wells QM-53, -56, -58, -61, -66, -68 through -74, -76, -77, and -81 are all sampled three times per year (Illinois Environmental Protection Agency [IEPA] memoranda dated July 9, 2004, and February 23, 2006). Monitoring wells QM-62 through -65, -67, -75, -78 through -80, and -82 are all sampled six times per year (IEPA memorandum dated July 9, 2004). In 1994, the termination of monitoring for Wells QM-51, -52, -54, -55, -57, and -60 was approved by the IEPA (memorandum dated May 4, 1994). Monitoring well QM-65 could not be sampled throughout the year due to a faulty pump. Monitoring of observation well OM-17 was also discontinued with the approval of the IEPA (letter dated December 16, 2011). This well is scheduled for service later. Only two samples were retrieved from Well QM-66 in 2016. Monitoring well QM-59 has been dry since February 1995 and is no longer monitored.

Most monitoring wells in the Mainstream Tunnel System were sampled at the required frequencies. However, in a few instances, samples from specific wells could not be retrieved for various reasons. Throughout the year, monitoring samples were not collected from QM-56 due to a defective pump, and QM-58 was inaccessible due to closure of facilities in the vicinity of QM-58. In 2016, the required six samples were retrieved from Wells QM-62 and -82, unlike previous years. Both wells were considered intermittently dry in the past.

### Summary of Data

**Monitoring Wells.** The analytical data for groundwater sampled during 2016 from monitoring wells QM-53 through QM-82 are presented in Table 1. Physical characteristics, such as elevation, groundwater temperature, and estimated time of recharge for each well between initial drawdown and sampling, are also included. Similar to year 2015, fecal coliform (FC) counts in Wells QM-61, -62, -63, -64, and -67 were much higher than expected at various times during the year. Three wells (QM-61, -64, and -68) were decontaminated earlier in the year, using the standard procedure, and significant reductions in FC counts were observed in Wells QM-64 and -68. Wells QM-61, -62, -63, -67, -68, -75, and -77 were all decontaminated on December 19, 2016.

Wells QM-62 and -63 were recently selected for special evaluation by U.S. Geological Survey personnel. Following this evaluation, both wells were serviced and decontaminated. The pumps in both wells and PVC pipe in QM-63 were replaced.

Table 2 lists the descriptive statistics for groundwater data of monitoring wells QM-53 through QM-82 for 2016.



FIGURE 1: MAP OF THE MONITORING WELLS IN THE MAINSTREAM TUNNEL SYSTEM

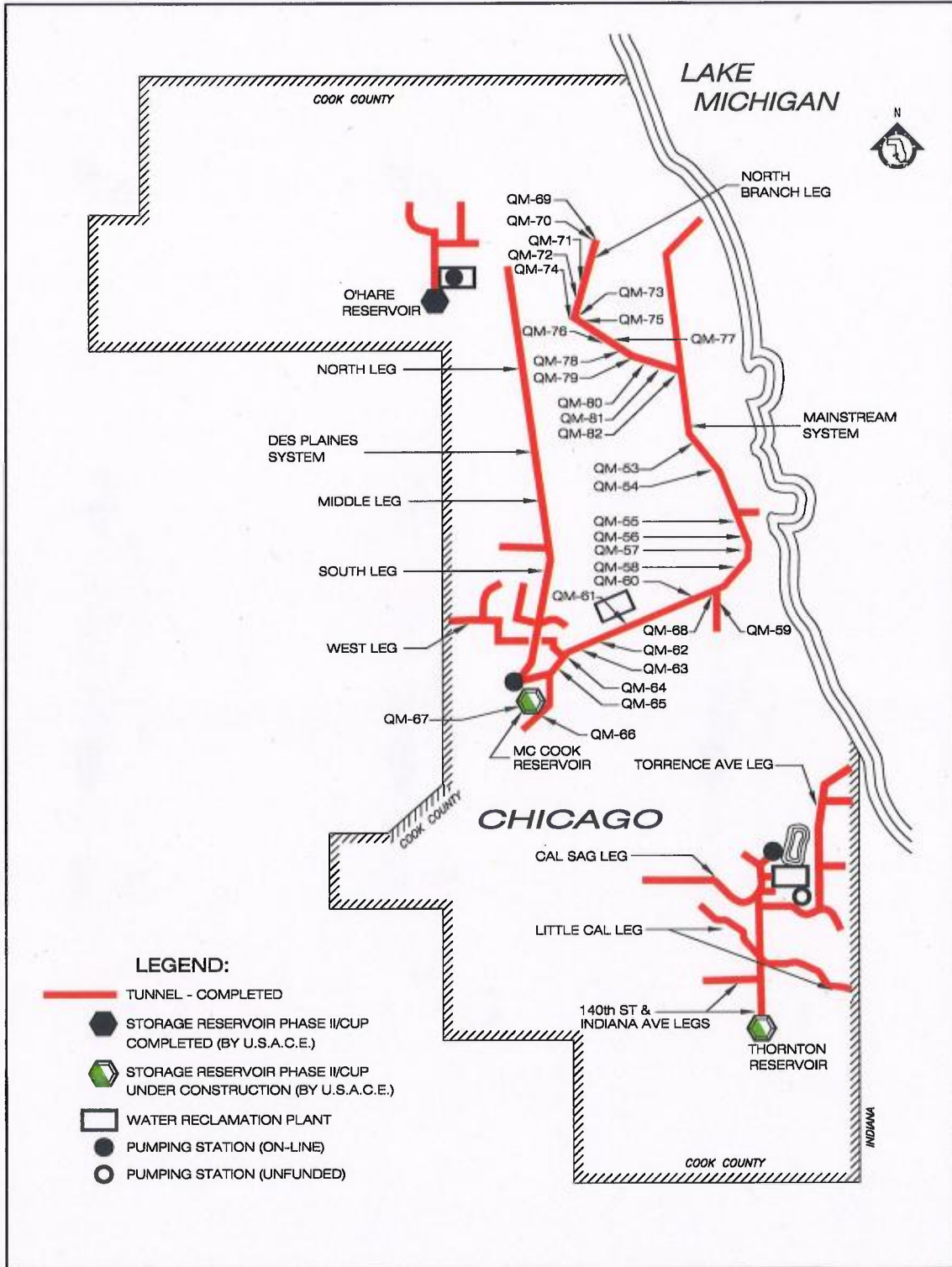


FIGURE 2: MAP OF THE OBSERVATION WELLS IN THE MAINSTREAM TUNNEL SYSTEM

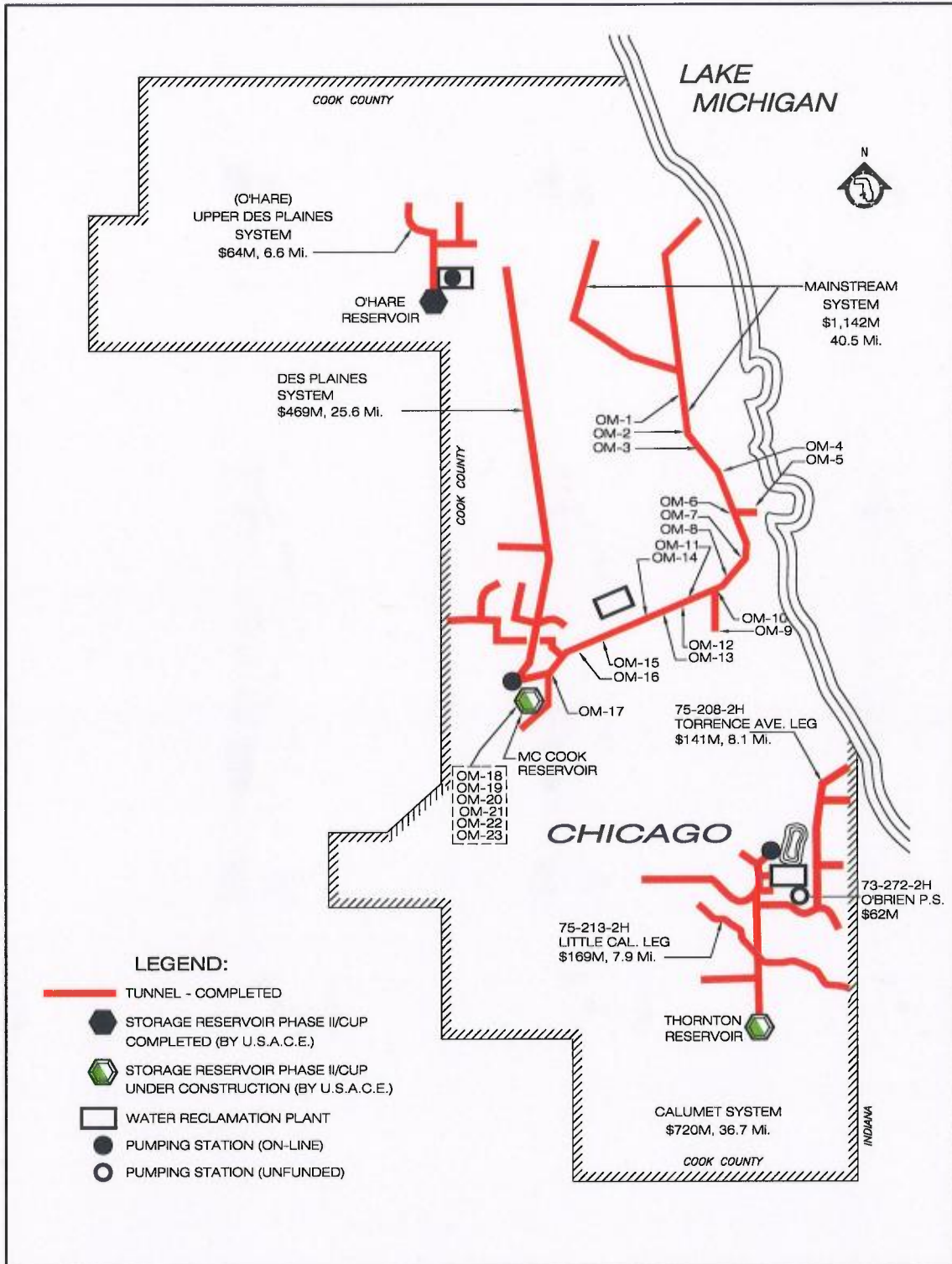


TABLE 1: ANALYSIS OF GROUNDWATER FROM WELLS QM-53 THROUGH QM-82 IN THE MAINSTREAM TUNNEL SYSTEM OF THE TUNNEL AND RESERVOIR PLAN SAMPLED DURING 2016

Well	Date Sampled	pH	EC <sup>1</sup> mS/m	TDS <sup>1</sup>	TOC <sup>1</sup>	Cl <sup>-</sup>	SO <sub>4</sub> <sup>2-</sup>	NH <sub>3</sub> -N	Hardness	Fecal Coliform CFU/100 mL	Temp °C	Water Elevation <sup>2</sup> ft	Recharge Time hr
QM-53	06/22/16	8.2	34	208	<1.0	16	37	0.11	152	<1	12.1	-36	<48
QM-53	09/08/16	8.3	35	220	<1.0	15	38	<0.10	149	<1	12.0	-34	<48
QM-53	12/07/16	8.2	35	128	<1.0	15	36	<0.10	152	<1	10.7	-35	<48
QM-61	02/03/16	7.6	56	270	<1.0	45	15	0.27	112	200	13.2	-142	<4
QM-61	06/27/16	7.3	75	388	<1.0	69	36	0.63	155	1,100	13.2	-147	<4
QM-61	09/08/16	7.4	68	382	1.2	66	29	0.65	162	2,900	15.1	-142	<4
QM-62	01/28/16	7.5	56	328	<1.0	54	30	0.16	151	140	13.0	-182	<48
QM-62	04/14/16	8.3	58	302	<1.0	47	27	0.43	152	160	14.4	-187	<48
QM-62	06/22/16	7.7	60	346	<1.0	52	19	0.60	155	1,400	14.2	-170	<48
QM-62	08/24/16	7.5	65	386	1.9	55	26	0.43	172	1,400	14.4	-164	<48
QM-62	10/05/16	7.3	56	342	1.5	72	18	0.54	175	14,200	14.9	-159	<48
QM-62	12/07/16	7.6	62	360	1.4	51	31	0.61	170	21	13.4	-177	<48
QM-63	01/28/16	7.3	184	1,688	2.3	49	994	2.2	927	4	13.1	-174	<48
QM-63	04/14/16	7.9	196	1,664	2.3	50	1,075	2.3	907	11	13.7	-178	<48
QM-63	06/22/16	7.5	150	1,710	1.6	51	950	2.0	829	7	13.8	-163	<48
QM-63	08/24/16	7.5	192	1,642	2.1	45	839	1.7	709	2,000	13.8	-160	<48
QM-63	10/05/16	7.4	152	1,532	2.6	48	971	2.1	849	3,300	14.2	-150	<48
QM-63	12/07/16	7.7	188	1,652	2.5	45	876	2.3	842	2	13.3	-166	<48
QM-64	02/03/16	7.5	69	402	<1.0	48	45	1.7	188	4	13.6	-148	<4
QM-64	03/24/16	8.0	76	408	1.1	47	40	1.5	183	<1	13.5	-169	<4
QM-64	06/27/16	7.5	70	420	<1.0	54	51	1.5	204	21	14.8	-156	<4

TABLE 1 (Continued): ANALYSIS OF GROUNDWATER FROM WELLS QM-53 THROUGH QM-82 IN THE MAINSTREAM TUNNEL SYSTEM OF THE TUNNEL AND RESERVOIR PLAN SAMPLED DURING 2016

Well	Date Sampled	pH	EC <sup>1</sup>	TDS <sup>1</sup>	TOC <sup>1</sup>	Cl <sup>-</sup>	SO <sub>4</sub> <sup>2-</sup>	NH <sub>3</sub> -N	Hardness	Fecal Coliform	Temp	Water Elevation <sup>2</sup>	Recharge Time
			mS/m				mg/L			CFU/100 mL	°C	ft	hr
QM-64	07/25/16	7.2	75	372	1.2	43	54	1.6	203	9,000	15.9	-114	<4
QM-64	10/31/16	7.3	71	398	1.3	51	43	1.6	180	200	14.8	-165	<4
QM-64	12/14/16	7.2	75	390	1.3	49	39	2.0	201	14	13.2	-170	<4
QM-66	10/05/16	12.4	423	1,910	1.5	151	165	1.6	4	<1	14.5	-319	<48
QM-66	11/09/16	12.3	460	1,790	1.7	157	138	1.4	2	<1	14.0	-319	<48
QM-67	02/24/16	7.2	203	636	3.5	180	<5	12	237	32	13.7	-137	<48
QM-67	05/26/16	7.2	150	810	3.0	242	51	12	297	9	14.1	-158	<48
QM-67	06/22/16	7.5	148	820	2.7	218	73	12	318	510	14.2	-157	<48
QM-67	08/17/16	7.3	139	780	3.6	191	44	12	295	480	16.3	-157	<48
QM-67	10/05/16	7.4	135	706	4.2	161	25	12	289	980	15.0	-159	<48
QM-67	12/07/16	7.5	124	642	4.0	348	18	13	275	4,600	13.2	-157	<48
QM-68	05/26/16	7.4	105	1,242	1.6	138	37	0.74	396	<1	14.0	-106	<48
QM-68	08/17/16	7.5	104	630	1.4	140	40	0.75	389	<1	16.7	-107	<48
QM-68	10/26/16	7.0	111	662	2.0	138	41	0.85	414	<1	13.2	-112	<48
QM-69	05/26/16	8.1	49	286	1.1	39	37	0.83	152	<1	12.5	-26	<48
QM-69	08/17/16	7.7	50	288	1.8	35	37	0.86	146	<1	15.4	-30	<48
QM-69	11/09/16	8.0	50	302	1.1	35	37	0.90	146	<1	11.9	-30	<48
QM-70	02/10/16	8.0	52	338	<1.0	47	56	0.47	144	<1	11.0	-53	<48
QM-70	06/30/16	8.0	56	316	<1.0	48	57	0.42	153	<1	12.2	-51	<48
QM-70	09/15/16	8.1	57	342	<1.0	52	54	0.39	160	<1	12.8	-61	<48

TABLE 1 (Continued): ANALYSIS OF GROUNDWATER FROM WELLS QM-53 THROUGH QM-82 IN THE MAINSTREAM TUNNEL SYSTEM OF THE TUNNEL AND RESERVOIR PLAN SAMPLED DURING 2016

Well	Date Sampled	pH	EC <sup>1</sup>	TDS <sup>1</sup>	TOC <sup>1</sup>	Cl <sup>-</sup>	SO <sub>4</sub> <sup>2-</sup>	NH <sub>3</sub> -N	Hardness	Fecal Coliform	Temp	Water Elevation <sup>2</sup>	Recharge Time
			mS/m	mg/L	mg/L					CFU/100 mL	°C	ft	hr
QM-71	02/10/16	8.0	71	442	<1.0	120	67	0.49	180	<1	10.3	-63	<48
QM-71	06/30/16	8.1	74	502	<1.0	125	70	0.47	191	<1	12.2	-61	<48
QM-71	09/15/16	7.9	70	338	<1.0	126	68	0.48	195	<1	12.8	-53	<48
QM-72	05/26/16	7.9	67	472	1.0	131	<5	0.32	216	<1	12.2	-67	<48
QM-72	08/17/16	7.3	61	382	<1.0	127	<5	0.36	220	<1	12.8	-83	<48
QM-72	11/09/16	7.3	62	366	<1.0	123	<5	0.36	218	<1	12.9	-85	<48
QM-73	02/10/16	7.7	48	280	1.2	35	<5	0.26	143	<1	10.8	-161	<48
QM-73	06/30/16	7.9	52	310	<1.0	37	<5	0.27	154	<1	13.7	-161	<48
QM-73	09/15/16	7.9	51	296	1.0	35	<5	0.25	157	<1	14.5	-164	<48
QM-74	02/10/16	7.9	45	268	1.1	60	<5	0.24	99	<1	10.5	-12	<48
QM-74	06/30/16	7.9	49	282	<1.0	54	<5	0.20	107	<1	11.0	-11	<48
QM-74	09/15/16	7.9	48	264	1.4	58	<5	0.23	108	<1	15.6	-13	<48
QM-75	01/28/16	7.6	36	230	<1.0	13	110	0.22	65	<1	11.3	-77	<48
QM-75	04/14/16	8.1	40	218	<1.0	13	18	0.18	68	<1	13.2	-119	<48
QM-75	06/08/16	7.5	38	232	<1.0	14	10	0.25	62	1	12.9	-76	<48
QM-75	07/21/16	7.8	38	282	<1.0	13	11	0.26	63	1	12.3	-78	<48
QM-75	09/15/16	7.9	38	230	<1.0	12	11	0.25	64	<1	13.2	-82	<48
QM-75	12/22/16	7.5	37	218	<1.0	12	22	0.22	78	<1	11.6	-82	<48
QM-76	02/10/16	8.1	42	352	1.0	13	67	0.23	57	1	10.8	-186	<48
QM-76	07/21/16	8.0	56	376	<1.0	12	64	0.21	58	<1	12.8	-186	<48