

C-11-IV.0 QUALITY ASSURANCE/QUALITY CONTROL

The monitoring and reporting program is supported by an independent quality assurance assessment program developed and implemented by the Orange County Stormwater Program. Laboratory analyses are independently validated through quality control check samples in addition to the quality assurance requirements established by USEPA and Standard Method procedures. The quality assurance program evaluates data for accuracy, precision, and contamination using certified reference materials, laboratory control standards for common analyses, and duplicate field samples along with equipment and trip blanks.

The proportion of quality assurance samples submitted this year was 20% of the total samples submitted to the contractor laboratories for analyses. The Annual QA/ QC Summary which describes the quality assurance (QA) sample type and percent breakdown are presented in **Attachment C-11-IV**.

The Monitoring Programs QA officer oversaw preparation and submittals of quality assurance (QA) samples to evaluate the quality of data produced by each of the three contractor laboratories and the Public Health Laboratory. The preparation included synthetic samples for accuracy which are comprised of aliquots of prepared standard solutions in ultra-pure (Nanopure) water matrices where the level of total dissolved solids (TDS) was adjusted with Ultrex grade sodium chloride to simulate comparable levels of TDS in environmental samples. Additionally, replicates of the environmental samples were also submitted to evaluate analytical precision.

Along with the previously described QA regime, the Dry-weather Reconnaissance monitoring staff routinely analyzed laboratory prepared standards to assess the quality of mobile laboratory field measurements. Moreover, contractor laboratories supplied QA data relating to their respective internal quality control programs utilizing certified reference materials (CRMs), spiked and replicate samples analyzed along with county environmental sample batches.

The results of the quality assurance program are summarized in tabular and graphic form in **Attachment C-11-IV**. Control charts were created to show the performance of the laboratories over the course of the monitoring year. The upper (UCL) and lower (UCL) control limits are shown on each of the control charts.

Analyses from the Quality Assurance/Quality Control program results indicate that:

- The majority of pathogen indicator bacteria accuracies were within bounds of the control limits with total coliform accuracies having less scatter than fecal coliform bacteria. Pathogen indicator bacteria precisions were generally within bounds of the control limits with the highest range of scatter occurring for *Enterococcus*.
- The recoveries for duplicate analyses for nutrients were generally acceptable with most of the results remaining within control bounds. The majority of out of bounds results occurred for total suspended solids (TSS) and turbidity. Total kjeldahl nitrogen (TKN) precision recoveries had a few outliers for saltwater matrices.

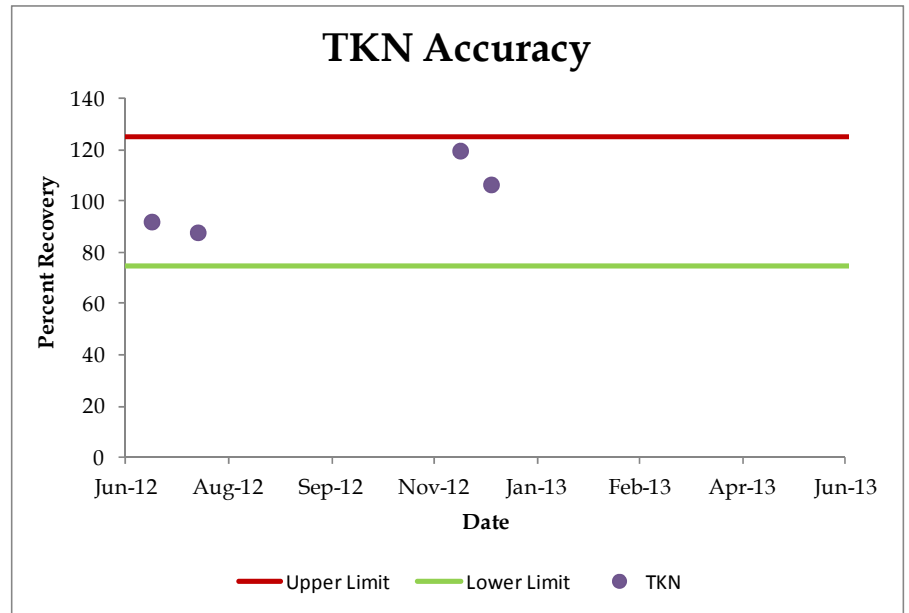
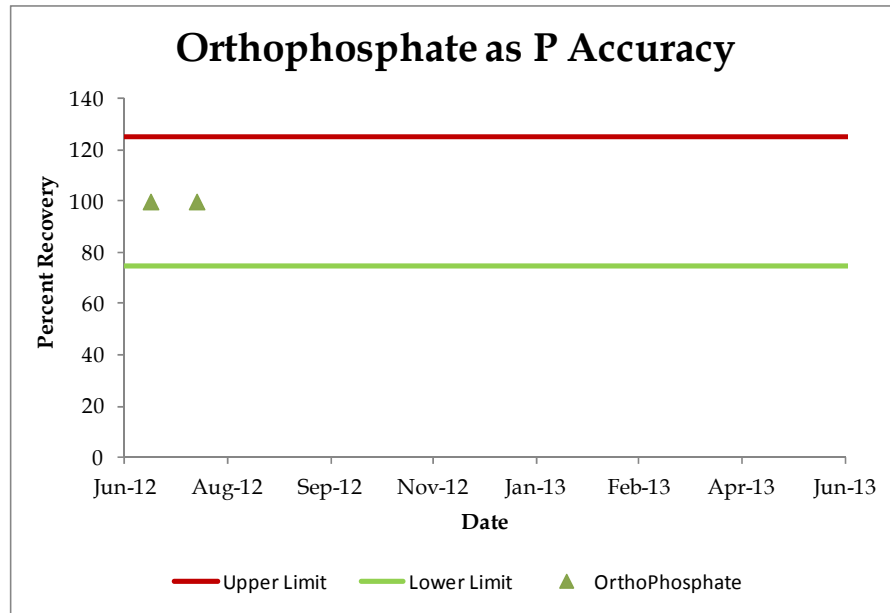
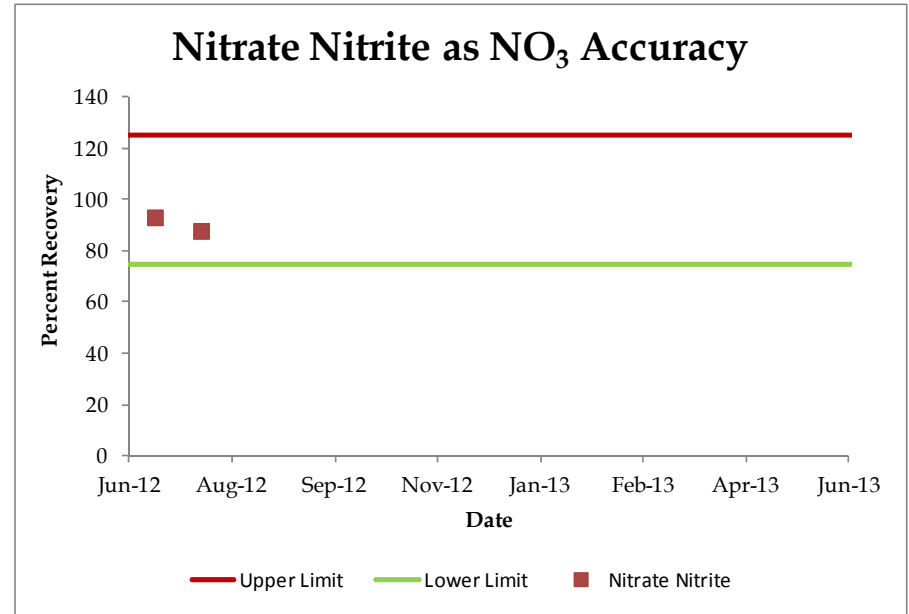
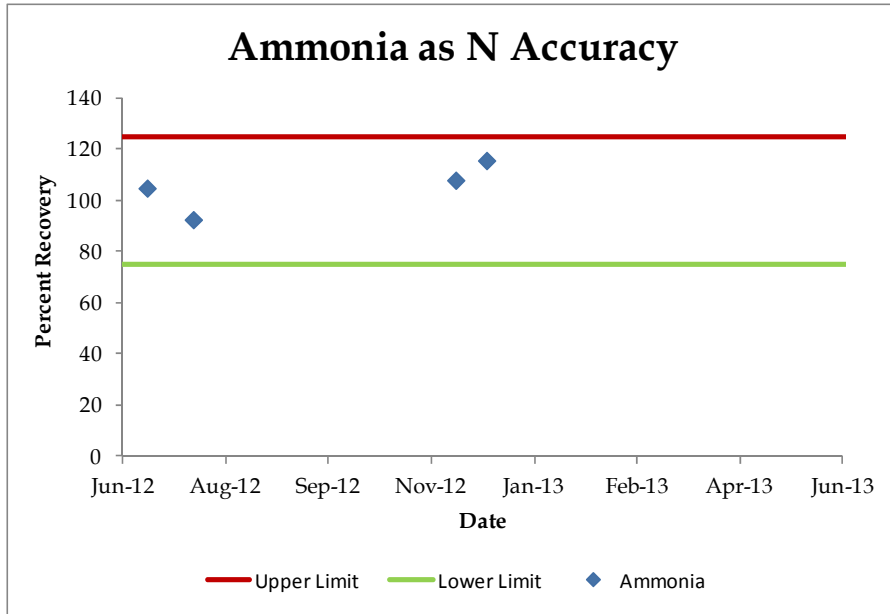
- Accuracy results for oil and grease analyses trended low throughout the year. Recoveries from two contract labs returned similar results prompting an ongoing investigatory QA/QC study.
- Trace metal precision and accuracy results were generally within bounds with the majority of outliers occurring for antimony, beryllium and thallium in a saltwater matrix. Trace metals tended to have the best overall performance in terms of having the least amount and range of scatter associated with the analytical results.
- Organophosphorous Pesticides (OPP) returned accuracies which tended to have large and varied scatter. An investigation was established in order to determine the cause of the scatter. Findings showed the standard had expired in October 2011. Although the expired standard can account for the results after October the investigation did not yield any findings into the results prior to the expiration date.
- Trip blanks as well as equipment blanks for nutrients and trace metals were generally within bounds of the non-detect limit. The majority of outliers for trace metals occurred for saltwater matrices using a Suprapur and Nanopure synthetic solution. The majority of these detects were for zinc, iron, copper and lead. The majority of detects for nutrients occurred for total organic carbon (TOC). The contract lab tasked with the TOC analyses was switched mid-year and produced better results.

Quality Assurance/Quality Control Annual QA/QC Summary Sheet

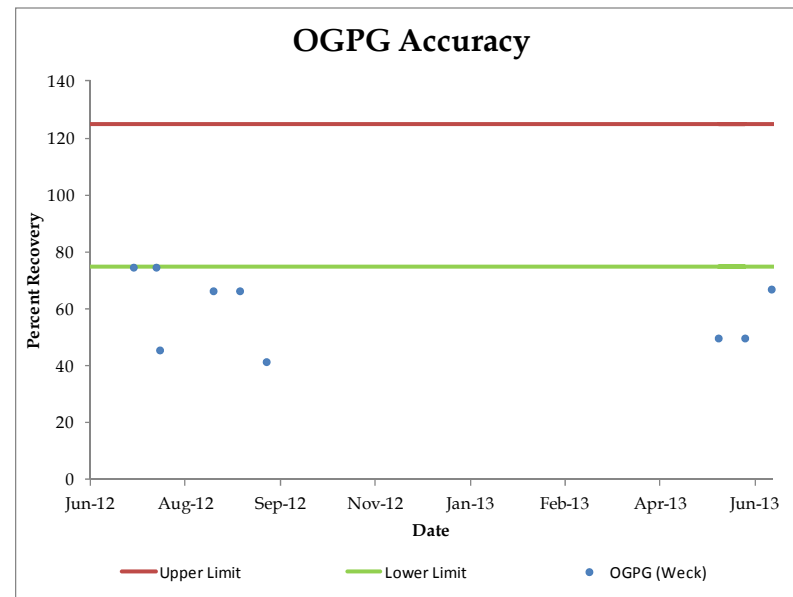
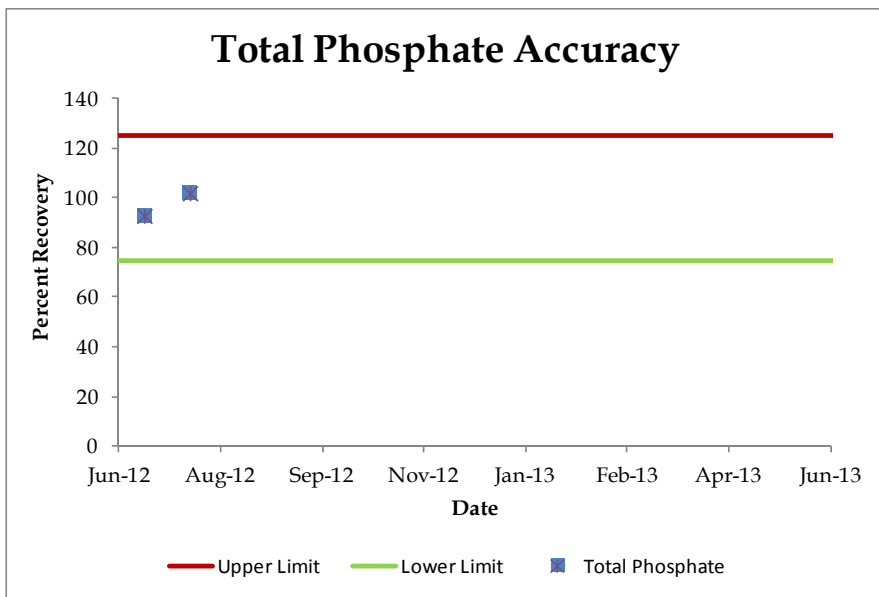
	Overall		5 day Biochemical Oxygen Demand		Chloride	Chemical Oxygen Demand		Carbamate Pesticides	Hexavalent Chromium	Dissolved Organic Carbon		Fipronil Pesticides	Glyphosate		General Minerals	HF183 Bacteroides	Indicator Bacteria		Nitrite
	FW	SW	FW	SW		FW	SW			FW	SW		FW	SW			FW	SW	
Total Samples	4164	1766	76	20	181	76	20	13	52	148	62	15	79	43	14	47	1187	1208	13
Duplicate	250	73	2	3	14	2	3	1	2	14	8	2	8	5	1	2	69	4	1
Equipment Blank	203	0	2		26	2			2	2		1	6		2	15			
Synthetic	50	0												1		11			
Trip Blank	338	32	3	2	14	3	2	3	1	7	2	1	7	2	1		156	4	1
Percentages	20%	6%	9.2%	25%	30%	9.2%	25%	31%	10%	16%	16%	27%	27%	16%	21%	9%	21%	0.7%	15%
Duplicate	6.0%	4.1%	3%	15%	8%	3%	15%	8%	4%	9%	13%	13%	10%	12%	7%	4%	6%	0%	8%
Equipment Blank	4.9%	0%	3%	0%	14%	3%	0%	0%	4%	1%	0%	7%	8%	0%	0%	4%	1%	0%	0%
Synthetic	1.2%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	7%	0%	1%	0%	0%
Trip Blank	8.1%	1.8%	4%	10%	8%	4%	10%	23%	2%	5%	3%	7%	9%	5%	7%	0%	13%	0%	8%

	Nutrients		Organo-chlorine Pesticides	Oil & Grease		Organo-phosphate Pesticides		PCB	Pyrethroid Pesticides	Sulfate	Semi-Volatile Organic Carbon Cpd	Surfactants (MBAS)		Total Dissolved Solids	Total Organic Carbon		Trace Metals & Iron		Total Suspended Solids
	FW	SW		FW	SW	FW	SW					FW	SW		FW	SW	FW	SW	
Total Samples	359	109	3	365	40	483	63	3	71	181	3	44	15	69	433	64	0	122	249
Duplicate	27	12		14	5	31	8		5	14		4	1	5	23	8	0	16	9
Equipment Blank	30			16		21			1	26				2	38		0		11
Synthetic	4			10		10								8			0		6
Trip Blank	26	5	1	17	2	29	4	1	9	14	1	6		4	25	5	0	4	8
Percentages	24%	16%	33%	16%	18%	19%	19%	33%	21%	30%	33%	23%	6.7%	16%	22%	20%	0%	16%	14%
Duplicate	8%	11%	0%	4%	13%	6%	13%	0%	7%	8%	0%	9%	7%	7%	5%	13%	0%	13%	4%
Equipment Blank	8%	0%	0%	4%	0%	4%	0%	0%	1%	14%	0%	0%	0%	3%	9%	0%	0%	0%	4%
Synthetic	1%	0%	0%	3%	0%	2%	0%	0%	0%	0%	0%	0%	0%	0%	2%	0%	0%	0%	2%
Trip Blank	7%	5%	33%	5%	5%	6%	6%	33%	13%	8%	33%	14%	0%	6%	6%	8%	0%	3%	3%

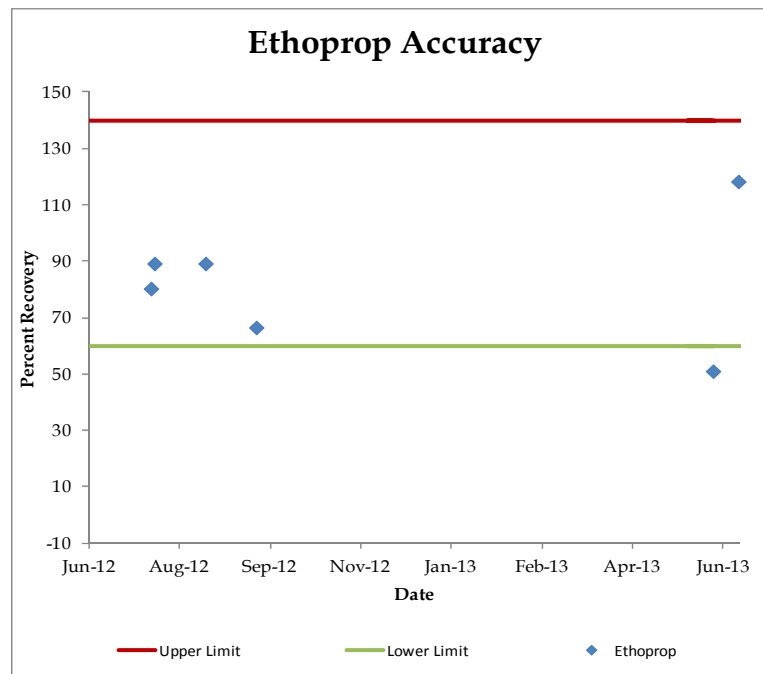
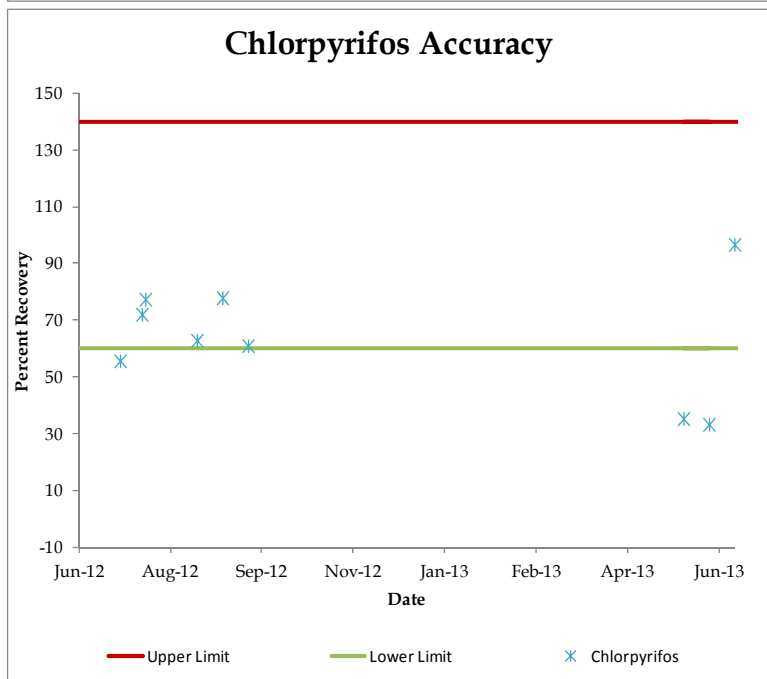
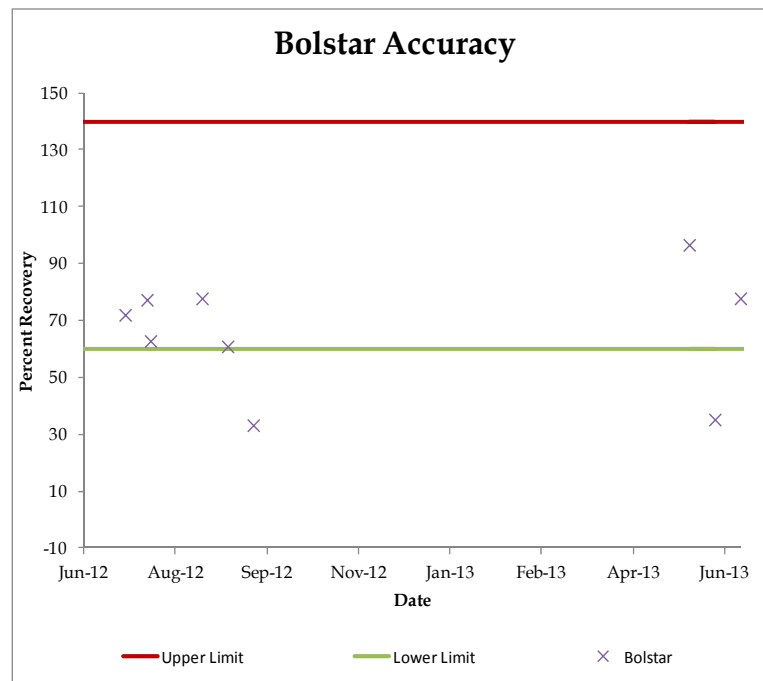
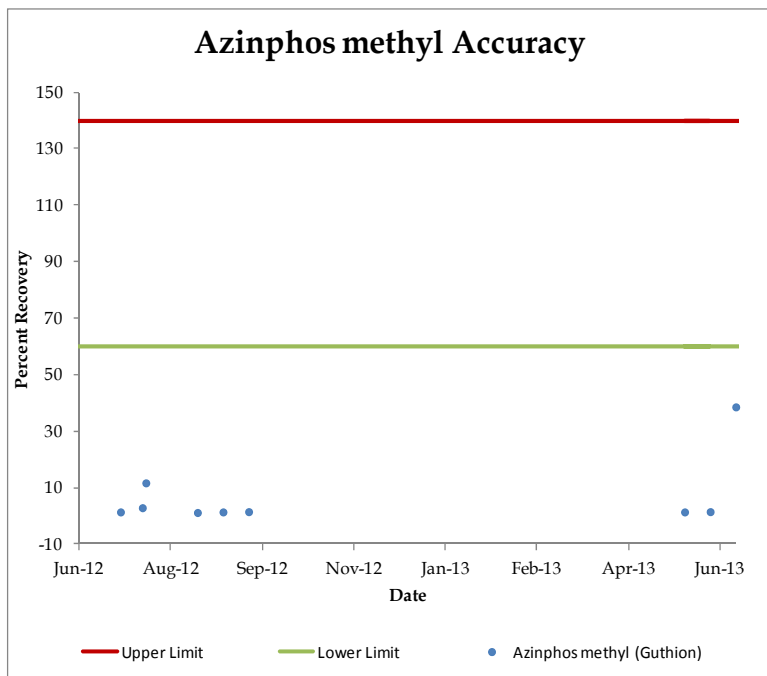
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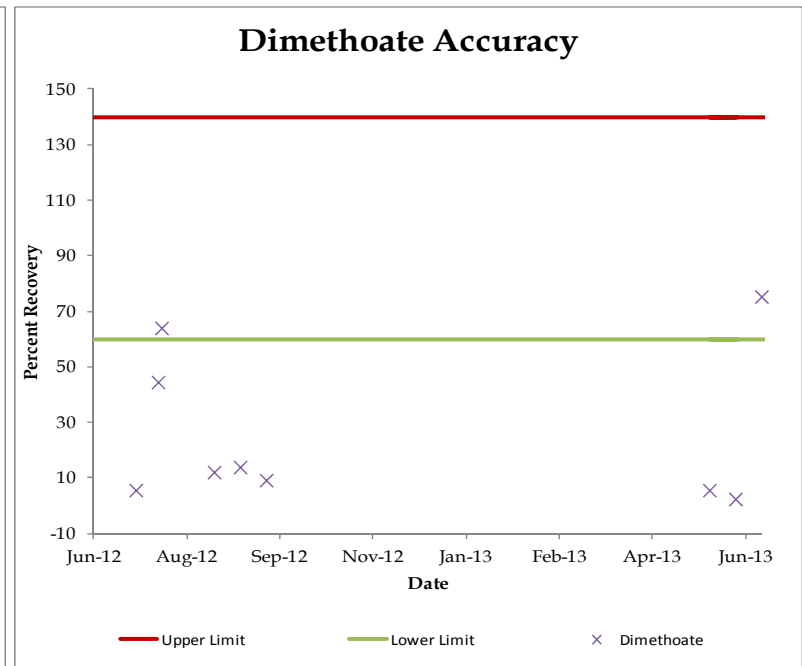
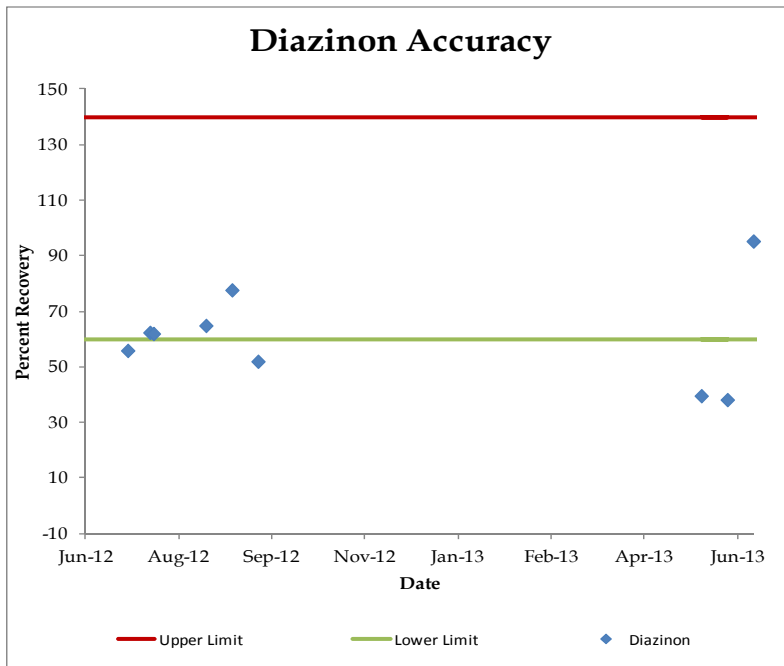
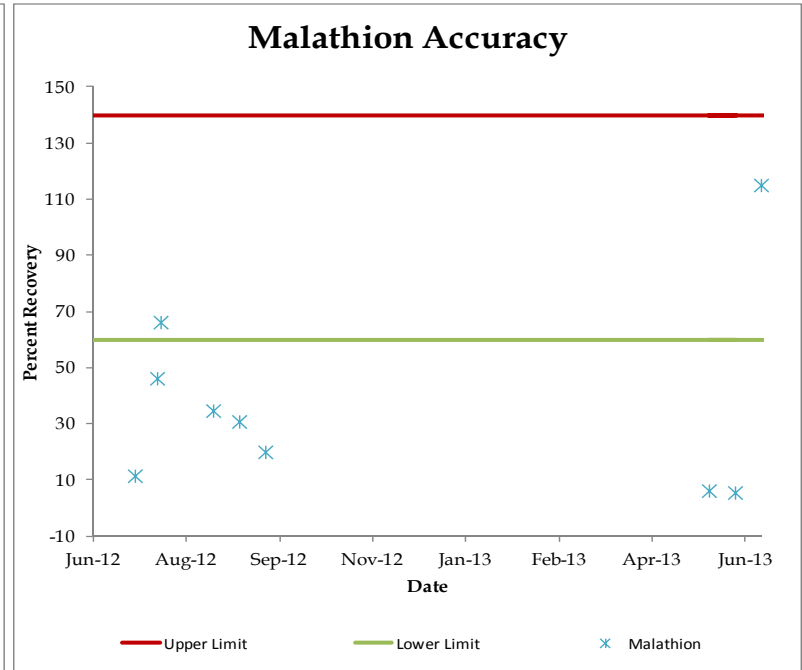
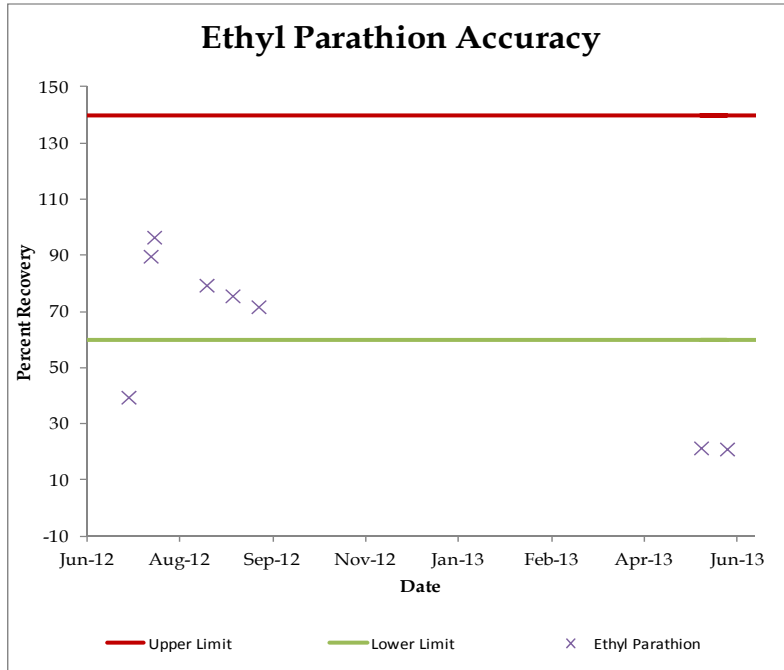
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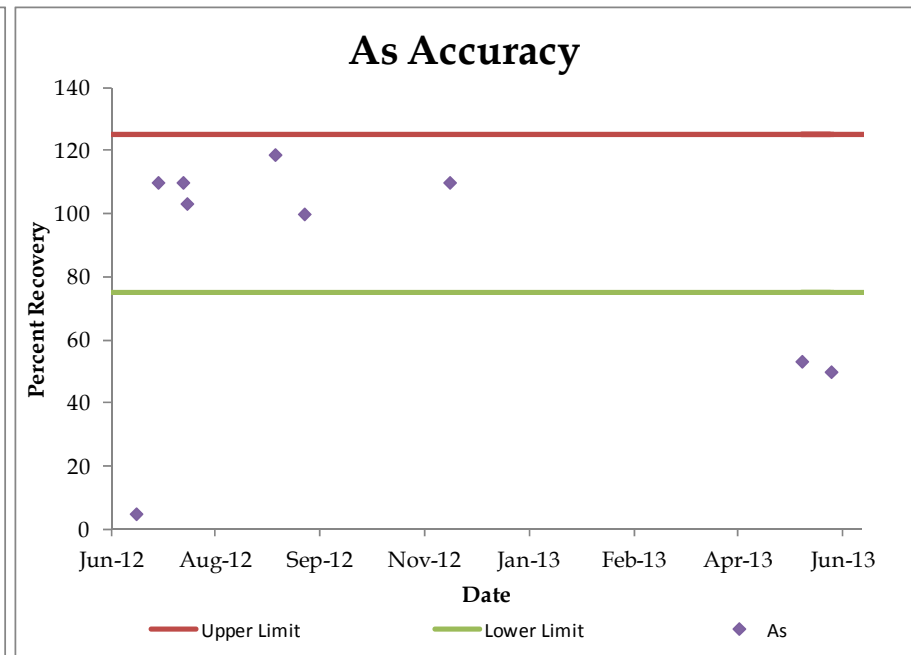
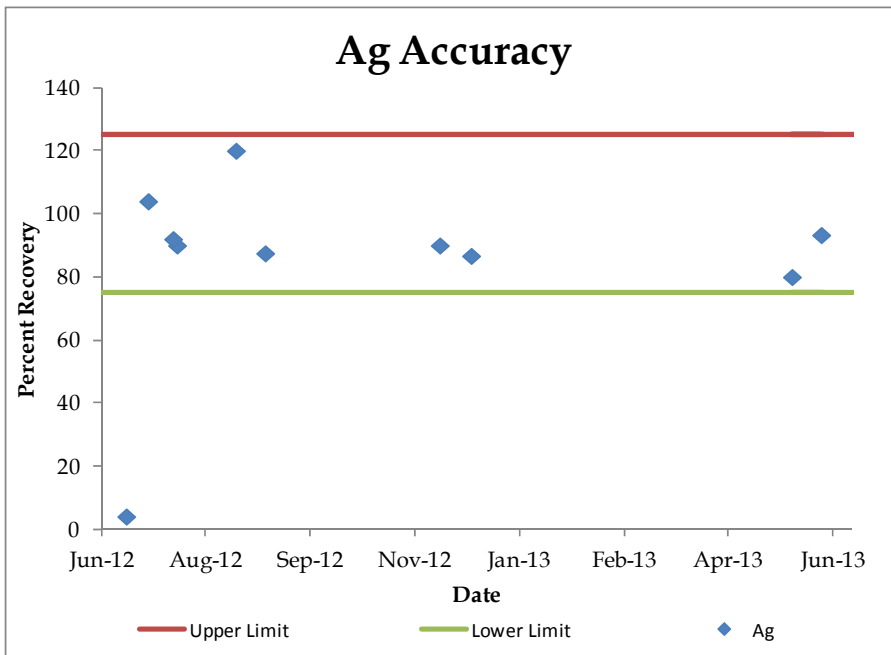
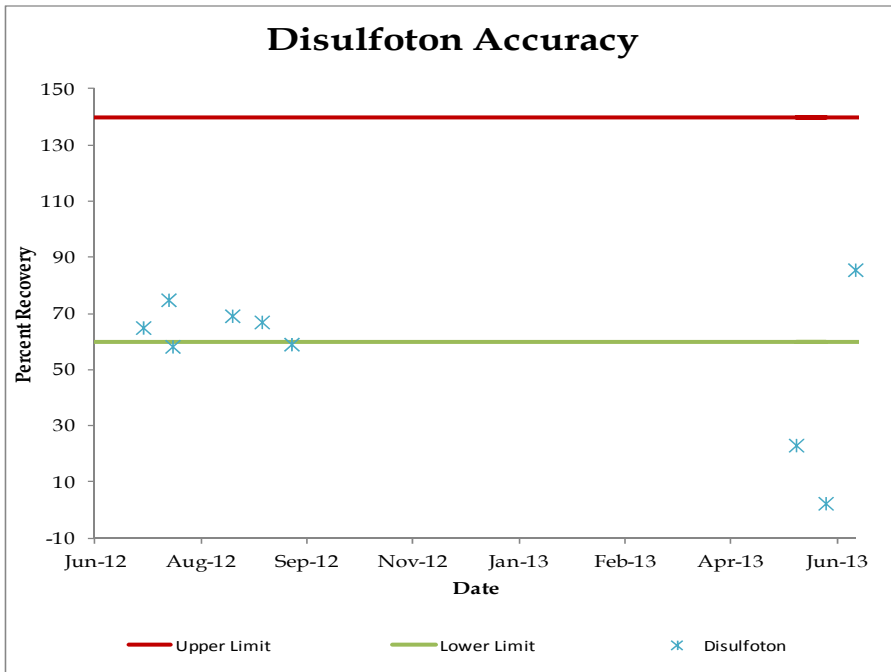
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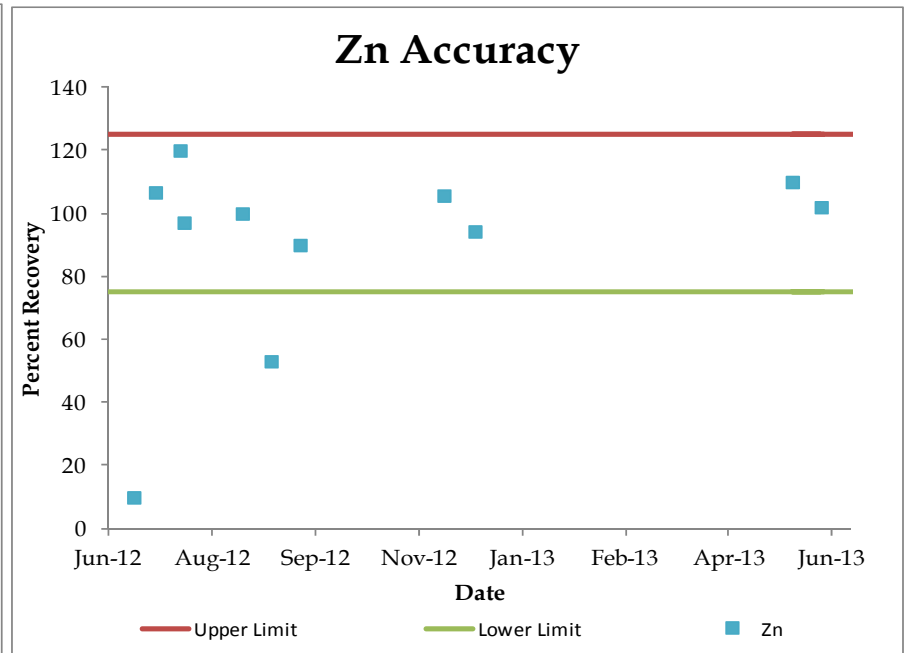
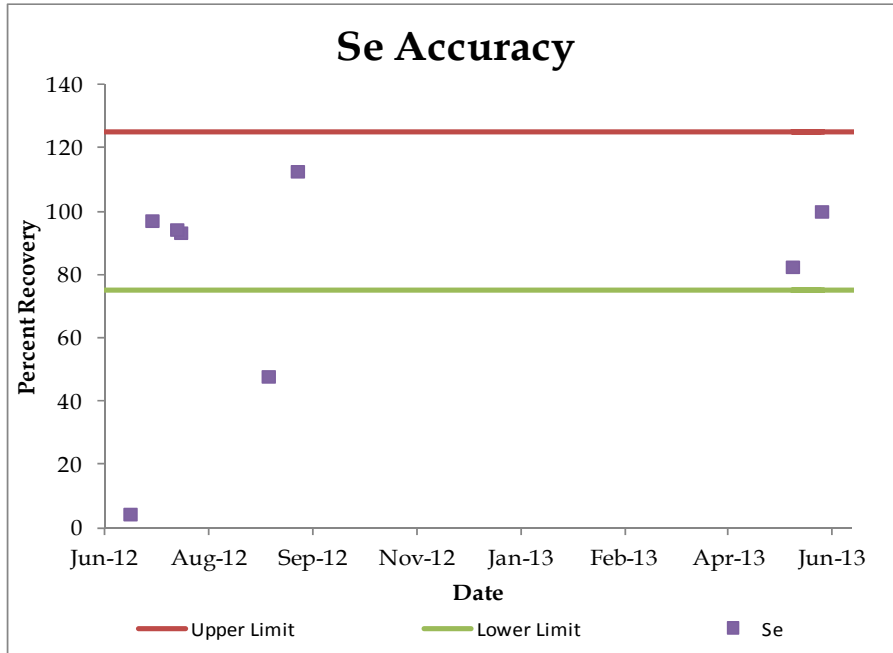
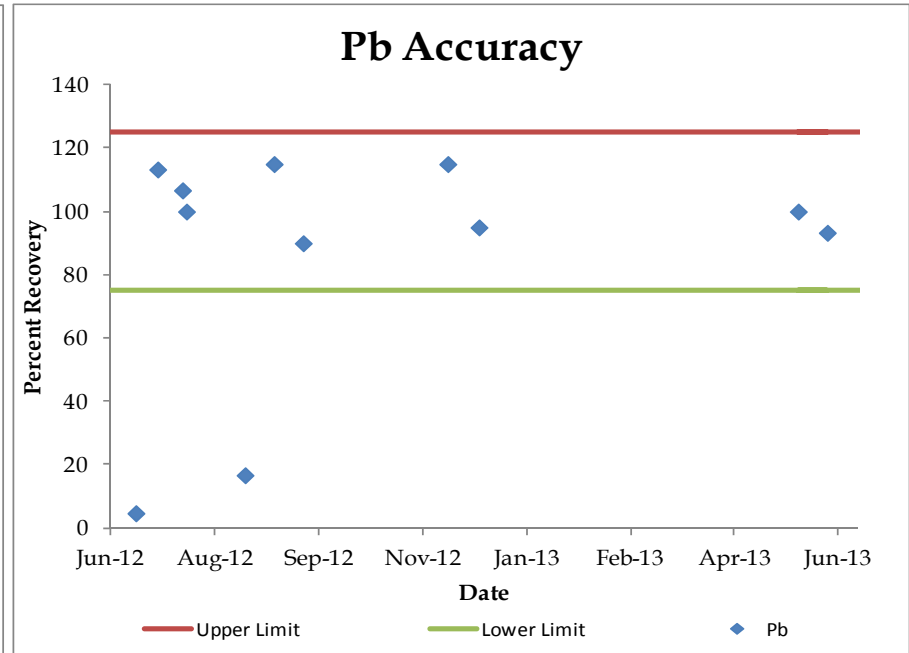
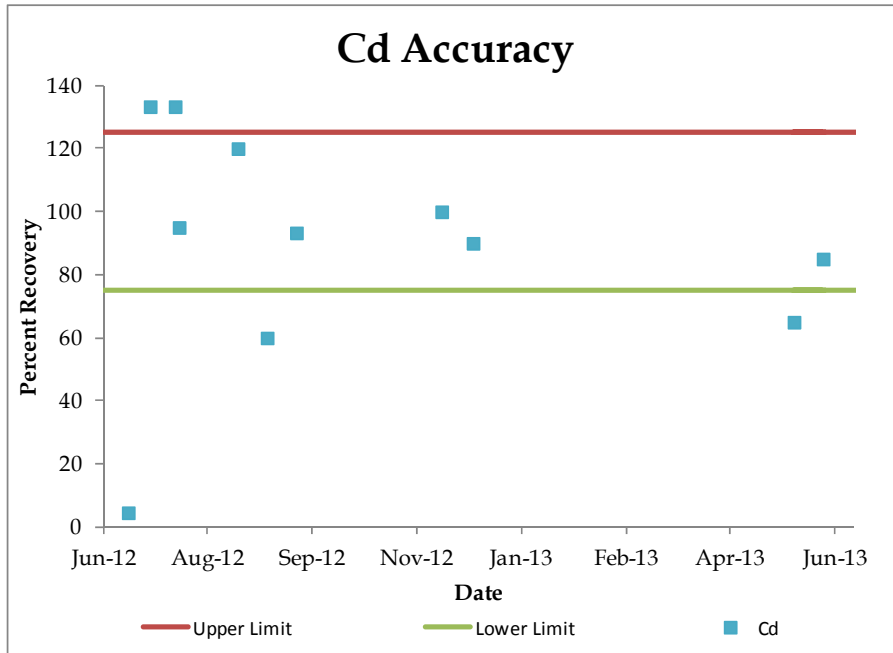
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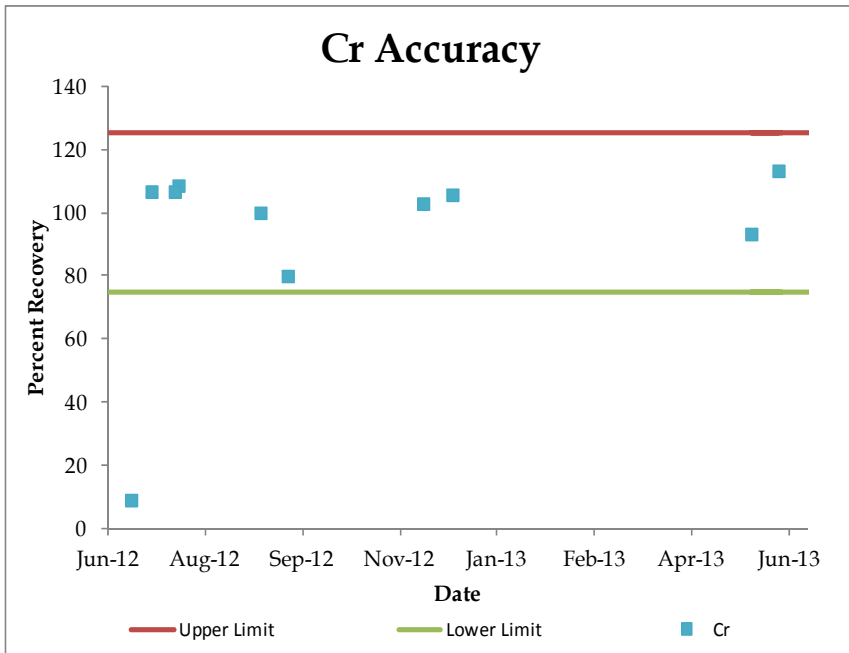
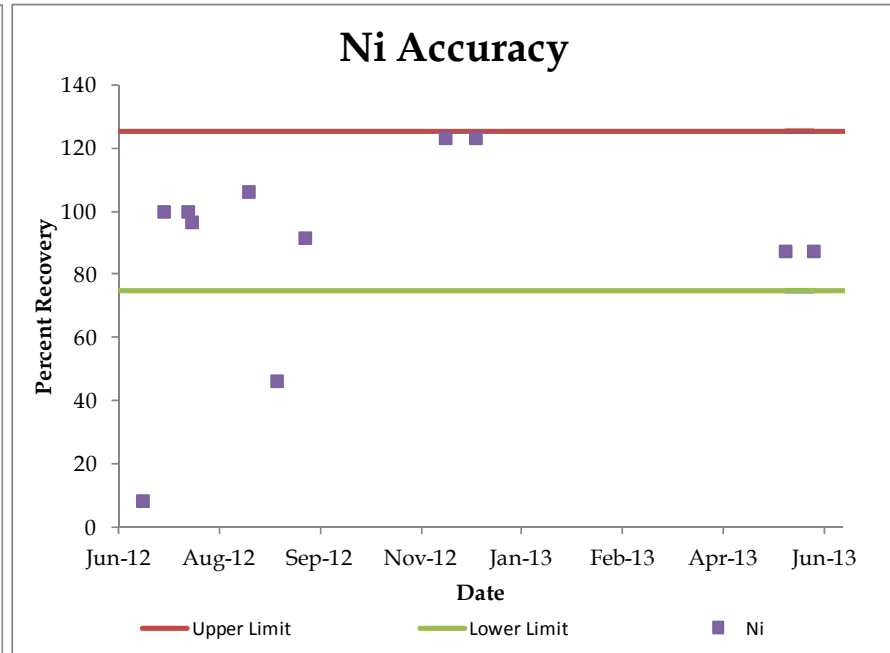
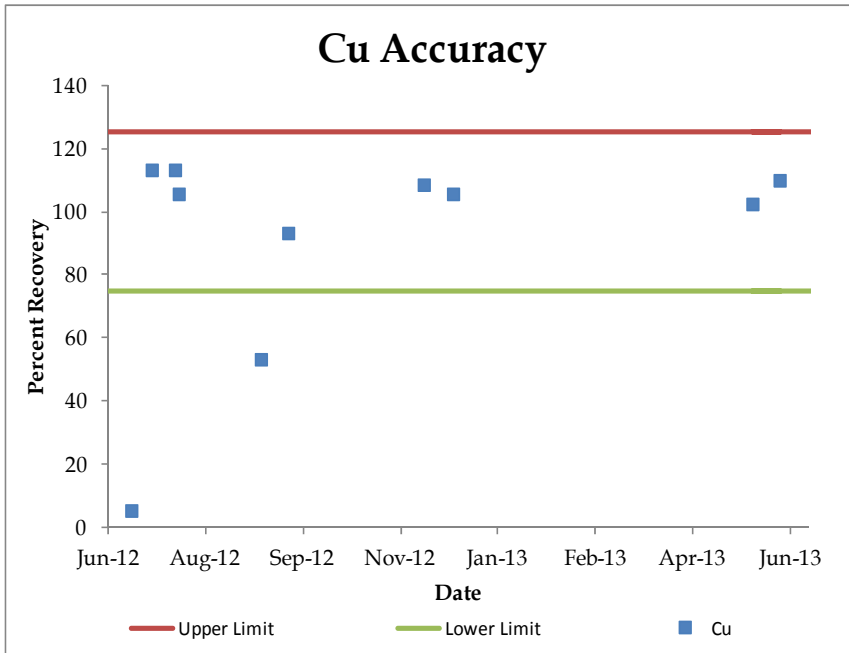
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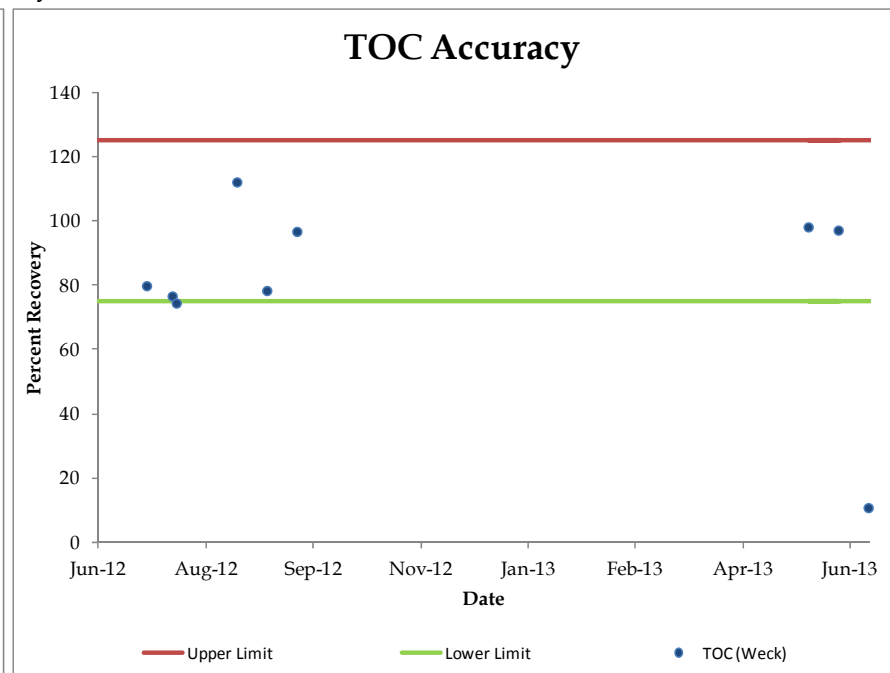
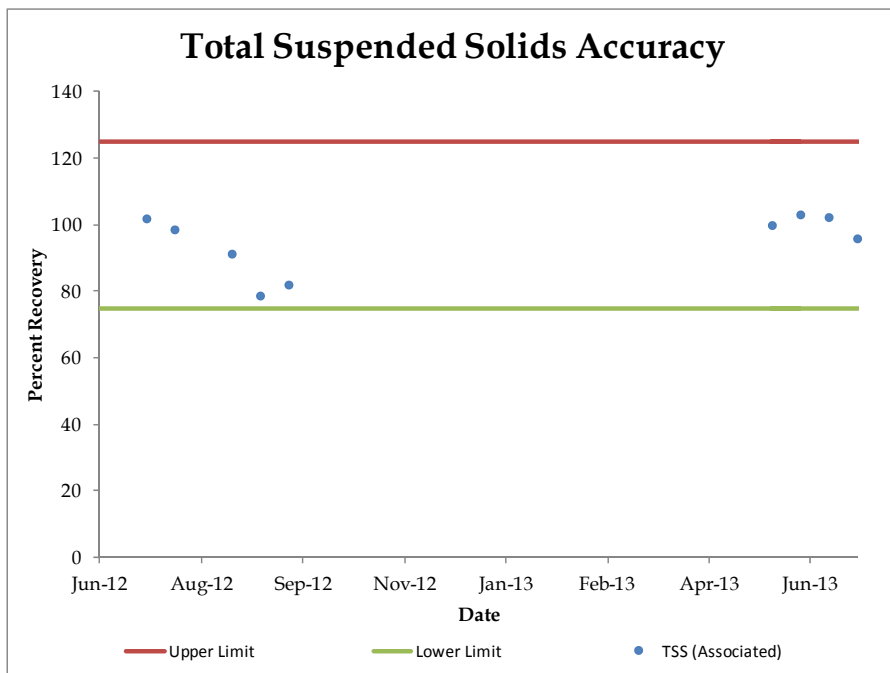
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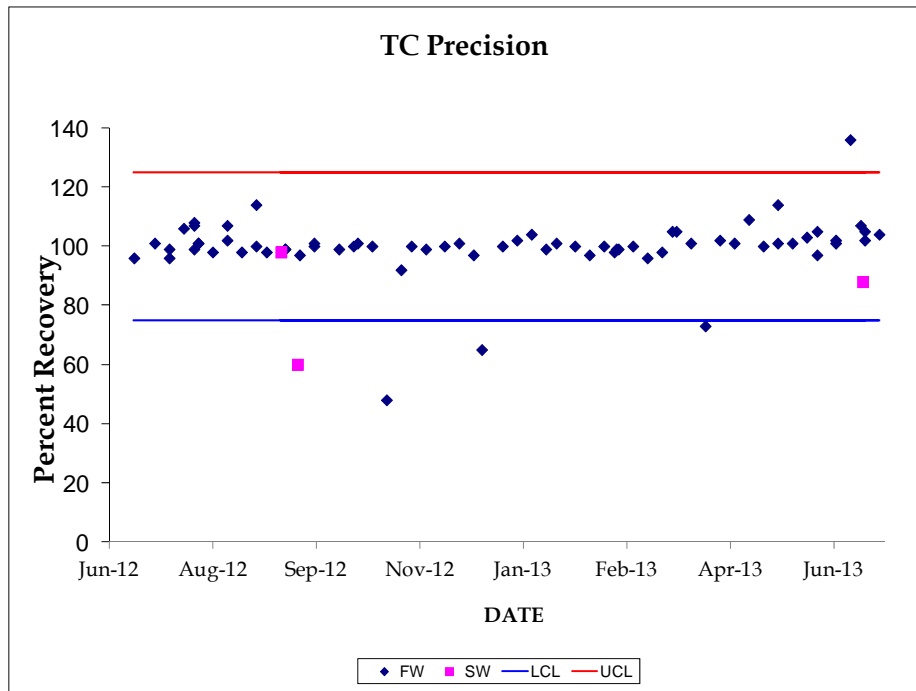
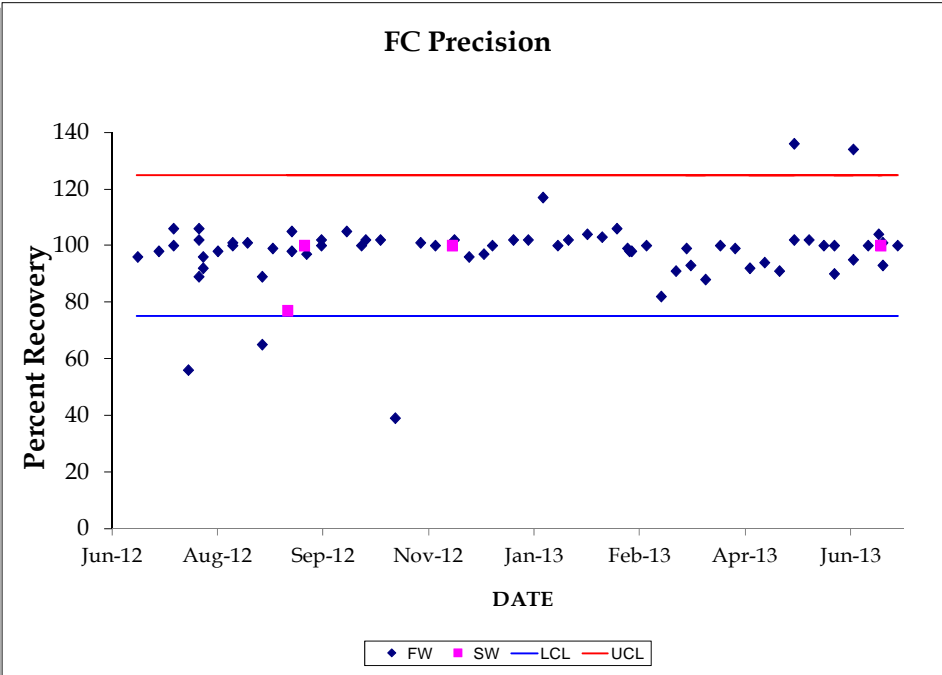
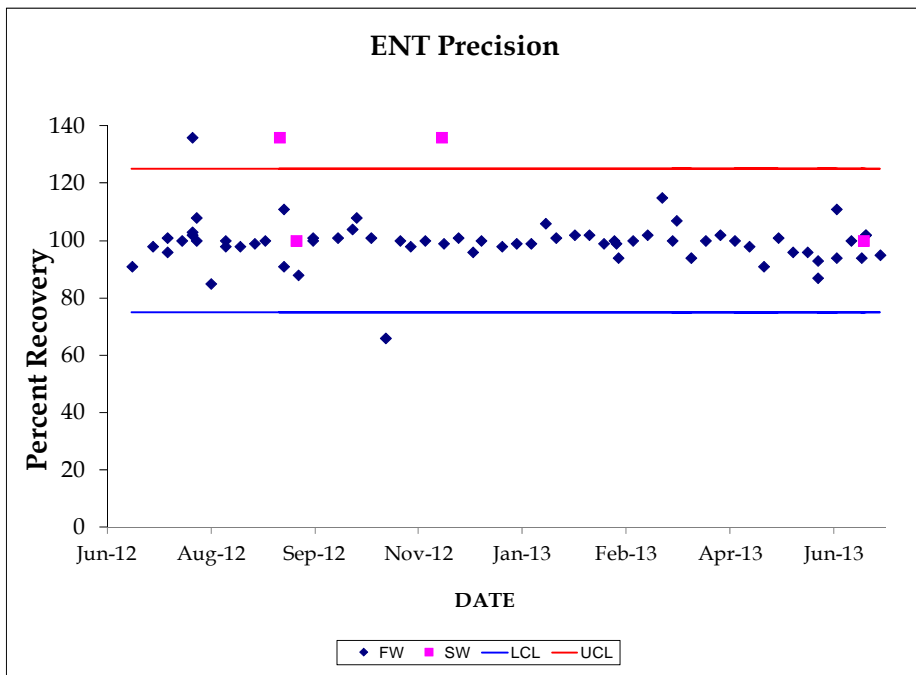
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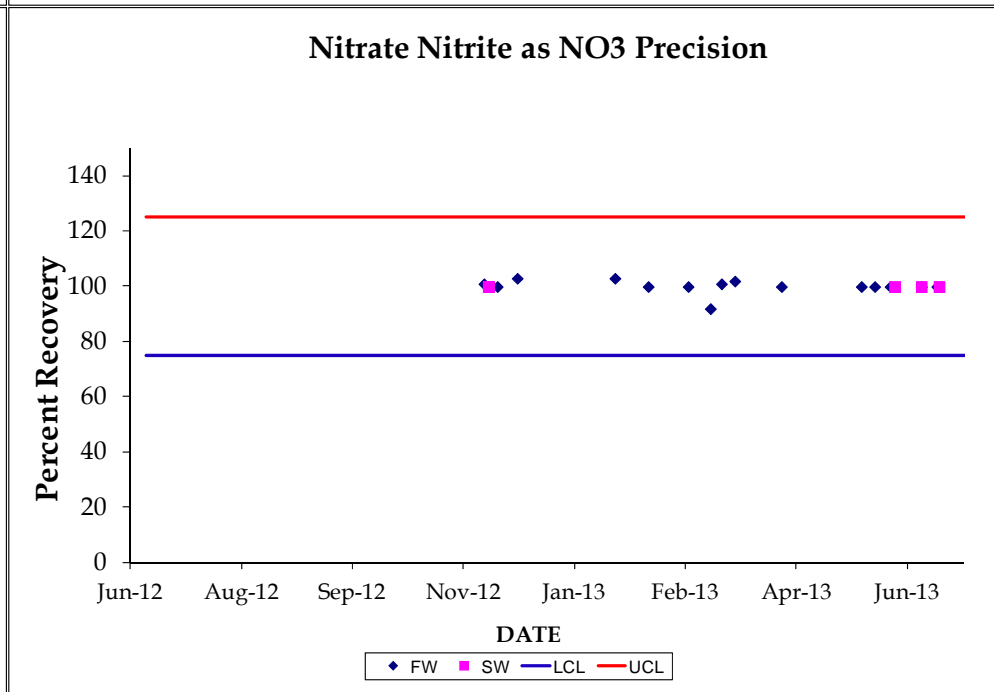
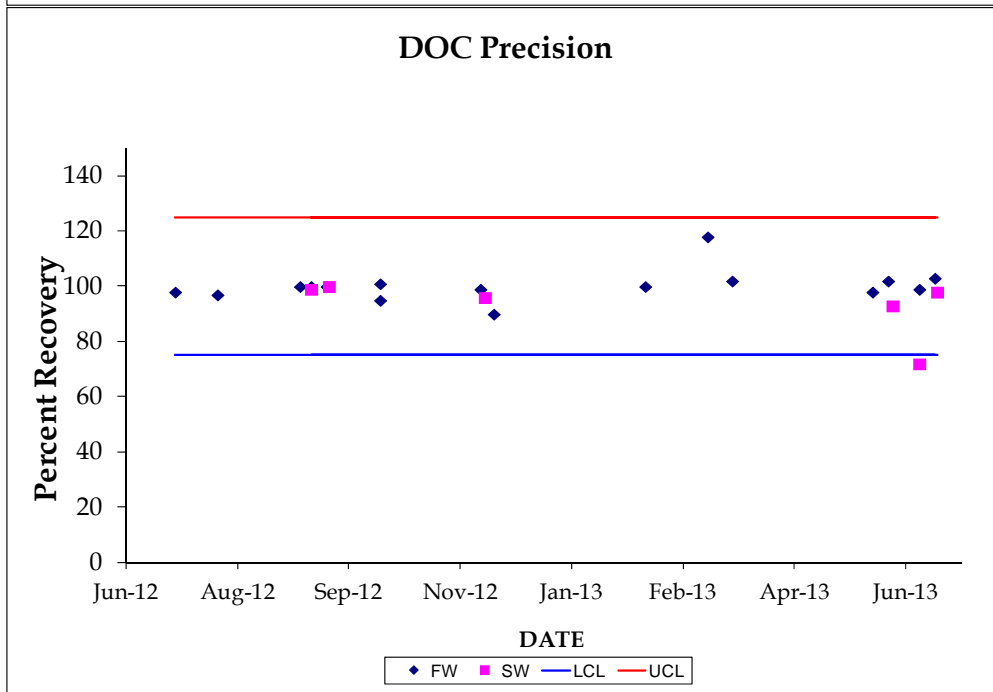
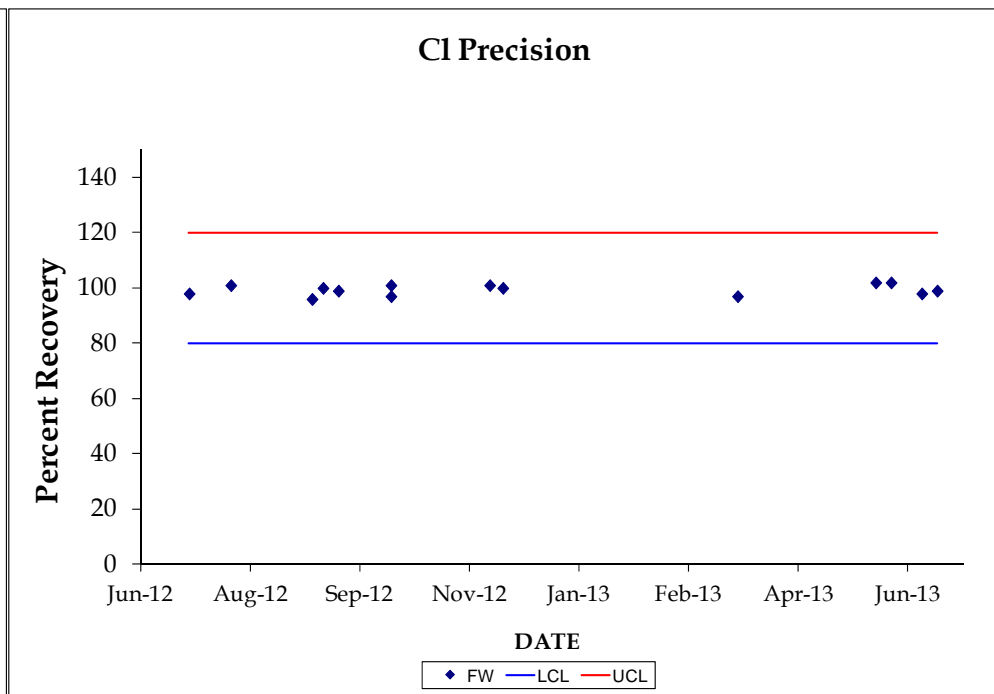
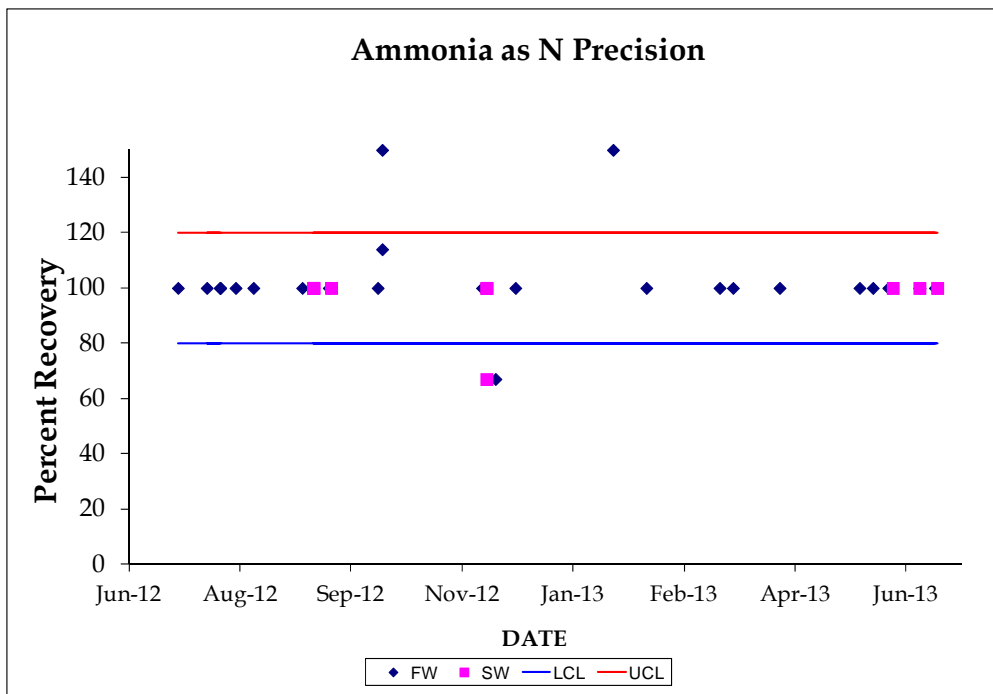
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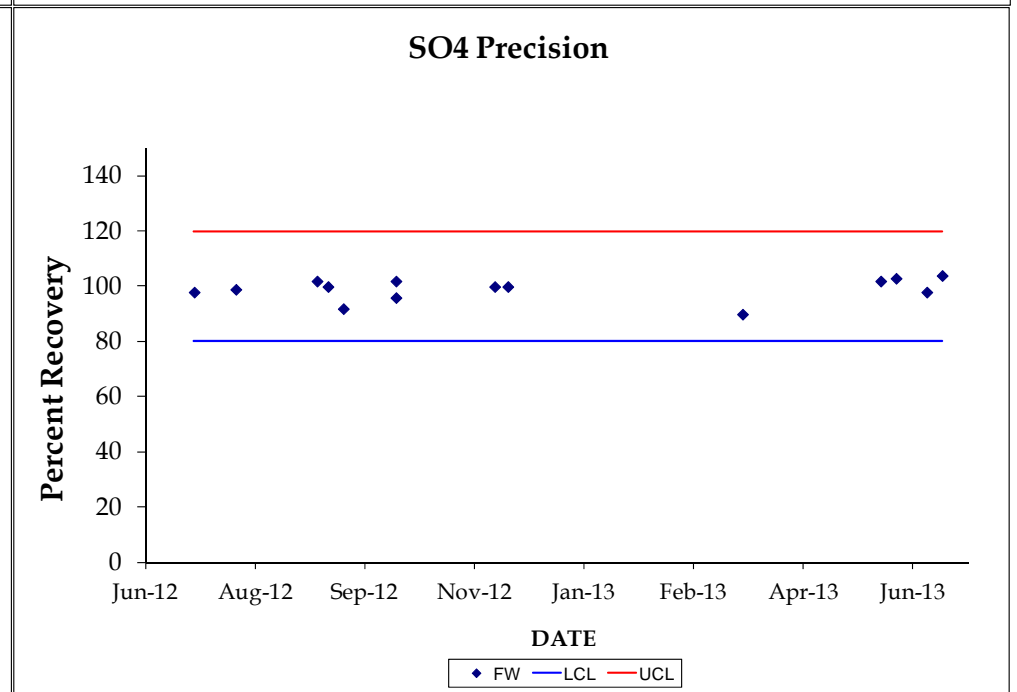
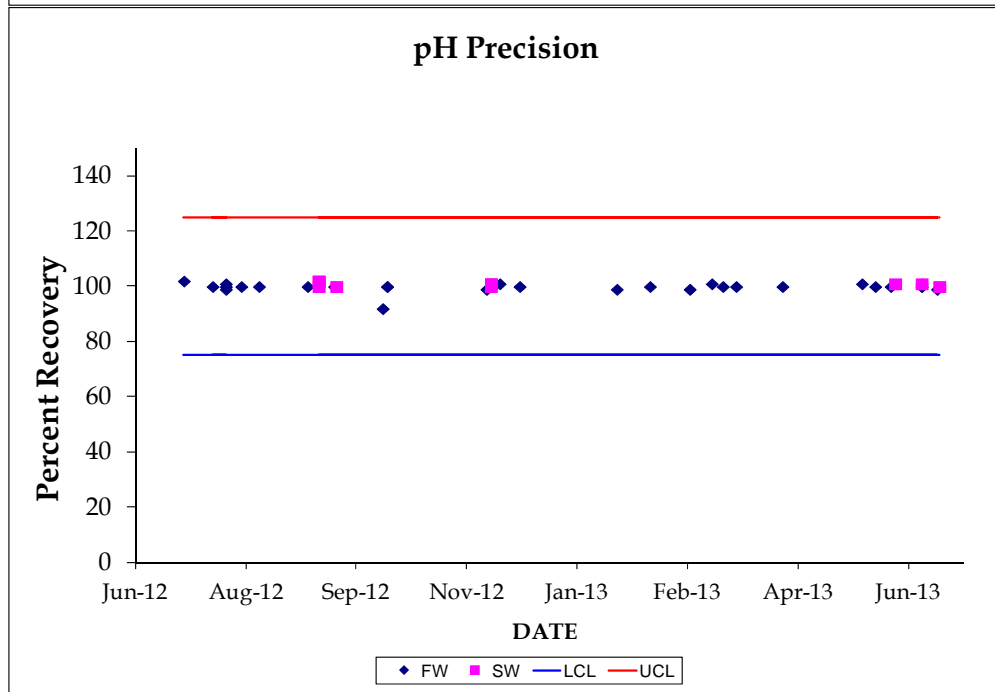
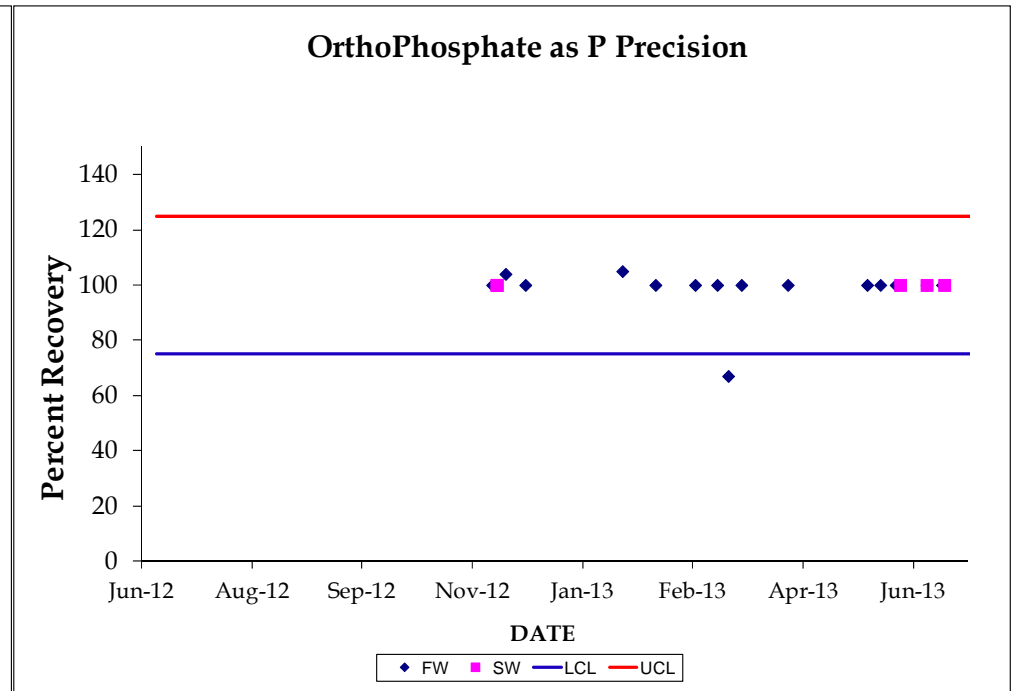
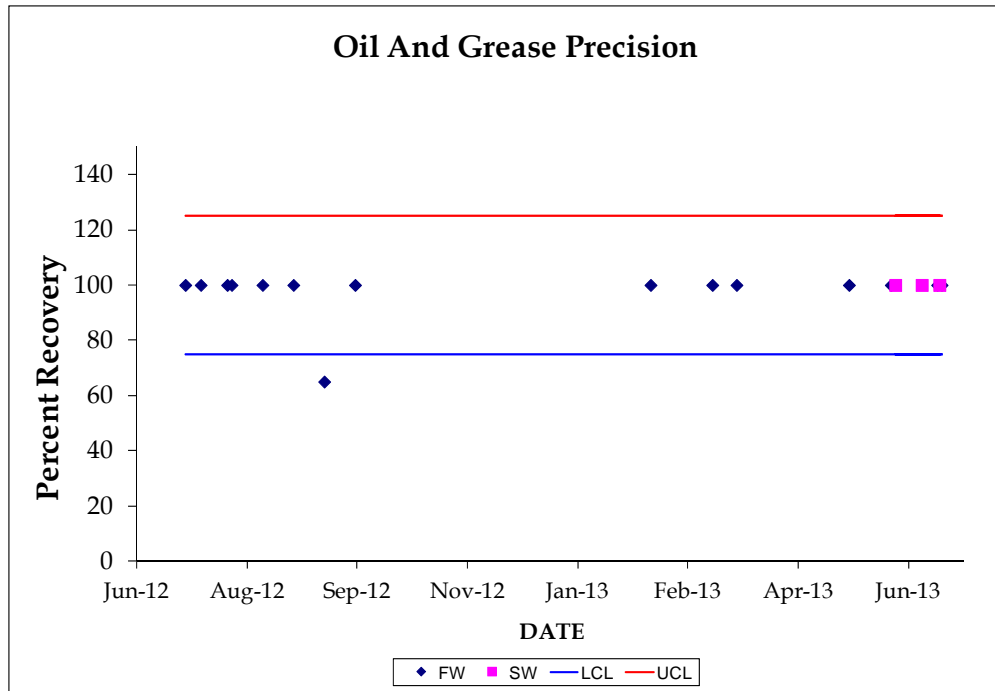
Quality Assurance/Quality Control
Precision Charts



Quality Assurance/Quality Control
Precision Charts

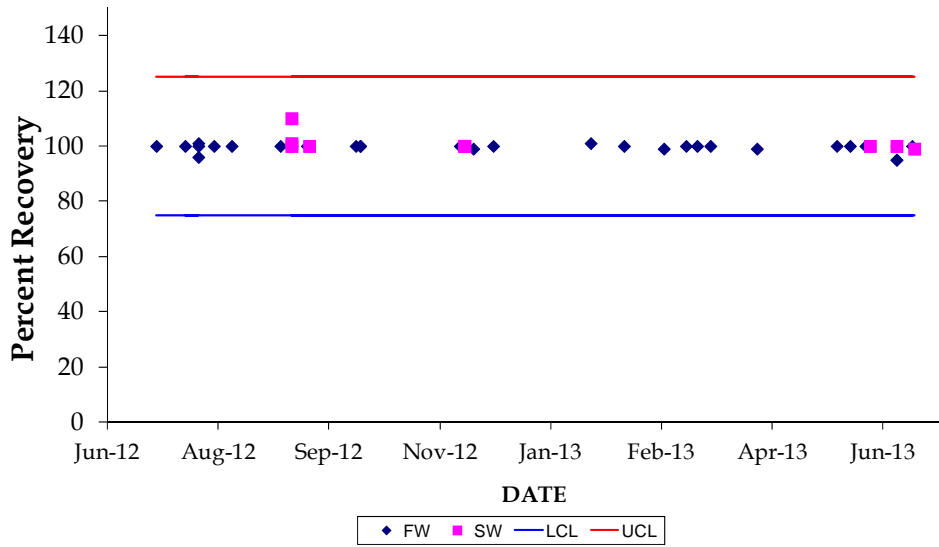


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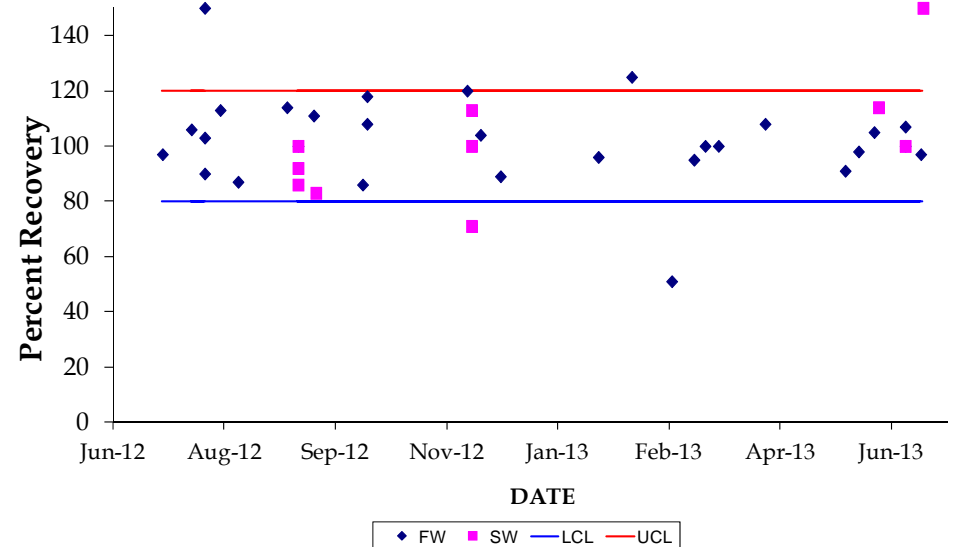


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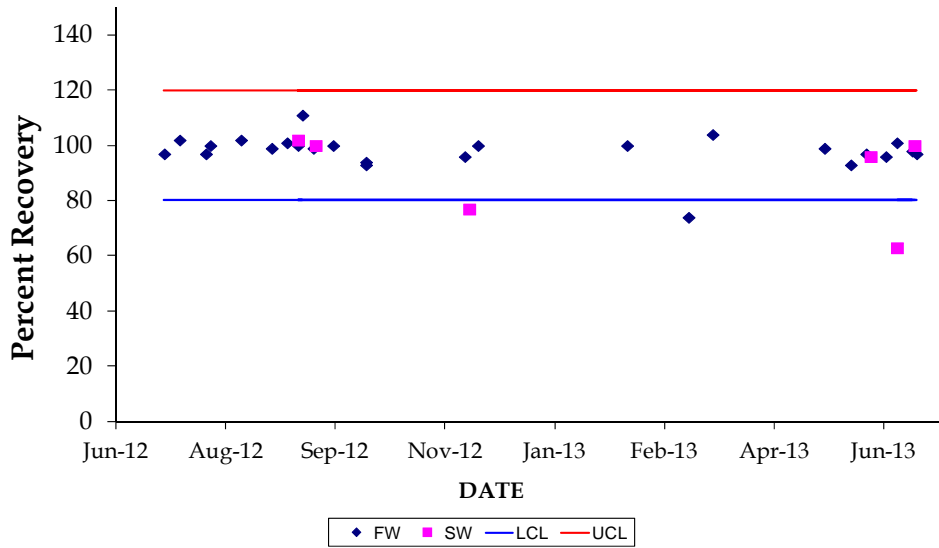
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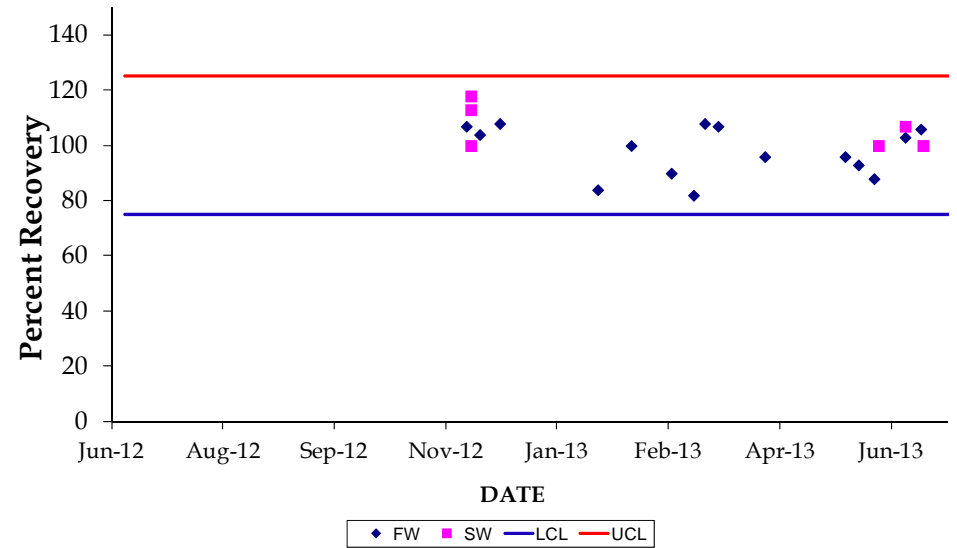
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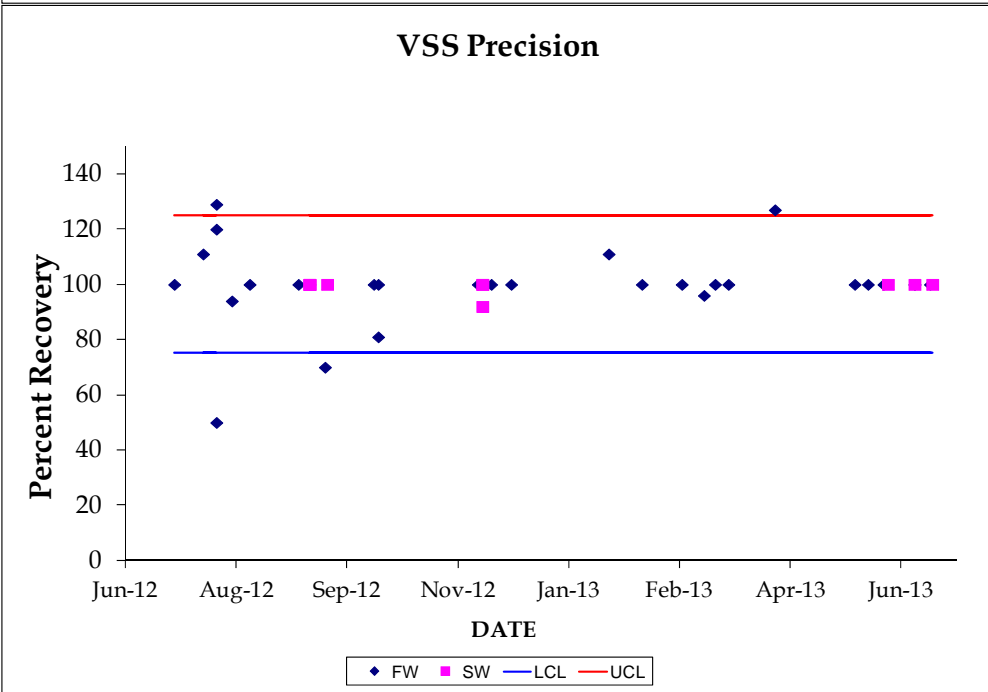
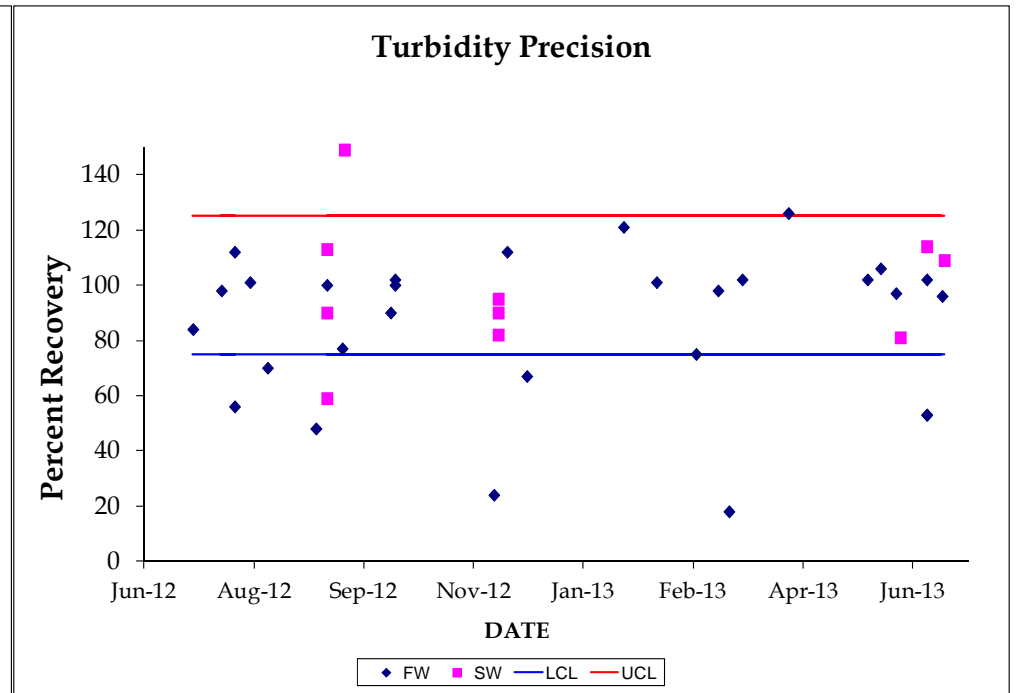
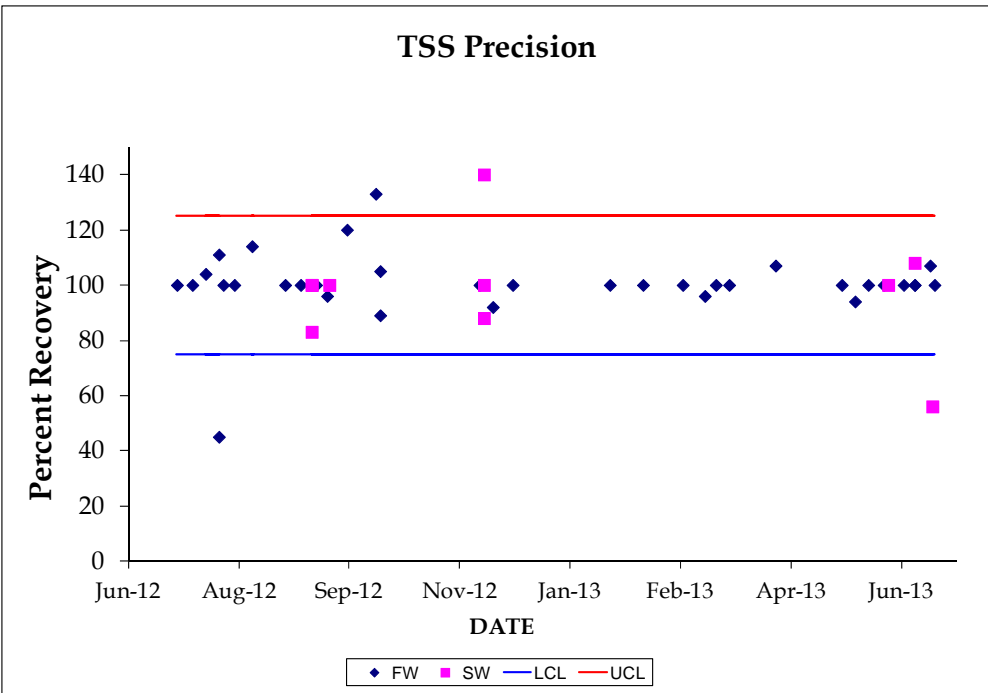
TOC Precision



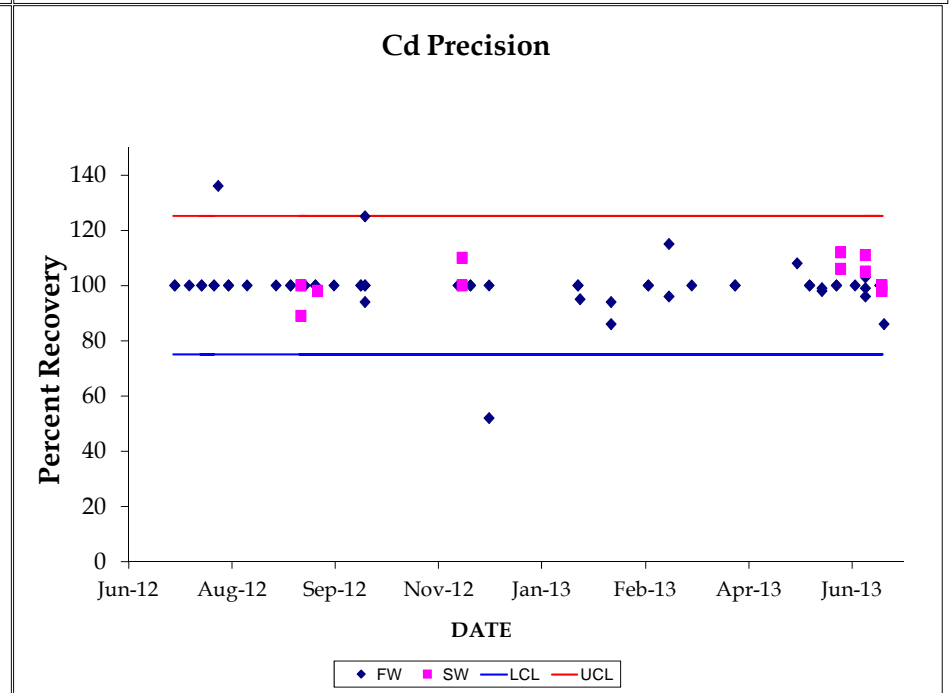
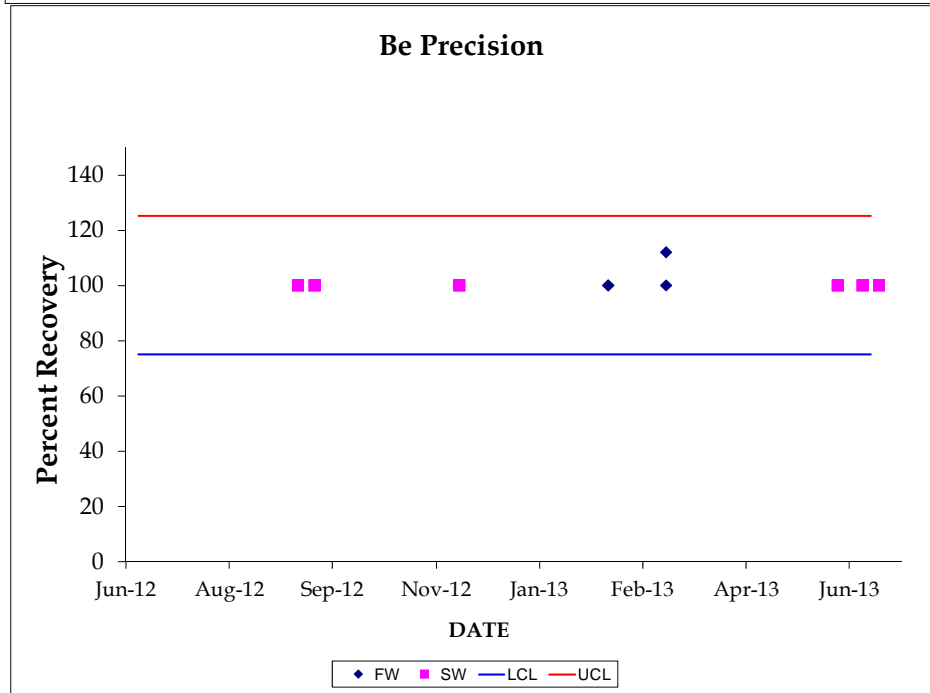
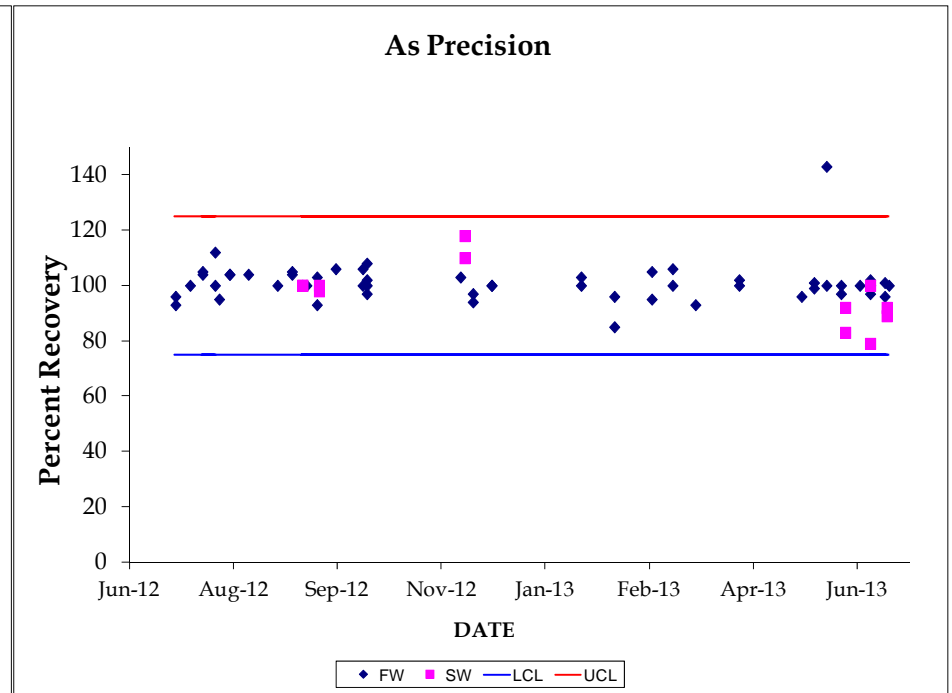
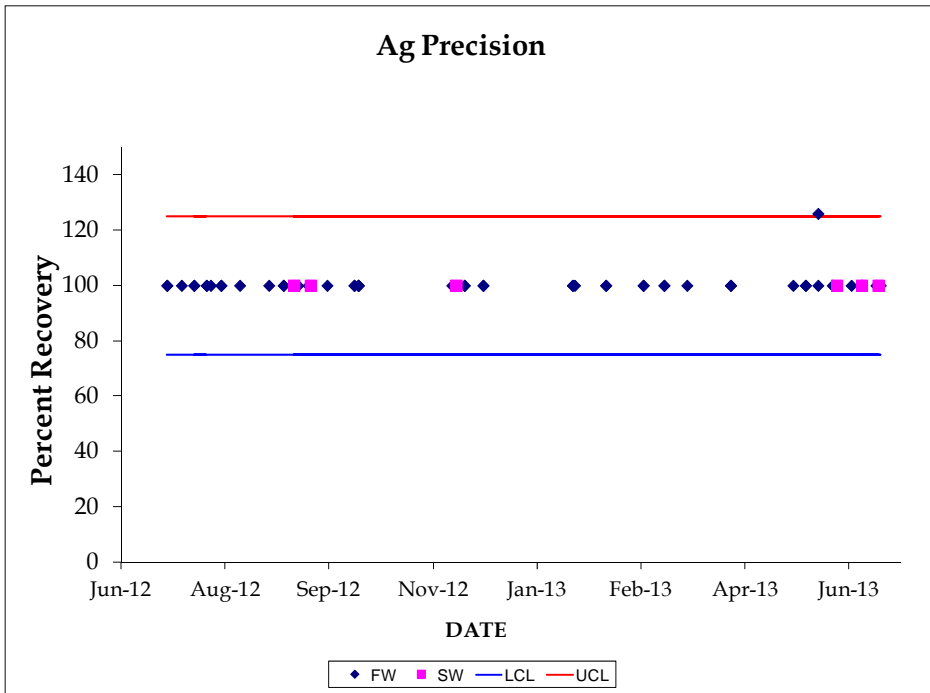
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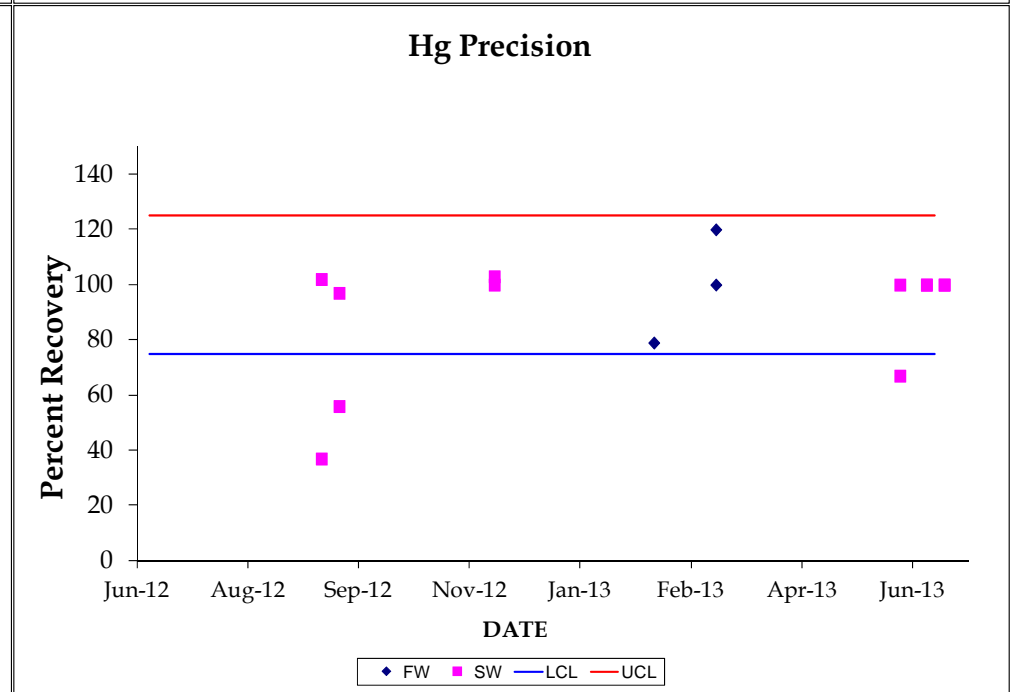
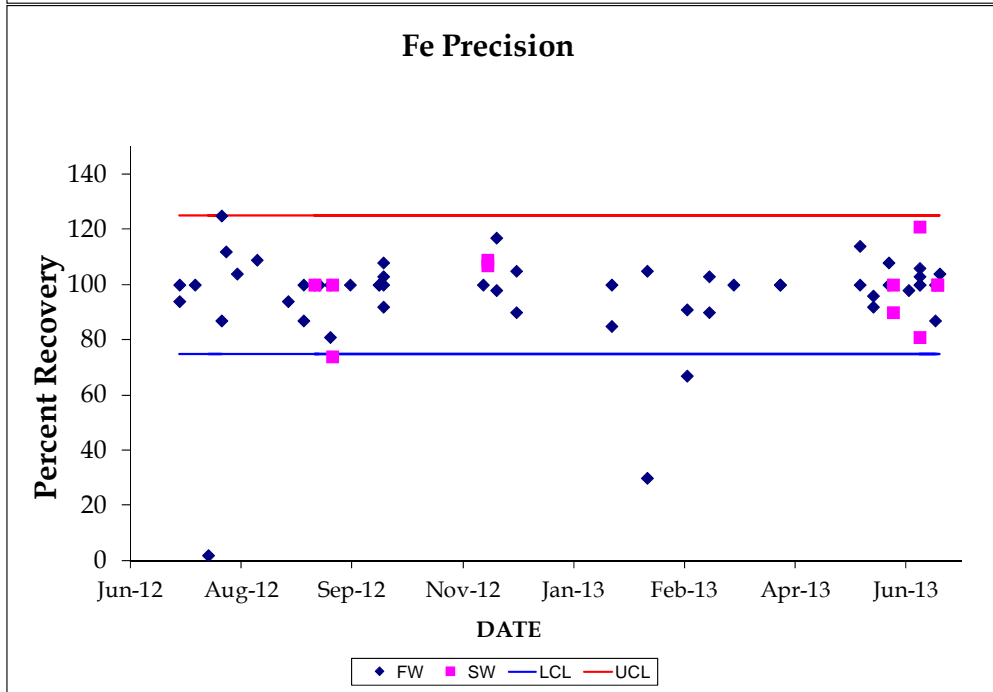
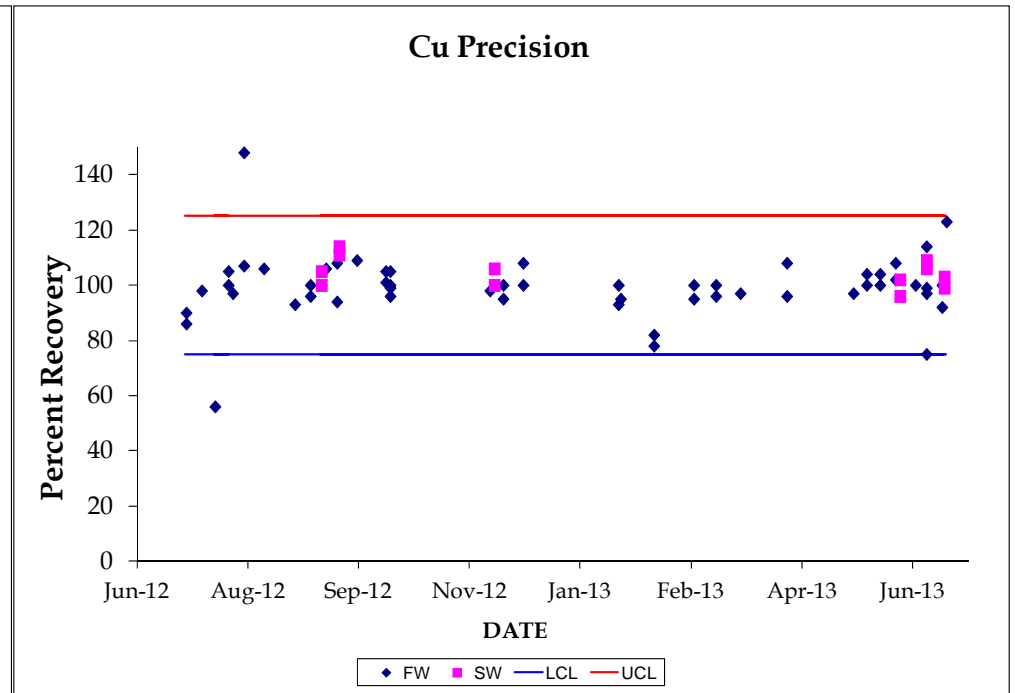
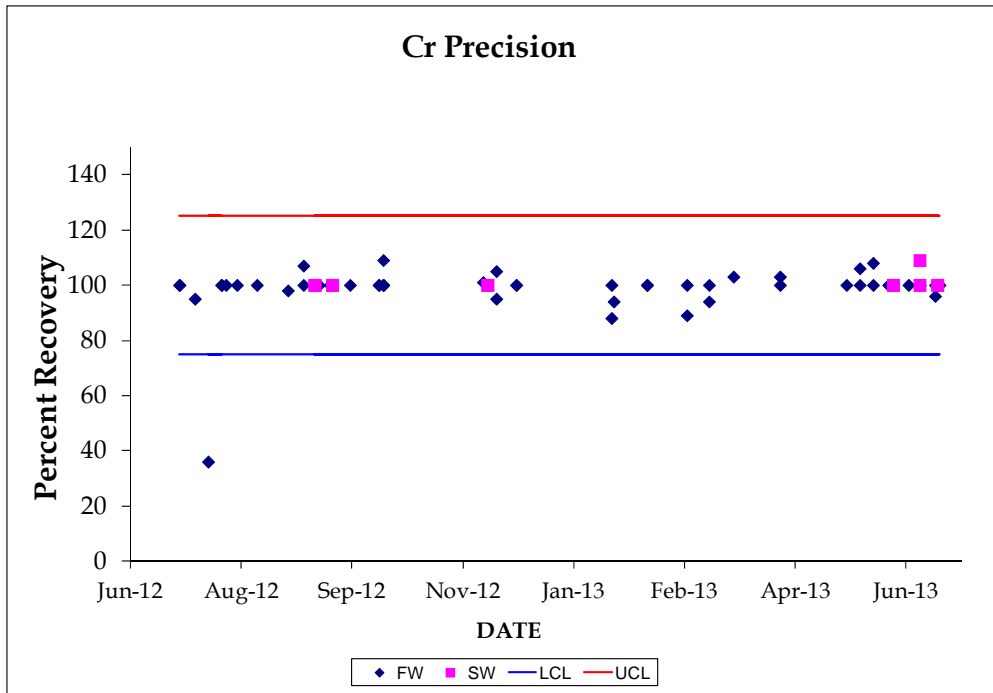
Quality Assurance/Quality Control
Precision Charts



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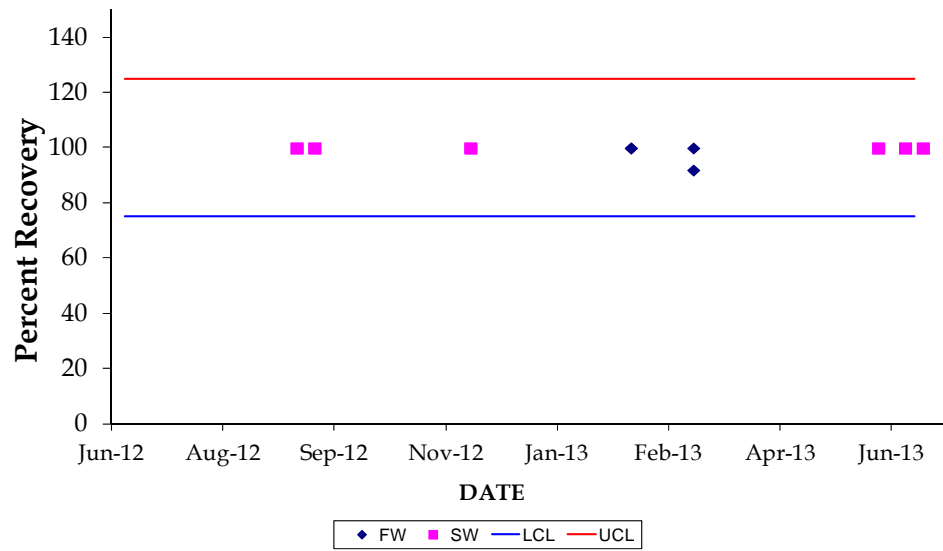


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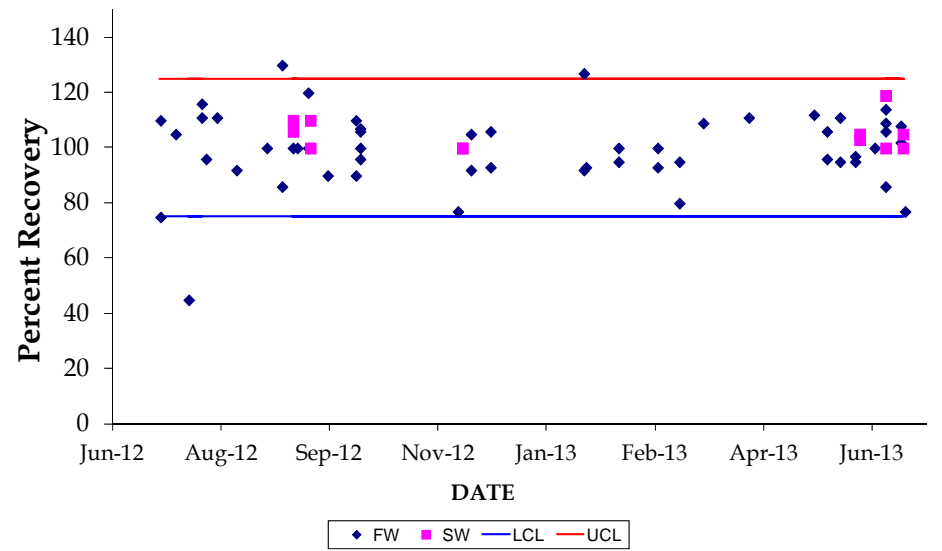


Quality Assurance/Quality Control
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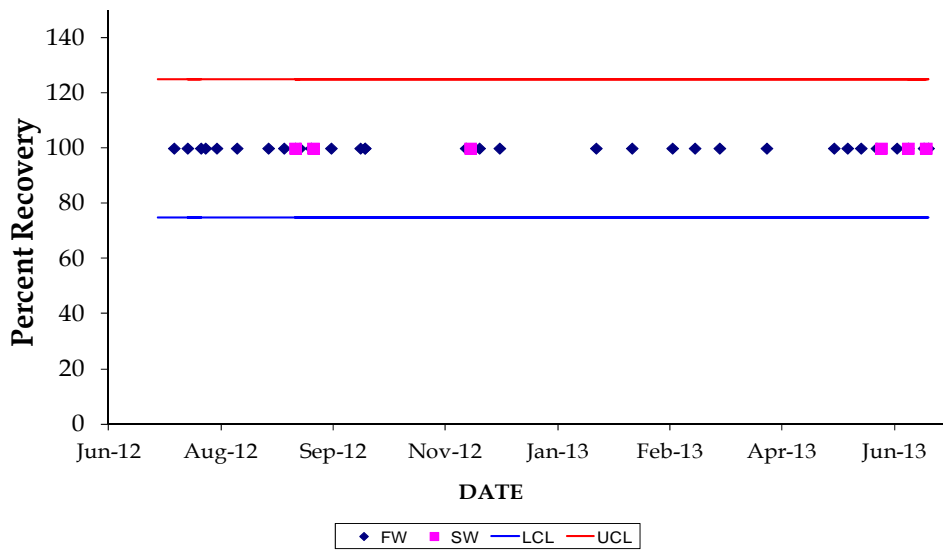
Tl Precision



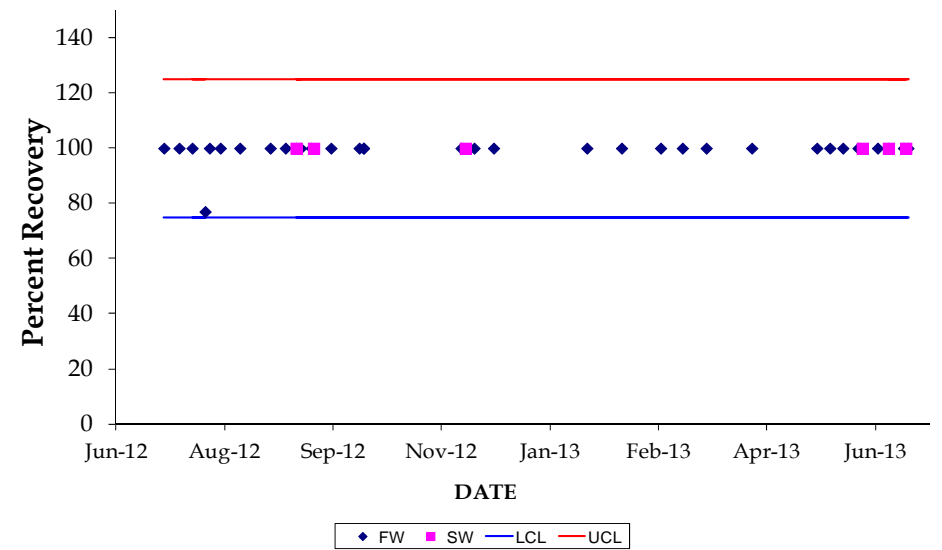
Zn Precision



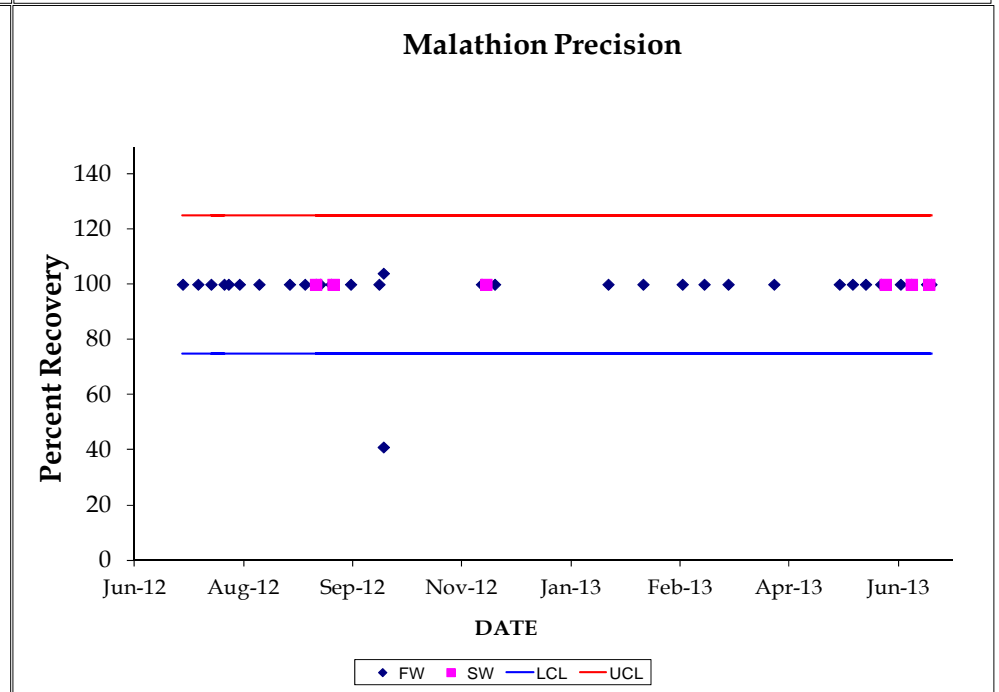
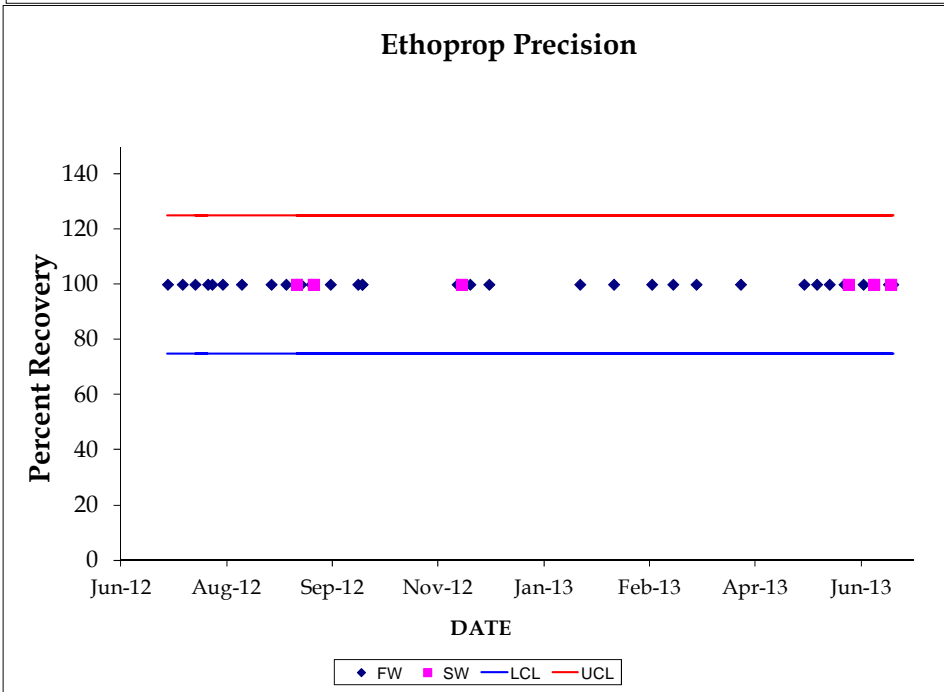
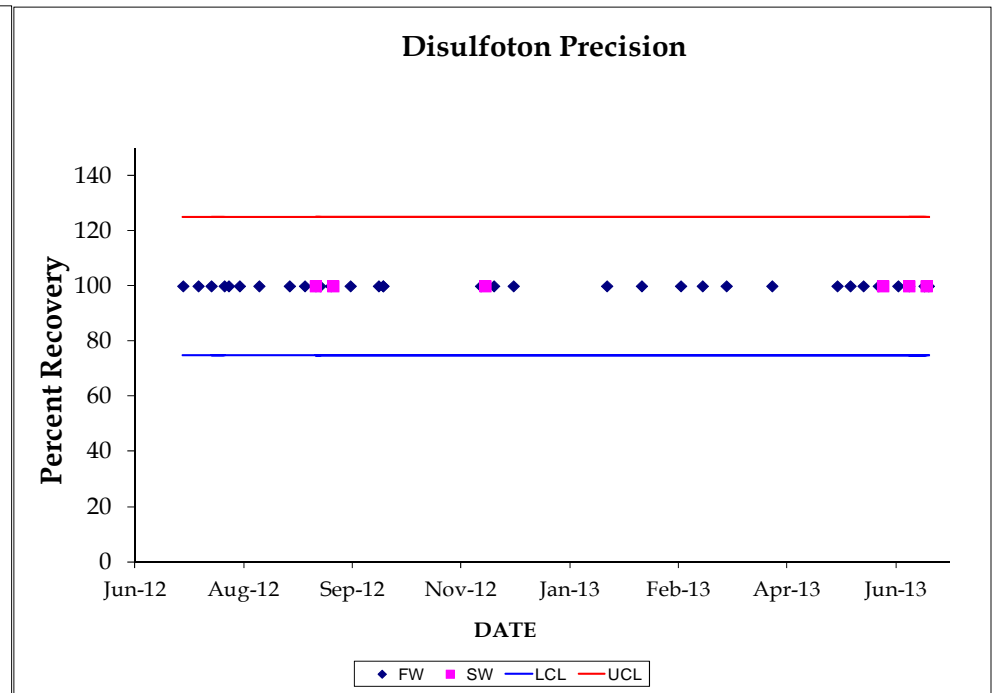
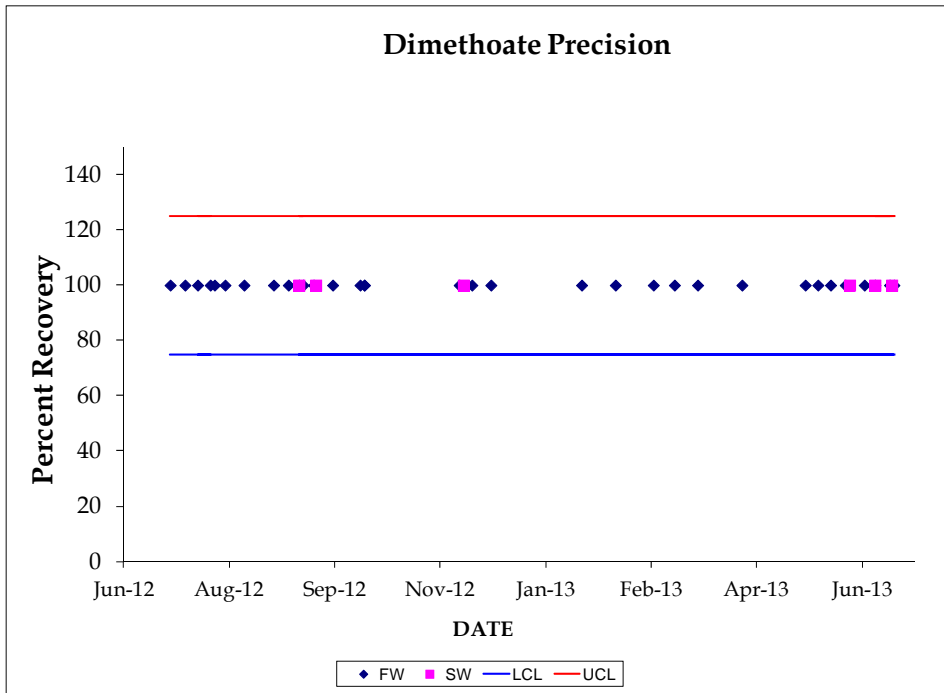
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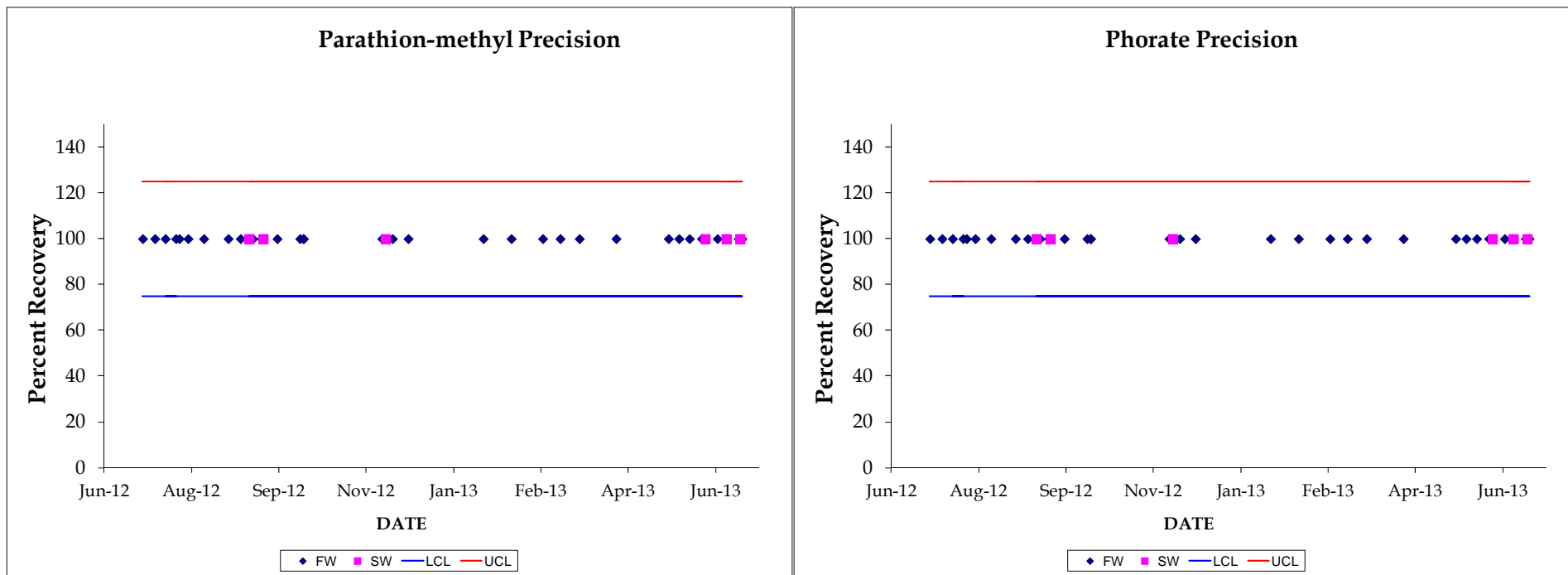
Diazinon Precision



Quality Assurance/Quality Control
Precision Charts



Quality Assurance/Quality Control
Precision Charts



**Quality Assurance/ Quality Control
Laboratory Blanks Results**

Total Dissolved Solids

Sample Date	Matrix	QA Sample Type	TDS (mg/L)
7/12/12	FW	Equipment Blank	<10
7/24/12	FW	Trip Blank	<10
8/1/12	FW	Equipment Blank	<10
9/6/12	FW	Trip Blank	<10
5/21/13	FW	Trip Blank	<10
6/11/13	FW	Trip Blank	<10

Quality Assurance/ Quality Control Laboratory Blanks Results

Total Organic Carbon

Sample Date	Matrix	QA Sample Type	TOC (mg/L)
08/31/12	GW	Trip Blank	<0.3
09/18/12	GW	Trip Blank	<0.3
07/12/12	FW	Equipment Blank	<0.3
07/12/12	FW	Equipment Blank	<0.3
07/19/12	FW	Equipment Blank	<0.3
07/24/12	FW	Trip Blank	<0.3
08/01/12	FW	Equipment Blank	<0.3
07/26/12	FW	Equipment Blank	<0.3
08/02/12	FW	Equipment Blank	<0.3
08/09/12	FW	Trip Blank	<0.3
08/16/12	FW	Equipment Blank	<0.3
08/23/12	FW	Trip Blank	<0.3
08/30/12	FW	Equipment Blank	<0.3
09/06/12	FW	Trip Blank	<0.3
09/06/12	FW	Trip Blank	<0.3
09/13/12	FW	Equipment Blank	<0.3
09/11/12	FW	Trip Blank	<0.3
09/11/12	SW	Trip Blank	3.13
09/20/12	FW	Trip Blank	<0.3
09/18/12	FW	Equipment Blank	<0.3
09/19/12	SW	Trip Blank	2.03
09/27/12	FW	Equipment Blank	<0.3
10/02/12	FW	Equipment Blank	<0.3
10/02/12	FW	Equipment Blank	<0.3
10/02/12	FW	Equipment Blank	<0.3
10/02/12	FW	Equipment Blank	<0.3
10/02/12	FW	Equipment Blank	<0.3
10/02/12	FW	Trip Blank	<0.3
10/02/12	FW	Equipment Blank	<0.3
10/11/12	FW	Trip Blank	<0.3
10/11/12	FW	Trip Blank	<0.3
10/12/12	FW	Equipment Blank	<0.3
10/12/12	FW	Trip Blank	<0.3
11/26/12	FW	Trip Blank	<0.3
11/28/12	SW	Trip Blank	<0.3
11/29/12	FW	Trip Blank	<0.3
12/02/12	FW	Equipment Blank	<0.3
02/08/13	FW	Trip Blank	<0.3
02/21/13	FW	Trip Blank	<0.3
03/08/13	FW	Trip Blank	<0.3
03/10/13	FW	Trip Blank	<0.3
03/19/13	FW	Trip Blank	<0.3

**Quality Assurance/ Quality Control
Laboratory Blanks Results**

Total Organic Carbon (cont.)

Sample Date	Matrix	QA Sample Type	TOC (mg/L)
03/28/13	FW	Equipment Blank	<0.3
03/28/13	FW	Equipment Blank	<0.3
03/28/13	FW	Equipment Blank	<0.3
03/28/13	FW	Equipment Blank	<0.3
03/28/13	FW	Equipment Blank	<0.3
03/28/13	FW	Trip Blank	<0.3
03/28/13	FW	Equipment Blank	<0.3
04/04/13	FW	Equipment Blank	
04/04/13	FW	Equipment Blank	<0.3
04/04/13	FW	Equipment Blank	
04/04/13	FW	Equipment Blank	
04/04/13	FW	Equipment Blank	
04/04/13	FW	Equipment Blank	
04/04/13	FW	Equipment Blank	
05/30/13	FW	Trip Blank	<0.3
05/23/13	FW	Equipment Blank	0.31
05/16/13	FW	Trip Blank	<0.3
05/21/13	FW	Trip Blank	<0.3
05/28/13	FW	Equipment Blank	<0.3
05/30/13	FW	Equipment Blank	<0.3
06/06/13	FW	Equipment Blank	<0.3
06/13/13	FW	Trip Blank	<0.3
06/20/13	FW	Equipment Blank	<0.3
06/11/13	SW	Trip Blank	<0.3
06/11/13	FW	Trip Blank	<0.3
06/18/13	FW	Equipment Blank	<0.3
06/19/13	FW	Trip Blank	<0.3
06/27/13	FW	Trip Blank	<0.3

Quality Assurance/ Quality Control Laboratory Blanks Results

Semi Volatile Organic Compounds

Sample Type: Trip Blank FW	
Date: 10/11/12	
Parameter	ng/L
1,2,4-Trichlorobenzene	<50
1,2-Dichlorobenzene	<50
1,3-Dichlorobenzene	<50
1,4-Dichlorobenzene	<50
1-Methylnaphthalene	<5
2,4- Dichlorophenol	<100
2,4- Dimethylphenol	<200
2,4,6- Trichlorophenol	<100
2,4-Dinitrophenol	<200
2,4-Dinitrotoluene	<100
2,6-Dinitrotoluene	<100
2-Chloronaphthalene	<100
2-chlorophenol	<100
2-Methyl-4,6-dinitrophenol	<200
2-Methylnaphthalene	5.9
2-Nitrophenol	<200
3,3'-dichlorobenzidine	<100
4-Bromophenylphenylether	<100
4-Chloro-3-methylphenol	<200
4-Chlorophenylphenylether	<100
4-Nitrophenol	<200
Acenaphthene	<5
Acenaphthylene	<5
Anthracene	13
Azobenzene	<100
Benzidine	<100
Benzo[a]anthracene	6.2
Benzo[a]pyrene	<5
Benzo[b]fluoranthene	7.3
Benzo[e]pyrene	
Benzo[g,h,i]perylene	<5
Benzo[k]fluoranthene	6.8
bis(2-Chloroethoxy)methane	<100
bis(2-Chloroethyl)ether	<100
bis(2-Chloroisopropyl)ether	<100
bis(2-Ethylhexyl) Phthalate	7400
Butylbenzyl Phthalate	100
Chrysene	<5
Dibenz[a,h]anthracene	<5
Diethyl Phthalate	<10
Dimethyl Phthalate	<10
Di-n-butyl Phthalate	30
Di-n-octyl Phthalate	<10

**Quality Assurance/ Quality Control
Laboratory Blanks Results**

**Semi Volatile Oranic Compounds
(cont.)**

Sample Type: Trip Blank FW	
Date: 10/11/12	
Parameter	ng/L
Fluoranthene	<5
Fluorene	<5
Hexachlorobenzene	<5
Hexachlorobutadiene	<100
Hexachlorocyclopentadiene	<100
Hexachloroethane	<100
Indeno[1,2,3-c,d]pyrene	<5
Isophorone	<100
Naphthalene	11
Nitrobenzene	<100
N-Nitrodimethylamine	<100
N-Nitrosodi-n-propylamine	<100
N-Nitrosodiphenylamine	<100
Pentachlorophenol	<100
Phenanthrene	5.6
Phenol	<200
Pyrene	<5

**Quality Assurance/ Quality Control
Laboratory Blanks Results**

HCA Bacteria

Sample Date	Matrix	QA Sample Type	TC	FC	ENT
			CFU/100 ml		
07/12/12	FW	Trip Blank	<9	<9	<9
07/05/12	FW	Trip Blank	<9	<9	<9
07/05/12	FW	Trip Blank	<9	<9	<9
07/02/12	FW	Trip Blank	<9	<9	<9
07/02/12	FW	Trip Blank	<9	<9	<9
07/12/12	FW	Equipment Blank	<9	<9	<9
07/09/12	FW	Trip Blank	<9	<9	<9
07/10/12	FW	Trip Blank	<9	<9	<9
07/11/12	FW	Trip Blank	<9	<9	<9
07/11/12	FW	Trip Blank	<9	<9	<9
07/12/12	FW	Equipment Blank	<9	<9	<9
07/16/12	FW	Trip Blank	<9	<9	<9
07/17/12	FW	Trip Blank	<9	<9	<9
07/18/12	FW	Trip Blank	<9	<9	<9
07/19/12	FW	Trip Blank	<9	<9	<9
07/16/12	FW	Trip Blank	<9	<9	<9
07/18/12	FW	Trip Blank	<9	<9	<9
07/24/12	FW	Trip Blank	<9	<9	<9
07/19/12	FW	Equipment Blank	<9	<9	<9
07/24/12	FW	Trip Blank	<9	<9	<9
07/24/12	FW	Trip Blank	<9	<9	<9
07/25/12	FW	Trip Blank	<9	<9	<9
07/26/12	FW	Trip Blank	<9	<9	<9
08/01/12	FW	Equipment Blank	<9	<9	<9
07/30/12	FW	Trip Blank	<9	<9	<9
08/01/12	FW	Trip Blank	<9	<9	<9
08/02/12	FW	Trip Blank	<9	<9	<9
07/26/12	FW	Equipment Blank	<9	<9	<9
07/31/12	SW	Trip Blank	<9	<9	<9
08/02/12	FW	Equipment Blank	<9	<9	<9
08/01/12	FW	Trip Blank			
08/06/12	FW	Trip Blank	<9	<9	<9
08/09/12	FW	Trip Blank	<9	<9	<9
08/07/12	FW	Trip Blank	<9	<9	<9
08/08/12	FW	Trip Blank	<9	<9	<9
08/09/12	FW	Trip Blank	<9	<9	<9
08/07/12	FW	Trip Blank	<9	<9	<9
08/08/12	FW	Trip Blank	<9	<9	<9
08/09/12	FW	Trip Blank	<9	<9	<9
08/13/12	FW	Trip Blank	<9	<9	<9
08/09/12	FW	Trip Blank	<9	<9	<9
08/14/12	FW	Trip Blank	<9	<9	<9
08/15/12	FW	Trip Blank	<9	<9	<9
08/16/12	FW	Trip Blank	<9	<9	<9

**Quality Assurance/ Quality Control
Laboratory Blanks Results**

HCA Bacteria (cont.)

Sample Date	Matrix	QA Sample Type	TC	FC	ENT
			CFU/100 ml		
08/14/12	FW	Trip Blank	<9	<9	<9
08/16/12	FW	Equipment Blank	<9	<9	<9
08/15/12	FW	Trip Blank	<9	<9	<9
08/16/12	FW	Trip Blank	<9	<9	<9
08/20/12	FW	Trip Blank	<9	<9	<9
08/23/12	FW	Trip Blank	<9	<9	<9
08/21/12	FW	Trip Blank	<9	<9	<9
08/22/12	FW	Trip Blank	<9	<9	<9
08/23/12	FW	Trip Blank	<9	<9	<9
08/21/12	FW	Trip Blank	<9	<9	<9
08/23/12	FW	Trip Blank	<9	<9	<9
08/30/12	FW	Equipment Blank	<9	<9	<9
08/27/12	FW	Trip Blank	<9	<9	<9
08/28/12	FW	Trip Blank	<9	<9	<9
08/29/12	FW	Trip Blank	<9	<9	<9
08/30/12	FW	Trip Blank	<9	<9	<9
08/28/12	FW	Trip Blank	<9	<9	<9
08/29/12	FW	Trip Blank	<9	<9	<9
09/05/12	FW	Trip Blank	<9	<9	<9
09/06/12	FW	Trip Blank	<9	<9	<9
09/06/12	FW	Trip Blank	<9	<9	<9
08/29/12	FW	Trip Blank	<9	<9	<9
09/04/12	FW	Trip Blank	<9	<9	<9
09/06/12	FW	Trip Blank	<9	<9	<9
09/05/12	FW	Trip Blank	<9	<9	<9
09/06/12	FW	Trip Blank	<9	<9	<9
09/06/12	FW	Trip Blank	<9	<9	<9
09/13/12	FW	Equipment Blank	<9	<9	<9
09/10/12	FW	Trip Blank	<9	<9	<9
09/11/12	FW	Trip Blank	<9	<9	<9
09/12/12	FW	Trip Blank	<9	<9	<9
09/13/12	FW	Trip Blank	<9	<9	<9
09/11/12	FW	Trip Blank	<9	<9	<9
09/11/12	SW	Trip Blank	<9	<9	<9
09/13/12	FW	Trip Blank	<9	<9	<9
09/13/12	FW	Trip Blank	3300	60	40
09/13/12	FW	Trip Blank	<9	<9	<9
09/12/12	FW	Trip Blank	<9	<9	<9
09/20/12	FW	Trip Blank	<9	<9	<9
09/17/12	FW	Trip Blank	<9	<9	<9
09/18/12	FW	Trip Blank	<9	<9	<9
09/19/12	FW	Trip Blank	<9	<9	<9
09/20/12	FW	Trip Blank	<9	<9	<9
09/18/12	FW	Trip Blank	<9	<9	<9

**Quality Assurance/ Quality Control
Laboratory Blanks Results**

HCA Bacteria (cont.)

Sample Date	Matrix	QA Sample Type	TC	FC	ENT
			CFU/100 ml		
09/19/12	SW	Trip Blank	<9	<9	<9
09/19/12	FW	Trip Blank	<9	<9	<9
09/20/12	FW	Trip Blank	<9	<9	<9
09/24/12	FW	Trip Blank	<9	<9	<9
09/25/12	FW	Trip Blank	<9	<9	<9
09/26/12	FW	Trip Blank	<9	<9	<9
09/27/12	FW	Trip Blank	<9	<9	<9
09/25/12	FW	Trip Blank	<9	<9	<9
09/27/12	FW	Equipment Blank	<9	<9	<9
09/26/12	FW	Trip Blank	<9	<9	<9
09/26/12	FW	Trip Blank	<9	<9	<9
09/27/12	FW	Trip Blank	<9	<9	<9
10/02/12	FW	Trip Blank	<9	<9	<9
10/03/12	FW	Trip Blank	<9	<9	<9
10/04/12	FW	Trip Blank			
10/10/12	FW	Trip Blank	<9	<9	<9
10/17/12	FW	Trip Blank	<9	<9	<9
10/09/12	FW	Trip Blank	<9	<9	<9
10/15/12	FW	Trip Blank	<9	<9	<9
10/16/12	FW	Trip Blank	<9	<9	<9
10/18/12	FW	Trip Blank	<9	<9	<9
10/23/12	FW	Trip Blank	<9	<9	<9
10/24/12	FW	Trip Blank	<9	<9	<9
10/25/12	FW	Trip Blank	<9	<9	<9
10/24/12	FW	Trip Blank	<9	<9	<9
10/30/12	FW	Trip Blank	<9	<9	<9
10/31/12	FW	Trip Blank	<9	<9	<9
11/01/12	FW	Trip Blank	<9	<9	<9
10/31/12	SW	Trip Blank	<9	<9	<9
11/01/12	FW	Trip Blank			
11/06/12	FW	Trip Blank	<9	<9	<9
11/07/12	FW	Trip Blank	<9	<9	<9
11/05/12	FW	Trip Blank	<9	<9	<9
11/08/12	FW	Trip Blank	<9	<9	<9
11/06/12	FW	Trip Blank	<9	<9	<9
11/13/12	FW	Trip Blank	<9	<9	<9
11/15/12	FW	Trip Blank	<9	<9	<9
11/14/12	FW	Trip Blank	<9	<9	<9
11/27/12	FW	Trip Blank	<9	<9	<9
11/20/12	FW	Trip Blank	<9	<9	<9
11/19/12	FW	Trip Blank	<9	<9	<9
12/11/12	FW	Trip Blank	<9	<9	<9
11/28/12	FW	Trip Blank	<9	<9	<9
11/29/12	FW	Trip Blank	<9	<9	<9

**Quality Assurance/ Quality Control
Laboratory Blanks Results**

HCA Bacteria (cont.)

Sample Date	Matrix	QA Sample Type	TC	FC	ENT
			CFU/100 ml		
11/13/12	FW	Trip Blank	<9	<9	<9
11/19/12	FW	Trip Blank	<9	<9	<9
11/26/12	FW	Trip Blank	<9	<9	<9
11/26/12	FW	Trip Blank	<9	<9	<9
11/28/12	SW	Trip Blank	<9	<9	<9
12/06/12	FW	Trip Blank	<9	<9	<9
12/05/12	FW	Trip Blank	<9	<9	<9
12/03/12	FW	Trip Blank	<9	<9	<9
12/04/12	FW	Trip Blank	<9	<9	<9
12/10/12	FW	Trip Blank	<9	<9	<9
12/10/12	FW	Trip Blank	<9	<9	<9
12/16/12	FW	Trip Blank	<9	<9	<9
12/17/12	FW	Trip Blank	<9	<9	<9
01/02/13	FW	Trip Blank	<9	<9	<9
01/03/13	FW	Trip Blank	<9	<9	<9
12/26/12	FW	Trip Blank	<9	<9	<9
01/08/13	FW	Trip Blank	<9	<9	<9
01/09/13	FW	Trip Blank	<9	<9	<9
01/03/13	FW	Trip Blank	<9	<9	<9
01/10/13	FW	Trip Blank	<9	<9	<9
01/15/13	FW	Trip Blank	<9	<9	<9
01/16/13	FW	Trip Blank	<9	<9	<9
01/17/13	FW	Trip Blank	<9	<9	<9
01/15/13	FW	Trip Blank	<9	<9	<9
01/16/13	FW	Trip Blank	<9	<9	<9
01/24/13	FW	Trip Blank	<9	<9	<9
01/23/13	FW	Trip Blank	<9	<9	<9
01/30/13	FW	Trip Blank	<9	<9	<9
01/26/13	FW	Trip Blank	<9	<9	<9
01/29/13	FW	Trip Blank	<9	<9	<9
01/31/13	FW	Trip Blank	<9	<9	<9
01/30/13	SW	Trip Blank	<9	<9	<9
02/05/13	FW	Trip Blank	<9	<9	<9
02/06/13	FW	Trip Blank	<9	<9	<9
02/07/13	FW	Trip Blank	<9	<9	<9
02/13/13	FW	Trip Blank	<9	<9	<9
02/14/13	FW	Trip Blank	<9	<9	<9
02/14/13	FW	Trip Blank	<9	<9	<9
02/07/13	FW	Trip Blank	<9	<9	<9
02/13/13	FW	Trip Blank	<9	<9	<9
02/21/13	FW	Trip Blank	<9	<9	<9
02/27/13	FW	Trip Blank	<9	<9	<9
02/19/13	FW	Trip Blank	<9	<9	<9
02/19/13	FW	Trip Blank	<9	<9	<9

**Quality Assurance/ Quality Control
Laboratory Blanks Results**

HCA Bacteria (cont.)

Sample Date	Matrix	QA Sample Type	TC	FC	ENT
			CFU/100 ml		
02/21/13	FW	Trip Blank	<9	<9	<9
02/23/13	FW	Trip Blank	<9	<9	<9
02/21/13	FW	Trip Blank	<9	<9	<9
02/26/13	FW	Trip Blank	<9	<9	<9
02/28/13	FW	Trip Blank	<9	<9	<9
02/26/13	SW	Trip Blank	<9	<9	<9
03/05/13	FW	Trip Blank	<9	<9	<9
03/04/13	FW	Trip Blank	<9	<9	<9
03/07/13	FW	Trip Blank	<9	<9	<9
03/08/13	FW	Trip Blank	<9	<9	<9
03/10/13	FW	Trip Blank	<9	<9	<9
03/12/13	FW	Trip Blank	<9	<9	<9
03/19/13	FW	Trip Blank	<9	<9	<9
03/13/13	FW	Trip Blank	<9	<9	<9
03/14/13	FW	Trip Blank	<9	<9	<9
03/20/13	FW	Trip Blank	<9	<9	<9
03/21/13	FW	Trip Blank	<9	<9	<9
03/26/13	FW	Trip Blank	<9	<9	<9
03/27/13	FW	Trip Blank	<9	<9	<9
03/28/13	FW	Trip Blank	<9	<9	<9
03/19/13	FW	Trip Blank	<9	<9	<9
04/01/13	FW	Trip Blank	<9	<9	<9
04/02/13	FW	Trip Blank	<9	<9	<9
04/04/13	FW	Trip Blank	<9	<9	<9
04/03/13	FW	Trip Blank	<9	<9	<9
04/09/13	FW	Trip Blank	<9	<9	<9
04/10/13	FW	Trip Blank	<9	<9	<9
04/11/13	FW	Trip Blank	<9	<9	<9
05/30/13	FW	Trip Blank	<9	<9	<9
05/23/13	FW	Equipment Blank	<9	<9	<9
04/16/13	FW	Trip Blank	<9	<9	<9
04/15/13	FW	Trip Blank	<9	<9	<9
04/18/13	FW	Trip Blank	<9	<9	<9
05/16/13	FW	Trip Blank	<9	<9	<9
04/24/13	FW	Trip Blank	<9	<9	<9
04/25/13	FW	Trip Blank	<9	<9	<9
04/23/13	FW	Trip Blank	<9	<9	<9
04/24/13	SW	Trip Blank	<9	<9	<9
04/30/13	FW	Trip Blank	<9	<9	<9
05/01/13	FW	Trip Blank	<9	<9	<9
05/02/13	FW	Trip Blank	<9	<9	<9
05/01/13	FW	Trip Blank	<9	<9	<9

**Quality Assurance/ Quality Control
Laboratory Blanks Results**

HCA Bacteria (cont.)

Sample Date	Matrix	QA Sample Type	TC	FC	ENT
			CFU/100 ml		
05/02/13	FW	Trip Blank	<9	<9	<9
05/15/13	FW	Trip Blank	<9	<9	<9
05/14/13	FW	Trip Blank	<9	<9	<9
05/07/13	FW	Trip Blank	<9	<9	<9
05/08/13	FW	Trip Blank	<9	<9	<9
05/10/13	FW	Trip Blank	<9	<9	<9
05/16/13	FW	Trip Blank	<9	<9	<9
05/16/13	FW	Trip Blank	<9	<9	<9
05/21/13	FW	Trip Blank	<9	<9	<9
05/22/13	FW	Trip Blank	<9	<9	<9
05/23/13	FW	Trip Blank	<9	<9	<9
05/30/13	FW	Trip Blank	<9	<9	<9
05/29/13	FW	Trip Blank	<9	<9	<9
05/28/13	FW	Trip Blank	<9	<9	<9
06/04/13	FW	Trip Blank	<9	<9	<9
06/06/13	FW	Trip Blank	<9	<9	<9
06/05/13	FW	Trip Blank	<9	<9	<9
05/23/13	SW	Trip Blank	<9	<9	<9
05/28/13	FW	Equipment Blank	<9	<9	<9
05/30/13	FW	Equipment Blank	<9	<9	<9
06/06/13	FW	Equipment Blank	<9	<9	<9
06/06/13	FW	Trip Blank	<9	<9	<9
06/13/13	FW	Trip Blank	<9	<9	<9
06/11/13	FW	Trip Blank	<9	<9	<9
06/12/13	FW	Trip Blank	<9	<9	<9
06/13/13	FW	Trip Blank	<9	<9	<9
06/11/13	FW	Trip Blank	<9	<9	<9
06/20/13	FW	Equipment Blank	<9	<9	<9
06/11/13	SW	Trip Blank	<9	<9	<9
06/13/13	FW	Trip Blank	<9	<9	<9
06/19/13	FW	Trip Blank			
06/20/13	FW	Trip Blank	<9	<9	<9
06/18/13	FW	Trip Blank	<9	<9	<9
06/18/13	FW	Equipment Blank			
06/19/13	FW	Trip Blank	<9	<9	<9
06/19/13	FW	Trip Blank	<9	<9	<9
06/20/13	FW	Trip Blank	<9	<9	<9
06/27/13	FW	Trip Blank	<9	<9	<9
06/25/13	FW	Trip Blank	<9	<9	<9
06/26/13	FW	Trip Blank	<9	<9	<9
06/27/13	FW	Trip Blank	<9	<9	<9
06/27/13	FW	Trip Blank	<9	<9	<9
06/27/13	FW	Trip Blank	<9	<9	<9
06/27/13	FW	Trip Blank	<9	<9	<9

Quality Assurance/ Quality Control Laboratory Blanks Results

Oil and Grease

Sample Date	Matrix	QA Sample Type	OGPG (mg/L)
7/12/12 9:01	FW	Equipment Blank	5
7/12/12 11:10	FW	Equipment Blank	5
7/19/12 10:00	FW	Equipment Blank	5
7/24/12 10:12	FW	Trip Blank	5
8/1/12 10:50	FW	Equipment Blank	5
7/26/12 7:46	FW	Equipment Blank	5
8/2/12 8:50	FW	Equipment Blank	5
8/9/12 7:55	FW	Trip Blank	5
8/16/12 8:25	FW	Equipment Blank	5
8/23/12 7:40	FW	Trip Blank	5
8/30/12 8:05	FW	Equipment Blank	5
9/6/12 7:40	FW	Trip Blank	5
9/6/12 0:00	FW	Trip Blank	5
9/13/12 8:30	FW	Equipment Blank	5
9/11/12 0:00	FW	Trip Blank	5
9/20/12 11:00	FW	Trip Blank	5
9/27/12 8:15	FW	Equipment Blank	5
11/26/12 7:15	FW	Trip Blank	48.1
11/26/12 7:16	FW	Trip Blank	5
2/8/13 0:00	FW	Trip Blank	5
3/8/13 0:00	FW	Trip Blank	5
3/8/13 7:00	FW	Trip Blank	5
3/19/13 10:55	FW	Trip Blank	5
5/30/13 11:50	FW	Trip Blank	5
5/23/13 8:20	FW	Equipment Blank	5
5/16/13 12:25	FW	Trip Blank	5
5/28/13 10:15	FW	Equipment Blank	5
5/30/13 10:20	FW	Equipment Blank	5
6/6/13 8:15	FW	Equipment Blank	5
6/13/13 10:55	FW	Trip Blank	5
6/20/13 8:15	FW	Equipment Blank	5
6/11/13 10:30	SW	Trip Blank	5
6/18/13 0:00	FW	Equipment Blank	5
6/19/13 11:30	FW	Trip Blank	5
6/27/13 12:10	FW	Trip Blank	5
9/18/12 0:00	FW	Equipment Blank	

Quality Assurance/ Quality Control Laboratory Blanks Results

Glyphosate

Sample Date	Matrix	QA Sample Type	Glyph (mg/L)
9/11/12	FW	Trip Blank	<5
9/11/12	SW	Trip Blank	<25
9/18/12	FW	Equipment Blank	<5
9/19/12	SW	Trip Blank	
10/11/12	FW	Trip Blank	<5
10/12/12	FW	Equipment Blank	<5
11/26/12	FW	Trip Blank	<5
11/28/12	SW	Trip Blank	<25
11/29/12	FW	Trip Blank	<5
12/2/12	FW	Equipment Blank	<5
2/21/13	FW	Trip Blank	<5
3/19/13	FW	Trip Blank	<5
5/28/13	FW	Equipment Blank	<5
5/30/13	FW	Equipment Blank	<5
6/18/13	FW	Equipment Blank	<5
6/19/13	FW	Trip Blank	<5

Biological Oxygen Demand

Sample Date	Matrix	QA Sample Type	BOD (mg/L)
07/12/12	FW	Equipment Blank	10
08/01/12	FW	Equipment Blank	<5
09/06/12	FW	Trip Blank	<5
02/08/13	FW	Trip Blank	7
03/08/13	FW	Trip Blank	9
03/08/13	FW	Trip Blank	10
06/11/13	SW	Trip Blank	<5

Chemical Oxygen Demand

Sample Date	Matrix	QA Sample Type	COD (mg/L)
7/12/12 11:10	FW	Equipment Blank	<10
8/1/12 10:50	FW	Equipment Blank	44.5
9/6/12 0:00	FW	Trip Blank	111
2/8/13 0:00	FW	Trip Blank	<10
3/8/13 0:00	FW	Trip Blank	<10
3/8/13 7:00	FW	Trip Blank	175
6/11/13 10:30	SW	Trip Blank	<50

Quality Assurance/ Quality Control Laboratory Blanks Results

Dissolved Organic Carbon

Sample Date	Matrix	QA Sample Type	DOC (mg/L)
7/12/12 11:10	FW	Equipment Blank	<0.3
8/1/12 10:50	FW	Equipment Blank	0.323
9/11/12 0:00	FW	Trip Blank	<0.3
10/11/12 0:00	FW	Trip Blank	<0.3
10/11/12 0:00	FW	Trip Blank	<0.3
11/26/12 0:00	FW	Trip Blank	<0.3
11/29/12 0:00	FW	Trip Blank	<0.3
2/8/13 0:00	FW	Trip Blank	<0.3
3/8/13 0:00	FW	Trip Blank	<0.3
3/10/13 0:00	FW	Trip Blank	0.332
6/11/13 10:30	SW	Trip Blank	<0.3

Total Suspended Solids

Sample Date	Matrix	QA Sample Type	TSS (mg/L)
08/06/12	FW	Equipment Blank	<5
07/12/12	FW	Equipment Blank	<5
07/03/12	FW	Trip Blank	<5
07/12/12	FW	Equipment Blank	<5
07/18/12	FW	Trip Blank	<5
07/19/12	FW	Equipment Blank	<5
07/24/12	FW	Trip Blank	<5
08/01/12	FW	Equipment Blank	<5
07/25/12	FW	Equipment Blank	<5
07/26/12	FW	Equipment Blank	<5
07/31/12	SW	Trip Blank	<5
08/02/12	FW	Equipment Blank	<5
08/01/12	FW	Equipment Blank	<5
08/09/12	FW	Trip Blank	<5
08/07/12	FW	Equipment Blank	<5
08/16/12	FW	Equipment Blank	<5
08/15/12	FW	Equipment Blank	<5
08/23/12	FW	Trip Blank	<5
08/30/12	FW	Equipment Blank	<5
08/29/12	SW	Trip Blank	<5
08/31/12	FW	Equipment Blank	<5
09/06/12	FW	Trip Blank	<5
09/05/12	FW	Trip Blank	<5
09/06/12	FW	Trip Blank	<5

**Quality Assurance/ Quality Control
Laboratory Blanks Results**

Total Suspended Solids (cont.)			
Sample Date	Matrix	QA Sample Type	TSS (mg/L)
09/13/12	FW	Equipment Blank	<5
09/11/12	FW	Trip Blank	<5
09/11/12	SW	Trip Blank	23
09/20/12	FW	Trip Blank	<5
09/18/12	FW	Equipment Blank	<5
09/19/12	SW	Trip Blank	8
09/27/12	FW	Equipment Blank	<5
09/26/12	FW	Equipment Blank	<5
10/02/12	FW	Equipment Blank	<5
10/02/12	FW	Equipment Blank	<5
10/02/12	FW	Equipment Blank	<5
10/02/12	FW	Equipment Blank	<5
10/02/12	FW	Equipment Blank	<5
10/02/12	FW	Trip Blank	<5
10/02/12	FW	Equipment Blank	<5
10/03/12	FW	Equipment Blank	<5
10/03/12	FW	Equipment Blank	<5
10/10/12	FW	Trip Blank	<5
10/11/12	FW	Trip Blank	<5
10/11/12	FW	Trip Blank	<5
10/12/12	FW	Equipment Blank	<5
10/12/12	FW	Trip Blank	<5
10/30/12	FW	Trip Blank	<5
10/31/12	SW	Trip Blank	<5
11/07/12	FW	Equipment Blank	<5
11/26/12	FW	Trip Blank	<5
11/28/12	SW	Trip Blank	<5
11/29/12	FW	Trip Blank	<5
12/02/12	FW	Equipment Blank	<5
12/06/12	FW	Trip Blank	<5
12/11/12	FW	Trip Blank	<5
12/14/12	FW	Trip Blank	<5
12/21/12	FW	Trip Blank	<5
12/21/12	FW	Trip Blank	<5
01/25/13	FW	Trip Blank	<5
01/30/13	FW	Trip Blank	<5
01/30/13	SW	Trip Blank	<5
01/31/13	FW	Trip Blank	<5
02/05/13	FW	Trip Blank	<5
02/08/13	FW	Trip Blank	<5
02/15/13	FW	Trip Blank	<5
02/21/13	FW	Trip Blank	<5
02/26/13	FW	Trip Blank	<5

**Quality Assurance/ Quality Control
Laboratory Blanks Results**

02/26/13	FW	Trip Blank	<5
02/26/13	SW	Trip Blank	<5

Total Suspended Solids (cont.)

Sample Date	Sample Date	Sample Date	Sample
03/08/13	FW	Trip Blank	<5
03/10/13	FW	Trip Blank	<5
03/13/13	FW	Trip Blank	<5
03/19/13	FW	Trip Blank	<5
03/27/13	FW	Trip Blank	<5
03/28/13	FW	Equipment Blank	<5
03/28/13	FW	Equipment Blank	<5
03/28/13	FW	Equipment Blank	<5
03/28/13	FW	Equipment Blank	<5
03/28/13	FW	Equipment Blank	<5
03/28/13	FW	Trip Blank	<5
03/28/13	FW	Equipment Blank	<5
04/02/13	FW	Trip Blank	<5
04/04/13	FW	Equipment Blank	
04/04/13	FW	Equipment Blank	<5
04/04/13	FW	Equipment Blank	
04/04/13	FW	Equipment Blank	
04/04/13	FW	Equipment Blank	
04/04/13	FW	Equipment Blank	
04/09/13	FW	Trip Blank	<5
05/30/13	FW	Trip Blank	<5
05/23/13	FW	Equipment Blank	<5
05/16/13	FW	Trip Blank	<5
04/16/13	FW	Trip Blank	<5
04/23/13	FW	Trip Blank	<5
04/24/13	SW	Trip Blank	<5
05/09/13	FW	Trip Blank	<5
05/15/13	FW	Trip Blank	<5
05/21/13	FW	Trip Blank	<5
05/22/13	FW	Trip Blank	<5
05/23/13	SW	Trip Blank	<5
05/28/13	FW	Equipment Blank	<5
05/30/13	FW	Equipment Blank	<5
05/30/13	FW	Trip Blank	<5
06/05/13	FW	Trip Blank	<5
06/06/13	FW	Equipment Blank	<5
06/13/13	FW	Trip Blank	<5
06/20/13	FW	Equipment Blank	<5
06/11/13	SW	Trip Blank	<5
06/11/13	FW	Trip Blank	<5
06/13/13	FW	Trip Blank	<5
06/18/13	FW	Equipment Blank	<5

Quality Assurance/ Quality Control Laboratory Blanks Results

06/19/13	FW	Trip Blank	<5
06/27/13	FW	Trip Blank	<5

Chloride and Sulfate

Sample Date	Matrix	QA Sample Type	Chloride	Sulfate
			mg/L	
7/12/12 11:10	FW	Equipment Blank	1	1
8/1/12 10:50	FW	Equipment Blank	1	1
9/6/12 0:00	FW	Trip Blank	1	1
9/11/12 0:00	FW	Trip Blank	1	1
9/18/12 0:00	FW	Equipment Blank	1	1
10/2/12 8:40	FW	Equipment Blank	1	1
10/2/12 8:15	FW	Equipment Blank	1	1.08
10/2/12 10:15	FW	Equipment Blank	1	1
10/2/12 9:37	FW	Equipment Blank	1	1.01
10/2/12 9:20	FW	Equipment Blank	1	1.15
10/2/12 0:00	FW	Trip Blank	1.12	1
10/2/12 9:05	FW	Equipment Blank	1	1.05
10/11/12 0:00	FW	Trip Blank	1	1
10/11/12 0:00	FW	Trip Blank	1.35	1
10/12/12 13:00	FW	Equipment Blank	1	1
10/12/12 0:00	FW	Trip Blank	1	1
11/26/12 0:00	FW	Trip Blank	1	1
11/29/12 0:00	FW	Trip Blank	1	1
12/2/12 0:00	FW	Equipment Blank	1	1
2/21/13 0:00	FW	Trip Blank	1	1
3/10/13 0:00	FW	Trip Blank	1	1
3/19/13 0:00	FW	Trip Blank	1	1
3/28/13 10:19	FW	Equipment Blank	1	1
3/28/13 10:00	FW	Equipment Blank	1	1
3/28/13 11:40	FW	Equipment Blank	1	1
3/28/13 11:20	FW	Equipment Blank	1	1
3/28/13 11:00	FW	Equipment Blank	1	1
3/28/13 0:00	FW	Trip Blank	1	1
3/28/13 10:45	FW	Equipment Blank	1	1
4/4/13 10:58	FW	Equipment Blank		
4/4/13 0:00	FW	Equipment Blank	1	1
4/4/13 10:24	FW	Equipment Blank		
4/4/13 12:40	FW	Equipment Blank		
4/4/13 12:30	FW	Equipment Blank		
4/4/13 11:40	FW	Equipment Blank		
4/4/13 11:26	FW	Equipment Blank		
5/21/13 0:00	FW	Trip Blank	1	1
5/28/13 10:15	FW	Equipment Blank	1	1
6/11/13 0:00	FW	Trip Blank	1	1

**Quality Assurance/ Quality Control
Laboratory Blanks Results**

6/18/13 0:00	FW	Equipment Blank	1	1
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General Minerals

Sample Date		7/2/2012
Matrix		FW
QA Sample Type		Trip Blank
Alkalinity as CaCO ₃	FW	3.9
B	ng/L	0.01
Ca	mg/L	<0.1
Chloride	mg/L	<0.5
CO ₂	mg/L	<5
CO ₃	mg/L	<2
Fluoride	mg/L	<0.1
Hardness	mg/L	<0.66
HCO ₃	mg/L	4.7
Hydroxide	mg/L	<2
K	mg/L	<0.1
Mg	mg/L	<0.1
Na	mg/L	<0.5
NO ₃	mg/L	<0.5
pH	SU	7.44
Silica	mg/L	<0.1
SpecCond	umhos/cm	<2
Sulfate	mg/L	<0.5
TDS	mg/L	<10
Turbidity	NTU	<0.1