TRC
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ACCEPTANCE TESTING AND DISTRIBUTION OF CY-2013 46.2 MM TEFLON FILTERS

Contract Order No. EP-D-10-079

TRC Project Number 176922.1002

Prepared for:

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U.S. Environmental Protection Agency
Research Triangle Park, North Carolina 27711

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January 29, 2013

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1.0 INTRODUCTION

The U.S. Environmental Protection Agency (EPA) is responsible for procuring, testing, and distributing 46.2 mm Teflon filters of high purity and strict quality control requirements to State and local air pollution control agencies for use in their ambient air monitoring networks for particulate matter. The 46.2 mm Teflon filters are used in particulate matter samplers used to collect $PM_{2.5}$ (particulate matter with an aerodynamic diameter less than or equal to a nominal 2.5 micrometers) ambient air samples. The process of procuring and distributing filters with homogeneous characteristics and known and acceptable quality assures uniformity in the collection of data from the national particulate network. Before being used in the national network, the filters are subjected to the following acceptance tests: (1) visual inspection, (2) filter weight stability, which include a test for loose surface particles (drop test) and a test for temperature stability, (3) trace metal analysis, (4) alkalinity, (5) maximum moisture pick-up, (6) filter support ring which includes ring thickness, ring outer diameter and ring width, and (7) collection efficiency (DOP test) including maximum pressure drop across the filter.

Calendar year 2013 Teflon filters are supplied by (MTL) Measurements Technology Laboratory. These filters differ in their numbering system in that the filter numbers are on the filter material itself rather than on the filter ring. This does not interfere with the use of the filters for collecting $PM_{2.5}$ particulate matter. Filter acceptance criteria were met for all tests conducted.

The following test results reflect the findings for this work assignment.

2.0 ACCEPTANCE TESTING RESULTS

2.1 VISUAL INSPECTION

The maximum number of filter rejects allowed for all physical characteristics combined is 6 percent. No defect is permitted for individual filter identification or for filter container identification and the maximum number allowed for visual inspection is 10 percent for defective filters and 5

percent for rejected filters. EPA considers a **reject** filter as one not useable for sampling. A **defective** filter is considered suitable for sampling but contains one or more useable defects.

Imperfections that will cause a filter to be classified as a **reject** filter includes:

Pinhole:

A small hole appearing (1) as a distinct and obvious bright point of light when examined over a light table or screen, or (2) as a dark spot when viewed over a black surface.

Separation of ring:

Any separation or lack of seal between the filter and reinforcing ring.

Chaff or flashing:

Any extra attached residual material on the ring or heat seal area which would prevent obtaining an airtight seal when the ring is placed under compression.

Discoloration:

Any obvious visible discoloration which might be evidence of a contaminant.

Imperfections that will cause a filter to be classified as a defective filter includes:

Loose-material:

Any extra loose material or dirt particles on the filter that would require removal by brushing prior to weighing.

Filter non-uniformity:

Any obvious visible non-uniformity in the appearance of the filter when viewed over a light table or black surface which might indicate gradation in porosity across the face of the filter.

Other:

A filter with any imperfections not described above, such as irregular surfaces or other results of poor workmanship.

From the total batch of 202,750 EPA CY-2013 Teflon filters supplied by Measurement Technology Laboratory (MTL), 525 filters were randomly selected for inclusion in the visual inspection testing. Of the 525 filters that were visually inspected, 9 filters (1.71 percent) were rejected, and 11 filters (2.1 percent) were defective, thus the batch of filters passed the visual inspection tests. Of the 9 rejected filters, 9 had a pinhole or small cut. Of the 11 defective filters, 5 had a thin spot, 4 were non-uniform, and 2 had a light or thin spot under the ring. The results of the visual inspection are presented in Appendix A.

Note that there were only 9 reject filters and 11 defective filters in TRC's original visual inspection that was quality control reviewed. Chester Lab was shipped a subset of the inspected filters for further testing. Individual filters were placed in individual glassine envelops and packets of 50 filters in the glassine envelops were then placed in a small padded envelope and then packed in a Fed Ex shipping box and shipped. Chester LabNet reported that there was a higher than usual rejection rate in the visible inspection done by Chester LabNet, so an additional batch of filters was sent to replace the rejected filters. TRC believes the rejected filters discovered by Chester LabNet may have been damaged in shipping.

2.2 FILTER WEIGHT STABILITY TESTS

2.2.1 Loose Surface Material Drop Test

Fifty of the filters passing the visual inspection test were subjected to the two parts of the filter weight stability tests. Chester LabNet of Tigard, OR conducted the tests. The first part, which is for loose surface material is sometimes called the "drop test." The filter is conditioned and then weighed. After the initial weighing, each test filter was placed in a filter cassette and the cassette dropped from a height of 25 cm to a flat hard surface, such as a particle-free wood bench. The filter was removed from the cassette and reweighed. The average change in weight for the batch of 50 filters must be less than 20 μg/filter.

The average change in weight for the 50 filters tested was 0 μg with a standard deviation of 12.9 μg. The maximum change was 49μg. See Appendix B for details.

2.2.2 Temperature Stability

Fifty filters were subjected to the second part of the filter stability test which is the test for temperature stability. Each of the test filters was weighed, placed in a drying oven set at 40° C ±2°C for 48 hours. The filters were removed from the oven, conditioned, and reweighed. The average change in weight for the fifty filters must be less than 20 μg/filter.

The average change in weight for the 50 filters tested was -3μg with a standard deviation of 8.5μg. The maximum change in weight was 29μg. Appendix B contains the complete test results.

2.3 TRACE ELEMENTS ANALYSIS

Fifty filters were analyzed for 42 trace elements using X-ray fluorescence analysis. A list of the trace elements tests to be conducted along with the allowable average concentrations are listed below. The acceptance criteria state that 90 percent (or 45 of the 50 filters) shall meet the following criteria. The average concentrations for the 42 trace elements in 90 percent of the filters shall be less than the concentrations listed in Table 1 (which is twice the minimum detectable concentrations). The EPA shall reject the filters if the concentration of any trace element is five times the concentration listed in Table 1.

The test was conducted by Chester LabNet of Tigard, OR and the results show that the filters met the acceptance criteria of having the average concentrations of the 42 trace elements in 90 percent of the filters less than the concentrations listed in Table 1.

In addition, the test results show that the batch of 50 filters met the criteria of no trace element concentration exceeding five times the concentration of the 42 elements listed in Table 1. There were five filters having an element concentration exceeding the allowable maximum acceptance criteria; however all of the fifty filters had an average concentration that did not exceed the allowable acceptance limit. The detailed results of the trace element analysis are included in Appendix C.

Table 1. Trace Elements

Element	Maximum Concentration (ng/cm^2)	Element	Maximum Concentration (ng/cm^2)
Al	94.4	Br	2.0
Si	32.8	Rb	2.0
P	22.6	Sr	2.2
S	13.4	Y	14.6
Cl	9.4	Zr	13.2
K	5.6	Mo	11.6
Ca	8.2	Rh	9.4
Sc	7.2	Pd	9.6
Ti	13.8	Ag	9.6
V	4.8	Cd	10.8
Cr	2.2	Sn	15.2
Mn	2.2	Sb	14.4
Fe	5.8	Te	16.2
Co	4.0	I	18.6
Ni	3.0	Cs	25.0
Cu	2.8	Ba	32.2
Zn	2.2	La	87.6
Ga	1.8	W	5.0
Ge	3.0	Au	4.4
As	2.8	Hg	4.4
Se	1.6	Pb	4.8

2.4 ALKALINITY

Fifty filters were selected for the alkalinity test. Testing was conducted by Chester LabNet of Tigard, OR. The method used to determine the alkalinity of the Teflon filters was a modification of the method for measuring alkalinity of filters presented in EPA's Appendix A of the Quality Assurance Handbook, Part II, Section 2.12 – $PM_{2.5}$ Reference/Class I Equivalent Methods. The acceptance criteria require that the alkalinity of each filter must be less than 25 microequivalents/ gram of filter.

Based on the difference in pH readings that were made before and after the extractions, the alkalinity per gram of filter material was calculated. All alkalinity samples had a starting pH of below 6, so all non-blank subtracted results were negative. Ethanol was used to wet the samples the samples since Teflon is hydrophobic. The ethanol washed the ID off of the filters. It is unknown as

to whether or not this affected the alkalinity. The absolute alkalinity for all filters was negative. After blank subtraction, some samples had positive alkalinity. Since the % RSD of the alkalinity measurements was over 20,000, Chester LabNet believes the values are essentially just baseline noises. The blank corrected alkalinities for the filters ranged from –1.0170 to 1.1793 μEq/g of filter material with an average value of 0.0029 μEq/g and a standard deviation of 0.5929μEq/g.

The test results show that the filters met the acceptance criteria of less than 25μEq/g of filter. Complete results are provided in Appendix D.

2.5 MAXIMUM MOISTURE PICK-UP

The acceptance criteria for this test is not more than a 10 μg weight increase after 24-hour exposure to air of 40 percent relative humidity (RH), relative to weight after 24-hour exposure to air of 35 percent RH. RTI International RTP, NC conducted the moisture pickup test for the CY-2013 MTL filters.

Fifty filters were subjected to this test. Before the initial weigh session, the MTL filters had small fibers and particulates that had to be removed before the weighing process could begin. Thirteen filters had to be weighed more than twice to ensure that the duplicates were less than 5 µg for accurate calculation of the mean difference in weight change. From RTI's experience with MTL filters, this is most likely attributable to static effects and is not unusual for these filters. So, in manual weighing, MTL filters must be placed extremely carefully onto the weigh pan and may need additional time near an ionizer or other static control device before weighing. However, this slight modification in the manual placement of the filter onto the weigh pan does not preclude manual mass determination on microanalytical balances.

The absolute mass mean difference in filter weights recorded for the 50 test filters at the two humidity settings was 2.0 µg with a maximum recorded absolute difference of 7 µg and a minimum recorded difference of 0 µg. The standard deviation was 0.003. The data were distributed between weight loss and weight gain, with a tendency toward weight loss. Thirty two (32) of the fifty test filters lost weight, ten (10) of the 50 filters showed no weight change, and eight (8) of the 50 filters gained weight. The details of the results are shown in Appendix E.

2.6 FILTER SUPPORT RING DIMENSIONS

Three characteristics of the filter support or reinforcing ring are included in this test. They include the outside diameter of the reinforcing ring, the width of the ring, and the thickness of the ring. The acceptance criteria for these characteristics are that all filters must meet the following dimensions:

	Maximum	*Minimum*
• Reinforcing ring, outside diameter	46.45 mm	45.95 mm
• Reinforcing ring, inside diameter	3.68 mm	3.17 mm
• Reinforcing ring, thickness	0.42 mm	0.31 mm

Fifty filters were selected for these tests and the average of two outside diameter measurements, ring width, and ring thickness were made on each filter. Of the 50 filters, 100 percent had the average diameter measurement within the outside diameter (OD) acceptance criteria. The mean of the OD diameter was 46.11 mm with a standard deviation of 0.09 mm.

All fifty filters passed the ring width dimension. Based on two measurements, the mean of the ring width measurements was 3.29 mm with a standard deviation of 0.06 mm.

All of the filters passed the ring thickness test. The mean thickness based on two measurements was 0.396 mm with a standard deviation of 0.007 mm. The results of the dimension tests are presented in Appendix F.

2.7 COLLECTION EFFICIENCY

Fifty filters were subjected to tests for the percent penetration of the filters and flow rate resistance at 16.67 L/min clean air flow. The tests were conducted by Air Techniques International, Baltimore, MD, using ASTM Method D2986-95, Standard Practice for Evaluation of Air Assay Media by the Monodispersive DOP (Dioctyl Phthalate) Smoke Test (0.3 micron diameter DOP). Acceptance criteria are as follows:

- A collection efficiency of greater than 99.7%

	Maximum
• Pressure drop at 16.67 L/min	30 cm H_2O

All of the 50 filters tested passed the collection efficiency tests. The mean of the entire 50 filters was 99.9979 with a standard deviation of 0.0024. The mean of the pressure drop was 15.45 cm H_2O with a standard deviation of 1.80 cm H_2O. Details of the results of these tests are given in Appendix G.

Appendix A

Visual Inspection

Teflon Filters

CY 2013 PM2.5 Teflon Filters Visual Inspection Results

Sample No.	Filter No.	Pass	Reject	Defect	Reason for Failure or Defect/Comments
1	3505951	✔			
2	3505952	✔			
3	3505955	✔			
4	3505957	✔			
5	3505963	✔			
6	3505966	✔			
7	3505970	✔			
8	3505972	✔			
9	3505974		✔		Multiple scratches and pinhole
10	3505975	✔			
11	3505978	✔			
12	3505980	✔			
13	3505983	✔			
14	3505987	✔			
15	3505988	✔			
16	3505991	✔			
17	3505992	✔			
18	3505995	✔			
19	3505996	✔			
20	3505999	✔			
21	3506000	✔			
22	3539651	✔			
23	3539653	✔			
24	3539654	✔			
25	3539655	✔			
26	3539656		✔		Large scratch center to bottom
27	3539657	✔			
28	3539659	✔			
29	3539660	✔			
30	3539661	✔			
31	3539665	✔			
32	3539672	✔			
33	3539673	✔			
34	3539674	✔			
35	3539676	✔			
36	3539680	✔			

CY 2013 PM2.5 Teflon Filters Visual Inspection Results

Sample No.	Filter No.	Pass	Reject	Defect	Reason for Failure or Defect/Comments
37	3539682	✔			
38	3539687	✔			
39	3539690	✔			
40	3539692	✔			
41	3539697	✔			
42	3539699	✔			
43	3541053	✔			
44	3541054	✔			
45	3541057	✔			
46	3541061	✔			
47	3541064	✔			
48	3541067	✔			
49	3541073	✔			
50	3541074	✔			
51	3541076	✔			
52	3541077	✔			
53	3541078	✔			
54	3541080	✔			
55	3541082		✔		Pinhole
56	3541084	✔			
57	3541085	✔			
58	3541091	✔			
59	3541095	✔			
60	3541096	✔			
61	3541097	✔			
62	3541099	✔			
63	3541100	✔			
64	3556101	✔			
65	3556106	✔			
66	3556108	✔			
67	3556109	✔			
68	3556111	✔			
69	3556113	✔			
70	3556114			✔	Pinhole under ring under number
71	3556115	✔			
72	3556117	✔			

CY 2013 PM2.5 Teflon Filters Visual Inspection Results

Sample No.	Filter No.	Pass	Reject	Defect	Reason for Failure or Defect/Comments
73	3556119	✔			
74	3556121	✔			
75	3556122			✔	Thin area bottom ~ 5:30
76	3556124	✔			
77	3556128	✔			
78	3556131	✔			
79	3556132	✔			
80	3556135	✔			
81	3556140	✔			
82	3556146	✔			
83	3556148	✔			
84	3556149	✔			
85	3564803	✔			
86	3564808	✔			
87	3564810	✔			
88	3564812	✔			
89	3564813	✔			
90	3564814	✔			
91	3564815	✔			
92	3564820	✔			
93	3564823	✔			
94	3564824	✔			
95	3564825	✔			
96	3564827	✔			
97	3564831	✔			
98	3564833	✔			
99	3564834	✔			
100	3564836	✔			
101	3564840	✔			
102	3564844	✔			
103	3564846	✔			
104	3564847	✔			
105	3564848	✔			
106	3574856	✔			
107	3574857	✔			
108	3574858	✔			

CY 2013 PM2.5 Teflon Filters Visual Inspection Results

Sample No.	Filter No.	Pass	Reject	Defect	Reason for Failure or Defect/Comments
109	3574860	✔			
110	3574863	✔			
111	3574864	✔			
112	3574865			✔	Large hole under ring at edge of filter
113	3574866	✔			
114	3574867	✔			
115	3574870	✔			
116	3574872	✔			
117	3574876	✔			
118	3574877	✔			
119	3574879	✔			
120	3574882	✔			
121	3574883	✔			
122	3574884	✔			
123	3574889	✔			
124	3574891	✔			
125	3574892	✔			
126	3574894	✔			
127	3579154	✔			
128	3579155	✔			
129	3579157	✔			
130	3579160	✔			
131	3579161	✔			
132	3579163	✔			
133	3579164	✔			
134	3579165		✔		Pinhole
135	3579166	✔			
136	3579169	✔			
137	3579170	✔			
138	3579171	✔			
139	3579172	✔			
140	3579173	✔			
141	3579175	✔			
142	3579179	✔			
143	3579188	✔			
144	3579194	✔			

CY 2013 PM2.5 Teflon Filters Visual Inspection Results

Sample No.	Filter No.	Pass	Reject	Defect	Reason for Failure or Defect/Comments
145	3579195	✔			
146	3579196	✔			
147	3579197	✔			
148	3585955	✔			
149	3585956	✔			
150	3585959	✔			
151	3585960	✔			
152	3585964	✔			
153	3585965	✔			
154	3585970	✔			
155	3585973	✔			
156	3585975	✔			
157	3585977	✔			
158	3585979	✔			
159	3585980	✔			
160	3585981	✔			
161	3585982	✔			
162	3585987	✔			
163	3585989	✔			
164	3585990	✔			
165	3585991	✔			
166	3585993	✔			
167	3585994	✔			
168	3585999	✔			
169	3593701	✔			
170	3593702	✔			
171	3593704	✔			
172	3593707	✔			
173	3593709	✔			
174	3593713	✔			
175	3593716	✔			
176	3593718	✔			
177	3593720		✔		Pinhole
178	3593723	✔			
179	3593725	✔			
180	3593726	✔			

CY 2013 PM2.5 Teflon Filters Visual Inspection Results

Sample No.	Filter No.	Pass	Reject	Defect	Reason for Failure or Defect/Comments
181	3593727	✔			
182	3593730	✔			
183	3593731	✔			
184	3593732	✔			
185	3593733	✔			
186	3593735	✔			
187	3593738	✔			
188	3593740	✔			
189	3593749	✔			
190	3599303	✔			
191	3599305	✔			
192	3599306	✔			
193	3599308	✔			
194	3599310	✔			
195	3599311	✔			
196	3599312	✔			
197	3599318	✔			
198	3599321	✔			
199	3599324	✔			
200	3599325	✔			
201	3599328	✔			
202	3599330	✔			
203	3599333	✔			
204	3599334	✔			
205	3599335	✔			
206	3599338	✔			
207	3599342	✔			
208	3599343	✔			
209	3599344	✔			
210	3599347	✔			
211	3608451	✔			
212	3608453	✔			
213	3608454	✔			
214	3608455	✔			
215	3608456	✔			
216	3608458	✔			

CY 2013 PM2.5 Teflon Filters Visual Inspection Results

Sample No.	Filter No.	Pass	Reject	Defect	Reason for Failure or Defect/Comments
217	3608460	✔			
218	3608464	✔			
219	3608466	✔			
220	3608469	✔			
221	3608473	✔			
222	3608476	✔			
223	3608477	✔			
224	3608480	✔			
225	3608484	✔			
226	3608489	✔			
227	3608490	✔			
228	3608491	✔			
229	3608492	✔			
230	3608498	✔			
231	3608499	✔			
232	3612251	✔			
233	3612262	✔			
234	3612266	✔			
235	3612269	✔			
236	3612270	✔			
237	3612271	✔			
238	3612272	✔			
239	3612274	✔			
240	3612277	✔			
241	3612278	✔			
242	3612281	✔			
243	3612282	✔			
244	3612283	✔			
245	3612286	✔			
246	3612288	✔			
247	3612291	✔			
248	3612292	✔			
249	3612294	✔			
250	3612295	✔			
251	3612296	✔			
252	3612300	✔			

CY 2013 PM2.5 Teflon Filters Visual Inspection Results

Sample No.	Filter No.	Pass	Reject	Defect	Reason for Failure or Defect/Comments
253	3612801	✔			
254	3612802	✔			
255	3612804	✔			
256	3612805	✔			
257	3612809	✔			
258	3612814	✔			
259	3612815	✔			
260	3612816	✔			
261	3612818	✔			
262	3612819	✔			
263	3612822	✔			
264	3612823	✔			
265	3612834	✔			
266	3612836	✔			
267	3612838	✔			
268	3612841	✔			
269	3612842	✔			
270	3612843	✔			
271	3612846	✔			
272	3612848	✔			
273	3612849	✔			
274	3617252	✔			
275	3617254	✔			
276	3617256	✔			
277	3617258	✔			
278	3617261	✔			
279	3617262	✔			
280	3617264	✔			
281	3617266	✔			
282	3617268	✔			
283	3617269	✔			
284	3617275	✔			
285	3617276	✔			
286	3617277	✔			
287	3617278	✔			
288	3617283	✔			

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Sample No.	Filter No.	Pass	Reject	Defect	Reason for Failure or Defect/Comments
289	3617289	✔			
290	3617290	✔			
291	3617292	✔			
292	3617293	✔			
293	3617296	✔			
294	3617298	✔			
295	3623103	✔			
296	3623104	✔			
297	3623109	✔			
298	3623112	✔			
299	3623117	✔			
300	3623118	✔			
301	3623121	✔			
302	3623124	✔			
303	3623125	✔			
304	3623127	✔			
305	3623128	✔			
306	3623129		✔		Pinhole
307	3623137	✔			
308	3623138	✔			
309	3623140	✔			
310	3623141		✔		Pinhole
311	3623144	✔			
312	3623145	✔			
313	3623147	✔			
314	3623148	✔			
315	3623149	✔			
316	3630951	✔			
317	3630952	✔			
318	3630955	✔			
319	3630956	✔			
320	3630960	✔			
321	3630961	✔			
322	3630964	✔			
323	3630966	✔			
324	3630969	✔			

CY 2013 PM2.5 Teflon Filters Visual Inspection Results

Sample No.	Filter No.	Pass	Reject	Defect	Reason for Failure or Defect/Comments
325	3630973	✔			
326	3630977	✔			
327	3630980	✔			
328	3630984	✔			
329	3630985	✔			
330	3630989	✔			
331	3630990	✔			
332	3630993	✔			
333	3630996	✔			
334	3630998	✔			
335	3630999	✔			
336	3631000	✔			
337	3651253	✔			
338	3651256	✔			
339	3651260	✔			
340	3651262	✔			
341	3651264	✔			
342	3651267	✔			
343	3651269	✔			
344	3651272	✔			
345	3651273	✔			
346	3651274	✔			
347	3651276	✔			
348	3651279	✔			
349	3651284	✔			
350	3651285	✔			
351	3651287			✔	Non-uniform
352	3651289	✔			
353	3651290	✔			
354	3651292	✔			
355	3651293	✔			
356	3651297	✔			
357	3651299	✔			
358	3654101	✔			
359	3654105			✔	Thin spots at center and 11
360	3654106	✔			

CY 2013 PM2.5 Teflon Filters Visual Inspection Results

Sample No.	Filter No.	Pass	Reject	Defect	Reason for Failure or Defect/Comments
361	3654118	✔			
362	3654120	✔			
363	3654121			✔	Thin spot center at 3:30
364	3654122	✔			
365	3654124	✔			
366	3654125	✔			
367	3654127	✔			
368	3654129	✔			
369	3654130	✔			
370	3654131	✔			
371	3654132			✔	Thin spot center
372	3654133	✔			
373	3654134			✔	Non-uniform
374	3654137	✔			
375	3654140	✔			
376	3654146	✔			
377	3654147	✔			
378	3654149	✔			
379	3654951	✔			
380	3654952	✔			
381	3654954	✔			
382	3654957	✔			
383	3654961	✔			
384	3654964	✔			
385	3654965	✔			
386	3654969	✔			
387	3654973	✔			
388	3654974	✔			
389	3654977	✔			
390	3654979	✔			
391	3654981			✔	Non-uniform
392	3654982				
393	3654989	✔			
394	3654990	✔			
395	3654991	✔			
396	3654993	✔			

CY 2013 PM2.5 Teflon Filters Visual Inspection Results

Sample No.	Filter No.	Pass	Reject	Defect	Reason for Failure or Defect/Comments
397	3654994	✔			
398	3654996	✔			
399	3655000	✔			
400	3658151	✔			
401	3658152	✔			
402	3658158	✔			
403	3658164	✔			
404	3658167	✔			
405	3658168	✔			
406	3658169	✔			
407	3658170	✔			
408	3658171	✔			
409	3658173	✔			
410	3658176	✔			
411	3658179	✔			
412	3658180	✔			
413	3658185	✔			
414	3658190	✔			
415	3658192	✔			
416	3658193	✔			
417	3658194	✔			
418	3658195	✔			
419	3658196	✔			
420	3658200	✔			
421	3683052	✔			
422	3683055	✔			
423	3683056	✔			
424	3683057	✔			
425	3683063	✔			
426	3683064			✔	Thin spot at 2:45
427	3683066	✔			
428	3683070	✔			
429	3683071	✔			
430	3683072	✔			
431	3683076	✔			
432	3683079	✔			

CY 2013 PM2.5 Teflon Filters Visual Inspection Results

Sample No.	Filter No.	Pass	Reject	Defect	Reason for Failure or Defect/Comments
433	3683080	✔			
434	3683081	✔			
435	3683085	✔			
436	3683087	✔			
437	3683088	✔			
438	3683090	✔			
439	3683096	✔			
440	3683098	✔			
441	3683099	✔			
442	3686552	✔			
443	3686553	✔			
444	3686554	✔			
445	3686556	✔			
446	3686557	✔			
447	3686561	✔			
448	3686565	✔			
449	3686574	✔			
450	3686575	✔			
451	3686576	✔			
452	3686577	✔			
453	3686578	✔			
454	3686579	✔			
455	3686581	✔			
456	3686582	✔			
457	3686583	✔			
458	3686586	✔			
459	3686590	✔			
460	3686592	✔			
461	3686596	✔			
462	3686597	✔			
463	3688604	✔			
464	3688605	✔			
465	3688611	✔			
466	3688613	✔			
467	3688617	✔			
468	3688618	✔			

CY 2013 PM2.5 Teflon Filters Visual Inspection Results

Sample No.	Filter No.	Pass	Reject	Defect	Reason for Failure or Defect/Comments
469	3688619	✔			
470	3688623	✔			
471	3688625	✔			
472	3688628	✔			
473	3688629	✔			
474	3688631	✔			
475	3688632	✔			
476	3688634		✔		Scrape center of filter
477	3688635	✔			
478	3688636	✔			
479	3688637	✔			
480	3688642	✔			
481	3688643	✔			
482	3688644	✔			
483	3688649	✔			
484	3697352	✔			
485	3697353	✔			
486	3697355	✔			
487	3697358	✔			
488	3697360	✔			
489	3697362	✔			
490	3697367	✔			
491	3697368	✔			
492	3697376	✔			
493	3697377	✔			
494	3697380	✔			
495	3697382	✔			
496	3697384	✔			
497	3697386	✔			
498	3697387	✔			
499	3697390	✔			
500	3697391	✔			
501	3697392	✔			
502	3697394	✔			
503	3697396	✔			
504	3697398	✔			

CY 2013 PM2.5 Teflon Filters Visual Inspection Results

Sample No.	Filter No.	Pass	Reject	Defect	Reason for Failure or Defect/Comments
505	3701302	✔			
506	3701303	✔			
507	3701304	✔			
508	3701309	✔			
509	3701310	✔			
510	3701312	✔			
511	3701314	✔			
512	3701315	✔			
513	3701317	✔			
514	3701322	✔			
515	3701325			✔	Non-uniform
516	3701326	✔			
517	3701331	✔			
518	3701333	✔			
519	3701334	✔			
520	3701337	✔			
521	3701338	✔			
522	3701339		✔		Pinhole
523	3701342	✔			
524	3701343	✔			
525	3701346	✔			
	Total	**505**	**9**	**11**	

Appendix B

Test Results Filter Stability

Gravimetric Acceptance Test Results

TRC-Raleigh Report # 12-587

LabNet ID	Filter ID	Tare Wt.(mg)	Loose, Surface Particle Test Gross Wt.(mg)	Loose, Surface Particle Test Net Wt.(µg)	Temperature Stability Test Gross Wt.(mg)	Temperature Stability Test Net Wt.(µg)
12-X1914	3556106	369.236	369.246	10	369.246	0
12-X1915	3505988	376.315	376.334	19	376.329	-5
12-X1916	3556128	368.594	368.592	-2	368.591	-1
12-X1917	3541053	375.649	375.644	-5	375.641	-3
12-X1918	3541076	376.288	376.293	5	376.281	-12
12-X1919	3541099	373.569	373.564	-5	373.554	-10
12-X1920	3564812	380.862	380.880	18	380.876	-4
12-X1921	3564815	381.479	381.487	8	381.485	-2
12-X1922	3564840	377.484	377.484	0	377.483	-1
12-X1923	3574872	385.235	385.249	14	385.249	0
12-X1924	3623112	357.174	357.181	7	357.182	1
12-X1925	3630998	374.342	374.336	-6	374.336	0
12-X1926	3585955	359.226	359.224	-2	359.220	-4
12-X1927	3585977	365.372	365.373	1	365.370	-3
12-X1928	3593701	376.045	376.047	2	376.042	-5
12-X1929	3654957	372.929	372.931	2	372.931	0
12-X1930	3599311	377.118	377.167	49	377.129	-38
12-X1931	3599333	372.496	372.489	-7	372.490	1
12-X1932	3608469	371.900	371.877	-23	371.874	-3
12-X1933	3608490	377.747	377.757	10	377.753	-4
12-X1934	3683066	380.997	381.001	4	380.999	-2
12-X1935	3612814	382.405	382.399	-6	382.397	-2
12-X1936	3686581	382.736	382.742	6	382.732	-10
12-X1937	3683085	376.680	376.670	-10	376.674	4
12-X1938	3617298	369.636	369.632	-4	369.626	-6
12-X1939	3623124	368.752	368.735	-17	368.735	0
12-X1940	3613145	370.736	370.746	10	370.745	-1
12-X1941	3630989	380.603	380.604	1	380.603	-1
12-X1942	3651260	367.229	367.237	8	367.232	-5
12-X1943	3688637	368.549	368.550	1	368.548	-2
12-X1944	3654122	381.190	381.196	6	381.194	-2
12-X1945	3654129	364.861	364.865	4	364.868	3
12-X1946	3654140	387.630	387.611	-19	387.614	3
12-X1947	3658152	370.552	370.545	-7	370.544	-1
12-X1948	3658170	373.623	373.603	-20	373.603	0
12-X1949	3658193	372.854	372.837	-17	372.831	-6
12-X1950	3683063	383.234	383.211	-23	383.211	0
12-X1951	3683088	385.628	385.638	10	385.640	2
12-X1952	3686553	362.026	362.031	5	362.024	-7
12-X1953	3686565	373.019	373.043	24	373.023	-20
12-X1954	3686578	381.820	381.815	-5	381.823	8
12-X1955	3688623	361.433	361.431	-2	361.435	4
12-X1956	3688631	365.312	365.319	7	365.308	-11
12-X1957	3688642	368.096	368.102	6	368.085	-17
12-X1958	3697358	375.552	375.548	-4	375.547	-1
12-X1959	3697377	365.387	365.382	-5	365.386	4
12-X1960	3697391	368.151	368.136	-15	368.129	-7
12-X1961	3701304	373.154	373.143	-11	373.141	-2
12-X1962	3701314	369.088	369.070	-18	369.099	29
12-X1963	3688605	372.615	372.621	6	372.624	3

	Loose, Surface Particle Test		Temperature Stability Test	
Average	**0**		**Average**	**-3**
Std Dev	12.9		**Std Dev**	8.5
Minimum	-23		**Minimum**	-38
Maximum	49		**Maximum**	29
SOW Max	20		**SOW Max**	20

Analysis performed by: ***CHESTER LabNet***
12242 SW Garden Place ♦ Tigard, OR 97223
(503) 624-2183 ♦ www.chesterlab.net

Appendix C

Test Results Trace Elements Analysis

XRF Acceptance Test Results

TRC-Raleigh Report # 12-587

Acceptance Limit (ng/cm²)	94.4		32.8		22.6		13.4		9.4		5.6	
Element*	Al		Si		P		S		Cl		K	
Filter ID	Result	Unc.	Result	Unc.	Result	Unc.	Result	Unc.	Result	Unc.	Result	Unc.
3541057	7.8	4.7	5.8	3.0	0.0	1.7	1.9	1.5	5.1	2.7	0.8	1.4
3539659	9.7	4.7	5.4	3.0	0.8	1.7	2.6	1.4	0.5	3.0	1.4	1.6
3539672	1.5	4.7	4.8	3.0	2.2	1.8	0.0	1.5	0.0	2.9	3.6	1.6
3556149	3.7	4.8	0.0	2.9	0.5	1.7	0.0	1.5	6.4	3.1	1.9	1.6
3574857	1.1	4.8	3.0	2.9	0.0	1.8	1.8	1.5	0.2	2.9	0.8	1.5
3556109	5.4	4.7	0.0	2.9	0.0	1.7	1.1	1.5	1.5	3.0	0.5	1.5
3556113	4.1	4.6	5.2	2.9	0.0	1.6	0.0	1.4	0.0	2.7	1.8	1.4
3556148	0.0	4.5	5.4	2.8	0.0	1.6	0.0	1.5	1.7	2.7	3.1	1.5
3564827	2.4	4.6	0.0	2.8	0.0	1.6	2.7	1.5	3.5	2.8	3.0	1.6
3574864	0.4	4.7	5.8	3.0	0.0	1.7	0.0	1.5	0.0	2.8	3.2	1.5
3579195	10.5	4.6	2.8	2.9	2.0	1.7	0.0	1.4	0.0	2.7	2.1	1.5
3574858	2.8	5.0	0.0	2.9	1.4	1.8	0.7	1.5	0.0	3.0	1.9	1.6
3505980	0.0	4.6	0.0	2.9	0.4	1.8	0.0	1.6	0.0	2.7	0.6	1.5
3585987	12.5	4.8	0.6	2.9	1.8	1.7	3.9	1.5	0.0	2.9	0.9	1.5
3585970	14.0	5.0	8.0	3.0	0.0	1.7	0.6	1.5	0.0	2.9	2.3	1.6
3585993	3.0	4.5	1.4	2.8	0.6	1.8	0.0	1.6	0.0	2.7	3.4	1.5
3585991	18.0	4.5	3.5	3.1	2.4	1.7	0.0	1.5	3.1	2.8	1.2	1.5
3593716	5.7	4.5	0.0	2.8	0.0	1.7	0.0	1.5	2.9	2.8	3.6	1.6
3593749	7.8	4.8	1.6	2.9	2.7	1.8	0.0	1.5	0.7	3.0	4.0	1.6
3599324	12.4	4.8	4.9	2.9	2.9	1.7	0.4	1.5	1.5	2.8	1.2	1.5
3608456	1.3	4.6	0.0	2.8	0.5	1.6	1.4	1.4	0.0	2.7	3.1	1.5
3608460	4.3	4.7	0.0	2.9	2.4	1.7	0.0	1.7	0.1	2.9	2.7	1.6
3608499	4.6	4.9	2.2	2.8	2.5	1.7	0.1	1.5	1.6	2.9	2.1	1.6
3612262	0.0	4.4	5.4	2.8	2.0	1.7	0.0	1.6	0.0	2.6	0.4	1.4
3612288	1.2	4.7	8.3	2.9	0.0	1.8	0.2	1.5	4.8	2.9	0.0	1.4
3612300	13.1	5.0	2.2	2.9	0.0	1.8	0.0	1.5	0.0	2.9	0.0	1.5
3612283	6.0	4.7	0.6	2.8	0.0	1.6	0.0	1.6	1.7	2.8	5.5	1.6
3612296	0.0	4.6	7.0	2.8	1.1	1.7	0.0	1.5	3.0	2.9	1.5	1.5
3617264	2.1	4.7	0.0	2.9	0.0	1.8	0.0	1.7	0.0	2.8	2.6	1.6
3612819	8.0	4.9	6.7	3.2	1.8	1.8	0.0	1.6	4.2	3.1	15.2	2.1
3623104	5.1	4.7	0.6	2.7	4.5	1.8	0.0	1.5	0.0	2.7	1.9	1.5
3623127	0.0	4.7	1.8	2.9	0.0	1.7	0.0	1.6	0.0	2.7	0.8	1.5
3630956	3.4	4.9	0.0	2.9	1.3	1.8	0.0	1.5	0.0	2.9	2.9	1.6
3630977	7.8	4.8	1.6	3.0	0.0	1.7	1.8	1.5	4.6	2.9	0.6	1.5
3631000	4.7	4.6	0.3	2.9	1.1	1.7	0.0	1.5	0.0	2.9	0.0	1.5
3651285	3.5	4.6	0.0	2.8	0.0	1.7	0.6	1.4	0.0	2.6	3.3	1.5
3651299	1.8	4.4	2.0	2.7	1.2	1.7	0.0	1.5	0.0	2.5	0.0	1.4
3654149	4.8	4.4	1.0	2.8	0.0	1.7	0.2	1.5	0.8	2.8	3.5	1.5
3654965	4.3	4.9	1.3	3.0	0.0	1.8	0.0	1.6	0.0	2.8	1.8	1.5
3617261	3.7	4.7	1.0	2.9	0.0	1.7	0.8	1.4	0.0	2.7	3.1	1.5
3630969	5.8	4.8	2.2	3.0	0.0	1.7	0.0	1.5	2.9	2.6	4.7	1.5
3654996	13.0	4.8	3.4	3.1	1.9	1.8	2.8	1.5	0.0	2.7	0.7	1.5
3658185	19.1	4.9	0.0	2.9	0.0	1.7	1.0	1.5	0.0	2.9	0.9	1.5
3683076	10.0	5.0	1.9	3.0	0.0	1.7	0.0	1.5	0.0	3.0	4.9	1.7
3683099	8.9	4.9	7.0	3.1	1.2	1.9	0.0	1.6	0.0	2.9	1.1	1.6
3686597	12.6	4.8	5.5	2.9	0.0	1.8	0.0	1.5	0.0	2.8	3.2	1.5
3688617	4.1	4.6	3.3	2.9	0.0	1.8	0.0	1.5	0.0	2.9	4.0	1.5
3688628	30.5	5.3	0.0	2.8	1.1	1.7	1.3	1.6	0.0	2.7	2.1	1.5
3688649	3.5	4.7	0.0	2.9	0.4	1.9	0.0	1.5	0.0	2.9	0.9	1.6
3630999	10.4	4.7	10.5	2.9	1.5	1.7	0.0	1.5	0.0	3.0	4.7	1.6
Average	6.4	4.7	2.7	2.9	0.8	1.7	0.5	1.5	1.0	2.8	2.4	1.5
Std Dev	5.90	0.18	2.77	0.10	1.06	0.07	0.92	0.07	1.69	0.13	2.34	0.10
Minimum	0.0	4.4	0.0	2.7	0.0	1.6	0.0	1.4	0.0	2.5	0.0	1.4
Maximum	30.5	5.3	10.5	3.2	4.5	1.9	3.9	1.7	6.4	3.1	15.2	2.1
SOW Max	94.4		32.8		22.6		13.4		9.4		5.6	
5x SOW Max	472		164		113		67.0		47.0		28.0	

*Note: Shaded analytical results identify detections above the maximum concentration (acceptance limit) for Teflon filters for XRF analysis. However, each of these analytical results was less than EPA's criteria of rejecting the filters if any trace metal is five times the maximum concentration listing.

Analysis performed by: ***CHESTER LabNet***

12242 SW Garden Place ♦ Tigard, OR 97223

(503) 624-2183 ♦ www.chesterlab.net

XRF Acceptance Test Results

TRC-Raleigh Report # 12-587

Acceptance Limit (ng/cm²)	8.2		7.2		13.8		4.8		2.2		2.2	
Element*	Ca		Sc		Ti		V		Cr		Mn	
Filter ID	Result	Unc.	Result	Unc.	Result	Unc.	Result	Unc.	Result	Unc.	Result	Unc.
3541057	0.1	1.1	1.3	0.7	0.5	0.6	0.8	0.5	1.1	0.6	0.0	0.8
3539659	2.4	1.2	0.7	0.8	0.5	0.7	0.0	0.6	1.1	0.7	0.2	0.9
3539672	2.2	1.2	0.0	0.7	0.0	0.7	0.1	0.6	1.1	0.7	0.0	0.9
3556149	0.0	1.1	0.1	0.8	0.0	0.7	0.0	0.6	0.0	0.7	0.0	0.8
3574857	0.0	1.1	0.0	0.7	0.0	0.7	0.6	0.6	0.2	0.7	0.7	0.8
3556109	0.0	1.0	0.2	0.7	0.0	0.7	0.0	0.6	1.4	0.7	1.6	0.9
3556113	0.0	1.0	1.7	0.7	0.4	0.6	1.0	0.5	0.0	0.6	0.0	0.9
3556148	0.0	1.0	0.2	0.7	1.0	0.6	0.4	0.5	1.4	0.6	0.0	0.8
3564827	0.0	1.1	1.0	0.7	0.0	0.7	0.0	0.6	0.0	0.7	0.3	0.8
3574864	0.0	1.0	0.8	0.7	0.1	0.6	1.2	0.6	0.1	0.7	0.0	0.9
3579195	0.0	1.0	0.4	0.7	0.0	0.6	0.4	0.5	0.0	0.7	0.8	0.8
3574858	0.0	1.1	1.1	0.8	0.0	0.7	1.8	0.6	0.0	0.7	0.0	0.8
3505980	1.3	1.2	0.3	0.7	29.5	1.9	0.6	0.6	0.4	0.7	1.4	0.8
3585987	0.0	1.1	1.7	0.7	1.0	0.7	1.0	0.6	0.0	0.7	0.0	0.8
3585970	0.0	1.1	1.7	0.8	0.0	0.7	0.1	0.6	0.7	0.7	0.0	0.9
3585993	0.0	1.0	0.8	0.7	1.0	0.6	1.0	0.5	0.9	0.6	0.0	0.8
3585991	0.0	1.0	1.1	0.8	0.5	0.7	0.5	0.6	0.1	0.7	0.0	0.8
3593716	0.0	1.0	0.0	0.7	0.0	0.7	0.6	0.6	0.2	0.7	0.0	0.8
3593749	0.0	1.1	1.8	0.7	0.7	0.7	1.1	0.6	0.9	0.7	1.5	0.9
3599324	0.0	1.1	0.4	0.7	0.0	0.7	0.1	0.6	0.3	0.7	0.0	0.8
3608456	2.0	1.1	0.0	0.7	0.0	2.6	0.0	1.0	0.2	0.6	0.1	0.8
3608460	0.0	1.0	2.1	0.8	0.0	0.7	0.0	0.6	0.5	0.7	2.0	0.9
3608499	0.0	1.1	1.2	0.8	1.1	0.7	0.0	0.6	0.5	0.7	0.3	0.9
3612262	0.0	0.9	0.4	0.7	0.0	0.6	0.1	0.5	0.0	0.6	0.2	0.9
3612288	0.0	1.1	0.9	0.7	0.0	0.7	0.7	0.6	1.3	0.7	0.8	0.8
3612300	0.3	1.2	1.0	0.8	1.1	0.7	0.4	0.6	1.0	0.7	0.0	0.9
3612283	0.0	1.0	0.0	0.7	0.0	0.6	0.8	0.6	0.0	0.7	0.4	0.8
3612296	0.3	1.1	0.3	0.7	1.2	0.7	0.0	0.5	0.1	0.7	0.8	0.8
3617264	0.0	1.1	0.6	0.8	0.4	0.7	0.0	0.6	0.3	0.7	0.5	0.8
3612819	6.9	1.4	0.4	0.8	0.9	0.7	1.5	0.6	1.0	0.7	0.0	0.9
3623104	0.0	1.0	0.6	0.7	0.2	0.7	0.1	0.6	0.6	0.7	0.4	0.8
3623127	0.0	1.0	1.1	0.7	0.0	0.6	0.6	0.5	0.3	0.7	0.5	0.9
3630956	0.0	1.1	1.0	0.7	1.5	0.7	0.5	0.6	0.0	0.7	0.0	0.9
3630977	0.0	1.0	1.1	0.7	0.0	0.6	0.9	0.6	0.8	0.7	0.0	0.8
3631000	0.0	1.0	0.0	0.7	0.0	0.6	0.5	0.5	0.0	0.7	0.1	0.8
3651285	0.0	1.0	0.4	0.7	0.0	0.6	0.3	0.5	0.1	0.6	0.0	0.8
3651299	0.0	1.0	1.7	0.7	1.1	0.6	0.5	0.5	0.1	0.6	0.0	0.8
3654149	0.0	1.0	0.4	0.7	0.4	0.6	0.2	0.6	0.0	0.7	0.6	0.8
3654965	0.0	1.1	1.6	0.7	0.6	0.7	0.0	0.6	0.9	0.7	0.2	0.8
3617261	0.0	1.0	0.4	0.7	0.3	0.6	1.0	0.5	1.0	0.6	0.0	0.8
3630969	0.2	1.1	0.3	0.7	0.4	0.7	0.4	0.5	1.7	0.7	1.7	0.8
3654996	1.0	1.1	0.7	0.7	0.0	0.6	0.5	0.5	1.2	0.7	0.5	0.9
3658185	0.0	1.1	1.1	0.8	0.0	0.7	0.9	0.6	0.8	0.7	0.3	0.8
3683076	0.0	1.2	1.1	0.8	0.7	0.7	0.1	0.6	0.5	0.7	0.5	0.9
3683099	0.0	1.1	0.9	0.8	1.1	0.7	0.0	0.6	0.7	0.7	0.0	0.8
3686597	1.8	1.2	0.0	0.7	0.7	0.7	0.6	0.6	0.1	0.7	0.0	0.9
3688617	0.5	1.1	0.9	0.7	1.5	0.7	0.2	0.5	0.0	0.7	0.0	0.8
3688628	0.0	1.1	1.5	0.7	0.6	0.6	0.9	0.5	1.5	0.7	0.3	0.8
3688649	0.0	1.1	0.7	0.8	1.5	0.7	0.4	0.6	0.8	0.7	1.4	0.9
3630999	0.0	1.1	2.6	0.8	0.0	0.7	0.0	0.6	0.7	0.7	0.0	0.9
Average	0.4	1.1	0.8	0.7	1.0	0.7	0.5	0.6	0.5	0.7	0.4	0.8
Std Dev	1.12	0.08	0.62	0.05	4.14	0.33	0.44	0.08	0.50	0.04	0.53	0.05
Minimum	0.0	0.9	0.0	0.7	0.0	0.6	0.0	0.5	0.0	0.6	0.0	0.8
Maximum	6.9	1.4	2.6	0.8	29.5	2.6	1.8	1.0	1.7	0.7	2.0	0.9
SOW Max	8.2		7.2		13.8		4.8		2.2		2.2	
5x SOW Max	41.0		36.0		69.0		24.0		11.0		11.0	

*Note: Shaded analytical results identify detections above the maximum concentration (acceptance limit) for Teflon filters for XRF analysis. However, each of these analytical results was less than EPA's criteria of rejecting the filters if any trace metal is five times the maximum concentration listing.

Analysis performed by: *CHESTER LabNet*
12242 SW Garden Place ♦ Tigard, OR 97223
(503) 624-2183 ♦ www.chesterlab.net

XRF Acceptance Test Results

TRC-Raleigh Report # 12-587

Acceptance Limit (ng/cm²)	5.8		4.0		3.0		2.8		2.2		1.8	
Element*	Fe		Co		Ni		Cu		Zn		Ga	
Filter ID	Result	Unc.	Result	Unc.	Result	Unc.	Result	Unc.	Result	Unc.	Result	Unc.
3541057	0.0	0.8	0.0	0.5	0.0	0.5	0.6	0.5	0.4	0.6	0.4	0.6
3539659	0.8	0.8	0.0	0.5	0.0	0.5	0.0	0.6	0.1	0.6	0.8	0.6
3539672	0.0	0.8	0.0	0.5	0.2	0.5	0.7	0.5	0.6	0.6	0.1	0.6
3556149	0.8	0.8	0.0	0.5	0.6	0.5	0.6	0.6	0.0	0.7	0.8	0.6
3574857	2.7	0.8	0.0	0.5	0.1	0.5	0.0	0.5	0.0	0.6	0.7	0.6
3556109	0.1	0.8	0.0	0.5	0.3	0.4	0.6	0.5	0.0	0.6	0.8	0.6
3556113	0.0	0.8	0.0	0.5	0.0	0.4	0.0	0.5	0.2	0.6	0.9	0.5
3556148	0.0	0.8	0.0	0.5	0.0	0.5	0.0	0.5	0.0	0.6	0.5	0.5
3564827	0.3	0.8	0.0	0.5	0.3	0.5	0.3	0.5	0.2	0.6	1.1	0.6
3574864	0.5	0.8	0.3	0.5	0.3	0.4	0.0	0.5	0.0	0.6	0.0	0.6
3579195	0.0	0.7	0.0	0.5	0.4	0.4	0.4	0.5	0.9	0.6	0.0	0.5
3574858	0.6	0.8	0.0	0.5	0.0	0.5	0.8	0.6	0.9	0.7	1.0	0.6
3505980	0.1	0.8	0.0	0.5	0.0	0.5	0.0	0.5	0.0	0.6	1.1	0.6
3585987	0.0	0.8	0.0	0.5	0.0	0.5	0.7	0.5	0.0	0.6	0.7	0.6
3585970	0.0	0.8	0.0	0.5	0.0	0.5	0.0	0.6	0.0	0.7	0.7	0.6
3585993	0.0	0.7	0.0	0.5	0.0	0.5	0.0	0.5	0.0	0.6	1.0	0.6
3585991	0.6	0.8	0.0	0.5	0.0	0.5	0.0	0.5	0.0	0.6	0.6	0.6
3593716	0.6	0.8	0.0	0.5	0.0	0.5	0.0	0.5	0.0	0.6	0.6	0.6
3593749	0.3	0.8	0.0	0.5	0.0	0.5	0.0	0.5	0.0	0.6	0.0	0.6
3599324	1.3	0.8	0.0	0.5	0.7	0.5	1.0	0.5	0.0	0.6	1.3	0.6
3608456	0.0	0.8	0.0	0.5	0.0	0.5	0.0	0.5	0.3	0.6	1.0	0.5
3608460	0.0	0.8	0.0	0.5	0.2	0.5	0.0	0.5	0.0	0.6	1.0	0.6
3608499	1.1	0.8	0.0	0.5	0.4	0.5	0.0	0.5	0.0	0.6	1.9	0.6
3612262	0.0	0.7	0.0	0.5	0.6	0.4	0.1	0.5	0.0	0.6	0.7	0.5
3612288	0.9	0.8	0.0	0.5	0.0	0.5	0.3	0.5	0.1	0.6	1.2	0.6
3612300	0.5	0.8	0.0	0.5	0.0	0.5	0.1	0.5	0.0	0.6	0.4	0.6
3612283	0.0	0.7	0.0	0.5	0.0	0.5	0.0	0.5	0.4	0.6	0.0	0.6
3612296	2.7	0.9	0.0	0.5	0.9	0.5	0.0	0.5	0.0	0.6	1.3	0.6
3617264	0.0	0.8	0.0	0.5	0.0	0.5	0.0	0.5	0.4	0.6	0.8	0.6
3612819	1.0	0.8	0.0	0.5	0.0	0.5	0.0	0.6	0.4	0.7	0.9	0.6
3623104	1.2	0.8	0.0	0.5	0.8	0.5	0.3	0.5	0.6	0.6	0.5	0.6
3623127	0.0	0.8	0.0	0.5	0.0	0.4	0.0	0.5	0.0	0.6	0.0	0.5
3630956	0.0	0.8	0.0	0.5	0.1	0.5	0.0	0.5	0.2	0.6	0.9	0.6
3630977	0.0	0.8	0.0	0.5	0.0	0.5	0.0	0.5	0.0	0.6	0.2	0.6
3631000	1.4	0.8	0.0	0.5	0.0	0.4	0.2	0.5	0.0	0.6	1.1	0.6
3651285	0.9	0.8	0.0	0.4	0.4	0.4	0.4	0.5	1.1	0.6	0.7	0.5
3651299	0.0	0.7	0.0	0.5	0.0	0.4	0.8	0.5	0.3	0.6	0.8	0.5
3654149	1.7	0.8	0.0	0.5	0.0	0.5	0.0	0.5	0.0	0.6	0.0	0.6
3654965	1.2	0.8	0.0	0.5	0.1	0.5	0.0	0.5	0.0	0.6	0.9	0.6
3617261	0.0	0.7	0.2	0.5	0.0	0.5	0.0	0.5	0.0	0.6	0.0	0.5
3630969	1.4	0.8	0.0	0.5	0.0	0.5	0.6	0.5	0.6	0.6	0.5	0.6
3654996	1.4	0.8	0.0	0.5	0.0	0.5	0.0	0.5	0.0	0.6	1.8	0.6
3658185	0.0	0.8	0.0	0.5	0.3	0.5	0.0	0.5	0.0	0.6	0.6	0.6
3683076	1.1	0.8	0.0	0.5	0.2	0.5	0.0	0.5	0.0	0.6	0.0	0.6
3683099	1.0	0.8	0.0	0.5	0.0	0.5	0.3	0.5	0.0	0.6	0.1	0.6
3686597	0.1	0.8	0.0	0.5	0.0	0.5	0.0	0.5	0.0	0.6	1.1	0.6
3688617	1.4	0.8	0.0	0.5	0.0	0.4	0.5	0.5	0.1	0.6	0.9	0.6
3688628	0.8	0.8	0.0	0.5	1.4	0.5	0.4	0.5	0.0	0.6	0.7	0.6
3688649	1.2	0.8	0.1	0.5	0.2	0.5	0.0	0.6	0.5	0.7	1.2	0.6
3630999	0.0	0.8	0.0	0.5	0.3	0.5	0.3	0.5	0.0	0.6	0.0	0.6
Average	0.6	0.8	0.0	0.5	0.2	0.5	0.2	0.5	0.2	0.6	0.7	0.6
Std Dev	0.69	0.04	0.05	0.01	0.29	0.04	0.28	0.03	0.28	0.03	0.47	0.04
Minimum	0.0	0.7	0.0	0.4	0.0	0.4	0.0	0.5	0.0	0.6	0.0	0.5
Maximum	2.7	0.9	0.3	0.5	1.4	0.5	1.0	0.6	1.1	0.7	1.9	0.6
SOW Max	5.8		4.0		3.0		2.8		2.2		1.8	
5x SOW Max	29.0		20.0		15.0		14.0		11.0		9.0	

*Note: Shaded analytical results identify detections above the maximum concentration (acceptance limit) for Teflon filters for XRF analysis. However, each of these analytical results was less than EPA's criteria of rejecting the filters if any trace metal is five times the maximum concentration listing.

Analysis performed by: ***CHESTER LabNet***
12242 SW Garden Place ♦ Tigard, OR 97223
(503) 624-2183 ♦ www.chesterlab.net

XRF Acceptance Test Results

TRC-Raleigh Report # 12-587

Acceptance Limit (ng/cm²)	3.0		2.8		1.6		2.0		2.0		2.2	
Element*	Ge		As		Se		Br		Rb		Sr	
Filter ID	Result	Unc.	Result	Unc.	Result	Unc.	Result	Unc.	Result	Unc.	Result	Unc.
3541057	0.3	0.5	0.5	0.5	0.4	0.4	0.5	0.4	0.5	0.5	0.0	0.6
3539659	0.0	0.6	1.3	0.5	0.4	0.5	0.1	0.4	0.0	0.5	0.2	0.6
3539672	0.0	0.6	0.0	0.8	0.0	0.5	0.4	0.4	0.7	0.5	0.0	0.6
3556149	0.0	0.6	1.5	0.5	0.0	0.5	0.2	0.5	1.2	0.5	1.1	0.6
3574857	0.3	0.5	0.0	0.8	0.4	0.5	0.0	0.4	0.5	0.5	0.1	0.6
3556109	0.0	0.5	1.4	0.5	0.4	0.5	0.9	0.4	0.0	0.5	0.3	0.6
3556113	0.7	0.5	0.8	0.5	0.3	0.4	0.0	0.4	1.3	0.5	0.0	0.5
3556148	0.8	0.5	0.0	0.7	1.1	0.4	0.2	0.4	0.7	0.5	0.4	0.5
3564827	1.3	0.5	0.0	0.8	0.7	0.5	0.2	0.4	0.0	0.5	0.6	0.6
3574864	0.0	0.6	0.4	0.5	0.6	0.5	1.2	0.4	0.4	0.5	0.0	0.6
3579195	0.4	0.5	0.0	0.8	0.6	0.5	0.5	0.4	0.6	0.5	0.0	0.5
3574858	1.1	0.6	1.7	0.5	1.7	0.5	0.5	0.5	0.7	0.5	0.0	0.6
3505980	0.9	0.5	0.0	0.8	0.4	0.5	0.8	0.4	0.4	0.5	0.4	0.6
3585987	0.7	0.5	1.0	0.5	1.5	0.5	0.6	0.4	0.5	0.5	0.7	0.6
3585970	0.6	0.6	0.8	0.5	1.1	0.5	0.0	0.4	0.3	0.5	0.5	0.6
3585993	0.4	0.5	0.6	0.5	0.9	0.4	0.3	0.4	0.3	0.5	0.2	0.6
3585991	0.7	0.5	1.1	0.5	1.3	0.5	0.5	0.4	0.3	0.5	0.0	0.6
3593716	0.0	0.5	0.0	0.5	0.6	0.5	0.6	0.4	0.0	0.5	1.2	0.6
3593749	0.9	0.6	0.0	0.8	1.2	0.5	1.2	0.4	0.7	0.5	0.0	0.6
3599324	0.9	0.5	0.7	0.5	1.0	0.5	0.3	0.4	0.8	0.5	0.6	0.6
3608456	0.0	0.6	0.6	0.5	1.4	0.4	0.8	0.4	0.1	0.5	1.1	0.6
3608460	0.0	0.6	0.0	0.8	0.5	0.5	0.8	0.4	0.8	0.5	0.5	0.6
3608499	0.0	0.7	0.3	0.5	1.5	0.5	0.7	0.4	1.2	0.5	0.0	0.6
3612262	0.7	0.5	0.3	0.4	1.4	0.4	0.6	0.4	0.4	0.5	0.5	0.5
3612288	0.2	0.5	0.0	0.8	0.5	0.5	0.3	0.4	0.3	0.5	0.0	0.6
3612300	1.3	0.6	1.3	0.5	0.4	0.5	0.3	0.4	1.3	0.5	0.0	0.6
3612283	0.4	0.5	0.5	0.5	1.1	0.5	0.8	0.4	0.0	0.5	0.0	0.6
3612296	0.3	0.5	0.9	0.5	1.4	0.5	0.0	0.4	0.1	0.5	0.2	0.6
3617264	0.9	0.5	0.0	0.8	1.6	0.5	0.7	0.4	0.0	0.5	0.7	0.6
3612819	0.0	0.7	0.0	0.8	0.6	0.5	0.0	0.4	1.2	0.5	1.0	0.6
3623104	0.3	0.5	0.0	0.8	0.3	0.5	1.3	0.4	0.9	0.5	0.7	0.6
3623127	0.5	0.5	0.0	0.8	0.5	0.5	0.1	0.4	0.7	0.5	0.0	0.6
3630956	0.5	0.6	1.0	0.5	1.1	0.5	0.7	0.4	1.0	0.5	1.5	0.6
3630977	0.4	0.5	0.7	0.5	0.3	0.5	0.0	0.4	0.5	0.5	0.8	0.6
3631000	0.8	0.5	0.6	0.5	0.9	0.5	0.9	0.4	0.6	0.5	0.0	0.6
3651285	0.0	0.5	1.0	0.5	1.1	0.4	0.9	0.4	0.7	0.5	1.2	0.6
3651299	0.0	0.5	0.7	0.5	1.1	0.4	0.0	0.4	0.0	0.5	0.5	0.5
3654149	0.0	0.6	0.9	0.5	1.1	0.5	0.3	0.4	0.5	0.5	0.3	0.6
3654965	1.6	0.5	1.1	0.5	0.6	0.5	0.2	0.4	0.9	0.5	0.0	0.6
3617261	0.6	0.5	0.8	0.5	1.3	0.5	0.7	0.4	0.8	0.5	0.0	0.6
3630969	1.3	0.5	0.0	0.8	1.0	0.5	1.3	0.4	0.0	0.5	0.0	0.6
3654996	0.5	0.5	1.5	0.5	0.0	0.5	0.3	0.4	1.1	0.5	0.0	0.6
3658185	1.5	0.6	1.2	0.5	1.4	0.5	0.4	0.4	0.9	0.5	0.8	0.6
3683076	0.0	0.6	0.2	0.5	1.0	0.5	0.2	0.4	0.6	0.5	1.3	0.6
3683099	0.0	0.7	1.2	0.5	0.2	0.5	0.4	0.4	0.9	0.5	0.2	0.6
3686597	0.7	0.5	0.0	0.8	1.1	0.5	0.4	0.4	0.7	0.5	1.3	0.6
3688617	0.0	0.6	0.1	0.5	0.1	0.5	0.6	0.4	1.1	0.5	1.0	0.6
3688628	0.0	0.6	0.7	0.5	1.1	0.5	0.0	0.4	0.5	0.5	0.8	0.6
3688649	1.1	0.6	1.1	0.5	1.2	0.5	0.5	0.4	0.2	0.5	0.3	0.6
3630999	0.9	0.6	0.0	0.5	0.3	0.5	0.6	0.4	0.6	0.5	0.0	0.6
Average	0.5	0.5	0.6	0.6	0.8	0.5	0.5	0.4	0.6	0.5	0.4	0.6
Std Dev	0.46	0.06	0.52	0.14	0.47	0.04	0.36	0.02	0.39	0.00	0.45	0.03
Minimum	0.0	0.5	0.0	0.4	0.0	0.4	0.0	0.4	0.0	0.5	0.0	0.5
Maximum	1.6	0.7	1.7	0.8	1.7	0.5	1.3	0.5	1.3	0.5	1.5	0.6
SOW Max	3.0		2.8		1.6		2.0		2.0		2.2	
5x SOW Max	15.0		14.0		8.0		10.0		10.0		11.0	

*Note: Shaded analytical results identify detections above the maximum concentration (acceptance limit) for Teflon filters for XRF analysis. However, each of these analytical results was less than EPA's criteria of rejecting the filters if any trace metal is five times the maximum concentration listing.

Analysis performed by: *CHESTER LabNet*
12242 SW Garden Place ♦ Tigard, OR 97223
(503) 624-2183 ♦ www.chesterlab.net

XRF Acceptance Test Results

TRC-Raleigh Report # 12-587

Acceptance Limit (ng/cm²)	14.6		13.2		11.6		9.4		9.6		9.6	
Element*	Y		Zr		Mo		Rh		Pd		Ag	
Filter ID	Result	Unc.	Result	Unc.	Result	Unc.	Result	Unc.	Result	Unc.	Result	Unc.
3541057	0.6	0.7	0.0	0.9	0.6	1.3	0.0	2.7	0.3	2.5	0.0	2.6
3539659	0.8	0.8	1.1	0.9	0.8	1.4	0.0	2.7	0.0	2.6	5.5	2.6
3539672	0.2	0.7	0.7	0.9	0.3	1.3	0.0	2.8	2.7	2.6	0.0	2.6
3556149	0.0	0.8	0.2	1.0	2.4	1.4	0.0	2.8	2.4	2.6	6.2	2.7
3574857	1.2	0.7	0.6	0.9	1.7	1.4	1.2	2.6	0.0	2.6	1.8	2.6
3556109	0.0	0.7	0.3	0.9	0.7	1.3	0.0	2.8	0.0	2.5	0.0	2.6
3556113	0.2	0.7	0.0	0.9	2.1	1.2	0.6	2.6	0.0	2.5	0.0	2.5
3556148	0.4	0.7	0.0	0.9	2.7	1.3	0.2	2.6	0.0	2.4	0.1	2.5
3564827	0.0	0.7	0.2	0.9	2.9	1.3	0.0	2.7	2.8	2.5	0.0	2.6
3574864	0.5	0.7	0.3	0.9	1.4	1.3	0.0	2.7	0.0	2.5	0.0	2.6
3579195	1.2	0.7	0.0	0.9	0.3	1.3	0.0	2.7	2.0	2.4	3.4	2.5
3574858	0.7	0.8	0.5	1.0	1.1	1.4	0.8	2.8	3.8	2.7	1.6	2.7
3505980	0.1	0.7	0.3	0.9	2.9	1.3	0.0	2.7	1.9	2.5	3.3	2.6
3585987	1.8	0.7	0.5	0.9	0.9	1.3	3.0	2.8	1.0	2.6	0.0	2.6
3585970	1.3	0.8	0.0	1.0	1.3	1.4	1.7	2.8	2.0	2.7	1.7	2.7
3585993	0.4	0.7	0.0	0.9	3.3	1.3	0.9	2.6	1.2	2.4	0.6	2.6
3585991	0.6	0.7	0.0	0.9	0.0	1.3	0.3	2.7	0.0	2.5	0.5	2.6
3593716	1.9	0.7	0.0	0.9	0.0	1.3	0.3	2.8	0.1	2.5	0.0	2.7
3593749	1.4	0.8	0.0	1.0	1.1	1.4	2.1	2.8	0.0	2.6	0.0	2.7
3599324	0.1	0.7	0.2	0.9	0.9	1.3	2.0	2.8	0.0	2.5	1.6	2.6
3608456	1.5	0.7	0.0	0.9	0.0	1.2	1.6	2.7	0.0	2.5	0.0	2.5
3608460	0.2	0.8	0.0	0.9	3.6	1.4	0.0	2.8	0.0	2.5	3.0	2.6
3608499	1.6	0.8	0.0	1.0	0.7	1.4	1.3	2.8	0.0	2.6	2.7	2.7
3612262	1.3	0.7	0.0	0.8	3.0	1.2	0.0	2.6	0.0	2.5	1.3	2.5
3612288	1.5	0.8	0.0	0.9	1.1	1.4	0.0	2.8	0.0	2.6	0.0	2.6
3612300	0.5	0.8	0.0	0.9	0.0	1.4	7.6	2.8	0.0	2.6	0.0	2.6
3612283	0.4	0.7	0.0	0.9	4.1	1.3	3.1	2.7	2.1	2.5	0.0	2.6
3612296	1.1	0.7	0.6	0.9	1.1	1.3	3.3	2.8	0.0	2.6	0.0	2.6
3617264	0.2	0.7	0.0	0.9	3.1	1.4	0.7	2.7	0.0	2.6	0.0	2.6
3612819	0.6	0.8	3.1	1.0	0.0	1.4	2.6	2.9	0.9	2.6	1.2	2.6
3623104	1.4	0.7	0.0	0.9	2.5	1.3	0.0	2.7	0.0	2.6	0.0	2.6
3623127	1.4	0.7	0.0	0.9	3.9	1.3	1.3	2.6	5.0	2.5	0.0	2.6
3630956	0.9	0.8	0.0	1.0	0.0	1.4	0.0	2.8	1.2	2.6	0.0	2.6
3630977	0.3	0.7	0.7	0.9	2.0	1.3	1.2	2.7	1.4	2.5	0.0	2.6
3631000	1.2	0.7	0.0	0.9	0.4	1.3	0.0	2.7	2.7	2.5	0.0	2.6
3651285	0.0	0.7	0.0	0.9	0.0	1.3	0.0	2.7	0.0	2.5	1.2	2.5
3651299	0.2	0.7	1.1	0.9	0.0	1.2	0.0	2.7	0.0	2.5	3.6	2.5
3654149	1.2	0.7	1.0	0.9	0.0	1.3	0.0	2.6	0.0	2.5	0.0	2.5
3654965	2.5	0.7	0.0	0.9	0.6	1.3	1.1	2.7	0.0	2.5	1.0	2.6
3617261	1.7	0.7	0.0	0.9	1.1	1.3	2.3	2.6	0.5	2.5	0.0	2.6
3630969	0.4	0.7	0.0	0.9	0.0	1.3	0.0	2.7	1.0	2.5	0.1	2.5
3654996	0.0	0.7	0.0	0.9	0.0	1.3	0.0	2.7	0.0	2.5	3.8	2.6
3658185	0.0	0.8	0.2	0.9	1.0	1.4	1.4	2.7	0.5	2.6	1.6	2.6
3683076	2.4	0.8	0.0	1.0	2.7	1.4	0.0	2.9	0.0	2.6	0.0	2.6
3683099	0.0	0.8	0.0	0.9	2.3	1.4	2.5	2.8	0.0	2.6	0.3	2.7
3686597	0.5	0.7	0.0	0.9	2.5	1.4	0.0	2.7	0.0	2.5	2.0	2.6
3688617	0.0	0.7	0.0	0.9	1.3	1.3	1.0	2.7	0.0	2.5	0.0	2.6
3688628	1.2	0.7	0.0	0.9	2.9	1.3	0.0	2.7	1.9	2.5	0.7	2.5
3688649	1.8	0.8	0.9	1.0	2.3	1.4	0.0	2.8	2.8	2.6	0.0	2.6
3630999	0.5	0.8	0.0	0.9	1.0	1.4	0.0	2.7	0.0	2.7	0.0	2.6
Average	0.8	0.7	0.3	0.9	1.4	1.3	0.9	2.7	0.8	2.5	1.0	2.6
Std Dev	0.68	0.05	0.52	0.04	1.22	0.06	1.38	0.08	1.20	0.07	1.51	0.06
Minimum	0.0	0.7	0.0	0.8	0.0	1.2	0.0	2.6	0.0	2.4	0.0	2.5
Maximum	2.5	0.8	3.1	1.0	4.1	1.4	7.6	2.9	5.0	2.7	6.2	2.7
SOW Max	14.6		13.2		11.6		9.4		9.6		9.6	
5x SOW Max	73.0		66.0		58.0		47.0		48.0		48.0	

*Note: Shaded analytical results identify detections above the maximum concentration (acceptance limit) for Teflon filters for XRF analysis. However, each of these analytical results was less than EPA's criteria of rejecting the filters if any trace metal is five times the maximum concentration listing.

Analysis performed by: *CHESTER LabNet*
12242 SW Garden Place ♦ Tigard, OR 97223
(503) 624-2183 ♦ www.chesterlab.net

XRF Acceptance Test Results

TRC-Raleigh Report # 12-587

Acceptance Limit (ng/cm²)	10.8		15.2		14.4		16.2		18.6		25.0	
Element*	Cd		Sn		Sb		Te		I		Cs	
Filter ID	Result	Unc.	Result	Unc.	Result	Unc.	Result	Unc.	Result	Unc.	Result	Unc.
3541057	1.5	2.5	1.3	3.5	0.0	3.9	0.0	4.9	3.8	6.6	2.3	1.6
3539659	0.7	2.6	0.9	3.7	0.4	4.0	1.8	5.2	10.8	7.1	2.2	1.7
3539672	0.0	2.5	1.3	3.7	4.3	4.0	10.9	5.2	0.0	7.0	0.2	1.6
3556149	0.0	2.6	1.2	3.8	0.0	4.3	4.9	5.3	1.3	7.3	1.1	1.7
3574857	0.3	2.6	3.3	3.7	6.4	4.2	0.0	5.1	0.0	6.9	0.5	1.6
3556109	0.0	2.6	0.0	3.6	4.7	4.0	0.0	5.1	0.0	6.9	0.6	1.7
3556113	0.0	2.5	3.5	3.5	0.6	3.9	0.0	4.8	0.0	6.7	2.9	1.4
3556148	4.2	2.5	0.0	3.5	0.0	3.8	0.0	4.8	5.4	6.7	0.0	1.5
3564827	0.0	2.6	0.0	3.6	0.0	4.0	7.9	5.0	1.4	6.9	0.6	1.6
3574864	0.0	2.6	0.0	3.5	1.6	3.9	0.0	5.0	1.0	6.7	0.0	1.4
3579195	0.0	2.5	4.4	3.5	0.0	3.9	0.0	4.8	4.9	6.6	3.1	1.5
3574858	0.0	2.7	0.0	3.8	0.0	4.2	0.0	5.4	2.0	7.5	0.2	1.7
3505980	2.4	2.6	0.5	3.5	0.0	3.9	0.0	4.9	5.0	6.8	0.0	1.6
3585987	1.2	2.6	0.0	3.6	0.0	4.1	0.0	5.0	7.6	7.1	2.8	1.6
3585970	0.0	2.8	0.0	3.8	0.0	4.3	8.8	5.4	0.0	7.5	1.6	1.7
3585993	0.9	2.5	3.8	3.5	3.1	3.8	0.0	4.9	3.4	6.6	0.0	1.5
3585991	0.0	2.6	0.4	3.6	0.0	4.1	5.2	5.1	4.0	7.0	2.7	1.6
3593716	0.0	2.6	0.6	3.6	0.0	4.1	0.0	5.2	0.0	6.8	2.7	1.7
3593749	0.0	2.7	0.0	3.7	0.0	4.2	0.0	5.3	0.0	7.2	0.8	1.6
3599324	0.0	2.6	0.0	3.5	3.2	4.0	0.0	5.1	1.9	6.9	2.0	1.6
3608456	0.0	2.5	0.0	3.5	4.0	3.8	0.0	5.0	0.0	6.6	0.4	1.4
3608460	5.5	2.6	0.0	3.6	2.5	4.1	5.4	5.2	0.0	7.0	1.7	1.5
3608499	0.0	2.6	1.1	3.7	0.0	4.2	0.0	5.3	0.0	7.1	3.8	1.7
3612262	1.1	2.5	0.0	3.4	0.0	3.9	0.0	4.8	4.5	6.5	0.7	1.5
3612288	0.0	2.7	4.3	3.6	0.0	4.0	0.0	5.2	0.0	7.0	2.5	1.6
3612300	4.9	2.6	0.0	3.6	0.0	4.1	0.0	5.1	0.0	7.0	0.0	1.6
3612283	2.1	2.5	0.6	3.5	1.7	4.0	0.0	5.0	0.0	6.8	0.0	1.6
3612296	0.4	2.6	0.0	3.6	4.8	4.0	0.0	5.1	0.0	7.0	2.0	1.6
3617264	5.3	2.6	0.0	3.6	2.9	4.0	0.0	5.1	8.4	7.1	1.0	1.6
3612819	4.0	2.6	0.6	3.6	0.0	4.2	2.0	5.2	0.0	7.2	2.9	1.7
3623104	3.7	2.5	0.0	3.5	0.0	3.9	2.5	5.0	11.8	6.7	1.4	1.6
3623127	0.0	2.5	4.3	3.6	0.0	3.9	0.0	5.0	0.4	6.8	2.1	1.5
3630956	0.0	2.7	1.6	3.6	0.5	4.1	0.0	5.3	20.7	7.2	1.4	1.6
3630977	0.0	2.6	0.0	3.5	0.2	4.1	0.0	5.1	4.1	7.0	0.7	1.6
3631000	0.0	2.5	0.0	3.5	0.0	3.9	2.4	4.9	0.0	6.8	1.1	1.5
3651285	0.0	2.6	3.9	3.4	0.0	3.9	7.1	4.8	9.2	6.7	2.6	1.4
3651299	1.9	2.5	3.5	3.4	0.0	3.8	0.0	4.8	1.5	6.5	1.3	1.5
3654149	1.8	2.5	0.4	3.5	0.2	3.9	0.0	4.9	0.0	6.7	0.0	1.5
3654965	0.5	2.6	3.4	3.6	2.4	4.1	0.0	5.2	0.0	6.9	2.3	1.6
3617261	2.4	2.5	0.0	3.5	0.0	4.0	0.0	5.0	5.2	6.8	1.2	1.5
3630969	1.8	2.5	0.8	3.5	0.0	4.0	0.0	4.9	0.0	6.7	1.3	1.5
3654996	0.0	2.6	0.0	3.5	2.5	4.0	0.0	4.9	0.0	6.9	1.6	1.6
3658185	3.5	2.6	0.0	3.6	0.0	4.1	0.0	5.2	0.0	7.1	1.4	1.6
3683076	0.0	2.7	0.0	3.7	0.0	4.2	0.0	5.3	10.8	7.4	0.2	1.8
3683099	0.8	2.7	2.6	3.7	10.6	4.1	2.6	5.1	1.2	7.1	0.7	1.7
3686597	5.6	2.6	0.0	3.5	0.0	4.1	4.5	5.1	0.0	7.0	2.8	1.7
3688617	0.0	2.6	0.0	3.5	1.2	4.0	0.1	4.9	5.5	6.8	0.0	1.5
3688628	0.0	2.6	0.3	3.5	0.0	3.9	0.0	4.9	2.9	6.8	0.7	1.5
3688649	2.4	2.7	0.0	3.6	5.2	4.1	0.0	5.3	0.0	7.0	4.1	1.7
3630999	1.4	2.6	3.4	3.7	0.0	4.0	0.0	5.2	2.2	7.1	1.6	1.6
Average	1.2	2.6	1.0	3.6	1.3	4.0	1.3	5.1	2.8	6.9	1.4	1.6
Std Dev	1.70	0.07	1.49	0.10	2.19	0.13	2.67	0.17	4.19	0.24	1.11	0.09
Minimum	0.0	2.5	0.0	3.4	0.0	3.8	0.0	4.8	0.0	6.5	0.0	1.4
Maximum	5.6	2.8	4.4	3.8	10.6	4.3	10.9	5.4	20.7	7.5	4.1	1.8
SOW Max	10.8		15.2		14.4		16.2		18.6		25.0	
5x SOW Max	54.0		76.0		72.0		81.0		93.0		125	

*Note: Shaded analytical results identify detections above the maximum concentration (acceptance limit) for Teflon filters for XRF analysis. However, each of these analytical results was less than EPA's criteria of rejecting the filters if any trace metal is five times the maximum concentration listing.

Analysis performed by: *CHESTER LabNet*
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(503) 624-2183 ♦ www.chesterlab.net

XRF Acceptance Test Results

TRC-Raleigh Report # 12-587

Acceptance Limit (ng/cm²)	32.2		87.6		5.0		4.4		4.4		4.8	
Element*	Ba		La		W		Au		Hg		Pb	
Filter ID	Result	Unc.	Result	Unc.	Result	Unc.	Result	Unc.	Result	Unc.	Result	Unc.
3541057	5.4	2.4	0.0	1.3	0.0	2.4	0.0	1.2	0.0	1.2	1.3	1.2
3539659	4.2	2.5	2.7	1.4	2.8	2.6	1.0	1.2	3.0	1.1	0.7	1.3
3539672	5.8	2.6	2.0	1.4	0.8	2.5	1.1	1.2	1.4	1.1	2.9	1.3
3556149	2.5	2.7	1.5	1.5	0.2	2.6	0.3	1.3	0.5	1.1	1.1	1.3
3574857	0.0	2.6	0.4	1.4	0.0	2.5	0.0	1.2	0.0	1.3	2.8	1.2
3556109	0.8	2.5	2.4	1.4	0.0	2.4	0.0	1.2	0.8	1.1	0.9	1.2
3556113	0.8	2.4	2.9	1.3	0.0	2.3	0.0	1.1	0.0	1.2	0.9	1.2
3556148	4.0	2.4	0.2	1.3	0.0	2.3	0.0	1.1	0.0	1.2	3.0	1.1
3564827	2.2	2.5	2.4	1.4	0.4	2.4	0.4	1.2	0.0	1.2	3.1	1.2
3574864	0.0	2.5	1.2	1.3	0.0	2.4	0.0	1.2	2.2	1.1	1.1	1.2
3579195	3.9	2.4	1.3	1.2	0.5	2.4	0.5	1.2	0.0	1.2	2.4	1.2
3574858	0.0	2.7	4.4	1.5	1.7	2.7	0.0	1.3	0.0	1.4	1.1	1.3
3505980	0.0	2.7	3.3	2.3	0.0	2.4	0.0	1.1	0.0	1.2	2.6	1.2
3585987	0.0	2.5	2.2	1.3	0.0	2.4	0.0	1.2	0.0	1.3	2.0	1.2
3585970	3.0	2.8	4.0	1.5	0.0	2.6	0.0	1.3	0.0	1.4	1.2	1.3
3585993	0.0	2.3	2.3	1.3	0.9	2.4	0.1	1.2	0.0	1.2	0.0	1.2
3585991	2.7	2.6	0.7	1.4	0.0	2.5	0.0	1.2	0.0	1.3	1.8	1.2
3593716	0.0	2.5	2.2	1.4	0.0	2.5	0.0	1.2	0.0	1.1	0.0	1.2
3593749	0.9	2.6	1.9	1.5	0.0	2.6	0.0	1.2	0.0	1.3	2.9	1.3
3599324	1.8	2.5	1.3	1.4	0.1	2.5	0.0	1.2	0.0	1.3	2.2	1.2
3608456	7.7	2.7	0.4	1.2	0.7	2.3	0.7	1.1	2.9	1.0	0.7	1.1
3608460	0.2	2.6	1.1	1.4	0.0	2.5	0.0	1.2	2.2	1.1	1.5	1.3
3608499	2.5	2.6	1.0	1.4	0.2	2.5	0.2	1.2	3.0	1.1	1.8	1.3
3612262	2.2	2.3	1.2	1.3	0.0	2.3	0.0	1.1	0.0	1.2	1.9	1.1
3612288	1.6	2.6	0.0	1.4	0.0	2.5	0.1	1.2	0.0	1.3	3.4	1.3
3612300	4.0	2.6	0.0	1.4	2.0	2.6	0.1	1.2	0.0	1.3	2.1	1.3
3612283	0.0	2.4	1.2	1.3	0.0	2.4	0.0	1.2	0.0	1.3	1.4	1.2
3612296	2.5	2.5	0.0	1.3	0.8	2.5	0.4	1.2	0.0	1.3	1.7	1.2
3617264	1.1	2.6	1.3	1.4	4.5	2.6	1.8	1.2	0.0	1.3	4.3	1.2
3612819	0.0	2.6	0.8	1.4	1.2	2.6	1.0	1.2	2.6	1.1	4.1	1.3
3623104	1.5	2.4	1.2	1.3	0.0	2.4	0.0	1.2	0.0	1.2	2.3	1.2
3623127	4.8	2.4	2.4	1.2	0.3	2.4	0.0	1.2	0.0	1.2	3.5	1.2
3630956	0.5	2.6	1.7	1.4	3.9	2.7	1.3	1.3	0.0	1.3	1.5	1.3
3630977	0.0	2.5	1.0	1.3	0.0	2.5	0.0	1.2	0.0	1.3	1.9	1.2
3631000	0.0	2.4	1.9	1.3	0.0	2.3	0.0	1.1	0.0	1.2	0.8	1.2
3651285	0.6	2.4	1.2	1.3	0.8	2.4	0.5	1.1	0.7	1.0	0.6	1.1
3651299	4.1	2.2	2.8	1.2	0.0	2.2	0.0	1.1	0.0	1.2	0.2	1.1
3654149	1.5	2.5	0.0	1.3	0.0	2.4	0.6	1.2	2.5	1.1	0.6	1.2
3654965	4.1	2.6	0.0	1.4	1.5	2.5	1.3	1.2	0.0	1.2	0.8	1.2
3617261	0.0	2.5	0.0	1.3	0.0	2.3	0.0	1.1	0.0	1.2	1.3	1.2
3630969	0.3	2.5	0.8	1.4	1.4	2.5	0.1	1.2	0.0	1.2	2.4	1.2
3654996	5.4	2.4	3.1	1.3	2.1	2.5	0.3	1.2	0.0	1.2	0.0	1.2
3658185	2.9	2.6	1.8	1.4	0.0	2.5	0.3	1.2	0.0	1.3	1.7	1.3
3683076	3.0	2.7	0.6	1.5	3.0	2.7	1.8	1.3	0.7	1.1	1.2	1.3
3683099	5.6	2.7	0.4	1.5	0.3	2.6	1.5	1.3	1.5	1.1	0.0	1.2
3686597	0.0	2.6	1.6	1.4	0.0	2.5	0.0	1.2	0.0	1.3	3.1	1.3
3688617	3.7	2.4	0.3	1.4	0.0	2.4	0.0	1.1	2.9	1.1	2.2	1.2
3688628	1.6	2.4	0.0	1.3	0.0	2.3	0.5	1.1	1.8	1.0	1.6	1.2
3688649	3.8	2.7	0.0	1.5	3.1	2.6	0.9	1.3	0.0	1.3	0.0	1.3
3630999	3.8	2.6	1.7	1.4	0.0	2.5	0.0	1.2	0.0	1.3	1.4	1.3
Average	2.1	2.5	1.4	1.4	0.7	2.5	0.3	1.2	0.6	1.2	1.7	1.2
Std Dev	2.00	0.13	1.11	0.16	1.11	0.12	0.51	0.06	1.01	0.10	1.08	0.06
Minimum	0.0	2.2	0.0	1.2	0.0	2.2	0.0	1.1	0.0	1.0	0.0	1.1
Maximum	7.7	2.8	4.4	2.3	4.5	2.7	1.8	1.3	3.0	1.4	4.3	1.3
SOW Max	32.2		87.6		5.0		4.4		4.4		4.8	
5x SOW Max	161		438		25.0		22.0		22.0		24.0	

*Note: Shaded analytical results identify detections above the maximum concentration (acceptance limit) for Teflon filters for XRF analysis. However, each of these analytical results was less than EPA's criteria of rejecting the filters if any trace metal is five times the maximum concentration listing.

Analysis performed by: *CHESTER LabNet*
12242 SW Garden Place ♦ Tigard, OR 97223
(503) 624-2183 ♦ www.chesterlab.net

Appendix D

Test Results Alkalinity

Alkalinity Acceptance Test Results

TRC-Raleigh Report # 12-587

LabNet ID	Filter ID	blank corrected result in µeq/filter
12-X1814	3505963	-0.8067
12-X1815	3651267	-0.6023
12-X1816	3505995	-0.2481
12-X1817	3539651	-0.9230
12-X1818	3639661	-0.8796
12-X1819	3541073	-0.8428
12-X1820	3541091	-0.8113
12-X1821	3556101	-0.9984
12-X1822	3654989	-0.8554
12-X1823	3556117	-1.0170
12-X1824	3556119	-0.8286
12-X1825	3658194	-0.5509
12-X1826	3564834	-0.1758
12-X1827	3686556	-0.5802
12-X1828	3574883	-0.3200
12-X1829	3612266	-0.3862
12-X1830	3686583	-0.4074
12-X1831	3585981	0.1343
12-X1832	3593725	0.0888
12-X1833	3599306	-0.0537
12-X1834	3599338	0.7724
12-X1835	3608455	0.4589
12-X1836	3608480	-0.1081
12-X1837	3612282	0.2098
12-X1838	3612294	0.4206
12-X1839	3612802	0.7926
12-X1840	3612843	0.7155
12-X1841	3617258	-0.0365
12-X1842	3617292	-0.1133
12-X1843	3623118	0.1022
12-X1844	3623137	0.1465
12-X1845	3630951	0.7607
12-X1846	3630966	0.4349
12-X1847	3651272	0.8768
12-X1848	3651290	0.5577
12-X1849	3654118	0.8356
12-X1850	3654133	1.1793
12-X1851	3654954	0.5043
12-X1852	3654982	0.4723
12-X1853	3658176	0.6385
12-X1854	3658196	-0.0513
12-X1855	3683052	-0.0052
12-X1856	3683080	0.3096
12-X1857	3686582	0.3904
12-X1858	3686590	0.0745
12-X1859	3688604	0.3008
12-X1860	3688635	0.8965
12-X1861	3697367	-0.3329
12-X1862	3697387	-0.3728
12-X1863	3697398	0.3785

Average	**0.0029**
Std Dev	0.5929
Minimum	-1.0170
Maximum	1.1793
SOW Max	25

Analysis performed by: ***CHESTER LabNet***
12242 SW Garden Place ♦ Tigard, OR 97223
(503) 624-2183 ♦ www.chesterlab.net

CHESTER LabNet

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Case Narrative

Date: January 24, 2013

General Information

Client:	TRC Environmental - Raleigh
Job Number:	T010
Report Number:	12-587
Sample Description:	47mm Teflon Blanks

Analysis

Analytes:	XRF Metals (Al - Pb), mass, alkalinity
Analytical Protocols:	X-Ray Fluorescence: EPA IO3.3, Stability Tests: EPA/600/R-94/038b, Alkalinity: Appendix A of QA guidance document 2.12 (modified)
Analytical Notes:	There was a higher than usual rejection rate in the visible inspection done by Chester LabNet, so an additional batch of filters was sent to replace the rejected filters. No problems were encountered during the XRF or gravimetric analyses. **All alkalinity samples had a starting pH of below 6; consequently all non-blank subtracted results were negative.** Ethanol was used to whet the samples since Teflon is hydrophobic. The ethanol washed the ID off of the filters. It is unknown as to whether or not this affected the alkalinity. The absolute alkalinity for all filters was negative. After blank subtraction, some samples had positive alkalinity. Since the % RSD of the alkalinity measurements was over 20,000, the lab believes that the values are essentially just "baseline noise".
QA/QC Review:	All of the data have been reviewed by the analysts performing the analyses and the project manager. All of the quality control and sample-specific information in this package is complete and meets or exceeds the minimum requirements for acceptability.
Comments:	If you have any questions or concerns regarding this analysis, please feel free to contact the project manager.
Disclaimer:	This report shall not be reproduced, except in full, without the written approval of the laboratory. The results only represent that of the samples as received into the laboratory.

Paul Duda 1/24/13

Project Manager Date
Paul Duda

Appendix E

Test Results Maximum

Moisture Pick-up

Acceptance Testing of 50 Measurement Technology Laboratories 46.2-mm PTFE (Teflon®) Filters for the 2013 $PM_{2.5}$ Program

Moisture Pickup Test

Client:	**TRC Environmental Corporation**
TRC Purchase Order No.:	**51883**
RTI Project No.:	**0212441.001.013**
Date:	**January 14, 2013**

By

Paige Presler-Jur
RTI International[1]
3040 Cornwallis Road
Research Triangle Park, NC 27709-2194
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Submitted To

Stan Sleva
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[1]RTI International is a trade name of Research Triangle Institute.

INTRODUCTION

RTI was instructed to perform maximum moisture pickup acceptance testing of Measurement Technology Laboratories (MTL) 46.2-mm PTFE (Teflon®) filters for the 2013 $PM_{2.5}$ Program. Fifty filters were provided for the test by TRC personnel. The 50 filters provided for the maximum moisture pickup test were received by RTI on December 11, 2012. To meet acceptance criteria according to moisture pickup test descriptions outlined in 40 CFR Part 50, Appendix L, and enclosed with the filters, a filter's weight is not to increase by more than 10 µg after 24-hour exposure to air of 40% relative humidity, relative to its weight after 24-hour exposure to air of 35% relative humidity.

GRAVIMETRIC ANALYSES

The microanalytical balance used for the moisture pickup test was a Mettler Toledo Model UMX2 with a readability of 0.1 µg and a repeatability of 0.25 µg. Filters were equilibrated and weighed in a controlled-environment weighing chamber whose ambient temperature and relative humidity are controlled and monitored by a dedicated conditioning, humidification, and dehumidification system. Filters were placed in the weighing chamber on January 10, 2013, and allowed to equilibrate in the weighing environment at 35% relative humidity and 22°C for 24 hours. Initial (tare) weighing was performed on January 11, 2013. The chamber's relative humidity controls were then reset for 40% relative humidity. The filters were allowed to equilibrate in the weighing environment at 40% relative humidity and 22°C for 24 hours, and then were reweighed on January 12, 2013. Relative humidity and temperature data were collected for the 24 hours prior to each weigh session using a temperature and humidity data logger. Data logger output was exported into Excel® spreadsheet format for calculation of means and standard deviations and for inclusion in this report. The data are provided in Attachment 1.

Two NIST-traceable reference weights bracketing the weight of the MTL 46.2 mm PTFE filter (200-mg and 500-mg) were weighed after balance start-up and calibration and then again after every tenth filter to monitor balance fluctuation in each weigh session. In addition, select filters were reweighed to monitor filter stability during each weigh session.

RESULTS OF ANALYSES

Weights for the 50 filters at 35% and 40% relative humidity are presented in the attached Table 1. During the Moisture Pickup Tests in 2012, it was noticed that the MTL filters had a tendency to have greater static effects than filters previously tested for the program. To minimize these effects on the calculation of mean difference in weights between the two relative humidity settings during these 2013 tests, QC percentages were increased for the 2 weigh sessions. A 100% duplicate QC percentage was used for the 35% RH weigh session to ensure an accurate first weight was recorded. A 33% duplicate QC percentage was used for the 40% RH weigh session. With the increase in duplicate percentage, internal duplicate QC data are presented in Table 1. Internal Environmental Chamber Condition QC data are presented in Table 2.

DISCUSSION

Replicate weighings of the reference weights and duplicate weighings of the MTL filters were within the acceptance ranges set forth in the U.S. EPA Quality Assurance Handbook, Volume II, Part II, Section 2.12 (Guidance Document 2.12). The mean difference in filter weights recorded for the 50 test filters at the two humidity settings was 2.0 µg, with a maximum recorded absolute difference of 7 µg and a minimum recorded difference of 0 µg. The data were distributed between weight loss and weight gain, with a tendency toward weight loss. Thirty two (32) of the 50 test filters lost weight, ten (10) of the 50 filters showed no weight change, and eight (8) of the 50 filters gained weight. Based on this limited evaluation of the filter media, the PTFE filters may be considered acceptable in terms of moisture pickup for use in the 2013 $PM_{2.5}$ Program.

Before the initial weigh session, the MTL filters had small fibers and particulates that had to be removed before the weighing process could begin. Thirteen (13) filters had to be weighed more than twice to ensure that the duplicates were under 5 µg for accurate calculation of the mean difference in weight change. To clearly illustrate the mass difference from potential moisture pickup in Table 1, these repeat weighings are presented in Table 3. From RTI's experience with MTL filters, this is most likely attributable to static effects and is not unusual for these filters. In manual weighing scenarios, MTL filters must be placed extremely carefully onto the weigh pan and may need additional time near an ionizer or other static control device before weighing, more so than Whatman filters. However, this slight adaption in the manual placement of the filter onto the weigh pan does not preclude manual mass determination on microanalytical balances. The analyst conducting this Moisture Pickup Test performed a 100% duplicate QC percentage during the initial weigh session to minimize static effects on the initial weight and verify the balance performance and chamber controls. In the final weigh session, a 33% duplicate QC percentage was performed as potential static or debris contamination effects could be tracked by the mass difference from the initial weigh session.

Table 1. Maximum Moisture Pickup Test

Measurement Technology Laboratories (MTL) 46.2-mm Teflon Filters

Filter ID Number	1/11/13 Initial Weight (mg) 35% RH	1/11/13 Duplicate (QC Check) Weight (mg) 35% RH	1/12/13 Initial Weight (mg) 40% RH	1/12/13 Duplicate (QC Check) Weight (mg) 40% RH	Relative Mass Difference (mg)	Absolute Mass Difference (mg)	Comments on Filter Appearance (General Comment: Filters had considerable amount of loose material that had to be blown off before 35% RH Session began.)
T3505952	368.512	368.510	368.507	368.505	-0.005	0.005	See Table 3
T3505966	361.611	361.610	361.610	361.609	-0.001	0.001	See Table 3
T3539657	377.813	377.811	377.812	377.811	-0.001	0.001	See Table 3
T3539692	378.956	378.954	378.955		-0.001	0.001	
T3541061	369.904	369.901	369.901		-0.003	0.003	
T3541096	372.519	372.517	372.519	372.516	0.000	0.000	
T3556111	364.825	364.822	364.822		-0.003	0.003	
T3556146	373.621	373.618	373.619		-0.002	0.002	
T3564814	377.184	377.184	377.188	377.184	0.004	0.004	
T3564844	381.604	381.603	381.602		-0.002	0.002	
T3574863	377.030	377.026	377.029		-0.001	0.001	
T3574889	373.158	373.156	373.158	373.155	0.000	0.000	
T3579163	381.920	381.917	381.922		0.002	0.002	
T3579175	381.533	381.535	381.533		0.000	0.000	
T3585960	358.479	358.477	358.474	358.476	-0.005	0.005	
T3585999	366.188	366.188	366.190		0.002	0.002	
T3593709	382.676	382.672	382.676		0.000	0.000	
T3593731	372.210	372.209	372.210	372.209	0.000	0.000	See Table 3
T3599321	380.674	380.673	380.674		0.000	0.000	
T3599344	365.603	365.601	365.602		-0.001	0.001	
T3608453	374.857	374.855	374.854	374.853	-0.003	0.003	
T3608489	381.146	381.144	381.146		0.000	0.000	
T3612269	369.510	369.511	369.511		0.001	0.001	
T3612291	369.444	369.440	369.442	369.441	-0.002	0.002	
T3612809	385.512	385.512	385.508		-0.004	0.004	
T3612841	375.339	375.335	375.337		-0.002	0.002	
T3617268	366.289	366.288	366.285	366.286	-0.004	0.004	
T3617293	388.012	388.009	388.010		-0.002	0.002	
T3623103	367.724	367.725	367.723		-0.001	0.001	
T3623144	359.610	359.606	359.603	359.601	-0.007	0.007	
T3630961	371.548	371.547	371.548		0.000	0.000	See Table 3
T3630990	378.745	378.744	378.744		-0.001	0.001	
T3651262	364.837	364.833	364.833	364.837	-0.004	0.004	See Table 3
T3651289	366.305	366.302	366.303		-0.002	0.002	
T3654124	377.850	377.846	377.852		0.002	0.002	See Table 3
T3654137	387.095	387.093	387.093	387.095	-0.002	0.002	See Table 3
T3654952	364.541	364.540	364.541		0.000	0.000	See Table 3
T3654991	375.035	375.033	375.034		-0.001	0.001	
T3658168	373.030	373.028	373.028	373.027	-0.002	0.002	
T3658190	372.480	372.478	372.480		0.000	0.000	
T3683055	387.412	387.409	387.409		-0.003	0.003	
T3683096	383.950	383.947	383.946	383.943	-0.004	0.004	See Table 3
T3686575	379.116	379.112	379.111		-0.005	0.005	
T3686596	368.690	368.688	368.689		-0.001	0.001	
T3688619	371.754	371.753	371.756	371.753	0.002	0.002	See Table 3
T3688636	369.612	369.608	369.608		-0.004	0.004	
T3697355	387.069	387.067	387.065		-0.004	0.004	
T3697384	368.387	368.383	368.384	368.386	-0.003	0.003	
T3697396	369.447	369.447	369.448		0.001	0.001	See Table 3
T3701302	373.721	373.720	373.722	373.721	0.001	0.001	See Table 3

Mean	0.002(0)
Min	0.000
Max	0.007

Table 2. QC Data
TRC Moisture Pickup Test

RTI Project Number:	0212441.001.013	Client:	TRC Environmental
Balance (C, D, E, or F):	D	Analyst:	PPJ
Date:	1/11/13 & 1/12/13	Filter Lot:	Unknown

							Internal QC Every Tenth Filter					
Internal QC Location	**Initial/Final**	**Date**	**Begin Time**	**End Time**	**RH (%)**	**Temp (Deg C)**	**200-mg Reference Standard S/N 83428**	**500-mg Reference Standard S/N 36595**	**Filter ID**	**First Weight (mg)**	**Replicate Weight (mg)**	**Difference (mg)**
Initial	Initial	01/11/13	1340		35	22	199.997	499.994				
10	Initial	01/11/13			35	22	199.997	499.994				
20	Initial	01/11/13			35	22	199.997	499.995	See Table 1: Pickup Test for 100% QC Duplicates performed during the 35% RH Weigh Session. All Duplicates were within +/- 5 ug.			
30	Initial	01/11/13			35	22	199.997	499.994				
40	Initial	01/11/13			35	22	199.997	499.993				
50	Initial	01/11/13		1700	35	22	199.998	499.995				
Initial	Final	01/12/13	1730		40	22	199.997	499.994				
10	Final	01/12/13			40	22	199.997	499.993				
20	Final	01/12/13			40	22	199.997	499.995	See Table 1: Pickup Test for 33% QC Duplicates performed during the 40% RH Weigh Session. All Duplicates were within +/- 5 ug.			
30	Final	01/12/13			40	22	199.997	499.994				
40	Final	01/12/13			40	22	199.997	499.995				
50	Final	01/12/13		1915	40	22	199.997	499.995				

Table 3. Replicate Weighings for Out of Specification Duplicates
Measurement Technology Laboratories (MTL) 46.2-mm Teflon Filters

Filter ID Number	1/11/13 Initial Weight (mg) 35% RH	1/11/13 Second (QC Check) Weight (mg) 35% RH	1/11/13 Third (QC Check) Weight (mg) 35% RH	1/11/13 Fourth (QC Check) Weight (mg) 35% RH	1/11/13 Fifth (QC Check) Weight (mg) 35% RH	1/11/13 Sixth (QC Check) Weight (mg) 35% RH	1/12/13 Initial Weight (mg) 40% RH	1/12/13 Second (QC Check) Weight (mg) 40% RH	1/12/13 Duplicate (QC Check) Weight (mg) 40% RH	Comments
T3505952	368.517	368.512	368.510				368.507	368.505		
T3505960	361.616	361.611	361.610				361.610	361.609		
T3539657	377.813	377.811					377.818	377.812	377.811	
T3593731	372.233	372.210	372.209				372.210	372.209		
T3630961	371.567	371.554	371.548	371.547			371.548			
T3651262	364.846	364.831	364.870	364.868	364.837	364.833	364.833	364.837		During 35% Weigh Session, after Fourth Weighing, the filter was placed by the ionizer for several minutes before the fifth weighing.
T3654124	377.861	377.850	377.846				377.852			
T3654137	387.103	387.096	387.093				387.093	387.095		
T3654952	364.548	364.541	364.540				364.541			
T3683096	383.966	383.959	383.950	383.947			383.946	383.943		
T3688619	371.759	371.754	371.753				371.756	371.753		
T3697396	369.457	369.447	369.448				369.448			
T3701302	373.721	373.720					373.730	373.722	373.721	

Attachment A. Gravimetry Chamber Temperature and RH Data
TRC Moisture Pickup Test

Date	Time	T (deg C)	RH (%)
1/10/13	13:31:00	22	35
1/10/13	13:36:00	22	35
1/10/13	13:41:00	22	35
1/10/13	13:46:00	22	35
1/10/13	13:51:00	22	35
1/10/13	13:56:00	22	35
1/10/13	14:01:00	22	35
1/10/13	14:06:00	22	35
1/10/13	14:11:00	22	35
1/10/13	14:16:00	22	35
1/10/13	14:21:00	22	35
1/10/13	14:26:00	22	35
1/10/13	14:31:00	22	35
1/10/13	14:36:00	22	35
1/10/13	14:41:00	22	35
1/10/13	14:46:00	22	35
1/10/13	14:51:00	22	35
1/10/13	14:56:00	22	35
1/10/13	15:01:00	22	35
1/10/13	15:06:00	22	35
1/10/13	15:11:00	22	35
1/10/13	15:16:00	22	35
1/10/13	15:21:00	22	35
1/10/13	15:26:00	22	35
1/10/13	15:31:00	22	35
1/10/13	15:36:00	22	35
1/10/13	15:41:00	22	35
1/10/13	15:46:00	22	35
1/10/13	15:51:00	22	35
1/10/13	15:56:00	22	35
1/10/13	16:01:00	22	35
1/10/13	16:06:00	22	35
1/10/13	16:11:00	22	35
1/10/13	16:16:00	22	35
1/10/13	16:21:00	22	35
1/10/13	16:26:00	22	35
1/10/13	16:31:00	22	35
1/10/13	16:36:00	22	35
1/10/13	16:41:00	22	35
1/10/13	16:46:00	22	35
1/10/13	16:51:00	22	35
1/10/13	16:56:00	22	35
1/10/13	17:01:00	22	35
1/10/13	17:06:00	22	35
1/10/13	17:11:00	22	35
1/10/13	17:16:00	22	35
1/10/13	17:21:00	22	35
1/10/13	17:26:00	22	35
1/10/13	17:31:00	22	35
1/10/13	17:36:00	22	35
1/10/13	17:41:00	22	35

(Prior to Initial)	Temp
24-hr average	22
24-hour std dev	0.03
	RH
24-hr average	35
24-hour std dev	0.11

(Prior to Final)	Temp
24-hr average	22
24-hour std dev	0.029
	RH
24-hr average	40
24-hour std dev	0.12

Date	Time	T (deg C)	RH (%)
1/10/13	17:46:00	22	35
1/10/13	17:51:00	22	35
1/10/13	17:56:00	22	35
1/10/13	18:01:00	22	35
1/10/13	18:06:00	22	35
1/10/13	18:11:00	22	35
1/10/13	18:16:00	22	35
1/10/13	18:21:00	22	35
1/10/13	18:26:00	22	35
1/10/13	18:31:00	22	35
1/10/13	18:36:00	22	35
1/10/13	18:41:00	22	35
1/10/13	18:46:00	22	35
1/10/13	18:51:00	22	35
1/10/13	18:56:00	22	35
1/10/13	19:01:00	22	35
1/10/13	19:06:00	22	35
1/10/13	19:11:00	22	35
1/10/13	19:16:00	22	35
1/10/13	19:21:00	22	35
1/10/13	19:26:00	22	35
1/10/13	19:31:00	22	35
1/10/13	19:36:00	22	35
1/10/13	19:41:00	22	35
1/10/13	19:46:00	22	35
1/10/13	19:51:00	22	35
1/10/13	19:56:00	22	35
1/10/13	20:01:00	22	35
1/10/13	20:06:00	22	35
1/10/13	20:11:00	22	35
1/10/13	20:16:00	22	35
1/10/13	20:21:00	22	35
1/10/13	20:26:00	22	35
1/10/13	20:31:00	22	35
1/10/13	20:36:00	22	35
1/10/13	20:41:00	22	35
1/10/13	20:46:00	22	35
1/10/13	20:51:00	22	35
1/10/13	20:56:00	22	35
1/10/13	21:01:00	22	35
1/10/13	21:06:00	22	35
1/10/13	21:11:00	22	35
1/10/13	21:16:00	22	35
1/10/13	21:21:00	22	35
1/10/13	21:26:00	22	35
1/10/13	21:31:00	22	35
1/10/13	21:36:00	22	35
1/10/13	21:41:00	22	35
1/10/13	21:46:00	22	35
1/10/13	21:51:00	22	35
1/10/13	21:56:00	22	35
1/10/13	22:01:00	22	35
1/10/13	22:06:00	22	35
1/10/13	22:11:00	22	35
1/10/13	22:16:00	22	35

Date	Time	T (deg C)	RH (%)
1/10/13	22:21:00	22	35
1/10/13	22:26:00	22	35
1/10/13	22:31:00	22	35
1/10/13	22:36:00	22	35
1/10/13	22:41:00	22	35
1/10/13	22:46:00	22	35
1/10/13	22:51:00	22	35
1/10/13	22:56:00	22	35
1/10/13	23:01:00	22	35
1/10/13	23:06:00	22	35
1/10/13	23:11:00	22	35
1/10/13	23:16:00	22	35
1/10/13	23:21:00	22	35
1/10/13	23:26:00	22	35
1/10/13	23:31:00	22	35
1/10/13	23:36:00	22	35
1/10/13	23:41:00	22	35
1/10/13	23:46:00	22	35
1/10/13	23:51:00	22	35
1/10/13	23:56:00	22	35
1/11/13	0:01:00	22	35
1/11/13	0:06:00	22	35
1/11/13	0:11:00	22	35
1/11/13	0:16:00	22	35
1/11/13	0:21:00	22	35
1/11/13	0:26:00	22	35
1/11/13	0:31:00	22	35
1/11/13	0:36:00	22	35
1/11/13	0:41:00	22	35
1/11/13	0:46:00	22	35
1/11/13	0:51:00	22	35
1/11/13	0:56:00	22	35
1/11/13	1:01:00	22	35
1/11/13	1:06:00	22	35
1/11/13	1:11:00	22	35
1/11/13	1:16:00	22	35
1/11/13	1:21:00	22	35
1/11/13	1:26:00	22	35
1/11/13	1:31:00	22	35
1/11/13	1:36:00	22	35
1/11/13	1:41:00	22	35
1/11/13	1:46:00	22	35
1/11/13	1:51:00	22	35
1/11/13	1:56:00	22	35
1/11/13	2:01:00	22	35
1/11/13	2:06:00	22	35
1/11/13	2:11:00	22	35
1/11/13	2:16:00	22	35
1/11/13	2:21:00	22	35
1/11/13	2:26:00	22	35
1/11/13	2:31:00	22	35
1/11/13	2:36:00	22	35
1/11/13	2:41:00	22	35
1/11/13	2:46:00	22	35
1/11/13	2:51:00	22	35

Date	Time	T (deg C)	RH (%)
1/11/13	2:56:00	22	35
1/11/13	3:01:00	22	35
1/11/13	3:06:00	22	35
1/11/13	3:11:00	22	35
1/11/13	3:16:00	22	35
1/11/13	3:21:00	22	35
1/11/13	3:26:00	22	35
1/11/13	3:31:00	22	35
1/11/13	3:36:00	22	35
1/11/13	3:41:00	22	35
1/11/13	3:46:00	22	35
1/11/13	3:51:00	22	35
1/11/13	3:56:00	22	35
1/11/13	4:01:00	22	35
1/11/13	4:06:00	22	35
1/11/13	4:11:00	22	35
1/11/13	4:16:00	22	35
1/11/13	4:21:00	22	35
1/11/13	4:26:00	22	35
1/11/13	4:31:00	22	35
1/11/13	4:36:00	22	35
1/11/13	4:41:00	22	35
1/11/13	4:46:00	22	35
1/11/13	4:51:00	22	35
1/11/13	4:56:00	22	35
1/11/13	5:01:00	22	35
1/11/13	5:06:00	22	35
1/11/13	5:11:00	22	35
1/11/13	5:16:00	22	35
1/11/13	5:21:00	22	35
1/11/13	5:26:00	22	35
1/11/13	5:31:00	22	35
1/11/13	5:36:00	22	35
1/11/13	5:46:00	22	35
1/11/13	5:51:00	22	35
1/11/13	5:56:00	22	35
1/11/13	6:01:00	22	35
1/11/13	6:06:00	22	35
1/11/13	6:11:00	22	35
1/11/13	6:16:00	22	35
1/11/13	6:21:00	22	35
1/11/13	6:26:00	22	35
1/11/13	6:31:00	22	35
1/11/13	6:36:00	22	35
1/11/13	6:41:00	22	35
1/11/13	6:46:00	22	35
1/11/13	6:51:00	22	35
1/11/13	6:56:00	22	35
1/11/13	7:01:00	22	35
1/11/13	7:06:00	22	35
1/11/13	7:11:00	22	35
1/11/13	7:16:00	22	35
1/11/13	7:21:00	22	35
1/11/13	7:26:00	22	35
1/11/13	7:31:00	22	35

Date	Time	T (deg C)	RH (%)
1/11/13	7:36:00	22	35
1/11/13	7:41:00	22	35
1/11/13	7:46:00	22	35
1/11/13	7:51:00	22	35
1/11/13	7:56:00	22	35
1/11/13	8:01:00	22	35
1/11/13	8:06:00	22	35
1/11/13	8:11:00	22	35
1/11/13	8:16:00	22	35
1/11/13	8:21:00	22	35
1/11/13	8:26:00	22	35
1/11/13	8:31:00	22	35
1/11/13	8:36:00	22	35
1/11/13	8:41:00	22	35
1/11/13	8:46:00	22	35
1/11/13	8:51:00	22	35
1/11/13	8:56:00	22	35
1/11/13	9:01:00	22	35
1/11/13	9:06:00	22	35
1/11/13	9:11:00	22	35
1/11/13	9:16:00	22	35
1/11/13	9:21:00	22	35
1/11/13	9:26:00	22	35
1/11/13	9:31:00	22	35
1/11/13	9:36:00	22	35
1/11/13	9:41:00	22	35
1/11/13	9:46:00	22	35
1/11/13	9:51:00	22	35
1/11/13	9:56:00	22	35
1/11/13	10:01:00	22	35
1/11/13	10:06:00	22	35
1/11/13	10:11:00	22	35
1/11/13	10:16:00	22	35
1/11/13	10:21:00	22	35
1/11/13	10:26:00	22	35
1/11/13	10:31:00	22	35
1/11/13	10:36:00	22	35
1/11/13	10:41:00	22	35
1/11/13	10:46:00	22	35
1/11/13	10:51:00	22	35
1/11/13	10:56:00	22	35
1/11/13	11:01:00	22	35
1/11/13	11:06:00	22	35
1/11/13	11:11:00	22	35
1/11/13	11:16:00	22	35
1/11/13	11:21:00	22	35
1/11/13	11:26:00	22	35
1/11/13	11:31:00	22	35
1/11/13	11:36:00	22	35
1/11/13	11:41:00	22	35
1/11/13	11:46:00	22	35
1/11/13	11:51:00	22	35
1/11/13	11:56:00	22	35
1/11/13	12:01:00	22	35
1/11/13	12:06:00	22	35

Date	Time	T (deg C)	RH (%)	
1/11/13	12:11:00	22	35	
1/11/13	12:16:00	22	35	
1/11/13	12:21:00	22	35	
1/11/13	12:26:00	22	35	
1/11/13	12:31:00	22	35	
1/11/13	12:36:00	22	35	
1/11/13	12:41:00	22	35	
1/11/13	12:46:00	22	35	
1/11/13	12:51:00	22	35	
1/11/13	12:56:00	22	35	
1/11/13	13:01:00	22	35	
1/11/13	13:06:00	22	35	
1/11/13	13:11:00	22	35	
1/11/13	13:16:00	22	35	
1/11/13	13:21:00	22	35	
1/11/13	13:26:00	22	35	
1/11/13	13:31:00	22	35	
1/11/13	13:36:00	22	35	
1/11/13	13:41:00	22	35	Initial (Tare) Weigh Begin
1/11/13	13:46:00	22	35	
1/11/13	13:51:00	22	35	
1/11/13	13:56:00	22	35	
1/11/13	14:01:00	22	35	
1/11/13	14:06:00	22	35	
1/11/13	14:11:00	22	35	
1/11/13	14:16:00	22	35	
1/11/13	14:21:00	22	35	
1/11/13	14:26:00	22	35	
1/11/13	14:31:00	22	35	
1/11/13	14:36:00	22	35	
1/11/13	14:41:00	22	35	
1/11/13	14:46:00	22	35	
1/11/13	14:51:00	22	35	
1/11/13	14:56:00	22	35	
1/11/13	15:01:00	22	35	
1/11/13	15:06:00	22	35	
1/11/13	15:11:00	22	35	
1/11/13	15:16:00	22	35	
1/11/13	15:21:00	22	35	
1/11/13	15:26:00	22	35	
1/11/13	15:31:00	22	35	
1/11/13	15:36:00	22	35	
1/11/13	15:41:00	22	35	
1/11/13	15:46:00	22	35	
1/11/13	15:51:00	22	35	
1/11/13	15:56:00	22	35	
1/11/13	16:01:00	22	35	
1/11/13	16:06:00	22	35	
1/11/13	16:11:00	22	35	
1/11/13	16:16:00	22	35	
1/11/13	16:21:00	22	35	
1/11/13	16:21:00	22	35	

Date	Time	T (deg C)	RH (%)	
1/11/13	16:26:00	22	35	
1/11/13	16:31:00	22	35	
1/11/13	16:36:00	22	35	
1/11/13	16:41:00	22	35	
1/11/13	16:46:00	22	35	
1/11/13	16:51:00	22	35	
1/11/13	16:56:00	22	35	
				Initial (Tare) Weigh
1/11/13	17:01:00	22	35	End
1/11/13	17:06:00	22	35	
1/11/13	17:11:00	22	37	
1/11/13	17:16:00	22	38	
1/11/13	17:21:00	22	40	
1/11/13	17:26:00	22	40	
1/11/13	17:31:00	22	40	
1/11/13	17:36:00	22	40	
1/11/13	17:41:00	22	40	
1/11/13	17:46:00	22	40	
1/11/13	17:51:00	22	40	
1/11/13	17:56:00	22	40	
1/11/13	18:01:00	22	40	
1/11/13	18:06:00	22	40	
1/11/13	18:11:00	22	40	
1/11/13	18:16:00	22	40	
1/11/13	18:21:00	22	40	
1/11/13	18:26:00	22	40	
1/11/13	18:31:00	22	40	
1/11/13	18:36:00	22	40	
1/11/13	18:41:00	22	40	
1/11/13	18:46:00	22	40	
1/11/13	18:51:00	22	40	
1/11/13	18:56:00	22	40	
1/11/13	19:01:00	22	40	
1/11/13	19:06:00	22	40	
1/11/13	19:11:00	22	40	
1/11/13	19:16:00	22	40	
1/11/13	19:21:00	22	40	
1/11/13	19:26:00	22	40	
1/11/13	19:31:00	22	40	
1/11/13	19:36:00	22	40	
1/11/13	19:41:00	22	40	
1/11/13	19:46:00	22	40	
1/11/13	19:51:00	22	40	
1/11/13	19:56:00	22	40	
1/11/13	20:01:00	22	40	
1/11/13	20:06:00	22	40	
1/11/13	20:11:00	22	40	
1/11/13	20:16:00	22	40	
1/11/13	20:21:00	22	40	
1/11/13	20:26:00	22	40	
1/11/13	20:31:00	22	40	
1/11/13	20:36:00	22	40	
1/11/13	20:41:00	22	40	

Date	Time	T (deg C)	RH (%)
1/11/13	20:46:00	22	40
1/11/13	20:51:00	22	40
1/11/13	20:56:00	22	40
1/11/13	21:01:00	22	40
1/12/13	0:01:00	22	40
1/12/13	0:06:00	22	40
1/12/13	0:11:00	22	40
1/12/13	0:16:00	22	40
1/12/13	0:21:00	22	40
1/12/13	0:26:00	22	40
1/12/13	0:31:00	22	40
1/12/13	0:36:00	22	40
1/12/13	0:41:00	22	40
1/12/13	0:46:00	22	40
1/12/13	0:51:00	22	40
1/12/13	0:56:00	22	40
1/12/13	1:01:00	22	40
1/12/13	1:06:00	22	40
1/12/13	1:11:00	22	40
1/12/13	1:16:00	22	40
1/12/13	1:21:00	22	40
1/12/13	1:26:00	22	40
1/12/13	1:31:00	22	40
1/12/13	1:36:00	22	40
1/12/13	1:41:00	22	40
1/12/13	1:46:00	22	40
1/12/13	1:51:00	22	40
1/12/13	1:56:00	22	40
1/12/13	2:01:00	22	40
1/12/13	2:06:00	22	40
1/12/13	2:11:00	22	40
1/12/13	2:16:00	22	40
1/12/13	2:21:00	22	40
1/12/13	2:26:00	22	40
1/12/13	2:31:00	22	40
1/12/13	2:36:00	22	40
1/12/13	2:41:00	22	40
1/12/13	2:46:00	22	40
1/12/13	2:51:00	22	40
1/12/13	2:56:00	22	40
1/12/13	3:01:00	22	40
1/12/13	3:06:00	22	40
1/12/13	3:11:00	22	40
1/12/13	3:16:00	22	40
1/12/13	3:21:00	22	40
1/12/13	3:26:00	22	40
1/12/13	3:31:00	22	40
1/12/13	3:36:00	22	40
1/12/13	3:41:00	22	40
1/12/13	3:46:00	22	40
1/12/13	3:51:00	22	40
1/12/13	3:56:00	22	40
1/12/13	4:01:00	22	40
1/12/13	4:06:00	22	40
1/12/13	4:11:00	22	40

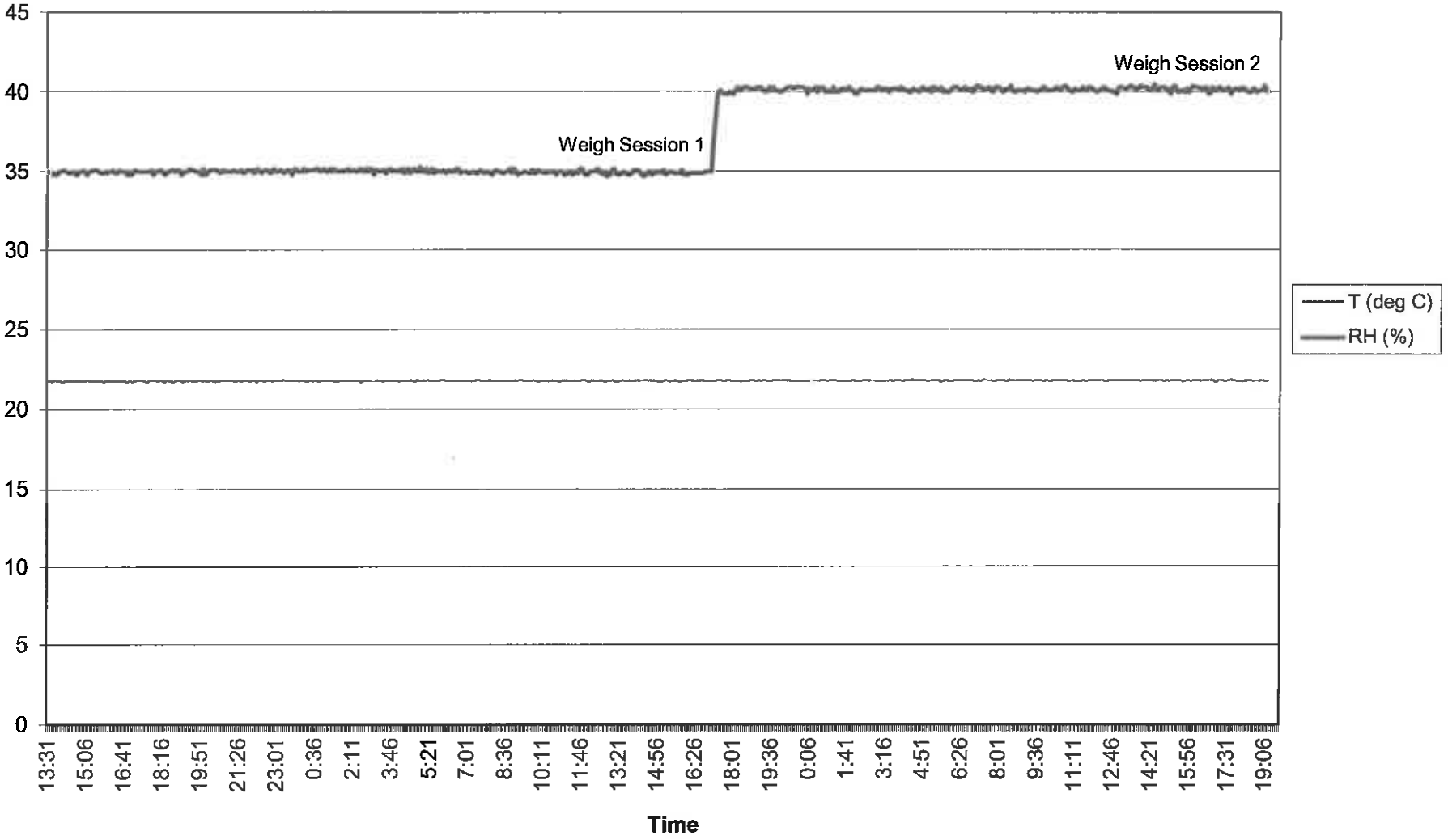
Date	Time	T (deg C)	RH (%)
1/12/13	4:16:00	22	40
1/12/13	4:21:00	22	40
1/12/13	4:26:00	22	40
1/12/13	4:31:00	22	40
1/12/13	4:36:00	22	40
1/12/13	4:41:00	22	40
1/12/13	4:46:00	22	40
1/12/13	4:51:00	22	40
1/12/13	4:56:00	22	40
1/12/13	5:01:00	22	40
1/12/13	5:06:00	22	40
1/12/13	5:11:00	22	40
1/12/13	5:16:00	22	40
1/12/13	5:21:00	22	40
1/12/13	5:26:00	22	40
1/12/13	5:31:00	22	40
1/12/13	5:36:00	22	40
1/12/13	5:41:00	22	40
1/12/13	5:46:00	22	40
1/12/13	5:51:00	22	40
1/12/13	5:56:00	22	40
1/12/13	6:01:00	22	40
1/12/13	6:06:00	22	40
1/12/13	6:11:00	22	40
1/12/13	6:16:00	22	40
1/12/13	6:21:00	22	40
1/12/13	6:26:00	22	40
1/12/13	6:31:00	22	40
1/12/13	6:36:00	22	40
1/12/13	6:41:00	22	40
1/12/13	6:46:00	22	40
1/12/13	6:51:00	22	40
1/12/13	6:56:00	22	40
1/12/13	7:01:00	22	40
1/12/13	7:06:00	22	40
1/12/13	7:11:00	22	40
1/12/13	7:16:00	22	40
1/12/13	7:21:00	22	40
1/12/13	7:26:00	22	40
1/12/13	7:31:00	22	40
1/12/13	7:36:00	22	40
1/12/13	7:41:00	22	40
1/12/13	7:46:00	22	40
1/12/13	7:51:00	22	40
1/12/13	7:56:00	22	40
1/12/13	8:01:00	22	40
1/12/13	8:06:00	22	40
1/12/13	8:11:00	22	40
1/12/13	8:16:00	22	40
1/12/13	8:21:00	22	40
1/12/13	8:26:00	22	40
1/12/13	8:31:00	22	40
1/12/13	8:36:00	22	40
1/12/13	8:41:00	22	40
1/12/13	8:46:00	22	40

Date	Time	T (deg C)	RH (%)
1/12/13	8:51:00	22	40
1/12/13	8:56:00	22	40
1/12/13	9:01:00	22	40
1/12/13	9:06:00	22	40
1/12/13	9:11:00	22	40
1/12/13	9:16:00	22	40
1/12/13	9:21:00	22	40
1/12/13	9:26:00	22	40
1/12/13	9:31:00	22	40
1/12/13	9:36:00	22	40
1/12/13	9:41:00	22	40
1/12/13	9:46:00	22	40
1/12/13	9:51:00	22	40
1/12/13	9:56:00	22	40
1/12/13	10:01:00	22	40
1/12/13	10:06:00	22	40
1/12/13	10:11:00	22	40
1/12/13	10:16:00	22	40
1/12/13	10:21:00	22	40
1/12/13	10:26:00	22	40
1/12/13	10:31:00	22	40
1/12/13	10:36:00	22	40
1/12/13	10:41:00	22	40
1/12/13	10:46:00	22	40
1/12/13	10:51:00	22	40
1/12/13	10:56:00	22	40
1/12/13	11:01:00	22	40
1/12/13	11:06:00	22	40
1/12/13	11:11:00	22	40
1/12/13	11:16:00	22	40
1/12/13	11:21:00	22	40
1/12/13	11:26:00	22	40
1/12/13	11:31:00	22	40
1/12/13	11:36:00	22	40
1/12/13	11:41:00	22	40
1/12/13	11:46:00	22	40
1/12/13	11:51:00	22	40
1/12/13	11:56:00	22	40
1/12/13	12:01:00	22	40
1/12/13	12:06:00	22	40
1/12/13	12:11:00	22	40
1/12/13	12:16:00	22	40
1/12/13	12:21:00	22	40
1/12/13	12:26:00	22	40
1/12/13	12:31:00	22	40
1/12/13	12:36:00	22	40
1/12/13	12:41:00	22	40
1/12/13	12:46:00	22	40
1/12/13	12:51:00	22	40
1/12/13	12:56:00	22	40
1/12/13	13:01:00	22	40
1/12/13	13:06:00	22	40
1/12/13	13:11:00	22	40
1/12/13	13:16:00	22	40
1/12/13	13:21:00	22	40

Date	Time	T (deg C)	RH (%)	
1/12/13	13:26:00	22	40	
1/12/13	13:31:00	22	40	
1/12/13	13:36:00	22	40	
1/12/13	13:41:00	22	40	
1/12/13	13:46:00	22	40	
1/12/13	13:51:00	22	40	
1/12/13	13:56:00	22	40	
1/12/13	14:01:00	22	40	
1/12/13	14:06:00	22	40	
1/12/13	14:11:00	22	40	
1/12/13	14:16:00	22	40	
1/12/13	14:21:00	22	40	
1/12/13	14:26:00	22	40	
1/12/13	14:31:00	22	41	
1/12/13	14:36:00	22	40	
1/12/13	14:41:00	22	40	
1/12/13	14:46:00	22	40	
1/12/13	14:51:00	22	40	
1/12/13	14:56:00	22	40	
1/12/13	15:01:00	22	40	
1/12/13	15:06:00	22	40	
1/12/13	15:11:00	22	40	
1/12/13	15:16:00	22	40	
1/12/13	15:21:00	22	40	
1/12/13	15:26:00	22	40	
1/12/13	15:31:00	22	40	
1/12/13	15:36:00	22	40	
1/12/13	15:41:00	22	40	
1/12/13	15:46:00	22	40	
1/12/13	15:51:00	22	40	
1/12/13	15:56:00	22	40	
1/12/13	16:01:00	22	40	
1/12/13	16:06:00	22	40	
1/12/13	16:11:00	22	40	
1/12/13	16:16:00	22	40	
1/12/13	16:21:00	22	40	
1/12/13	16:26:00	22	40	
1/12/13	16:31:00	22	40	
1/12/13	16:36:00	22	40	
1/12/13	16:41:00	22	40	
1/12/13	16:46:00	22	40	
1/12/13	16:51:00	22	40	
1/12/13	16:56:00	22	40	
1/12/13	17:01:00	22	40	
1/12/13	17:06:00	22	40	
1/12/13	17:11:00	22	40	
1/12/13	17:16:00	22	40	
1/12/13	17:21:00	22	40	
1/12/13	17:26:00	22	40	
1/12/13	17:31:00	22	40	
				Final Weigh
1/12/13	17:36:00	22	40	Begin
1/12/13	17:41:00	22	40	
1/12/13	17:46:00	22	40	

Date	Time	T (deg C)	RH (%)	
1/12/13	17:51:00	22	40	
1/12/13	17:56:00	22	40	
1/12/13	18:01:00	22	40	
1/12/13	18:06:00	22	40	
1/12/13	18:11:00	22	40	
1/12/13	18:16:00	22	40	
1/12/13	18:21:00	22	40	
1/12/13	18:26:00	22	40	
1/12/13	18:31:00	22	40	
1/12/13	18:36:00	22	40	
1/12/13	18:41:00	22	40	
1/12/13	18:46:00	22	40	
1/12/13	18:51:00	22	40	
1/12/13	18:56:00	22	40	
1/12/13	19:01:00	22	40	
1/12/13	19:06:00	22	40	
1/12/13	19:11:00	22	40	
				Final Weigh
1/12/13	19:16:00	22	40	End

Moisture Pickup Tests January 11, 12 2013



Appendix F

Test Results Filter

Support Ring Dimensions

CY-2013 Teflon Filter Dimensions Test Results

Sample Number	Filter ID	Ring OD #1 (mm)1	Ring OD #2 (mm)2	Ring OD Ave.	Pass/Fail	Ring Width # 1(mm)3	Ring Width #2 (mm)4	Ring Width Ave.	Pass/Fail	Ring Thickness #1 (mm)3	Ring Thickness #2 (mm)4	Ring Thickness Ave.	Pass/Fail
1	3505996	46.02	45.97	46.00	Pass	3.40	3.20	3.30	Pass	0.39	0.39	0.39	Pass
2	3539665	45.96	45.99	45.98	Pass	3.37	3.32	3.35	Pass	0.40	0.40	0.40	Pass
3	3539673	46.12	46.15	46.14	Pass	3.22	3.20	3.21	Pass	0.40	0.40	0.40	Pass
4	3539680	46.38	46.40	46.39	Pass	3.21	3.45	3.33	Pass	0.40	0.39	0.39	Pass
5	3541067	46.25	46.20	46.23	Pass	3.20	3.25	3.23	Pass	0.40	0.39	0.39	Pass
6	3541095	45.97	46.07	46.02	Pass	3.21	3.25	3.23	Pass	0.39	0.39	0.39	Pass
7	3564803	46.15	46.24	46.20	Pass	3.38	3.27	3.33	Pass	0.40	0.40	0.40	Pass
8	3564820	46.07	45.96	46.02	Pass	3.26	3.24	3.25	Pass	0.41	0.41	0.41	Pass
9	3564823	45.91	46.20	46.06	Pass	3.23	3.32	3.28	Pass	0.40	0.40	0.40	Pass
10	3564836	46.12	46.10	46.11	Pass	3.28	3.35	3.32	Pass	0.39	0.40	0.40	Pass
11	3564847	45.96	46.01	45.99	Pass	3.35	3.37	3.36	Pass	0.42	0.41	0.41	Pass
12	3574876	46.15	46.02	46.09	Pass	3.36	3.18	3.27	Pass	0.40	0.40	0.40	Pass
13	3574879	46.08	46.21	46.15	Pass	3.21	3.32	3.27	Pass	0.40	0.40	0.40	Pass
14	3574884	46.30	46.27	46.29	Pass	3.24	3.30	3.27	Pass	0.40	0.40	0.40	Pass
15	3579166	46.17	46.07	46.12	Pass	3.30	3.32	3.31	Pass	0.41	0.41	0.41	Pass
16	3579170	45.97	46.10	46.04	Pass	3.21	3.26	3.24	Pass	0.41	0.40	0.40	Pass
17	3579171	46.02	46.05	46.04	Pass	3.32	3.32	3.32	Pass	0.39	0.40	0.40	Pass
18	3579194	46.12	46.17	46.15	Pass	3.25	3.27	3.26	Pass	0.40	0.40	0.40	Pass
19	3585965	46.20	46.10	46.15	Pass	3.12	3.37	3.25	Pass	0.39	0.39	0.39	Pass
20	3585982	46.02	46.18	46.10	Pass	3.24	3.12	3.18	Pass	0.40	0.39	0.39	Pass
21	3585994	46.05	46.01	46.03	Pass	3.22	3.23	3.23	Pass	0.39	0.39	0.39	Pass
22	3593726	46.15	46.00	46.08	Pass	3.26	3.30	3.28	Pass	0.40	0.41	0.40	Pass
23	3599318	46.07	46.12	46.10	Pass	3.34	3.35	3.35	Pass	0.39	0.40	0.39	Pass
24	3608464	46.16	46.31	46.24	Pass	3.42	3.47	3.45	Pass	0.39	0.39	0.39	Pass
25	3608498	45.97	46.07	46.02	Pass	3.33	3.39	3.36	Pass	0.40	0.40	0.40	Pass
26	3612274	46.10	46.07	46.09	Pass	3.23	3.35	3.29	Pass	0.40	0.40	0.40	Pass
27	3612823	46.12	45.95	46.04	Pass	3.31	3.36	3.34	0.386	0.40	0.40	0.40	Pass
28	3612834	46.00	45.96	45.98	Pass	3.34	3.35	3.35	Pass	0.40	0.40	0.40	Pass
29	3612838	45.95	46.10	46.03	Pass	3.37	3.21	3.29	Pass	0.39	0.39	0.39	Pass
30	3617269	45.85	46.65	46.25	Pass	3.42	3.26	3.21	Pass	0.39	0.39	0.39	Pass
31	3617290	46.11	46.43	46.27	Pass	3.22	3.26	3.24	Pass	0.39	0.39	0.39	Pass
32	3623138	46.04	46.11	46.08	Pass	3.34	3.31	3.33	Pass	0.39	0.39	0.39	Pass
33	3630980	46.03	46.17	46.10	Pass	3.15	3.24	3.20	Pass	0.40	0.40	0.40	Pass
34	3651264	46.06	46.13	46.10	Pass	3.27	3.34	3.31	Pass	0.40	0.40	0.40	Pass
35	3651284	46.29	46.11	46.20	Pass	3.22	3.18	3.20	Pass	0.39	0.39	0.39	Pass
36	3654130	46.01	46.18	46.10	Pass	3.26	3.30	3.28	Pass	0.39	0.39	0.39	Pass
37	3654951	46.06	46.07	46.07	Pass	3.25	3.21	3.23	Pass	0.39	0.39	0.39	Pass
38	3654964	45.95	46.11	46.03	Pass	3.26	3.24	3.25	Pass	0.40	0.40	0.40	Pass
39	3654994	46.07	45.98	46.03	Pass	3.34	3.37	3.36	Pass	0.40	0.40	0.40	Pass
40	3658169	46.01	46.02	46.02	Pass	3.37	3.38	3.38	Pass	0.39	0.39	0.39	Pass
41	3658173	46.23	46.06	46.15	Pass	3.27	3.34	3.31	Pass	0.39	0.39	0.39	Pass
42	3683056	46.10	46.14	46.12	Pass	3.32	3.31	3.32	Pass	0.41	0.40	0.41	Pass
43	3683070	46.25	46.11	46.18	Pass	3.34	3.26	3.30	Pass	0.39	0.39	0.39	Pass
44	3683087	46.15	46.10	46.13	Pass	3.26	3.24	3.25	Pass	0.40	0.41	0.41	Pass
45	3686557	46.12	46.34	46.23	Pass	3.40	3.31	3.36	Pass	0.39	0.40	0.39	Pass
46	3686579	46.18	45.97	46.08	Pass	3.38	3.28	3.33	Pass	0.40	0.41	0.41	Pass
47	3688632	46.05	46.02	46.04	Pass	3.37	3.28	3.33	Pass	0.39	0.39	0.39	Pass
48	3697362	46.12	46.21	46.17	Pass	3.40	3.37	3.39	Pass	0.39	0.39	0.39	Pass
49	3697390	46.08	46.10	46.09	Pass	3.21	3.26	3.24	Pass	0.39	0.39	0.39	Pass
50	3701309	46.20	46.12	46.16	Pass	3.33	3.37	3.35	Pass	0.40	0.40	0.40	Pass
Average				46.11				3.29				0.396	
Std. Deviation				0.09				0.06				0.007	
CV (%)				0.19				1.73				1.650	
N (Pass)				50				50				50	
N (Fail)				0				0				0	
% (Pass)				100				100				100	

Appendix G

Test Results Collection Efficiency and Pressure Drop

CY-2013 Teflon Filter Retention Test

Sample	Penetration %	Efficiency %	Resistance cm/H_2O	Resistance In/H_2O
3574866	0.002	99.9980	17.27	6.8
3574892	0.004	99.9960	17.02	6.7
3579160	0.001	99.9990	15.49	6.1
3579188	0.004	99.9960	16.00	6.3
3585956	0.001	99.9990	16.00	6.3
3585990	0.003	99.9970	14.48	5.7
3593702	0.014	99.9860	16.26	6.4
3593738	0.001	99.9990	16.00	6.3
3599305	0.001	99.9990	14.99	5.9
3599335	0.003	99.9970	18.54	7.3
3505957	0.001	99.9990	15.75	6.2
3505983	0.001	99.9990	16.76	6.6
3539654	0.003	99.9970	13.21	5.2
3539697	0.001	99.9990	13.21	5.2
3541054	0.004	99.9960	14.22	5.6
3541085	0.001	99.9990	17.27	6.8
3556108	0.001	99.9990	16.51	6.5
3556131	0.001	99.9990	17.78	7
3564810	0.003	99.9970	17.02	6.7
3564846	0.001	99.9990	20.83	8.2
3608454	0.001	99.9990	14.99	5.9
3608491	0.001	99.9990	14.48	5.7
3612270	0.002	99.9980	13.46	5.3
3612295	0.001	99.9990	14.99	5.9
3612815	0.01	99.9900	14.99	5.9
3612846	0.001	99.9990	14.73	5.8
3617256	0.001	99.9990	14.73	5.8
3617283	0.001	99.9990	14.73	5.8
3623109	0.005	99.9950	13.46	5.3
3623140	0.001	99.9990	18.80	7.4
3630952	0.001	99.9990	15.49	6.1
3630996	0.001	99.9990	12.45	4.9
3651256	0.001	99.9990	14.22	5.6
3651292	0.001	99.9990	13.72	5.4
3654106	0.003	99.9970	13.97	5.5
3654131	0.001	99.9990	12.45	4.9
3654961	0.001	99.9990	13.46	5.3
3654993	0.001	99.9990	12.70	5
3658164	0.001	99.9990	16.00	6.3
3658195	0.001	99.9990	13.97	5.5
3683057	0.003	99.9970	15.75	6.2
3683098	0.001	99.9990	16.26	6.4
3686561	0.001	99.9990	13.97	5.5
3686586	0.001	99.9990	15.75	6.2
3688611	0.003	99.9970	18.03	7.1
3688643	0.001	99.9990	18.29	7.2
3697360	0.001	99.9990	13.72	5.4
3697394	0.004	99.9960	14.99	5.9
3701310	0.001	99.9990	16.26	6.4
3701338	0.001	99.9990	17.27	6.8
	0.0021	**99.9979**	**15.45**	**6.08**
Std Dev.	**0.0024**	**0.0024**	**1.80**	**0.71**

DOP @ 72 degrees Fahrenheit, B.P = 29.47 in H2O
Testing performed in accordance with ASTM D2986-95A
Test flow rate 16.67slpm

ATI – Air Techniques International
TEST LABORATORY
FILTER TEST REPORT

CUSTOMER TRC	TEST CRITERIA DOP PENETRATION .03 % @ RATED FLOW | N/A % @ 20% RATED FLOW	NUMBER ORDERED 50	DATE RECEIVED 11 Dec 13
PURCHASE ORDER NUMBER 176922.1002.0000	RESISTANCE 11.1 IN. W.G. @ 100 % RATED FLOW	NUMBER RECEIVED 50	DATE TESTED 24 Jan 13
FILTER MODEL NUMBER Teflon	SPECIFICATION AST2986a-99 M D	NUMBER ACCEPTED 50	DATE SHIPPED 25 Jan 13
MANUFACTURER TRC	TEST CONDITIONS	REJECTS	
FILTER DESCIPTION Teflon 47 mm diameter	Test Air Temperature 95 ° F | TEST FLOW (ACFM) 16.67 lpm	PENETRATION	RESISTANCE 1
P.O. Approved By: JDR/CAH | RATED FLOW (SCFM) 16.67 lpm	BAROMETRIC PRESS 760 mm Hg. | Test Air Humidity in % RH 14	DAMAGE	OTHER

ITEM No.	FILTER SERIAL NUMBER	INSPECTION RESULTS	TEST RESULTS			FILTER TESTED BY:
			RESISTANCE	% PENETRATION		
				100%	N/A	
1	3574866	Accepted	6.8	.002	N/A	JDR
2	3574892	"	6.7	.004	N/A	JDR
3	3579160	"	6.1	.001	N/A	JDR
4	3579188	"	6.3	.004	N/A	JDR
5	3585956	"	6.3	.001	N/A	JDR
6	3585990	"	5.7	.003	N/A	JDR
7	3593702	"	6.4	.014	N/A	JDR
8	3593738	"	6.3	.001	N/A	JDR
9	3599305	"	5.9	.001	N/A	JDR
10	3599335	"	7.3	.003	N/A	JDR
11	3505957	"	6.2	.001	N/A	JDR
12	3505983	"	6.6	.001	N/A	JDR
13	3539654	"	5.2	.003	N/A	JDR
14	3539697	"	5.2	.001	N/A	JDR
15	3541054	"	5.6	.004	N/A	JDR
16	3541085	"	6.8	.001	N/A	JDR
17	3556108	"	6.5	.001	N/A	JDR
18	3556131	"	7.0	.001	N/A	JDR

DISTRIBUTION Emailed test reports to Stan Sleva	TESTED BY: APPROVED BY:

FILTER TEST REPORT (Continuation)

Customer: TRC

PURCHASE ORDER NO.: 176922.1002.0000

ITEM No.	FILTER SERIAL NUMBER	INSPECTION RESULTS	TEST RESULTS			FILTER TESTED BY:
			RESISTANCE	% PENETRATION		
				100%	N/A	
19	3564810	Accepted	6.7	.003	N/A	JDR
20	3564846	"	8.2	.001	N/A	JDR
21	3608454	"	5.9	.001	N/A	JDR
22	3608491	"	5.7	.001	N/A	JDR
23	3612270	"	5.3	.002	N/A	JDR
24	3612295	"	5.9	.001	N/A	JDR
25	3612815	"	5.9	.010	N/A	JDR
26	3612846	"	5.8	.001	N/A	JDR
27	3617256	"	5.8	.001	N/A	JDR
28	3617283	"	5.8	.001	N/A	JDR
29	3623109	"	5.3	.005	N/A	JDR
30	3623140	"	7.4	.001	N/A	JDR
31	3630952	"	6.1	.001	N/A	JDR
32	3630996	"	4.9	.001	N/A	JDR
33	3651256	"	5.6	.001	N/A	JDR
34	3651292	"	5.4	.001	N/A	JDR
35	3654106	"	5.5	.003	N/A	JDR
36	3654131	"	4.9	.001	N/A	JDR
37	3654961	"	5.3	.001	N/A	JDR
38	3654993	"	5.0	.001	N/A	JDR
39	3658164	"	6.3	.001	N/A	JDR
40	3658195	"	5.5	.001	N/A	JDR
41	3683057	"	6.2	.003	N/A	JDR
42	3683098	"	6.4	.001	N/A	JDR
43	3686561	"	5.5	.001	N/A	JDR
44	3686586	"	6.2	.001	N/A	JDR
45	3688611	"	7.1	.003	N/A	JDR
46	3688643	"	7.2	.001	N/A	JDR
47	3697360	"	5.4	.001	N/A	JDR
48	3697394	"	5.9	.004	N/A	JDR
49	3701310	"	6.4	.001	N/A	JDR
50	3701338		6.8	.001	N/A	JDR