

# International Space Station Potable Water Characterization for 2013

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**In this post-construction, operational phase of International Space Station (ISS) with an ever-increasing emphasis on its use as a test bed for future exploration missions, the ISS crews continue to rely on water reclamation systems for the majority of their water needs. The onboard water supplies include U.S. Segment potable water from humidity condensate and urine, Russian Segment potable water from condensate, and ground-supplied potable water, as reserve. In 2013, the cargo returned on the Soyuz 32-35 flights included archival potable water samples collected from Expeditions 34-37. The former Water and Food Analytical Laboratory (now Toxicology and Environmental Chemistry Laboratory) at the NASA Johnson Space Center continued its long-standing role of performing chemical analyses on ISS return water samples to verify compliance with potable water quality specifications. This paper presents and discusses the analytical results for potable water samples returned from Expeditions 34-37, including a comparison to ISS quality standards. During the summer of 2013, the U.S. Segment potable water experienced a third temporary rise and fall in total organic carbon (TOC) content, as the result of organic contamination breaking through the water system's treatment process. Analytical results for the Expedition 36 archival samples returned on Soyuz 34 confirmed that dimethylsilanediol was once again the responsible contaminant, just as it was for the previous comparable TOC rises in 2010 and 2012. Discussion herein includes the use of the in-flight total organic carbon analyzer (TOCA) as a key monitoring tool for tracking these TOC rises and scheduling appropriate remediation.**

## Nomenclature

BKO	Russian Multifiltration Beds
CatRx	Catalytic Reactor
CE	Capillary Electrophoresis
CWC	Contingency Water Container
CWC-I	Contingency Water Container - Iodine
DAI	Direct Aqueous Injection
DMSD	Dimethylsilanediol
EPA	Environmental Protection Agency
GC/MS	Gas Chromatography/Mass Spectrometry
IC	Ion Chromatography
ICP/MS	Inductively Coupled Plasma/Mass Spectrometry
ISE	Ion Selective Electrode
ISS	International Space Station
ISS MORD	ISS Medical Operations Requirements Document
IX	Ion Exchange
JSC	Johnson Space Center

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KSC	Kennedy Space Center
LC	Liquid Chromatography
LC/MS	Liquid Chromatography/Mass Spectrometry
LCV	Leuco Crystal Violet
MCL	Maximum Contaminant Level
MF	Multifiltration
N/A	Not Applicable
NA	Not Analyzed
NASA	National Aeronautics and Space Administration
NTU	Nephelometric Turbidity Unit
PFU	Protoflight unit
PWD	Potable-Water Dispenser
RIP	Rack Interface Panel
R&R	Remove and Replace
SM	Service Module
SRV-K	System for Regeneration of Condensate Water
SVO-ZV	System for Water Storage and Dispensing
SWEG	Spacecraft Water Exposure Guideline
TECL	Toxicology and Environmental Chemistry Laboratory
THM	Trihalomethanes
TOCA	Total Organic Carbon Analyzer
U.S.	United States
UV	Ultraviolet
WAFAL	Water and Food Analytical Laboratory
WPA	Water Processor Assembly

## I. Introduction

During the 12-month period beginning in late November of 2012 and comprising Expeditions 34-37, the International Space Station (ISS) achieved the 13<sup>th</sup> year of continuous human operations. With the emphasis now more on research, including the use of station as a test bed for future exploration missions, the crews continued to rely primarily on reclaimed water for consumption. The former Water and Food Analytical Laboratory (WAFAL) now Toxicology and Environmental Chemistry Laboratory (TECL) at the NASA Johnson Space Center continued its long-standing role of performing chemical analyses on ISS return water samples to verify compliance with potable water quality specifications. Analytical data for archival water samples returned during Expeditions 1-33 have been previously reported<sup>1-11</sup>. This paper presents and discusses the analytical results from chemical characterization of the water samples returned during 2013 from Expeditions 34-37, as detailed in Table 1.

Water samples returned on Soyuz 34-37 were unstowed at the landing site and turned over to a NASA representative for transportation home with the U.S. crewmembers on a NASA aircraft. Upon arrival at Ellington Field in Houston, Texas the returned samples were received by a TECL representative and delivered directly to the JSC water laboratory for processing and analysis.

Allocation of the ISS return water samples for the various chemical analyses was performed in the TECL based upon sample volume. If the sample volume was sufficient ( $\geq 500$  mL) then full chemical characterization was performed using the standard and custom analytical methods identified in Table 2. Individual sample volumes of less than 500 mL required elimination of some analyses and/or reductions in allocated volumes, resulting in reduced sensitivity of some analyses performed. Return water samples were shared with the JSC Microbiology Laboratory and their microbial analysis results were separately reported elsewhere.

Russian Segment and U.S. Segment water sample analysis results were evaluated for compliance with the potable-water quality requirements found in the *ISS Medical Operations Requirement Document (ISS MORD)*<sup>12</sup> and the *System Specification for the ISS* document<sup>13</sup>, respectively.

Expedition	Flight No.	Samples Received	Sample Type	Sample Collection Date	Sample Receipt Date
34	Soyuz 32	1	PWD Ambient	2/11/2013	3/17/2013
		1	PWD Hot	2/19/2013	
		1	SRV-K Hot	2/19/2013	
		1	SVO-ZV	2/19/2013	
	<b>Total:</b>	<b>4</b>			
35	Soyuz 33	1	PWD Ambient	4/8/2013	5/15/2013
	<b>Total:</b>	<b>1</b>			
36	Soyuz 34	1	PWD Ambient	7/30/2013	9/12/2013
		1	PWD Hot	8/26/2013	
		1	SRV-K Hot	8/26/2013	
		1	SRV-K Warm	9/6/2013	
		1	WPA RIP	8/19/2013	
	<b>Total:</b>	<b>5</b>			
37	Soyuz 35	1	PWD Ambient	10/8/2013	11/12/2013
		1	PWD Hot	11/6/2013	
		1	SRV-K Warm	11/6/2013	
		1	SVO-ZV	11/6/2013	
	<b>Total:</b>	<b>4</b>			

**Table 2. Water Analytical Methods**

Parameter	Method
pH and conductivity	Potentiometric
Total Solids	Gravimetric
Turbidity	Nephelometric
Iodine and iodide	Leuco crystal violet (LCV)
Fluoride	Ion chromatography (IC)
Metals/Minerals	Inductively coupled plasma/mass spectrometry (ICP/MS)
Inorganic anions & cations	Ion chromatography (IC)
Total organic carbon (TOC)	Ultraviolet or heated persulfate oxidation
Alcohols and glycols	Direct injection gas chromatography/mass spectrometry (GC/MS)
Volatile organics	GC/MS with a purge and trap concentrator
Semi-volatile organics	GC/MS after liquid/liquid extraction
Organic acids and amines	Capillary electrophoresis (CE)
Urea/Caprolactam	Liquid chromatography (LC) with UV diode array detector
Formaldehyde	GC/MS after derivatization and extraction
Dimethylsilanediol	LC with refractive index detector

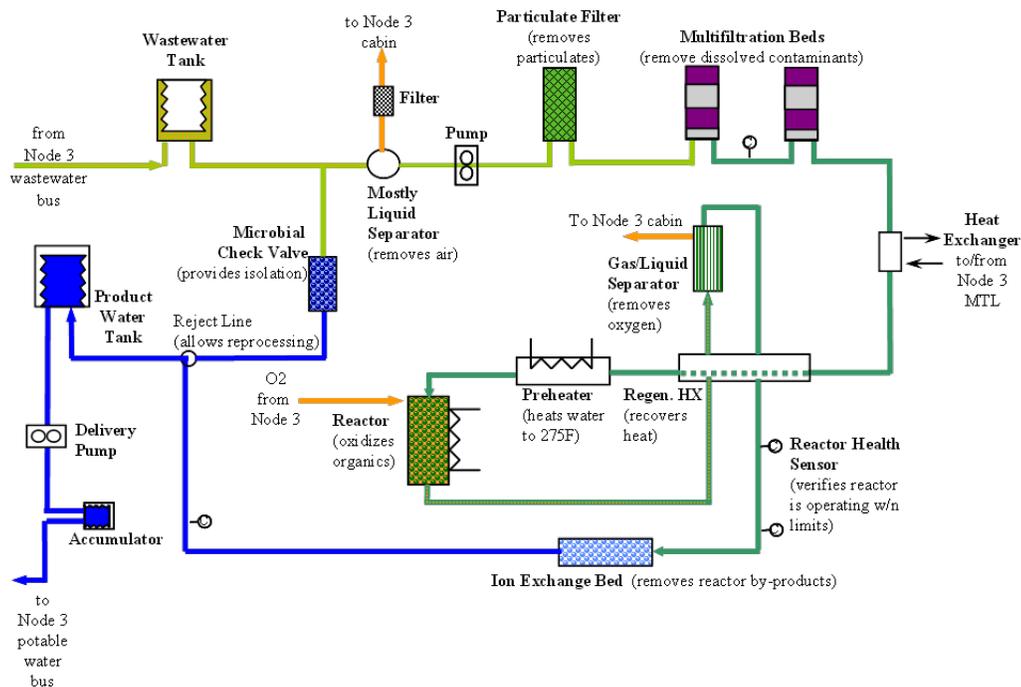
## II. Background

During Expeditions 34-37 the onboard water recovery systems provided the majority of the crews' potable water. Available onboard water supplies include U.S. Segment potable water recovered from humidity condensate and urine distillate, Russian Segment potable water regenerated from humidity condensate, and Russian ground-supplied potable water.

### U.S. Water Processor Assembly

The U.S. water processor assembly (WPA) located in Node 3 produces potable water by treating a combined wastewater feed containing urine distillate and humidity condensate. This combined wastewater is processed into potable water by a combination of treatment processes (Figure 1). Dissolved inorganic and organic contaminants are removed using multifiltration beds containing a mixture of adsorbents and ion-exchange resins. Further removal of organic contaminants is done using a high-temperature catalytic oxidation reactor. Final treatment is accomplished via a polishing ion-exchange bed that removes reactor by-products and adds residual iodine biocide before storage

of the product water for delivery to the ISS potable-water bus. The U.S. potable-water dispenser (PWD) delivers water from the potable bus to the crews for consumption as either hot or ambient water, after removing the iodine biocide at the point of use.



**Figure 1. U.S. water processor assembly – WPA.**

The total organic carbon analyzer (TOCA) was delivered along with the WPA to support the ISS 6-person crew operations.<sup>14</sup> The TOCA monitors total organic carbon (TOC) in the WPA product water by providing a measurement of the total amount of organic carbon without identification of specific organic constituents. The TOCA draws water samples from the WPA product tank directly using a dedicated hose on a weekly basis. It is also used monthly to analyze a water sample that the crew collects in a TOCA sample bag from either the PWD hot or ambient ports.

### Russian Segment Water Systems

The Russian condensate water recovery system (SRV-K) located in the Service Module of the Russian Segment processes atmospheric humidity condensate recovered directly from cabin air into potable water. U.S. Segment condensate transferred to and stored in a contingency water container (CWC) can also be processed in the SRV-K, as needed. The SRV-K treatment process removes organic and inorganic contaminants using a catalytic filter reactor, phase separator, and multifiltration beds. A conditioning bed adds silver biocide for microbial control and minerals (calcium, magnesium and fluoride) to the product water before storage. Product water is available to the crews via the SRV-K galley, where it is pasteurized before being dispensed from either hot or warm ports (Figure 2). The SRV-K system is also designed to accept ground-supplied potable water as makeup, whenever the demand for drinking water exceeds the availability of condensate.

The ISS crews also have available stored potable water from the Russian system for water storage and dispensing (SVO-ZV) that is located in the Service Module. The SVO-ZV system consists of a 22-liter bladder tank in a hard shell (EDV), a manual air pump to pressurize the tank, and a hand-held dispenser (Figure 3). The SVO-ZV tank is typically filled with Russian ground-supplied potable water that is delivered to the ISS in the Progress vehicle's 210-liter Rodnik tanks. This water can be accessed from the SVO-ZV dispenser port at ambient temperature.



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**Figure 2. SRV-K Galley.**  
*Astronaut Donald Pettit collects a SRV-K sample.*



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**Figure 3. SVO-ZV Stored Water Dispenser.**  
*Astronaut Donald Pettit collects a SVO-ZV sample.*

### III. Discussion of Analytical Results

Tabulations of chemical analyses results for ISS return water samples collected during Expeditions 34-37 from the SRV-K (regenerated), SVO-ZV (stored), and WPA water supplies, can be found in Appendices 1, 2, and 3 respectively. Each data table provides the respective ISS potability limits for easy comparison with the analytical results. Results by expedition, including compliance with ISS standards, are discussed below.

#### EXPEDITION 34

Four archival potable water samples were collected using U.S. water sample hardware during Expedition 34 (PWD ambient, PWD hot, SRV-K hot, and SVO-ZV) as listed in Table 1. All 4 samples were returned on Soyuz 32 and received in the TECL on March 17, 2013. Due to limited sample volume, solids were not analyzed on any of the samples and turbidity was not analyzed on the SVO-ZV sample. Due to minor leakage from the sample bag during transit, iodine, and semi-volatile organics were not analyzed on the SVO-ZV sample.

**ISS U.S. Segment:*****PWD Potable-Water Samples***

All chemical parameters measured for the PWD ambient and hot water samples collected on February 11, 2013 and February 19, 2013, respectively, met the potable-water quality requirements in the *System Specification for the International Space Station*, SSP 41000, document<sup>13</sup>. Nickel levels ranged from 9 to 10 µg/L. Total iodine levels were below the method detection limit of 0.05 mg/L and met the ISS acceptability limit at the point of consumption of <0.2 mg/L (see Figure 4). The plot shows that the WPA has maintained a fairly constant iodine biocide concentration of ~2 mg/L in recent years. The total organic carbon (TOC) results ranged from 0.14 to 0.17 mg/L and were well below the U.S. Segment TOC limit of 3.0 mg/L (see Figure 5). Dimethylsilanediol (DMSD), which was the lone compound responsible for previous TOC rises in 2010 and 2012<sup>15-16</sup> (see TOC excursions in Figure 5), was not detected (<0.5 mg/L) in either of the February PWD samples. Methyl sulfone levels ranged from 54 to 96 µg/L (Figure 6). Organic carbon accountability of the 2 samples was 10 to 14%, with <0.2 mg/L TOC unaccounted.

**ISS Russian Segment:*****SRV-K Potable-Water Sample***

All chemical parameters measured for the SRV-K hot water sample collected on February 19, 2013 met the potable-water quality requirements listed in the ISS MORD document<sup>12</sup>, except for turbidity (4.4 NTU versus the MORD limit of 1.5 NTU), iron (316 µg/L versus 300 µg/L), manganese (64 µg/L versus 50 µg/L), and nickel (158 µg/L versus 100 µg/L limit). Historical nickel levels for SRV-K samples are presented in Figure 7. Although manganese and nickel levels were above ISS MORD requirements they were both below their respective Spacecraft Water Exposure Guidelines (SWEGs) of 300 µg/L<sup>17</sup>. The ISS MORD requirement for iron was established based on the U.S. EPA secondary drinking water regulation for aesthetics, so the slightly elevated level should not affect crew health. The calcium, magnesium and total inorganic carbon results along with the turbidity, manganese, chloride, and sulfate levels suggest that Rodnik water (Russian ground-supplied water) was being used as make-up water when the sample was collected. The total silver level was 42 µg/L, slightly below the desired biocidal range of 100 to 500 µg/L, which can increase the risk of microbial growth. The TOC level of 0.44 mg/L was well below the ISS MORD limit (Figure 8) and no target organic compounds were detected.

***SVO-ZV Potable-Water Sample***

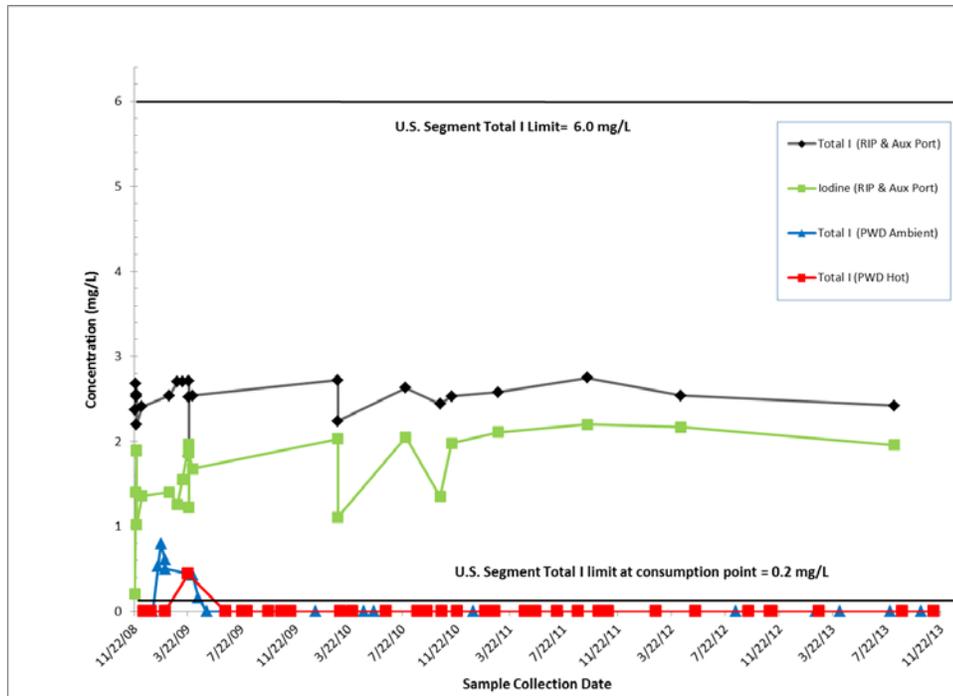
All chemical parameters measured for the SVO-ZV water sample collected on February 19, 2013 met the potable-water quality requirements listed in the ISS MORD with the exception of manganese. An updated plot of the historical trends for manganese is shown in Figure 9. The manganese concentration of 76 µg/L was slightly above the ISS MORD requirement of 50 µg/L, but well below the SWEG of 300 µg/L. The total silver level was 127 µg/L, and within the acceptable biocidal range. The TOC concentration of 0.48 mg/L in the February sample was well below the ISS MORD limit and no target organic compounds were detected.

**EXPEDITION 35**

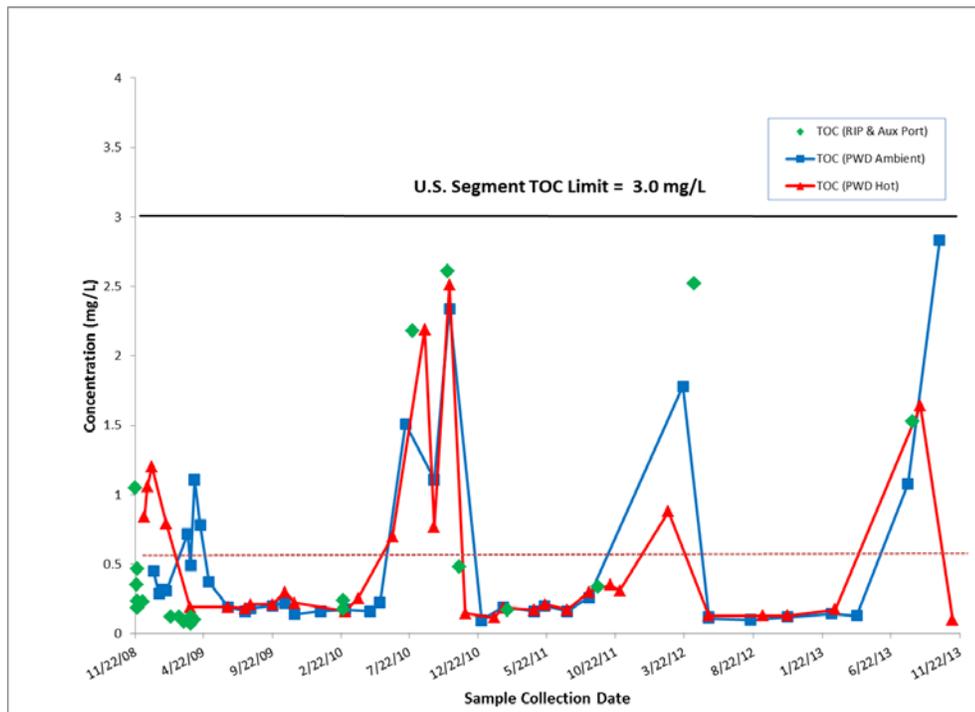
As detailed in Table 1, only 1 archival potable-water sample was returned from Expedition 35. In total, 4 potable water samples were collected, 2 from the U.S. Segment and 2 from the Russian Segment but 3 were not loaded on the Soyuz return vehicle. The 3 non-returning samples were later located on board but the decision was made to discard them because of low priority for their return on Soyuz. The single returning sample was collected from the PWD ambient port on April 8, 2013, returned on Soyuz 33, and received in the TECL on May 15, 2013. Due to limited sample volume, total solids were not measured on the sample.

**ISS U.S. Segment:*****PWD Potable-Water Sample***

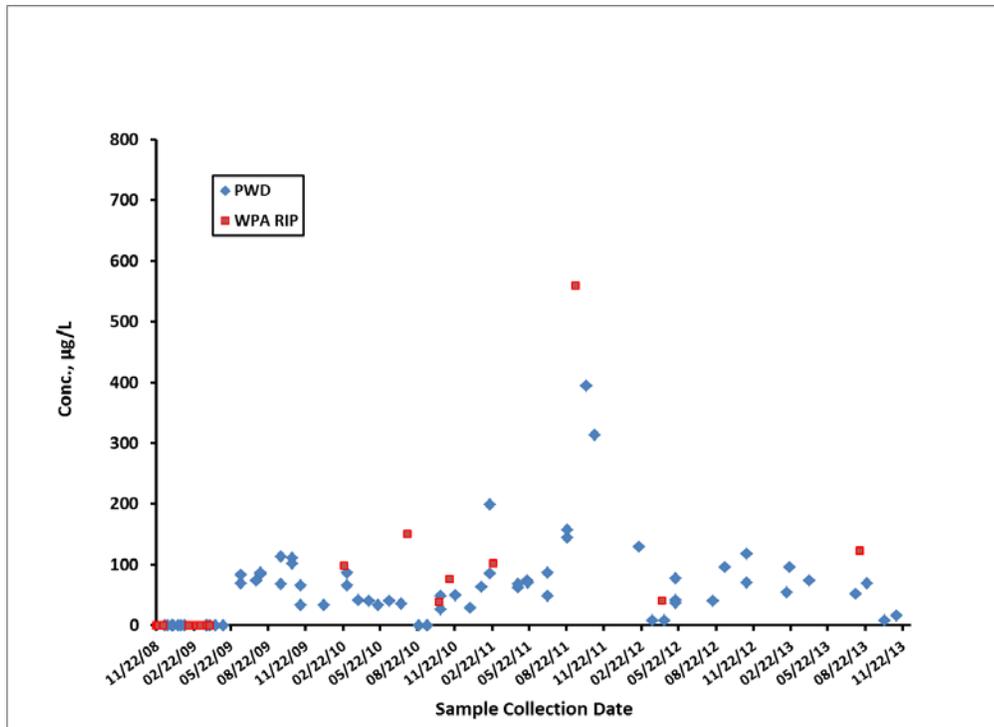
All chemical parameters measured for the PWD ambient water sample collected on April 8, 2013 met the U.S. Segment potable-water quality requirements. The nickel level was 7 µg/L. Total iodine (I) was below the method detection limit of <0.05 mg/L in the sample and met the 0.2 mg/L maximum at the point of consumption (Figure 4). The TOC result was 0.13 mg/L, and well below the U.S. Segment limit of 3.0 mg/L (Figure 5). The only organic compound detected was methyl sulfone at 74 µg/L (Figure 6). The organic carbon accountability was 15%, with less than 0.2 mg/L of TOC unaccounted.



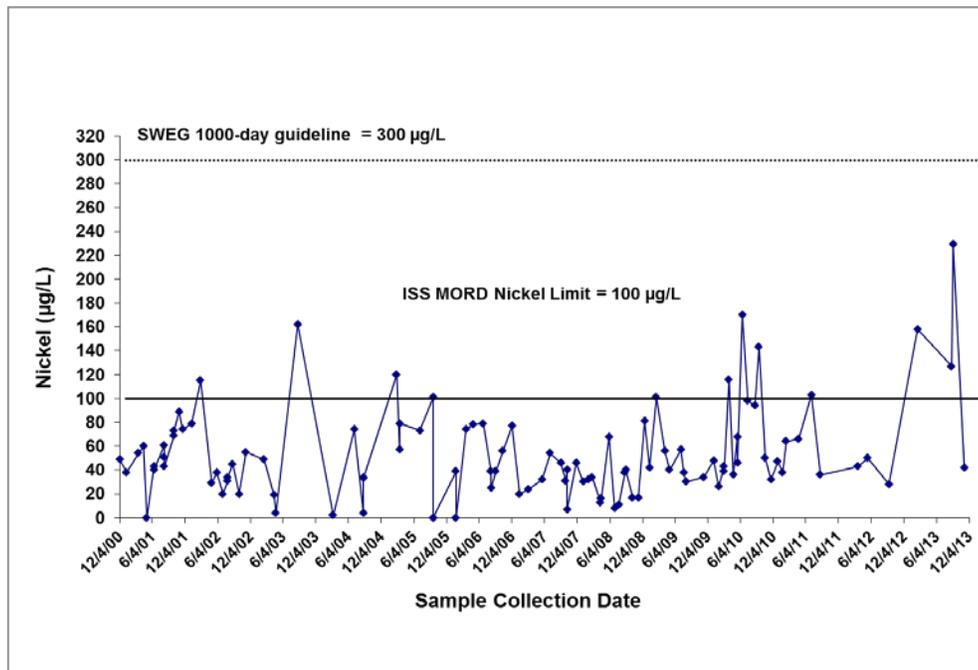
**Figure 4. Total I and Iodine Levels in US Potable Water Samples ISS ULF2 to Soyuz 35.**



**Figure 5. TOC Levels in WPA Archival Water Samples ISS ULF2 to Soyuz 35.**  
*-Note the 3 separate TOC rises in 2010, 2012, and 2013 from DMSD breakthrough*



**Figure 6 - Methyl Sulfone in US Potable Water Samples  
ISS ULF2 to Soyuz 35.**



**Figure 7. Nickel Levels in SRV-K Water Samples  
ISS Flights 4A to Soyuz 35.**

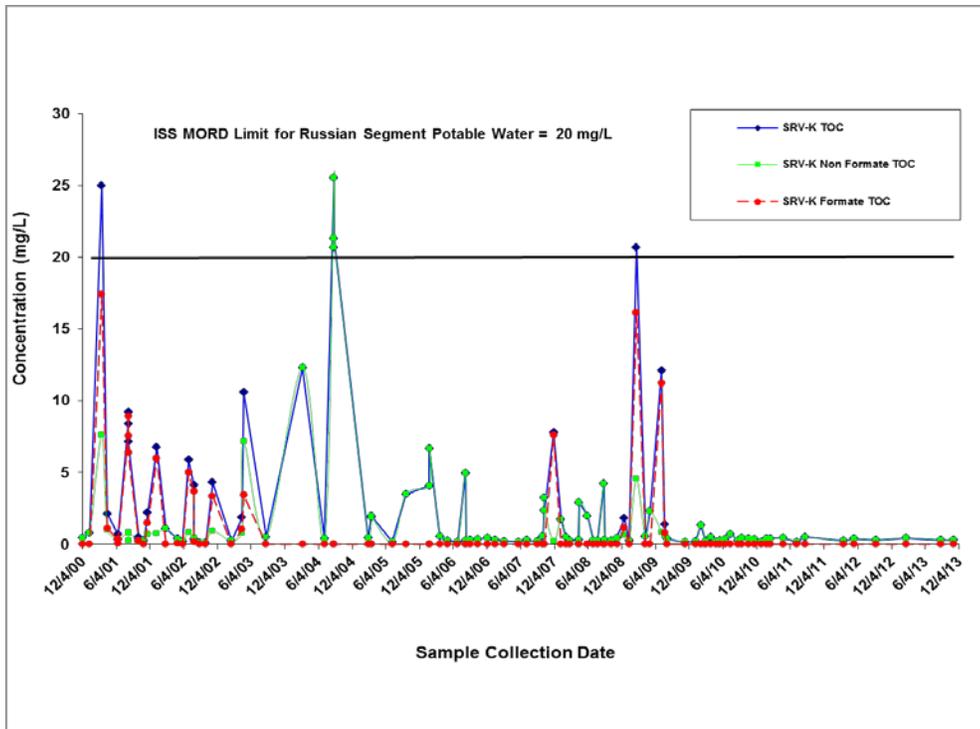


Figure 8. Total, Formate, & Non-formate Organic Carbon in SRV-K Potable Water ISS Flights 4A to Soyuz 35.

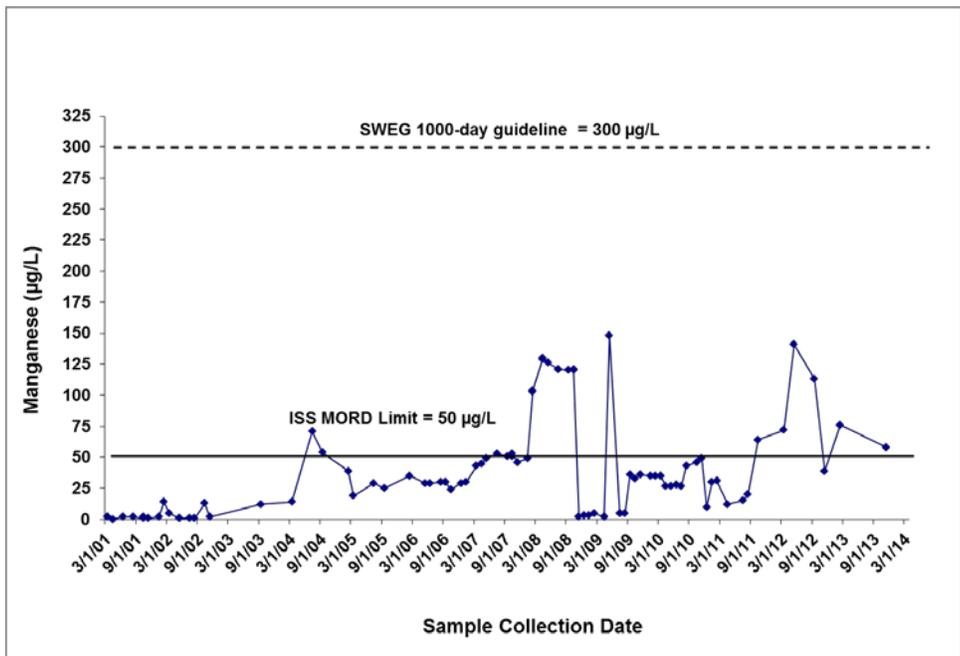


Figure 9. Manganese Levels in SVO-ZV Water Samples ISS Flights 5A to Soyuz 35.

## EXPEDITION 36

As detailed in Table 1, a total of 5 archival water samples were collected using U.S. water sample hardware during Expedition 36 (PWD ambient, PWD hot, SRV-K hot, SRV-K warm, and WPA RIP). All of these samples were returned on Soyuz 34 and received in the TECL on September 12, 2013. Due to limited sample volume, turbidity was only measured on the PWD ambient sample and solids were not measured on any of the samples. No chemical analyses were initially planned for the SRV-K Warm sample that was originally collected to confirm the results of an earlier in-flight microbial analysis. Upon inspection after receipt, reddish brown precipitates were observed, so metal and mineral analyses were performed on the sample.

During the summer of 2013, the U.S. Segment potable water experienced an anticipated temporary rise and fall in total organic carbon (TOC) content, as the result of organic contamination breaking through the water system's treatment process. This TOC rise was detected and monitored using the onboard TOCA. Analytical results for the Expedition 36 archival samples returned on Soyuz 34 confirmed the in-flight TOCA results and determined that dimethylsilanediol was once again the sole responsible contaminant, just as it was for comparable TOC rises in 2010 and 2012<sup>15,16</sup>.

### ISS U.S. Segment:

#### *PWD Potable-Water Samples*

The two PWD samples from Expedition 36 were collected on July 30, 2013 (ambient) and August 26, 2013 (hot). All chemical parameters measured for these 2 samples met the U.S. Segment potable-water quality requirements. The nickel levels ranged from 5 to 6 µg/L. Total iodine (I) in the sample was below the method detection limit of <0.05 mg/L and met the 0.2 mg/L maximum at the point of consumption (Figure 4).

The TOC results for the PWD ambient and hot samples were 1.08 and 1.64 mg/L, respectively (Figure 5). Although these levels were well below the 3.0 mg/L limit, they confirmed an upward trend seen in the onboard TOCA results. The TOC concentrations measured in the archive samples were in close agreement with those measured in-flight as shown in Table 3. These data demonstrate excellent accuracy for the TOC concentrations measured with the replacement ISS TOCA unit (PFU2) that became operational in June 4, 2013.

**Table 3. Comparison of E36 Archive Samples to In-flight TOCA Results**

In-flight TOCA (PFU2)			Expedition 36 (E36) Archive Samples		
Date	Location	TOC (mg/L)	Date	Location	TOC (mg/L)
7/31/13	PWD ambient	0.99	7/30/13	PWD ambient	1.08
8/19/13	WPA hose	1.20	8/19/13	WPA RIP	1.53
8/26/13	PWD hot	1.69	8/26/13	PWD hot	1.64

DMSD ranged from 3.8 to 5.7 mg/L in the PWD samples that is above nominal levels but below the 35.0 mg/L Spacecraft Water Exposure Guideline (SWEG)<sup>18</sup>. The methyl sulfone level ranged from 52 to 69 µg/L (Figure 6). The organic carbon accountability of the PWD samples ranged from 92 to 93%, with less than 0.2 mg/L of TOC unaccounted, confirming that the rise in TOC levels is due to DMSD.

#### *WPA RIP Product-Water Sample*

A WPA product-water sample was collected from the WPA rack interface panel (RIP) on August 19, 2013, 2 days before replacement of the WPA multifiltration (MF) beds. The MF beds were replaced in response to the increasing TOC levels in the WPA product water as measured with the TOCA. The TOC in this sample was 1.53 mg/L (Figure 5). DMSD (5.3 mg/L) and methyl sulfone (0.12 mg/L) were the only organics detected. The organic carbon accountability was 92%, with less than 0.2 mg/L TOC unaccounted. The iodine level was 1.96 mg/L and within the required range of 1.0 to 4.0 mg/L residual iodine. The only metals detected were nickel (29 µg/L) and zinc (1 µg/L).

### ISS Russian Segment:

#### *SRV-K Potable-Water Samples*

All chemical parameters measured for the SRV-K hot water sample collected on August 26, 2013 met the potable-water quality requirements listed in the ISS MORD document except for nickel. The nickel level of 127

µg/L exceeded the ISS MORD limit of 100 µg/L but was well below the SWEG of 300 µg/L (Figure 7). The total silver level of 6 µg/L was well below the desired biocidal range of 100 to 500 µg/L, which can increase the risk of microbial growth. The TOC level of 0.31 mg/L was well below the ISS MORD limit, and no target organics (including DMSD) were detected.

As noted above, the SRV-K warm sample collected on September 6, 2013 was originally collected to confirm the results from a previous in-flight microbial analysis. Upon inspection of the sample a reddish brown precipitate was found, so a small volume was allocated for analysis of metals and minerals. Iron (915 µg/L) and nickel (229 µg/L) levels were above the ISS MORD limits of 300 and 100 µg/L, respectively. The sample also contained elevated calcium (56.5 mg/L), magnesium (15.3 mg/L), aluminum (269 µg/L), copper (982 µg/L), lead (41 µg/L), and zinc (121 µg/L) compared to historical levels. Although a new mineralization cartridge was installed in the SRV-K water system several days before this sample was collected, it is unclear that the elevated levels of metals and minerals are associated with installation of the new cartridge. Most likely these levels resulted from the corrosion found in the dispensing unit, which was replaced in late November of 2013.

### EXPEDITION 37

Four archival potable water samples were collected using U.S. water sample hardware during Expedition 37 (PWD ambient, PWD hot, SRV-K warm, and SVO-ZV) as summarized in Table 1. All 4 samples were returned on Soyuz 35 and received in the TECL on November 12, 2013. Due to limited sample volume, solids were not analyzed on any of the samples and turbidity was not measured except on the PWD ambient sample. Due to leakage from the sample bag during transit, iodine, and semi-volatile organics were not analyzed on the SVO-ZV sample.

#### ISS U.S. Segment:

##### *PWD Potable-Water Samples*

All chemical parameters measured for the PWD ambient and hot water samples collected on October 8, 2013 and November 6, 2013, respectively, met the U.S. Segment potable-water quality requirements. Nickel levels ranged from 5 to 6 µg/L. Total iodine levels were below the method detection limit of 0.05 mg/L and met the ISS acceptability limit at the point of consumption of <0.2 mg/L (see Figure 4).

The TOC results for the October 8 and November 6 samples were 2.83 and <0.1 mg/L, respectively. The October 8 PWD sample's TOC level represents the peak for the most recent TOC rise that approached but never reached the U.S. Segment limit of 3 mg/L (Figure 5). The subsequent decrease in TOC can be attributed to the change out of the WPA MF beds on August 21, 2013. The lag time between the change out of the beds and the TOC peak (~48 days) is consistent with the previous TOC increases of 2010 and 2012 and represents the time needed to flush DMSD out of the WPA polishing ion-exchange bed. DMSD levels were 12.0 and <0.5 mg/L in the October 8 and November 6 samples, respectively. The October 8 sample's DMSD level remained below the 35.0 mg/L SWEG. The November 6 sample result confirms that the DMSD had been flushed from the WPA at that time. These archive sample results are consistent with the in-flight TOCA data as shown in Table 4.

**Table 4. Comparison of E37 Archive Samples to In-flight TOCA Results**

In-flight TOCA (PFU2)			Expedition 37 (E37) Archive Samples		
Date	Location	TOC(mg/L)	Date	Location	TOC (mg/L)
10/8/13	PWD ambient	3.04	10/8/13	PWD ambient	2.83
11/6/13	PWD hot	<0.285	11/6/13	PWD hot	<0.10

Methyl sulfone was below reportable levels in both samples (Figure 6). The organic carbon accountability of the October 8 sample was >100% with an excess TOC concentration of 0.295 mg/L. DMSD was the primary compound responsible for the TOC rise, just as it was for the 2010 and 2012 rises.

#### ISS Russian Segment:

##### *SRV-K Potable-Water Sample*

All chemical parameters measured for the SRV-K warm water sample collected on November 6, 2013 met the potable-water quality requirements listed in the ISS MORD. Levels of iron (41 µg/L), nickel (42 µg/L), aluminum (17 µg/L), copper (4 µg/L), lead (<1 µg/L), and zinc (58 µg/L) were lower than the previous SRV-K warm sample

collected on September 6, 2013. The total silver level in the November 6 sample was 21 µg/L. This is below the minimum acceptable biocidal level (100 µg/L) that can increase the risk of microbial growth. The TOC level of 0.31 mg/L was well below the ISS MORD limit (Figure 8) and no target organic compounds were detected.

#### ***SVO-ZV Potable-Water Sample***

All chemical parameters measured for the SVO-ZV water sample collected on November 6, 2013 met the potable-water quality requirements listed in the ISS MORD with the exception of manganese. The manganese concentration of 58 µg/L was slightly above the ISS MORD requirement of 50 µg/L, but well below the SWEG of 300 µg/L (Figure 9). The total silver level was 134 µg/L, and within the acceptable biocidal range. The TOC concentration of 0.48 mg/L was well below the ISS MORD limit and no target organic compounds were detected.

### **IV. Conclusions and Recommendations**

Chemical analyses results for archive water samples collected in 2013 from the PWD and RIP during Expeditions 34-37 and returned on Soyuz flights 32-35 confirm that the WPA potable water was chemically acceptable for consumption by the ISS crews. During the summer of 2013, the WPA water experienced an anticipated temporary rise and fall in TOC content, as the result of organic contamination breaking through the treatment processes. The TOC levels in the PWD archival samples climbed to a peak of 2.8 mg/L in the October 8 sample but never reached the U.S. Segment limit of 3.0 mg/L, before reversing and quickly falling to nominal levels below the method detection limit (<0.10 mg/L). The subsequent decrease in TOC can be attributed to the change out of the WPA MF beds on August 21. The lag time between the change out of the beds and the TOC peak (~48 days) is consistent with the previous TOC increases of 2010 and 2012 and represents the time needed to flush DMSD out of the WPA polishing ion-exchange bed. Analytical results for Expeditions 36-37 samples returned on Soyuz 34-35 confirmed that DMSD was again responsible for the TOC rise, just as it was for the 2010 and 2012 TOC rises. The levels of DMSD in the PWD archive samples reached a high of 12.0 mg/L before falling back below the detection limit, but never came close to the 35.0 mg/L SWEG limit. Although below levels of health concern, DMSD may still affect the WPA performance by masking the presence of low-levels of other organic compounds that might also breakthrough the system. As mentioned earlier, the 2013 TOC rise was anticipated based upon experience and lessons learned from the previous TOC rises of 2010 and 2012. Although the WPA internal conductivity sensors were again ineffective in signaling DMSD breakthrough, the TOCA once again demonstrated its value and necessity as a key monitoring tool for tracking TOC rises, in particular those associated with DMSD breakthrough, and for scheduling appropriate remediate action (e.g., MF bed R&R). The in-flight TOCA results during the recent TOC rise were consistent with the archive sample results as shown in Tables 3-4, thereby confirming TOCA accuracy for detecting DMSD. Even though the timing of DMSD breakthrough is now fully understood, predictable and being tracked, it is recommended that the ongoing multidisciplinary effort to establish root cause and the environmental source(s) of DMSD in WPA product water should continue.

Due to the ultrapure nature of typical WPA product water, the organic accountability for PWD samples collected outside of the TOC rise period remained low. Current detection limits and sensitivity of the established analytical methods make it difficult to account for about 0.1 mg/L of organic carbon, the average amount of unaccounted carbon in these typical WPA samples from Expeditions 34-37. Nevertheless, efforts are ongoing in the TECL to evaluate current analytical methods to improve sensitivity and/or specificity, to modify or refine current methods to include more target compounds, if feasible, and to develop methods to quantify new compounds, once they are identified.

The chemical analyses results for the Russian Segment archival water samples collected in 2013 from the SRV-K and SVO-ZV during Expeditions 34-37 indicate that the potable water was chemically acceptable for crew consumption. Silver biocide levels in both SVO-ZV samples were within the acceptable range thereby reducing the risk of microbial growth. Manganese exceeded the ISS MORD limit of 50 µg/L in both SVO-ZV samples returned from Expeditions 33-37; however, levels remained well below the 300 µg/L SWEG. It is recommended that manganese continue to be closely monitored in the SVO-ZV water supply even though the system is not widely used by the crews. Nickel in 3 of 4 SRV-K water samples returned during Expeditions 34-37 slightly exceeded the ISS MORD limit of 100 µg/L, but were below the SWEG of 300 µg/L. Total silver levels in 3 of 4 SRV-K samples were below the desired biocide range of 100 to 500 µg/L, indicating that the primary means of microbial control in the

SRV-K galley continues to be heating of the water by the pasteurization unit. Continued monitoring of nickel, biocide level and microbial content in SRV-K water is therefore recommended.

## Appendices

Chemical analysis results for archival potable-water samples returned in 2013 from the Russian Segment SRV-K (regenerated water) system during Expeditions 34-37 are presented in Appendix 1. Results of chemical analyses performed on archival potable-water samples returned in 2013 from the Russian Segment SVO-ZV (stored water) system are presented in Appendix 2. Appendix 3 contains the results for U.S. Segment archival water samples that were collected from the PWD and WPA RIP and returned in 2013.

## Acknowledgments

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**Appendix 1. ISS SRV-K Potable Water (Regenerated) Summary of  
Samples Returned During Expeditions 34 through 37**

Mission Sample Location Sample Description Sample Date Analysis/Sample ID	Units	Potable Water Maximum Contaminant Level (MCL)	Maximum Contaminant Level Source	Expedition 34	Expedition 36		Expedition 37
				Soyuz 32	Soyuz 34		Soyuz 35
				Potable Water 2/19/2013 20130317003	SRV-K Hot Potable Water 8/26/2013 20130912003	SRV-K Warm Potable Water 9/6/2013 20130912004	SRV-K Warm Potable Water 11/6/2013 20131112004
<b>Physical Characteristics</b>							
pH	pH units	5.5-9.0	MORD	6.1	7.7	NA	8.0
Conductivity	µS/cm			535	250	NA	220
Turbidity	NTU	1.5*	MORD	4.4	NA	NA	NA
Solids	mg/L	100 (1,000#)	MORD	NA	NA	NA	NA
<b>Iodine (LCV)</b>							
Total I	mg/L	0.05	MORD	<0.05	NA	NA	<0.05
<b>Anions (IC/ISE)</b>							
Bromide	mg/L			<0.1	<0.1	NA	<0.1
Chloride	mg/L	250	MORD	3.4	0.8	NA	2.9
Fluoride	mg/L	1.5/4	MCL	0.2	0.8	NA	0.1
Nitrate as Nitrogen (NO3-N)	mg/L	10	MCL	<0.2	3.6	NA	<0.2
Phosphate as P (PO4-P)	mg/L			<0.1	<0.1	NA	<0.1
Sulfate	mg/L	250	MORD	30.6	21.9	NA	18.5
<b>Cations (IC)</b>							
Ammonia as Nitrogen (NH3-N)	mg/L	2/1	MORD/SWEG	<0.12	<0.12	NA	<0.12
<b>Metals (ICP/MS)</b>							
Calcium	mg/L	100	MORD	76.3	32.0	56.5	27.6
Magnesium	mg/L	50	MORD	25.6	8.65	15.3	6.76
Potassium	mg/L			8.12	0.77	0.62	1.60
Sodium	mg/L			4.65	4.92	2.05	2.51
Aluminum	µg/L			195	11	269	17
Antimony	µg/L	2000/6	SWEG/EPA MCL	<2	<2	<4	<2
Arsenic	µg/L	10	MCL	<1	<1	<2	<1
Barium	µg/L	10,000/1,000	SWEG/MORD	59	85	6	18
Beryllium	µg/L	4	EPA MCL	<1	<1	<2	<1
Cadmium	µg/L	22/5	SWEG/MORD	<1	<1	2	<1
Chromium	µg/L	100	MCL	8	3	17	<1
Cobalt	µg/L			<1	<1	12	<1
Copper	µg/L	1,000/1,300	MCL	178	77	982	4
Iron	µg/L	300	MORD	316	12	915	41
Lead	µg/L	50/15	MCL	13	1	41	<1
Manganese	µg/L	300/50	SWEG/MORD	64	3	29	23
Mercury	µg/L	2	MCL	<0.5	<0.5	<1	<0.5
Molybdenum	µg/L			<1	<1	<2	<1
Nickel	µg/L	300/100	SWEG/MORD	158	127	229	42
Selenium	µg/L	10/50	MCL	<1	<1	<2	<1
Silver	µg/L	400/500	SWEG/MORD	42	6	85	21
Silver, Dissolved	µg/L			<2	<2	<2	3
Zinc	µg/L	2,000/5,000	SWEG/MORD	24	26	121	58
<b>Silicon (ICP/MS)</b>							
Silicon (ICP/MS)	µg/L			6420	6740	2950	1690
<b>Total Organic Carbon (Sievers)</b>							
Total Inorganic Carbon	mg/L			68.3	23.6	NA	21.1
Total Organic Carbon	mg/L	20**	MORD	0.44	0.31	NA	0.31
<b>Volatile Organics</b>							
Acetone	µg/L	15,000	SWEG	<5	<50	NA	<5
Acrylonitrile	µg/L			<5	<50	NA	<5
Allyl chloride (3-Chloropropene)	µg/L			<5	<50	NA	<5
Benzene	µg/L	70/5	SWEG/EPA MCL	<5	<50	NA	<5
Bromobenzene	µg/L			<5	<50	NA	<5
Bromochloromethane	µg/L			<5	<50	NA	<5
Bromodichloromethane	µg/L	THM 80	EPA MCL	<5	<50	NA	<5
Bromoform	µg/L	THM 80	EPA MCL	<5	<50	NA	<5
Bromomethane	µg/L			<5	<50	NA	<5
2-Butanone (Methyl ethyl ketone)	µg/L	54,000/4000	SWEG/EPA MCL	<5	<50	NA	<5
n-Butylbenzene	µg/L			<5	<50	NA	<5
sec-Butylbenzene	µg/L			<5	<50	NA	<5
tert-Butylbenzene	µg/L			<5	<50	NA	<5
Carbon disulfide	µg/L			<5	<50	NA	<5
Carbon tetrachloride	µg/L	5	EPA MCL	<5	<50	NA	<5
Chloroacetonitrile	µg/L			<5	<50	NA	<5
Chlorobenzene	µg/L	100	EPA MCL	<5	<50	NA	<5
1-Chlorobutane (Butyl chloride)	µg/L			<5	<50	NA	<5
Chloroethane	µg/L			<5	<50	NA	<5
Chloroform	µg/L	6,500/THM 80	SWEG/EPA MCL	<5	<50	NA	<5
Chloromethane	µg/L			<5	<50	NA	<5
2-Chlorotoluene	µg/L			<5	<50	NA	<5

NA=Not analyzed; MI=Matrix interference  
 \*MORD limit 1.5 mg/L (Russian method)  
 \*\*limit does not include contribution from formate  
 #solids allowable limit after mineralization  
 SWEG - 1000 days (5-2006)

**Appendix 1. ISS SRV-K Potable Water (Regenerated) Summary of  
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4-Chlorotoluene	µg/L			<5	<50	NA	<5
Dibromochloromethane	µg/L	THM 80	EPA MCL	<5	<50	NA	<5
1,2-Dibromo-3-chloropropane (DBCP)	µg/L	0.2	EPA MCL	<5	<50	NA	<5
1,2-Dibromoethane (EDB)	µg/L	0.05	EPA MCL	<5	<50	NA	<5
Dibromomethane	µg/L			<5	<50	NA	<5
1,2-Dichlorobenzene	µg/L	600	EPA MCL	<5	<50	NA	<5
1,3-Dichlorobenzene	µg/L			<5	<50	NA	<5
1,4-Dichlorobenzene	µg/L	75	EPA MCL	<5	<50	NA	<5
trans-1,4-Dichloro-2-butene	µg/L			<5	<50	NA	<5
Dichlorodifluoromethane	µg/L			<5	<50	NA	<5
1,1-Dichloroethane	µg/L			<5	<50	NA	<5
1,2-Dichloroethane	µg/L	5	EPA MCL	<5	<50	NA	<5
1,1,1-Dichloroethane	µg/L	7	EPA MCL	<5	<50	NA	<5
cis-1,2-Dichloroethane	µg/L	70	EPA MCL	<5	<50	NA	<5
trans-1,2-Dichloroethane	µg/L	100	EPA MCL	<5	<50	NA	<5
1,2-Dichloropropane	µg/L	5	EPA MCL	<5	<50	NA	<5
1,3-Dichloropropane	µg/L			<5	<50	NA	<5
2,2-Dichloropropane	µg/L			<5	<50	NA	<5
1,1-Dichloropropanone	µg/L			<5	<50	NA	<5
1,1-Dichloropropene	µg/L			<5	<50	NA	<5
cis-1,3-Dichloropropene	µg/L			<5	<50	NA	<5
trans-1,3-Dichloropropene	µg/L			<5	<50	NA	<5
Diethyl ether	µg/L			<5	<50	NA	<5
Ethylbenzene	µg/L	700	EPA MCL	<5	<50	NA	<5
Ethyl methacrylate	µg/L			<5	<50	NA	<5
Hexachlorobutadiene	µg/L			<5	<50	NA	<5
Hexachloroethane	µg/L			<5	<50	NA	<5
2-Hexanone	µg/L			<5	<50	NA	<5
Iodomethane	µg/L			<5	<50	NA	<5
Isopropylbenzene (Cumene)	µg/L			<5	<50	NA	<5
4-Isopropyltoluene (Cymene)	µg/L			<5	<50	NA	<5
Methacrylonitrile	µg/L			<5	<50	NA	<5
Methyl acrylate	µg/L			<5	<50	NA	<5
Methyl-t-butyl ether (MTBE)	µg/L			<5	<50	NA	<5
Methylene chloride (Dichloromethane)	µg/L	15,000/5	SWEG/EPA MCL	<5	<50	NA	<5
Methyl methacrylate	µg/L			<5	<50	NA	<5
4-Methyl-2-pentanone	µg/L			<5	<50	NA	<5
Naphthalene	µg/L			<5	<50	NA	<5
Nitrobenzene	µg/L			<5	<50	NA	<5
2-Nitropropane	µg/L			<5	<50	NA	<5
Pentachloroethane	µg/L			<5	<50	NA	<5
Propionitrile (Ethyl cyanide)	µg/L			<5	<50	NA	<5
n-Propylbenzene	µg/L			<5	<50	NA	<5
Styrene	µg/L	100	EPA MCL	<5	<50	NA	<5
1,1,1,2-Tetrachloroethane	µg/L			<5	<50	NA	<5
1,1,2,2-Tetrachloroethane	µg/L			<5	<50	NA	<5
Tetrachloroethane	µg/L	5	EPA MCL	<5	<50	NA	<5
Tetrahydrofuran	µg/L			<5	<50	NA	<5
Toluene	µg/L	1,000	EPA MCL	<5	<50	NA	<5
1,2,3-Trichlorobenzene	µg/L			<5	<50	NA	<5
1,2,4-Trichlorobenzene	µg/L	70	EPA MCL	<5	<50	NA	<5
1,1,1-Trichloroethane	µg/L	200	EPA MCL	<5	<50	NA	<5
1,1,2-Trichloroethane	µg/L	5	EPA MCL	<5	<50	NA	<5
Trichloroethene	µg/L	5	EPA MCL	<5	<50	NA	<5
Trichlorofluoromethane	µg/L			<5	<50	NA	<5
1,2,3-Trichloropropane	µg/L			<5	<50	NA	<5
1,2,4-Trimethylbenzene	µg/L			<5	<50	NA	<5
1,3,5-Trimethylbenzene	µg/L			<5	<50	NA	<5
Vinyl Acetate	µg/L			<5	<50	NA	<5
Vinyl Chloride	µg/L	2	EPA MCL	<5	<50	NA	<5
m&p-Xylene	µg/L	Total Xylenes 10,000	EPA MCL	<10	<100	NA	<10
o-Xylene	µg/L	Total Xylenes 10,000	EPA MCL	<5	<50	NA	<5
<b>Volatile Organics - Non-Targets (Tentatively Identified Compounds (&gt;= 80% match quality))</b>							
Acetaldehyde	µg/L			not found	not found	NA	not found
Trimethylsilanol	µg/L			not found	not found	NA	not found
<b>Extractable Organics</b>							
Acetophenone	µg/L			<32	<32	NA	<16
Benzaldehyde	µg/L			<16	<16	NA	<8
Benzoic acid	µg/L			<96	not found	NA	<48
Benzothiazole	µg/L			<16	<16	NA	<8
Benzyl alcohol	µg/L			<16	<16	NA	<8
Benzyl butyl phthlate	µg/L			<16	<16	NA	<8
2-Butoxyethanol	µg/L			<32	<32	NA	<16
2-(2-Butoxyethoxy)ethanol	µg/L			<32	<32	NA	<16

NA=Not analyzed; MI=Matrix interference  
 \*MORD limit 1.5 mg/L (Russian method)  
 \*\*limit does not include contribution from formate  
 #solids allowable limit after mineralization  
 SWEG - 1000 days (5-2006)

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2-(2-Butoxyethoxy)ethyl acetate	µg/L			<16	<16	NA	<8
n-Butylpalmitate	µg/L			<32	<32	NA	<16
Butylated hydroxyanisole (BHA)	µg/L			<16	<16	NA	<8
N-Butylbenzenesulfonamide	µg/L			<16	<16	NA	<8
3-tert-Butylphenol	µg/L			<48	<48	NA	<24
Caffeine	µg/L			<16	<16	NA	<8
tris-2-Chloroethyl phosphate	µg/L			<16	<16	NA	<8
Cholesterol	µg/L			<128	<128	NA	<64
o-Cresol (2-Methylphenol)	µg/L			<16	<16	NA	<8
Cyclododecane	µg/L			<16	<16	NA	<8
Decamethylcyclotetrasiloxane	µg/L			<16	<16	NA	<8
Decanoic acid	µg/L			<48	<48	NA	<24
2,6-Di-tert-butyl-1,4-benzoquinone	µg/L			<16	<16	NA	<8
2,4-Di-tert-butylphenol	µg/L			<16	<16	NA	<8
1,4-Diacetylbenzene	µg/L			<16	<16	NA	<8
N,N-Dibutylformamide	µg/L			<16	<16	NA	<8
Dibutyl phthalate	µg/L	40,000	SWEG	<16	<16	NA	<8
Dibutylamine	µg/L	Dialkylamines 300	SWEG	<16	<16	NA	<8
N,N-Diethyl-m-toluidide	µg/L			<16	<16	NA	<8
Diethylphthalate	µg/L			<16	<16	NA	<8
Diethylene glycol monoethyl ether	µg/L			<16	<16	NA	<8
N,N-Diethylformamide	µg/L			<48	<48	NA	<24
Diodomethane (Methyl iodide)	µg/L			<16	<16	NA	<8
Diiisopropyl adipate	µg/L			<16	<16	NA	<8
Dimethyl phthalate	µg/L			<16	<16	NA	<8
N,N-Dimethyl acetamide	µg/L			<16	<16	NA	<8
N,N-Dimethylbenzylamine	µg/L	Dialkylamines 300	SWEG	<16	<16	NA	<8
N,N-Dimethylformamide	µg/L			<32	<32	NA	<16
Diethylene glycol methyl ether	µg/L			<16	NA	NA	<8
Dodecamethylcyclotetrasiloxane	µg/L			<16	<16	NA	<8
2-Ethoxyethanol	µg/L			<32	<32	NA	<16
2-Ethyl-1-hexanol	µg/L			<16	<16	NA	<8
2-Ethylhexanoic acid	µg/L			<32	<32	NA	<16
bis-2-Ethylhexyl adipate	µg/L	400	EPA MCL	<16	<16	NA	<8
bis-2-Ethylhexyl phthalate (Diocetyl phthalate)	µg/L	20,000/6	SWEG/EPA MCL	<16	<16	NA	<8
4-Ethylmorpholine	µg/L			<16	<16	NA	<8
1-Formylpiperidine	µg/L			<16	<16	NA	<8
Heptanoic acid	µg/L			<48	<48	NA	<24
2-Heptanone	µg/L			<16	<16	NA	<8
gamma-Hexalactone	µg/L			<16	<16	NA	<8
Hexanoic acid	µg/L			<48	<48	NA	<24
2-Hexanol	µg/L			<16	<16	NA	<8
2-Hydroxybenzothiazole	µg/L			<16	<16	NA	<8
Ibuprofen	µg/L			<48	<48	NA	<24
Iodoform	µg/L			<16	<16	NA	<8
Isophorone	µg/L			<16	<16	NA	<8
4-Isopropylphenol	µg/L			<16	<16	NA	<8
Lauramide	µg/L			<16	<16	NA	<8
Lauric acid (Dodecanoic acid)	µg/L			<480	<480	NA	<240
p-Menth-1-en-8-ol (alpha-Terpineol)	µg/L			<16	<16	NA	<8
2-Mercaptobenzothiazole	µg/L	30,000	SWEG	<160	<160	NA	<80
2-Methyl-2,4-pentandiol	µg/L			<16	<16	NA	<8
1-Methyl-2-pyrrolidinone	µg/L			<16	<16	NA	<8
Methyl-4-hydroxybenzoate	µg/L			<16	<16	NA	<8
Methyl sulfone	µg/L			<16	<16	NA	<8
2-Methyl butyric acid	µg/L			<48	<48	NA	<24
2-Methylthiobenzothiazole	µg/L			<16	<16	NA	<8
Monomethyl phthalate	µg/L			<16	<16	NA	<8
Myristic acid	µg/L			<160	<160	NA	<80
(+)-Neomenthol	µg/L			<16	<16	NA	<8
Nicotine	µg/L			<16	<16	NA	<8
Nonadecane	µg/L			<16	<16	NA	<8
Nonanoic acid	µg/L			<200	<200	NA	<100
1-Octadecanol	µg/L			<48	<48	NA	<24
Octamethylcyclotetrasiloxane	µg/L			<16	<16	NA	<8
Octanoic acid	µg/L			<96	<96	NA	<48
4-tert-Octylphenol	µg/L			<16	<16	NA	<8
Oleic acid	µg/L			<280	<280	NA	<140
Oxindole	µg/L			<16	<16	NA	<8
Palmitic acid	µg/L			<480	<480	NA	<240
Pentacosane	µg/L			<16	<16	NA	<8
sec-Phenethyl alcohol	µg/L			<16	<16	NA	<8
Phenol	µg/L	4,000/1,000	SWEG/MORD	<16	<16	NA	<8
2-Phenoxyethanol	µg/L			<16	<16	NA	<8
N-Phenyl-2-naphthylamine	µg/L	260,000	SWEG	<16	<16	NA	<8
2-Phenyl-2-propanol	µg/L			<16	<16	NA	<8

NA=Not analyzed; MI=Matrix interference  
 \*MORD limit 1.5 mg/L (Russian method)  
 \*\*limit does not include contribution from formate  
 #solids allowable limit after mineralization  
 SWEG - 1000 days (5-2006)

**Appendix 1. ISS SRV-K Potable Water (Regenerated) Summary of  
Samples Returned During Expeditions 34 through 37**

Mission	Sample Location	Units	Potable Water Maximum Contaminant Level (MCL)	Maximum Contaminant Level Source	Expedition 34	Expedition 36		Expedition 37
					Soyuz 32	Soyuz 34		Soyuz 35
Sample Description	Sample Date	Analysis/Sample ID			SRV-K Hot Potable Water 2/19/2013 20130317003	SRV-K Hot Potable Water 8/26/2013 20130912003	SRV-K Warm Potable Water 9/6/2013 20130912004	SRV-K Warm Potable Water 11/6/2013 20131112004
2-Phenylacetic acid		µg/L			<64	<64	NA	<32
Phenethyl alcohol		µg/L			<16	<16	NA	<8
2-Phenylphenol		µg/L			<16	<16	NA	<8
Salicylic Acid		µg/L			<128	<128	NA	<64
trans-Squalene		µg/L			<32	<32	NA	<16
1-Tetradecanol		µg/L			<16	<16	NA	<8
Tetramethylsuccinonitrile		µg/L			<16	<16	NA	<8
Tetramethyl thiourea		µg/L			<16	<16	NA	<8
Tetramethylurea		µg/L			<16	<16	NA	<8
Thymol		µg/L			<16	<16	NA	<8
1,3,5-Triallyl-1,3,5-triazine-2,4,6(1H,3H,5H)-trione		µg/L			<16	<16	NA	<8
Tributylamine		µg/L	Trialkylamines 400	SWEG	<16	<16	NA	<8
Tributyl phosphate		µg/L			<16	<16	NA	<8
Triethyl phosphate		µg/L			<32	<32	NA	<16
2,2,4-Trimethyl-1,3-pentanediol diisobutyrate		µg/L			<32	<32	NA	<16
Tripropylene glycol monomethyl ether		µg/L			<16	<16	NA	<8
Undecanoic acid		µg/L			<96	<96	NA	<48
2-Undecanone		µg/L			<16	<16	NA	<8
Valeric acid (Pentanoic acid)		µg/L			<96	<96	NA	<48
Vanillin		µg/L			<32	<32	NA	<16
<b>Alcohols (DAI/GC/MS)</b>								
1-Butanol		µg/L			<200	<200	NA	<200
2-Butanol		µg/L			<200	<200	NA	<200
Ethanol		µg/L			<200	<200	NA	<200
Methanol		µg/L	40,000	SWEG	<200	<200	NA	<200
2-Methyl-1-butanol		µg/L			<200	<200	NA	<200
2-Methyl-2-butanol		µg/L			<200	<200	NA	<200
3-Methyl-1-butanol (Isopentanol)		µg/L			<300	<300	NA	<300
2-Methyl-1-propanol		µg/L			<200	<200	NA	<200
2-Methyl-2-propanol		µg/L			<200	<200	NA	<200
1-Pentanol (Amyl alcohol)		µg/L			<200	<200	NA	<200
2-Pentanol (sec-Amyl alcohol)		µg/L			<200	<200	NA	<200
3-Pentanol		µg/L			<200	<200	NA	<200
1-Propanol		µg/L			<200	<200	NA	<200
2-Propanol (Isopropanol)		µg/L			<200	<200	NA	<200
<b>Glycols (DAI/GC/MS)</b>								
1,2-Ethandiol (Ethylene glycol)		µg/L	4,000/12000	SWEG/MORD	<1000	<1000	NA	<1000
1,2-Propanediol (Propylene glycol)		µg/L	1,700,000	SWEG	<1000	<1000	NA	<1000
<b>Silanes (L/C/M/S/MS) (R &amp; D Method -NIST traceable standard not available)</b>								
Dimethylsilanediol (DMSD)		µg/L	25,000	SWEG	<500	<500	NA	<500
<b>Carboxylates (CE)</b>								
Acetate		µg/L			<625	<625	NA	<625
Formate		µg/L	2,500,000	SWEG	<625	<625	NA	<625
Glycolate		µg/L			<625	<625	NA	<625
Glyoxylate		µg/L			<625	<625	NA	<625
Lactate		µg/L			<625	<625	NA	<625
Oxalate		µg/L			<1250	<1250	NA	<1250
Propionate		µg/L			<1250	MI	NA	<625
<b>Aldehydes</b>								
Formaldehyde		µg/L	12,000	SWEG	<10	<10	NA	<10
<b>Amines (CE)</b>								
Ethylamine		µg/L	Monoalkylamines 2000	SWEG	<250	<250	NA	<250
Methylamine		µg/L	Monoalkylamines 2000	SWEG	<250	<250	NA	<250
n-Propylamine		µg/L	Monoalkylamines 2000	SWEG	<500	<500	NA	<500
Trimethylamine		µg/L	Trialkylamines 400	SWEG	<500	<500	NA	<500
<b>Non-volatiles (L/C/UV-VIS)</b>								
Urea		µg/L			<800	<800	NA	<800
Caprolactam		µg/L	100,000	SWEG	<32	<32	NA	<16
<b>Organic Carbon Recovery</b>								
Unaccounted Organic Carbon		percent			0.00	0.00	NA	0.00
		mg/L			0.44	0.31	NA	0.00

NA=Not analyzed; MI=Matrix interference  
 \*MORD limit 1.5 mg/L (Russian method)  
 \*\*limit does not include contribution from formate  
 #solids allowable limit after mineralization  
 SWEG - 1000 days (5-2006)

Appendix 2. ISS SVO-ZV Potable Water Summary of Samples Returned During Expeditions 34 through 37

Mission	Sample Location	Potable Water	Maximum Contaminant Level (MCL)	Maximum Contaminant Level Source	Expedition 34	Expedition 37
					Sovuz 32	Sovuz 35
Sample Description	Sample Date	Units			Potable Water	Potable Water
Analysis/Sample ID					2/19/2013 20130317002	11/6/2013 20131112003
<b>Physical Characteristics</b>						
pH		pH units	5.5-9.0	MORD	8.3	8.1
Conductivity		µS/cm			600	490
Turbidity		NTU	1.5*	MORD	NA	NA
Solids		mg/L	100 (1,000 <sup>b</sup> )	MORD	NA	NA
<b>Iodine (LCV)</b>						
Total I		mg/L	0.05	MORD	NA	<0.05
<b>Anions (IC/SE)</b>						
Bromide		mg/L			<0.1	<0.1
Chloride		mg/L	250	MORD	2.7	8.0
Fluoride		mg/L	1.5/4	MORD/EPA MCL	0.2	0.3
Nitrate as Nitrogen (NO3-N)		mg/L	10	MORD/EPA MCL	<0.2	0.3
Phosphate as P (PO4-P)		mg/L			<0.1	<0.1
Sulfate		mg/L	250	MORD	34.4	38.2
<b>Cations (IC)</b>						
Ammonia as Nitrogen (NH3-N)		mg/L	2/1	MORD/SWEG	<0.12	<0.12
<b>Metals (ICP/MS)</b>						
Calcium		mg/L	100	MORD	87.6	63.0
Magnesium		mg/L	50	MORD	30.6	17.5
Potassium		mg/L			9.38	4.83
Sodium		mg/L			4.56	7.50
Aluminum		µg/L			52	195
Antimony		µg/L	2000/6	SWEG/EPA MCL	<2	<2
Arsenic		µg/L	10	MORD/EPA MCL	1	<1
Barium		µg/L	10,000/1,000	SWEG/MORD	72	51
Beryllium		µg/L	4	EPA MCL	<1	<1
Cadmium		µg/L	22/5	SWEG/MORD	<1	1
Chromium		µg/L	100	MORD/EPA MCL	4	<1
Cobalt		µg/L			<1	<1
Copper		µg/L	1,000/1,300	MORD/EPA MCL	3	2
Iron		µg/L	300	MORD	25	75
Lead		µg/L	50/15	MORD/EPA MCL	<1	<1
Manganese		µg/L	300/50	SWEG/MORD	78	58
Mercury		µg/L	2	MORD/EPA MCL	<0.5	<0.5
Molybdenum		µg/L			<1	<1
Nickel		µg/L	300/100	SWEG/MORD	3	3
Selenium		µg/L	10/50	MORD/EPA MCL	<1	<1
Silver		µg/L	400/500	SWEG/MORD	127	134
Silver, Dissolved		µg/L			<5	54
Zinc		µg/L	2,000/5,000	SWEG/MORD	23	30
<b>Silicon (ICP/MS)</b>						
Silicon (ICP/MS)		µg/L			7790	5000
<b>Total Organic Carbon (Sieves)</b>						
Total Inorganic Carbon		mg/L			65.7	52.1
Total Organic Carbon		mg/L	20**	MORD	0.48	0.48
<b>Volatiles Organics</b>						
Acetone		µg/L	15,000	SWEG	<20	<5
Acrylonitrile		µg/L			<20	<5
Allyl chloride (3-Chloropropene)		µg/L			<20	<5
Benzene		µg/L	70/5	SWEG/EPA MCL	<20	<5
Bromobenzene		µg/L			<20	<5
Bromochloromethane		µg/L			<20	<5
Bromodichloromethane		µg/L	THM 80	EPA MCL	<20	<5
Bromoform		µg/L	THM 80	EPA MCL	<20	<5
Bromomethane		µg/L			<20	<5
2-Butanone (Methyl ethyl ketone)		µg/L	54,000/4000	SWEG/EPA MCL	<20	<5
n-Butylbenzene		µg/L			<20	<5
sec-Butylbenzene		µg/L			<20	<5
tert-Butylbenzene		µg/L			<20	<5
Carbon disulfide		µg/L			<20	<5
Carbon tetrachloride		µg/L	5	EPA MCL	<20	<5
Chloroacetonitrile		µg/L			<20	<5
Chlorobenzene		µg/L	100	EPA MCL	<20	<5
1-Chlorobutane (Butyl chloride)		µg/L			<20	<5
Chloroethane		µg/L			<20	<5
Chloroform		µg/L	6,500/THM 80	SWEG/EPA MCL	<20	<5
Chloromethane		µg/L			<20	<5
2-Chlorotoluene		µg/L			<20	<5
4-Chlorotoluene		µg/L			<20	<5
Dibromochloromethane		µg/L	THM 80	EPA MCL	<20	<5
1,2-Dibromo-3-chloropropane (DBCP)		µg/L	0.2	EPA MCL	<20	<5
1,2-Dibromoethane (EDB)		µg/L	0.05	EPA MCL	<20	<5

NA=Not analyzed; MI=Matrix interference  
 \*MORD limit 1.5 mg/L (Russian method)  
 \*\*limit does not include contribution from formate  
 #solids allowable limit after mineralization  
 SWEG - 1000 days (5-2006)

Appendix 2. ISS SVO-ZV Potable Water Summary of Samples Returned During Expeditions 34 through 37

Mission	Sample Location	Potable Water	Maximum Contaminant Level (MCL)	Maximum Contaminant Level Source	Expedition 34	Expedition 37
					Sovuz 32	Sovuz 35
					SVO-ZV	SVO-ZV
Sample Description					Potable Water	Potable Water
Sample Date					2/19/2013	11/6/2013
Analysis/Sample ID	Units				20130317002	20131112003
Dibromomethane	µg/L				<20	<5
1,2-Dichlorobenzene	µg/L	600	EPA MCL		<20	<5
1,3-Dichlorobenzene	µg/L				<20	<5
1,4-Dichlorobenzene	µg/L	75	EPA MCL		<20	<5
trans-1,4-Dichloro-2-butene	µg/L				<20	<5
Dichlorodifluoromethane	µg/L				<20	<5
1,1-Dichloroethane	µg/L				<20	<5
1,2-Dichloroethane	µg/L	5	EPA MCL		<20	<5
1,1-Dichloroethene	µg/L	7	EPA MCL		<20	<5
cis-1,2-Dichloroethene	µg/L	70	EPA MCL		<20	<5
trans-1,2-Dichloroethene	µg/L	100	EPA MCL		<20	<5
1,2-Dichloropropane	µg/L	5	EPA MCL		<20	<5
1,3-Dichloropropane	µg/L				<20	<5
2,2-Dichloropropane	µg/L				<20	<5
1,1-Dichloropropanone	µg/L				<20	<5
1,1-Dichloropropene	µg/L				<20	<5
cis-1,3-Dichloropropene	µg/L				<20	<5
trans-1,3-Dichloropropene	µg/L				<20	<5
Diethyl ether	µg/L				<20	<5
Ethylbenzene	µg/L	700	EPA MCL		<20	<5
Ethyl methacrylate	µg/L				<20	<5
Hexachlorobutadiene	µg/L				<20	<5
Hexachloroethane	µg/L				<20	<5
2-Hexanone	µg/L				<20	<5
Iodomethane	µg/L				<20	<5
Isopropylbenzene (Cumene)	µg/L				<20	<5
4-Isopropyltoluene (Cymene)	µg/L				<20	<5
Methacrylonitrile	µg/L				<20	<5
Methyl acrylate	µg/L				<20	<5
Methyl-t-butylether (MTBE)	µg/L				<20	<5
Methylene chloride (Dichloromethane)	µg/L	15,000/5	SWEG/EPA MCL		<20	<5
Methyl methacrylate	µg/L				<20	<5
4-Methyl-2-pentanone	µg/L				<20	<5
Naphthalene	µg/L				<20	<5
Nitrobenzene	µg/L				<20	<5
2-Nitropropane	µg/L				<20	<5
Pentachloroethane	µg/L				<20	<5
Propionitrile (Ethyl cyanide)	µg/L				<20	<5
n-Propylbenzene	µg/L				<20	<5
Styrene	µg/L	100	EPA MCL		<20	<5
1,1,1,2-Tetrachloroethane	µg/L				<20	<5
1,1,1,2-Tetrachloroethane	µg/L				<20	<5
Tetrachloroethene	µg/L	5	EPA MCL		<20	<5
Tetrahydrofuran	µg/L				<20	<5
Toluene	µg/L	1,000	EPA MCL		<20	<5
1,2,3-Trichlorobenzene	µg/L				<20	<5
1,2,4-Trichlorobenzene	µg/L	70	EPA MCL		<20	<5
1,1,1-Trichloroethane	µg/L	200	EPA MCL		<20	<5
1,1,2-Trichloroethane	µg/L	5	EPA MCL		<20	<5
Trichloroethene	µg/L	5	EPA MCL		<20	<5
Trichlorofluoromethane	µg/L				<20	<5
1,2,3-Trichloropropane	µg/L				<20	<5
1,2,4-Trimethylbenzene	µg/L				<20	<5
1,3,5-Trimethylbenzene	µg/L				<20	<5
Vinyl Acetate	µg/L				<20	<5
Vinyl Chloride	µg/L	2	EPA MCL		<20	<5
m&p-Xylene	µg/L	Total Xylenes 10,000	EPA MCL		<40	<10
o-Xylene	µg/L	Total Xylenes 10,000	EPA MCL		<20	<5
<b>Volatile Organics - Non-Targets (Tentatively Identified Compounds (&gt;= 80% match quality))</b>						
Acetaldehyde	µg/L				not found	not found
Trimethylsilanol	µg/L				not found	not found
<b>Extractable Organics</b>						
Acetophenone	µg/L				NA	<16
Benzaldehyde	µg/L				NA	<8
Benzoic acid	µg/L				NA	<48
Benzothiazole	µg/L				NA	<8
Benzyl alcohol	µg/L				NA	<8
Benzyl butyl phthalate	µg/L				NA	<8
2-Butoxyethanol	µg/L				NA	<16
2-(2-Butoxyethoxy)ethanol	µg/L				NA	<16
2-(2-Butoxyethoxy)ethyl acetate	µg/L				NA	<8
n-Butylpalmitate	µg/L				NA	<16
Butylated hydroxyanisole (BHA)	µg/L				NA	<8
N-Butylbenzenesulfonamide	µg/L				NA	<8
3-tert-Butylphenol	µg/L				NA	<24
Caffeine	µg/L				NA	<8
tris-2-Chloroethyl phosphate	µg/L				NA	<8
Cholesterol	µg/L				NA	<64

NA=Not analyzed; MI=Matrix interference  
 \*MORD limit 1.5 mg/L (Russian method)  
 \*\*limit does not include contribution from formate  
 #solids allowable limit after mineralization  
 SWEG - 1000 days (5-2006)

Appendix 2. ISS SVO-ZV Potable Water Summary of Samples Returned During Expeditions 34 through 37

Mission	Sample Location	Potable Water	Maximum Contaminant Level (MCL)	Maximum Contaminant Level Source	Expedition 34		Expedition 37	
					Sovuz 32		Sovuz 35	
					Potable Water	Potable Water	Potable Water	Potable Water
					2/19/2013	11/6/2013	20130317002	20131112003
		Units						
Sample Description								
Sample Date								
Analysis/Sample ID								
o-Cresol (2-Methylphenol)		µg/L			NA	<8		
Cyclododecane		µg/L			NA	<8		
Decamethylcyclotetrasiloxane		µg/L			NA	<8		
Decanoic acid		µg/L			NA	<24		
2,6-Di-t-butyl-1,4-benzoquinone		µg/L			NA	<8		
2,4-Di-t-butylphenol		µg/L			NA	<8		
1,4-Diacetylbenzene		µg/L			NA	<8		
N,N-Dibutylformamide		µg/L			NA	<8		
Dibutyl phthalate		µg/L	40,000	SWEG	NA	<8		
Dibutylamine		µg/L	Dialkylamines 300	SWEG	NA	<8		
N,N-Diethyl-m-toluamide		µg/L			NA	<8		
Diethylphthalate		µg/L			NA	<8		
Diethylene glycol monoethyl ether		µg/L			NA	<8		
N,N-Diethylformamide		µg/L			NA	<24		
Diiodomethane (Methyl iodide)		µg/L			NA	<8		
Diisopropyl adipate		µg/L			NA	<8		
Dimethyl phthalate		µg/L			NA	<8		
N,N-Dimethyl acetamide		µg/L			NA	<8		
N,N-Dimethylbenzylamine		µg/L	Dialkylamines 300	SWEG	NA	<8		
N,N-Dimethylformamide		µg/L			NA	<16		
Dipropylene glycol methyl ether		µg/L			NA	<8		
Dodecamethylcyclohexasiloxane		µg/L			NA	<8		
2-Ethoxyethanol		µg/L			NA	<16		
2-Ethyl-1-hexanol		µg/L			NA	<8		
2-Ethylhexanoic acid		µg/L			NA	<16		
bis-2-Ethylhexyl adipate		µg/L	400	EPA MCL	NA	<8		
bis-2-Ethylhexyl phthalate (Diethyl phthalate)		µg/L	20,000/6	SWEG/EPA MCL	NA	<8		
4-Ethylmorpholine		µg/L			NA	<8		
1-Formylpiperidine		µg/L			NA	<8		
Heptanoic acid		µg/L			NA	<24		
2-Heptanone		µg/L			NA	<8		
gamma-Hexalactone		µg/L			NA	<8		
Hexanoic acid		µg/L			NA	<24		
2-Hexanol		µg/L			NA	<8		
2-Hydroxybenzothiazole		µg/L			NA	<8		
Ibuprofen		µg/L			NA	<24		
Iodoform		µg/L			NA	<8		
Isophorone		µg/L			NA	<8		
4-Isopropylphenol		µg/L			NA	<8		
Lauramide		µg/L			NA	<8		
Lauric acid (Dodecanoic acid)		µg/L			NA	<240		
p-Menth-1-en-8-ol (alpha-Terpineol)		µg/L			NA	<8		
2-Mercaptobenzothiazole		µg/L	30,000	SWEG	NA	<80		
2-Methyl-2,4-pentanediol		µg/L			NA	<8		
1-Methyl-2-pyrrolidinone		µg/L			NA	<8		
Methyl-4-hydroxybenzoate		µg/L			NA	<8		
Methyl sulfone		µg/L			NA	<8		
2-Methyl butyric acid		µg/L			NA	<24		
2-Methylthio benzothiazole		µg/L			NA	<8		
Monomethyl phthalate		µg/L			NA	<8		
Myristic acid		µg/L			NA	<80		
(+)-Neomenthol		µg/L			NA	<8		
Nicotine		µg/L			NA	<8		
Nonadecane		µg/L			NA	<8		
Nonanoic acid		µg/L			NA	<100		
1-Octadecanol		µg/L			NA	<24		
Octamethylcyclotetrasiloxane		µg/L			NA	<8		
Octanoic acid		µg/L			NA	<48		
4-tert-Octylphenol		µg/L			NA	<8		
Oleic acid		µg/L			NA	<140		
Oxindole		µg/L			NA	<8		
Palmitic acid		µg/L			NA	<240		
Pentacosane		µg/L			NA	<8		
sec-Phenethyl alcohol		µg/L			NA	<8		
Phenol		µg/L	4,000/1,000	SWEG/MORD	NA	<8		
2-Phenoxyethanol		µg/L			NA	<8		
N-Phenyl-2-naphthylamine		µg/L	260,000	SWEG	NA	<8		
2-Phenyl-2-propanol		µg/L			NA	<8		
2-Phenylacetic acid		µg/L			NA	<32		
Phenethyl alcohol		µg/L			NA	<8		
2-Phenylphenol		µg/L			NA	<8		
Salicylic Acid		µg/L			NA	<64		
trans-Squalene		µg/L			NA	<16		
1-Tetradecanol		µg/L			NA	<8		
Tetramethylsuccinonitrile		µg/L			NA	<8		
Tetramethyl thiourea		µg/L			NA	<8		
Tetramethylurea		µg/L			NA	<8		
Thymol		µg/L			NA	<8		
1,3,5-Triallyl-1,3,5-triazine-2,4,6(1H,3H,5H)-trione		µg/L			NA	<8		
Tributylamine		µg/L	Trialkylamines 400	SWEG	NA	<8		

NA=Not analyzed; MI=Matrix interference  
 \*MORD limit 1.5 mg/L (Russian method)  
 \*\*limit does not include contribution from formate  
 #solids allowable limit after mineralization  
 SWEG - 1000 days (5-2006)

Appendix 2. ISS SVO-ZV Potable Water Summary of Samples Returned During Expeditions 34 through 37

Mission	Sample Location	Potable Water	Maximum Contaminant Level (MCL)	Maximum Contaminant Level Source	Expedition 34	Expedition 37
					Sovuz 32	Sovuz 35
Sample Description	Sample Date	Units			Potable Water	Potable Water
Analysis/Sample ID					2/19/2013 20130317002	11/6/2013 20131112003
Tributyl phosphate		µg/L			NA	<8
Triethyl phosphate		µg/L			NA	<16
2,2,4-Trimethyl-1,3-pentanediol diisobutyrate		µg/L			NA	<16
Tripropylene glycol monomethyl ether		µg/L			NA	<8
Undecanoic acid		µg/L			NA	<48
2-Undecanone		µg/L			NA	<8
Valeric acid (Pentanoic acid)		µg/L			NA	<48
Vanillin		µg/L			NA	<16
<b>Alcohols (DAI/GC/MS)</b>						
1-Butanol		µg/L			<200	<200
2-Butanol		µg/L			<200	<200
Ethanol		µg/L			<200	<200
Methanol		µg/L	40,000	SWEG	<200	<200
2-Methyl-1-butanol		µg/L			<200	<200
2-Methyl-2-butanol		µg/L			<200	<200
3-Methyl-1-butanol (Isopentanol)		µg/L			<300	<300
2-Methyl-1-propanol		µg/L			<200	<200
2-Methyl-2-propanol		µg/L			<200	<200
1-Pentanol (Amyl alcohol)		µg/L			<200	<200
2-Pentanol (sec-Amyl alcohol)		µg/L			<200	<200
3-Pentanol		µg/L			<200	<200
1-Propanol		µg/L			<200	<200
2-Propanol (Isopropanol)		µg/L			<200	<200
<b>Glycols (DAI/GC/MS)</b>						
1,2-Ethandiol (Ethylene glycol)		µg/L	4,000/1,2000	SWEG/MORD	<1000	<1000
1,2-Propanediol (Propylene glycol)		µg/L	1,700,000	SWEG	<1000	<1000
<b>Silanis (LC/MS/MS) (R&amp;D Method - NIST traceable standard not available)</b>						
Dimethylsilanediol (DMSD)		µg/L	25,000	SWEG	<500	<500
<b>Carboxylates (CE)</b>						
Acetate		µg/L			<625	<625
Formate		µg/L	2,500,000	SWEG	<625	<625
Glycolate		µg/L			<625	<625
Glyoxylate		µg/L			<625	<625
Lactate		µg/L			<625	<625
Oxalate		µg/L			<1250	<1250
Propionate		µg/L			<1250	<625
<b>Aldehydes</b>						
Formaldehyde		µg/L	12,000	SWEG	<20	<10
<b>Amines (CE)</b>						
Ethylamine		µg/L	Monoalkylamines 2000	SWEG	<250	<250
Methylamine		µg/L	Monoalkylamines 2000	SWEG	<250	<250
n-Propylamine		µg/L	Monoalkylamines 2000	SWEG	<500	<500
Trimethylamine		µg/L	Trialkylamines 400	SWEG	<500	<500
<b>Non-volatiles (LC/UV-VIS)</b>						
Urea		µg/L			<800	<800
Caprolactam		µg/L	100,000	SWEG	<500	<16
<b>Organic Carbon Recovery</b>						
Unaccounted Organic Carbon		percent			0.00	0.00
		mg/L			0.48	0.00

NA=Not analyzed; MI=Matrix interference  
 \*MORD limit 1.5 mg/L (Russian method)  
 \*\*limit does not include contribution from formate  
 #solids allowable limit after mineralization  
 SWEG - 1000 days (5-2006)

Appendix 3. ISS WPA PWD and RIP Summary of Samples Returned During Expeditions 34 through 37

Mission	Sample Location	Potable Water	Maximum Contaminant Level (MCL)	Maximum Contaminant Level Source	Expedition 34		Expedition 35	Expedition 36		Expedition 37		Expedition 36
					Soyuz 32		Sovuz 33	Soyuz 34		Soyuz 35		Sovuz 34
Sample Description	Units				WPA PWD Ambient	WPA PWD Hot	WPA PWD Ambient	WPA PWD Ambient	WPA PWD Hot	WPA PWD Ambient	WPA PWD Hot	WPA RIP
Sample Date					Potable Water	Potable Water	Potable Water	Potable Water	Potable Water	Potable Water	Potable Water	Product Water (prior to MF bed R&R)
Analysis/Sample ID					2/11/2103 20130317001	2/19/2013 20130317004	4/8/2013 20130515001	7/30/2013 20130912001	8/26/2013 20130912002	10/8/2013 20131112001	11/6/2013 20131112002	8/19/2013 20130912005
<b>Physical Characteristics</b>												
pH	pH units	4.5-8.5	41000		5.2	6.9	4.9	6.4	6.2	5.3	4.8	6.0
Conductivity	µS/cm				2	1	2	1	2	5	4	2
Turbidity	NTU	1	41000		<0.4	<0.4	<0.4	<0.4	NA	<0.4	NA	NA
Total Solids	mg/L	100	41000		NA	NA	NA	NA	NA	NA	NA	NA
<b>Iodine (LCV)</b>												
Total I	mg/L	6/0.2	41000 (1 l max/tl l at pt of consumption)		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	2.42
Iodine	mg/L				<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	1.96
Iodide	mg/L				<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.46
<b>Anions (IC/SE)</b>												
Bromide	mg/L				<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Chloride	mg/L				<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Fluoride	mg/L				<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Nitrate as Nitrogen (NO3-N)	mg/L	10	41000		<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Phosphate as P (PO4-P)	mg/L				<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Sulfate	mg/L	250	41000		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
<b>Cations (IC)</b>												
Ammonia as Nitrogen (NH3-N)	mg/L	1	SWEG&41000		<0.12	<0.12	<0.12	<0.12	<0.12	<0.12	<0.12	<0.125
<b>Metals (ICP/MS)</b>												
Calcium	mg/L	30	41000		0.01	<0.01	0.01	0.02	0.04	0.05	<0.01	0.02
Magnesium	mg/L	50	41000		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Potassium	mg/L	340	41000		<0.01	<0.01	0.02	<0.01	<0.01	0.05	<0.01	<0.01
Sodium	mg/L				<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Aluminum	µg/L				1	1	2	<1	<1	1	3	<1
Antimony	µg/L	2,000	SWEG		<2	<2	<2	<2	<2	<2	<2	<2
Arsenic	µg/L	10	41000		<1	<1	<1	<1	<1	<1	<1	<1
Barium	µg/L	10,000	SWEG&41000		<1	<1	<1	1	<1	<1	<1	<1
Beryllium	µg/L				<1	<1	<1	<1	<1	<1	<1	<1
Cadmium	µg/L	22	SWEG&41000		<1	<1	<1	<1	<1	<1	<1	<1
Chromium	µg/L	230	41000		<1	<1	<1	<1	<1	<1	<1	<1
Cobalt	µg/L				<1	<1	<1	<1	<1	<1	<1	<1
Copper	µg/L	1,000	41000		<1	<1	<1	<1	<1	<1	<1	<1
Iron	µg/L	300	41000		<3	<3	<3	<3	<3	<3	<3	<3
Lead	µg/L	50	41000		<1	<1	<1	<1	<1	<1	<1	<1
Manganese	µg/L	300	SWEG&41000		<1	<1	<1	<1	<1	<1	<1	<1
Mercury	µg/L	2	41000		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Molybdenum	µg/L				<1	<1	<1	<1	<1	<1	<1	<1
Nickel	µg/L	300	SWEG&41000		10	9	7	5	6	5	6	29
Selenium	µg/L	10	41000		1	<1	<1	<1	<1	<1	<1	<1
Silver	µg/L	400	SWEG&41000		<1	<1	<1	<1	<1	<1	<1	<1
Zinc	µg/L	2,000	SWEG&41000		2	4	<1	<1	<1	2	<1	1
<b>Silicon (ICP/MS)</b>												
Silicon (ICP/MS)	µg/L				180	105	31	993	1620	3180	64	1420
<b>Total Organic Carbon (Sievers)</b>												
Total Inorganic Carbon	mg/L				0.90	0.83	1.07	1.11	1.03	0.94	0.83	1.07
Total Organic Carbon	mg/L	3	41000		0.14	0.17	0.13	1.08	1.64	2.83	<0.1	1.53

NA=Not analyzed;  
 MI=Matrix interference  
 SWEG - 1000 days (11-2008)

Appendix 3. ISS WPA PWD and RIP Summary of Samples Returned During Expeditions 34 through 37

Mission	Sample Location	Potable Water	Maximum Contaminant Level (MCL)	Maximum Contaminant Level Source	Expedition 34		Expedition 35	Expedition 36		Expedition 37		Expedition 36
					Soyuz 32		Sovuz 33	Soyuz 34		Soyuz 35		Sovuz 34
					WPA PWD Ambient	WPA PWD Hot	WPA PWD Ambient	WPA PWD Ambient	WPA PWD Hot	WPA PWD Ambient	WPA PWD Hot	WPA RIP
Sample Description					Potable Water	Potable Water	Potable Water	Potable Water	Potable Water	Potable Water	Potable Water	Product Water (prior to MF bed R&R)
Sample Date					2/11/2103	2/19/2013	4/8/2013	7/30/2013	8/26/2013	10/8/2013	11/6/2013	8/19/2013
Analysis/Sample ID	Units				20130317001	20130317004	20130515001	20130912001	20130912002	20131112001	20131112002	20130912005
<b>Volatile Organics</b>												
Acetone	µg/L	15,000	SWEG		<5	<5	<5	<5	<5	<5	<5	<5
Acrylonitrile	µg/L				<5	<5	<5	<5	<5	<5	<5	<5
Allyl chloride (3-Chloropropene)	µg/L				<5	<5	<5	<5	<5	<5	<5	<5
Benzene	µg/L	70/5	SWEG/EPA		<5	<5	<5	<5	<5	<5	<5	<5
Bromobenzene	µg/L				<5	<5	<5	<5	<5	<5	<5	<5
Bromochloromethane	µg/L				<5	<5	<5	<5	<5	<5	<5	<5
Bromodichloromethane	µg/L	THM 80	EPA MCL		<5	<5	<5	<5	<5	<5	<5	<5
Bromofrom	µg/L	THM 80	EPA MCL		<5	<5	<5	<5	<5	<5	<5	<5
Bromomethane	µg/L				<5	<5	<5	<5	<5	<5	<5	<5
2-Butanone (Methyl ethyl ketone)	µg/L	54,000/4000	SWEG/EPA MCL		<5	<5	<5	<5	<5	<5	<5	<5
n-Butylbenzene	µg/L				<5	<5	<5	<5	<5	<5	<5	<5
sec-Butylbenzene	µg/L				<5	<5	<5	<5	<5	<5	<5	<5
tert-Butylbenzene	µg/L				<5	<5	<5	<5	<5	<5	<5	<5
Carbon disulfide	µg/L				<5	<5	<5	<5	<5	<5	<5	<5
Carbon tetrachloride	µg/L	5	EPA MCL		<5	<5	<5	<5	<5	<5	<5	<5
Chloroacetonitrile	µg/L				<5	<5	<5	<5	<5	<5	<5	<5
Chlorobenzene	µg/L	100	EPA MCL		<5	<5	<5	<5	<5	<5	<5	<5
1-Chlorobutane (Butyl chloride)	µg/L				<5	<5	<5	<5	<5	<5	<5	<5
Chloroethane	µg/L				<5	<5	<5	<5	<5	<5	<5	<5
Chloroform	µg/L	6,500/THM 80	SWEG/EPA MCL		<5	<5	<5	<5	<5	<5	<5	<5
Chloromethane	µg/L				<5	<5	<5	<5	<5	<5	<5	<5
2-Chlorotoluene	µg/L				<5	<5	<5	<5	<5	<5	<5	<5
4-Chlorotoluene	µg/L				<5	<5	<5	<5	<5	<5	<5	<5
Dibromochloromethane	µg/L	THM 80	EPA MCL		<5	<5	<5	<5	<5	<5	<5	<5
1,2-Dibromo-3-chloropropane (DBCP)	µg/L	0.2	EPA MCL		<5	<5	<5	<5	<5	<5	<5	<5
1,2-Dibromoethane (EDB)	µg/L	0.05	EPA MCL		<5	<5	<5	<5	<5	<5	<5	<5
Dibromomethane	µg/L				<5	<5	<5	<5	<5	<5	<5	<5
1,2-Dichlorobenzene	µg/L	600	EPA MCL		<5	<5	<5	<5	<5	<5	<5	<5
1,3-Dichlorobenzene	µg/L				<5	<5	<5	<5	<5	<5	<5	<5
1,4-Dichlorobenzene	µg/L	75	EPA MCL		<5	<5	<5	<5	<5	<5	<5	<5
trans-1,4-Dichloro-2-butene	µg/L				<5	<5	<5	<5	<5	<5	<5	<5
Dichlorodifluoromethane	µg/L				<5	<5	<5	<5	<5	<5	<5	<5
1,1-Dichloroethane	µg/L				<5	<5	<5	<5	<5	<5	<5	<5
1,2-Dichloroethane	µg/L	5	EPA MCL		<5	<5	<5	<5	<5	<5	<5	<5
1,1-Dichloroethene	µg/L	7	EPA MCL		<5	<5	<5	<5	<5	<5	<5	<5
cis-1,2-Dichloroethene	µg/L	70	EPA MCL		<5	<5	<5	<5	<5	<5	<5	<5
trans-1,2-Dichloroethene	µg/L	100	EPA MCL		<5	<5	<5	<5	<5	<5	<5	<5
1,2-Dichloropropane	µg/L	5	EPA MCL		<5	<5	<5	<5	<5	<5	<5	<5
1,3-Dichloropropane	µg/L				<5	<5	<5	<5	<5	<5	<5	<5
2,2-Dichloropropane	µg/L				<5	<5	<5	<5	<5	<5	<5	<5
1,1-Dichloropropanone	µg/L				<5	<5	<5	<5	<5	<5	<5	<5
1,1-Dichloropropene	µg/L				<5	<5	<5	<5	<5	<5	<5	<5
cis-1,3-Dichloropropene	µg/L				<5	<5	<5	<5	<5	<5	<5	<5
trans-1,3-Dichloropropene	µg/L				<5	<5	<5	<5	<5	<5	<5	<5
Diethyl ether	µg/L				<5	<5	<5	<5	<5	<5	<5	<5
Ethylbenzene	µg/L	700	EPA MCL		<5	<5	<5	<5	<5	<5	<5	<5
Ethyl methacrylate	µg/L				<5	<5	<5	<5	<5	<5	<5	<5
Hexachlorobutadiene	µg/L				<5	<5	<5	<5	<5	<5	<5	<5
Hexachloroethane	µg/L				<5	<5	<5	<5	<5	<5	<5	<5
2-Hexanone	µg/L				<5	<5	<5	<5	<5	<5	<5	<5
Iodomethane	µg/L				<5	<5	<5	<5	<5	<5	<5	<5
Isopropylbenzene (Cumene)	µg/L				<5	<5	<5	<5	<5	<5	<5	<5
4-Isopropyltoluene (Cymene)	µg/L				<5	<5	<5	<5	<5	<5	<5	<5
Methacrylonitrile	µg/L				<5	<5	<5	<5	<5	<5	<5	<5

NA=Not analyzed;  
MI=Matrix interference  
SWEG - 1000 days (11-2008)



Appendix 3. ISS WPA PWD and RIP Summary of Samples Returned During Expeditions 34 through 37

Mission	Sample Location	Potable Water	Maximum Contaminant Level (MCL)	Maximum Contaminant Level Source	Expedition 34		Expedition 35		Expedition 36		Expedition 37		Expedition 36
					Soyuz 32		Sovuz 33		Soyuz 34		Soyuz 35		Sovuz 34
					WPA PWD Ambient	WPA PWD Hot	WPA PWD Ambient	WPA PWD Hot	WPA PWD Ambient	WPA PWD Hot	WPA PWD Ambient	WPA PWD Hot	WPA RIP
Sample Description	Units				Potable Water	Potable Water	Potable Water	Potable Water	Potable Water	Potable Water	Potable Water		Product Water (prior to MF bed R&R)
Sample Date					2/11/2103	2/19/2013	4/8/2013	7/30/2013	8/26/2013	10/8/2013	11/6/2013		8/19/2013
Analysis/Sample ID					20130317001	20130317004	20130515001	20130912001	20130912002	20131112001	20131112002		20130912005
Decanoic acid	µg/L				<24	<48	<24	<24	<48	<24	<48		<48
2,6-Di-t-butyl-1,4-benzoquinone	µg/L				<8	<16	<8	<8	<16	<8	<16		<16
2,4-Di-t-butylphenol	µg/L				<8	<16	<8	<8	<16	<8	<16		<16
1,4-Diacetylbenezene	µg/L				<8	<16	<8	<8	<16	<8	<16		<16
N,N-Dibutylformamide	µg/L				<8	<16	<8	<8	<16	<8	<16		<16
Dibutyl phthalate	µg/L	40,000		SWEG	<8	<16	<8	<8	<16	<8	<16		<16
Dibutylamine	µg/L	Dialkylamines 300		SWEG	<8	<16	<8	<8	<16	<8	<16		<16
N,N-Diethyl-m-tolamide	µg/L				<8	<16	<8	<8	<16	<8	<16		<16
Diethylphthalate	µg/L				<8	<16	<8	<8	<16	<8	<16		<16
Diethylene glycol monoethyl ether	µg/L				<8	<16	<8	<8	<16	<8	<16		<16
N,N-Diethylformamide	µg/L				<24	<48	<24	<24	<48	<24	<48		<48
Diiodomethane (Methyl iodide)	µg/L				<8	<16	<8	<8	<16	<8	<16		<16
Diisopropyl adipate	µg/L				<8	<16	<8	<8	<16	<8	<16		<16
Dimethyl phthalate	µg/L				<8	<16	<8	<8	<16	<8	<16		<16
N,N-Dimethyl acetamide	µg/L				<8	<16	<8	<8	<16	<8	<16		<16
N,N-Dimethylbenzylamine	µg/L	Dialkylamines 300		SWEG	<8	<16	<8	<8	<16	<8	<16		<16
N,N-Dimethylformamide	µg/L				<16	<32	<16	<16	<32	<16	<32		<32
Dipropylene glycol methyl ether	µg/L				<8	<16	<8	NA	NA	<8	<16		NA
Dodecamethylcyclohexasiloxane	µg/L				<8	<16	<8	<8	<16	<8	<16		<16
2-Ethoxyethanol	µg/L				<16	<32	<16	<16	<32	<16	<32		<32
2-Ethyl-1-hexanol	µg/L				<8	<16	<8	<8	<16	<8	<16		<16
2-Ethylhexanoic acid	µg/L				<16	<32	<16	<16	<32	<16	<32		<32
bis-2-Ethylhexyl adipate	µg/L	400		EPA MCL	<8	<16	<8	<8	<16	<8	<16		<16
bis-2-Ethylhexyl phthalate (Diocetyl phthalate)	µg/L	20,000/6		SWEG/EPA MCL	<8	<16	<8	<8	<16	<8	<16		<16
4-Ethylmorpholine	µg/L				<8	<16	<8	<8	<16	<8	<16		<16
1-Formylpiperidine	µg/L				<8	<16	<8	<8	<16	<8	<16		<16
Heptanoic acid	µg/L				<24	<48	<24	<24	<48	<24	<48		<48
2-Heptanone	µg/L				<8	<16	<8	<8	<16	<8	<16		<16
gamma-Hexalactone	µg/L				<8	<16	<8	<8	<16	<8	<16		<16
Hexanoic acid	µg/L				<24	<48	<24	<24	<48	<24	<48		<48
2-Hexanol	µg/L				<8	<16	<8	<8	<16	<8	<16		<16
2-Hydroxybenzothiazole	µg/L				<8	<16	<8	<8	<16	<8	<16		<16
Ibuprofen	µg/L				<24	<48	<24	<24	<48	<24	<48		<48
Iodoform	µg/L				<8	<16	<8	<8	<16	<8	<16		<16
Isophorone	µg/L				<8	<16	<8	<8	<16	<8	<16		<16
4-Isopropylphenol	µg/L				<8	<16	<8	<8	<16	<8	<16		<16
Lauramide	µg/L				<8	<16	<8	<8	<16	<8	<16		<16
Lauric acid (Dodecanoic acid)	µg/L				<240	<480	<240	<240	<480	<240	<480		<480
p-Menth-1-en-8-ol (alpha-Terpineol)	µg/L				<8	<16	<8	<8	<16	<8	<16		<16
2-Mercaptobenzothiazole	µg/L	30,000		SWEG	<80	<160	<80	<80	<160	<80	<160		<160
2-Methyl-2,4-pentadiol	µg/L				<8	<16	<8	<8	<16	<8	<16		<16
1-Methyl-2-pyrrolidone	µg/L				<8	<16	<8	<8	<16	<8	<16		<16
Methyl-4-hydroxybenzoate	µg/L				<8	<16	<8	<8	<16	<8	<16		<16
Methyl sulfone	µg/L				54	96	74	52	69	<8	<16		123
2-Methyl butyric acid	µg/L				<24	<48	<24	<24	<48	<24	<48		<48
2-Methylthio benzothiazole	µg/L				<8	<16	<8	<8	<16	<8	<16		<16
Monomethyl phthalate	µg/L				<8	<16	<8	<8	<16	<8	<16		<16
Myristic acid	µg/L				<80	<160	<80	<80	<160	<80	<160		<160
(+)-Neomenthol	µg/L				<8	<16	<8	<8	<16	<8	<16		<16
Nicotine	µg/L				<8	<16	<8	<8	<16	<8	<16		<16
Nonadecane	µg/L				<8	<16	<8	<8	<16	<8	<16		<16
Nonanoic acid	µg/L				<100	<200	<100	<100	<200	<100	<200		<200
1-Octadecanol	µg/L				<24	<48	<24	<24	<48	<24	<48		<48
Octamethylcyclotetrasiloxane	µg/L				<8	<16	<8	<8	<16	<8	<16		<16
Octanoic acid	µg/L				<48	<96	<48	<48	<96	<48	<96		<96

NA=Not analyzed;  
 MI=Matrix interference  
 SWEG - 1000 days (11-2008)

Appendix 3. ISS WPA PWD and RIP Summary of Samples Returned During Expeditions 34 through 37

Mission	Sample Location	Potable Water	Maximum Contaminant Level (MCL)	Maximum Contaminant Level Source	Expedition 34		Expedition 35		Expedition 36		Expedition 37		Expedition 36
					Soyuz 32		Sovuz 33		Soyuz 34		Soyuz 35		Sovuz 34
					WPA PWD Ambient	WPA PWD Hot	WPA PWD Ambient	WPA PWD Ambient	WPA PWD Hot	WPA PWD Ambient	WPA PWD Hot	WPA PWD Ambient	WPA PWD Hot
Sample Description					Potable Water	Potable Water	Potable Water	Potable Water	Potable Water	Potable Water	Potable Water		Product Water (prior to MF bed R&R)
Sample Date					2/11/2103	2/19/2013	4/8/2013	7/30/2013	8/26/2013	10/8/2013	11/6/2013		8/19/2013
Analysis/Sample ID	Units				20130317001	20130317004	20130515001	20130912001	20130912002	20131112001	20131112002		20130912005
4-tert-Octylphenol	µg/L				<8	<16	<8	<8	<16	<8	<16		<16
Oleic acid	µg/L				<140	<280	<140	<140	<280	<140	<280		<280
Oxindole	µg/L				<8	<16	<8	<8	<16	<8	<16		<16
Palmitic acid	µg/L				<240	<480	<240	<240	<480	<240	<480		<480
Pentacosane	µg/L				<8	<16	<8	<8	<16	<8	<16		<16
sec-Phenethyl alcohol	µg/L				<8	<16	<8	<8	<16	<8	<16		<16
Phenol	µg/L	4,000		SWEG	<8	<16	<8	<8	<16	<8	<16		<16
2-Phenoxyethanol	µg/L				<8	<16	<8	<8	<16	<8	<16		<16
N-Phenyl-2-naphthylamine	µg/L	260,000		SWEG	<8	<16	<8	<8	<16	<8	<16		<16
2-Phenyl-2-propanol	µg/L				<8	<16	<8	<8	<16	<8	<16		<16
2-Phenylacetic acid	µg/L				<32	<64	<32	<32	<64	<32	<64		<64
Phenethyl alcohol	µg/L				<8	<16	<8	<8	<16	<8	<16		<16
2-Phenylphenol	µg/L				<8	<16	<8	<8	<16	<8	<16		<16
Salicylic Acid	µg/L				<64	<128	<64	<64	<128	<64	<128		<128
trans-Squalene	µg/L				<16	<32	<16	<16	<32	<16	<32		<32
1-Tetradecanol	µg/L				<8	<16	<8	<8	<16	<8	<16		<16
Tetramethylsuccinonitrile	µg/L				<8	<16	<8	<8	<16	<8	<16		<16
Tetramethyl thiourea	µg/L				<8	<16	<8	<8	<16	<8	<16		<16
Tetramethylurea	µg/L				<8	<16	<8	<8	<16	<8	<16		<16
Thymol	µg/L				<8	<16	<8	<8	<16	<8	<16		<16
1,3,5-Triallyl-1,3,5-triazine-2,4,6-(1H,3H,5H)-trione	µg/L				<8	<16	<8	<8	<16	<8	<16		<16
Tributylamine	µg/L	Trialkylamines 400		SWEG	<8	<16	<8	<8	<16	<8	<16		<16
Tributyl phosphate	µg/L				<8	<16	<8	<8	<16	<8	<16		<16
Triethyl phosphate	µg/L				<16	<32	<16	<16	<32	<16	<32		<32
2,2,4-Trimethyl-1,3-pentanediol diisobutyrate	µg/L				<16	<32	<16	<16	<32	<16	<32		<32
Tripropylene glycol monomethyl ether	µg/L				<8	<16	<8	<8	<16	<8	<16		<16
Undecanoic acid	µg/L				<48	<96	<48	<48	<96	<48	<96		<96
2-Undecanone	µg/L				<8	<16	<8	<8	<16	<8	<16		<16
Valeric acid (Pentanoic acid)	µg/L				<48	<48	<48	<48	<96	<48	<96		<96
Vanillin	µg/L				<16	<32	<16	<16	<32	<16	<32		<32
<b>Acid Extractables-EPA 625 List</b>													
4-Chloro-3-methylphenol	µg/L				<16	<32	<16	<16	<32	<16	<32		<32
2-Chlorophenol	µg/L				<16	<32	<16	<16	<32	<16	<32		<32
2,4-Dichlorophenol	µg/L				<16	<32	<16	<16	<32	<16	<32		<32
2,4-Dimethylphenol	µg/L				<16	<32	<16	<16	<32	<16	<32		<32
2,4-Dinitrophenol	µg/L				<16	<32	<16	NA	NA	<16	<32		NA
2-Methyl-4,6-dinitrophenol	µg/L				<16	<32	<16	<16	<32	<16	<32		<32
2-Nitrophenol	µg/L				<16	<32	<16	<16	<32	<16	<32		<32
4-Nitrophenol	µg/L				<16	<32	<16	<16	<32	<16	<32		<32
Pentachlorophenol	µg/L	1		EPA MCL	<16	<32	<16	<16	<32	<16	<32		<32
Phenol	µg/L	4,000		SWEG	<8	<16	<8	<8	<16	<8	<16		<16
2,4,5-Trichlorophenol	µg/L				<16	<32	<16	<16	<32	<16	<32		<32
2,4,6-Trichlorophenol	µg/L				<16	<32	<16	<16	<32	<16	<32		<32
4-Methylphenol	µg/L				<8	<16	<8	<8	<16	<8	<16		<16
<b>Base/Neutral Extractables- EPA 625 List</b>													
Benzidine	µg/L				<16	<32	<16	<16	<32	<16	<32		<32
3,3-Dichlorobenzidine	µg/L				<16	<32	<16	<16	<32	<16	<32		<32
bis-(2-Ethylhexyl)phthalate	µg/L	20,000/6		SWEG/EPA MCL	<8	<16	<8	<8	<16	<8	<16		<16
Benzyl butyl phthalate	µg/L				<8	<16	<8	<8	<16	<8	<16		<16
Dibutylphthalate	µg/L	40,000		SWEG	<8	<16	<8	<8	<16	<8	<16		<16
Diethylphthalate	µg/L				<8	<16	<8	<8	<16	<8	<16		<16
Dimethylphthalate	µg/L				<8	<16	<8	<8	<16	<8	<16		<16
Di-n-octyl phthalate	µg/L				<16	<32	<16	<16	<32	<16	<32		<32

NA=Not analyzed;  
 MI=Matrix interference  
 SWEG - 1000 days (11-2008)

Appendix 3. ISS WPA PWD and RIP Summary of Samples Returned During Expeditions 34 through 37

Mission	Sample Location	Potable Water	Maximum Contaminant Level (MCL)	Maximum Contaminant Level Source	Expedition 34		Expedition 35	Expedition 36		Expedition 37		Expedition 36
					Soyuz 32		Sovuz 33	Soyuz 34		Soyuz 35		Sovuz 34
					WPA PWD Ambient	WPA PWD Hot	WPA PWD Ambient	WPA PWD Ambient	WPA PWD Hot	WPA PWD Ambient	WPA PWD Hot	WPA RIP
Sample Description					Potable Water	Potable Water	Potable Water	Potable Water	Potable Water	Potable Water	Potable Water	Product Water (prior to MF bed R&R)
Sample Date					2/11/2103	2/19/2013	4/8/2013	7/30/2013	8/26/2013	10/8/2013	11/6/2013	8/19/2013
Analysis/Sample ID	Units				20130317001	20130317004	20130515001	20130912001	20130912002	20131112001	20131112002	20130912005
N-Nitrosodimethylamine	µg/L				<16	<32	<16	<16	<32	<16	<32	<32
N-Nitrosodiphenylamine	µg/L				<16	<32	<16	<16	<32	<16	<32	<32
N-Nitrosodi-n-propylamine	µg/L				<16	<32	<16	<16	<32	<16	<32	<32
2,4-Dinitrotoluene	µg/L				<16	<32	<16	<16	<32	<16	<32	<32
2,6-Dinitrotoluene	µg/L				<16	<32	<16	<16	<32	<16	<32	<32
Isophorone	µg/L				<8	<16	<8	<8	<16	<8	<16	<16
Nitrobenzene	µg/L				<16	<32	<16	<16	<32	<16	<32	<32
Acenaphthene	µg/L				<16	<32	<16	<16	<32	<16	<32	<32
Acenaphthylene	µg/L				<16	<32	<16	<16	<32	<16	<32	<32
Anthracene	µg/L				<16	<32	<16	<16	<32	<16	<32	<32
Benzo(a)anthracene	µg/L				<16	<32	<16	<16	<32	NA	NA	<32
Benzo(a)pyrene	µg/L	0.2	EPA MCL		<10	<20	<10	<10	<20	<10	<20	<20
Benzo(b)fluoranthene	µg/L				<8	<16	<8	<8	<16	<8	<16	<16
Benzo(ghi)perylene	µg/L				<10	<20	<10	<10	<20	<10	<20	<20
Benzo(k)fluoranthene	µg/L				<8	<16	<8	<8	<16	<8	<16	<16
Chrysene	µg/L				<20	<40	<20	<20	<40	<20	<40	<40
Dibenzof(a,h)anthracene	µg/L				<10	<20	<10	<10	<20	<10	<20	<20
Fluoranthene	µg/L				<8	<16	<8	<8	<16	<8	<16	<16
Fluorene	µg/L				<16	<32	<16	<16	<32	<16	<32	<32
Indeno(1,2,3-cd)pyrene	µg/L				<10	<20	<10	<10	<20	<10	<20	<20
Naphthalene	µg/L				<40	<80	<40	<40	<80	<40	<80	<80
Phenanthrene	µg/L				<8	<16	<8	<8	<16	<8	<16	<16
Pyrene	µg/L				<8	<16	<8	<8	<16	<8	<16	<16
bis(2-Chloroethyl) ether	µg/L				<16	<32	<16	<16	<32	<16	<32	<32
bis(2-Chloroethoxy) methane	µg/L				<16	<32	<16	<16	<32	<16	<32	<32
bis(2-Chloroisopropyl) ether	µg/L				<16	<32	<16	<16	<32	<16	<32	<32
4-Bromophenyl phenyl ether	µg/L				<16	<32	<16	<16	<32	<16	<32	<32
4-Chlorophenyl phenyl ether	µg/L				<16	<32	<16	<16	<32	<16	<32	<32
2-Chloronaphthalene	µg/L				<16	<32	<16	<16	<32	<16	<32	<32
1,2-Dichlorobenzene	µg/L	600	EPA MCL		<16	<32	<16	<16	<32	<16	<32	<32
1,3-Dichlorobenzene	µg/L	600	EPA MCL		<16	<32	<16	<16	<32	<16	<32	<32
1,4-Dichlorobenzene	µg/L	75	EPA MCL		<16	<32	<16	<16	<32	<16	<32	<32
Hexachlorobenzene	µg/L	30			<16	<32	<16	<16	<32	<16	<32	<32
Hexachlorobutadiene	µg/L	1			<16	<32	<16	<16	<32	<16	<32	<32
Hexachlorocyclopentadiene	µg/L	50	EPA MCL		<16	<32	<16	<16	<32	<16	<32	<32
Hexachloroethane	µg/L	1			<16	<32	<16	<16	<32	<16	<32	<32
1,2,4-Trichlorobenzene	µg/L	70	EPA MCL		<16	<32	<16	<16	<32	<16	<32	<32
<b>Alcohols (DAI/GC/MS)</b>												
1-Butanol	µg/L				<200	<200	<200	<200	<200	<200	<200	<200
2-Butanol	µg/L				<200	<200	<200	<200	<200	<200	<200	<200
Ethanol	µg/L				<200	<200	<200	<200	<200	<200	<200	<200
Methanol	µg/L	40,000	SWEG		<200	<200	<200	<200	<200	<200	<200	<200
2-Methyl-1-butanol	µg/L				<200	<200	<200	<200	<200	<200	<200	<200
2-Methyl-2-butanol	µg/L				<200	<200	<200	<200	<200	<200	<200	<200
3-Methyl-1-butanol (Isopentanol)	µg/L				<300	<300	<300	<300	<300	<300	<300	<300
2-Methyl-1-propanol	µg/L				<200	<200	<200	<200	<200	<200	<200	<200
2-Methyl-2-propanol	µg/L				<200	<200	<200	<200	<200	<200	<200	<200
1-Pentanol (Amyl alcohol)	µg/L				<200	<200	<200	<200	<200	<200	<200	<200
2-Pentanol (sec-Amyl alcohol)	µg/L				<200	<200	<200	<200	<200	<200	<200	<200
3-Pentanol	µg/L				<200	<200	<200	<200	<200	<200	<200	<200
1-Propanol	µg/L				<200	<200	<200	<200	<200	<200	<200	<200
2-Propanol (Isopropanol)	µg/L				<200	<200	<200	<200	<200	<200	<200	<200

NA=Not analyzed;  
MI=Matrix interference  
SWEG - 1000 days (11-2008)

Appendix 3. ISS WPA PWD and RIP Summary of Samples Returned During Expeditions 34 through 37

Mission	Sample Location	Potable Water	Maximum Contaminant Level (MCL)	Maximum Contaminant Level Source	Expedition 34		Expedition 35	Expedition 36		Expedition 37		Expedition 36
					Soyuz 32		Sovuz 33	Soyuz 34		Soyuz 35		Sovuz 34
Sample Description	Units				WPA PWD Ambient	WPA PWD Hot	WPA PWD Ambient	WPA PWD Ambient	WPA PWD Hot	WPA PWD Ambient	WPA PWD Hot	WPA RIP
Sample Date					Potable Water	Potable Water	Potable Water	Potable Water	Potable Water	Potable Water	Potable Water	Product Water (prior to MF bed R&R)
Analysis/Sample ID					2/11/2103 20130317001	2/19/2013 20130317004	4/8/2013 20130515001	7/30/2013 20130912001	8/26/2013 20130912002	10/8/2013 20131112001	11/6/2013 20131112002	8/19/2013 20130912005
<b>Glycols (DAI/GC/MS)</b>												
1,2-Ethanediol (Ethylene glycol)	µg/L	4000	SWEG	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000
1,2-Propanediol (Propylene glycol)	µg/L	1,700,000	SWEG	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000
<b>Siloxanes (GC/MS &amp; LC/MS/MS) (R&amp;D Method - NIST traceable standard not available)</b>												
Dimethylsilanediol (DMSD)	µg/L	25,000	SWEG	<500	<500	<500	3800	5700	12000	<500		5300
<b>Carboxylates (CE)</b>												
Acetate	µg/L			<625	<625	<625	<625	<625	<625	<625	<625	<625
Formate	µg/L	2,500,000	SWEG	<625	<625	<625	<625	<625	<625	<625	<625	<625
Glycolate	µg/L			<625	<625	<625	<625	<625	<625	<625	<625	<625
Glyoxylate	µg/L			<625	<625	<625	<625	<625	<625	<625	<625	<625
Lactate	µg/L			<625	<625	<625	<625	<625	<625	<625	<625	<625
Oxalate	µg/L			<1250	<1250	<1250	<1250	<1250	<1250	<1250	<1250	<1250
Propionate	µg/L			<1250	<1250	<625	<625	<625	<625	<625	<625	MI
<b>Aldehydes</b>												
Formaldehyde	µg/L	12,000/1,000	SWEG/EPA HA	<10	<10	<10	<10	<10	<10	<10	<10	<10
<b>Amines (CE)</b>												
Ethylamine	µg/L	Monoalkylamines 2000	SWEG	<250	<250	<250	<250	<250	<250	<250	<250	<250
Methylamine	µg/L	Monoalkylamines 2000	SWEG	<250	<250	<250	<250	<250	<250	<250	<250	<250
n-Propylamine	µg/L	Monoalkylamines 2000	SWEG	<500	<500	<500	<500	<500	<500	<500	<500	<500
Trimethylamine	µg/L	Trialkylamines 400	SWEG	<500	<500	<500	<500	<500	<500	<500	<500	<500
<b>Non-volatiles (LC/UV-VIS)</b>												
Urea	µg/L			<800	<800	<800	<800	<800	<800	<800	<800	<800
Caprolactam	µg/L	100,000	SWEG	<16	<32	<16	<16	<32	<16	<32	<32	<32
<b>Organic Carbon Recovery</b>												
Unaccounted Organic Carbon	percent			9.64	14.08	14.58	92.85	91.57	110.42	N/A	0.00	92.26
	mg/L			0.13	0.15	0.11	0.08	0.14	0.00	0.00	0.00	0.12

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SWEG - 1000 days (11-2008)