



Pilot Study Report

for

Z-92™ Uranium Treatment Process



conducted at

City of Lawrenceville, Georgia

January 8, 2007

Executive Summary

Uranium removal pilot study was conducted for the City of Lawrenceville, Georgia at their Ezzard Road Well No. 3 treatment facility. The City of Lawrenceville's water system contains concentrations of uranium and gross alpha that are in excess of the Maximum Contaminant Levels (MCL).

The City of Lawrenceville selected Water Remediation Technology's (WRT) Z-92™ Uranium Treatment Process as a possible cost effective solution for their uranium and gross alpha problem. WRT provided a 1.5 GPM (gallons per minute) treatment system, which was delivered and installed on September 25, 2006.

The purpose of this pilot study is to document the effectiveness of the WRT system on relatively high uranium and gross alpha and to provide information necessary to meet regulatory compliance.

The treatment system has successfully met uranium and gross alpha compliance at all times during the pilot study. The system was in operation for 49 days prior to writing this report and effectively reduced the level of uranium (Figure 1) and gross alpha (Figure 2).

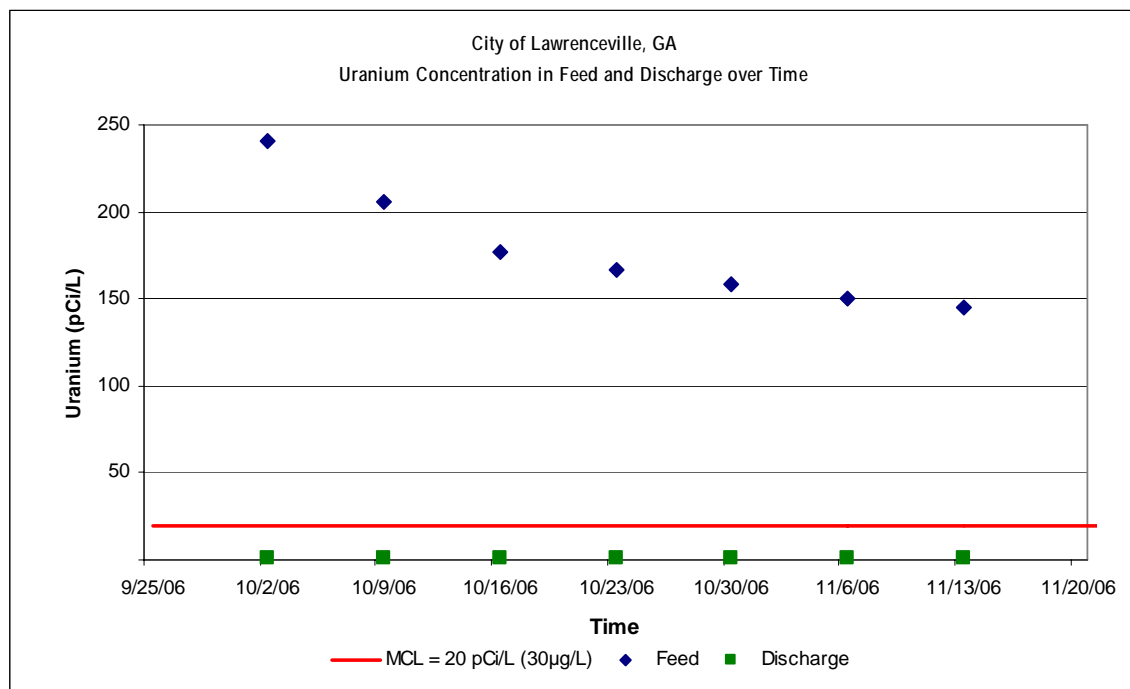


Figure 1

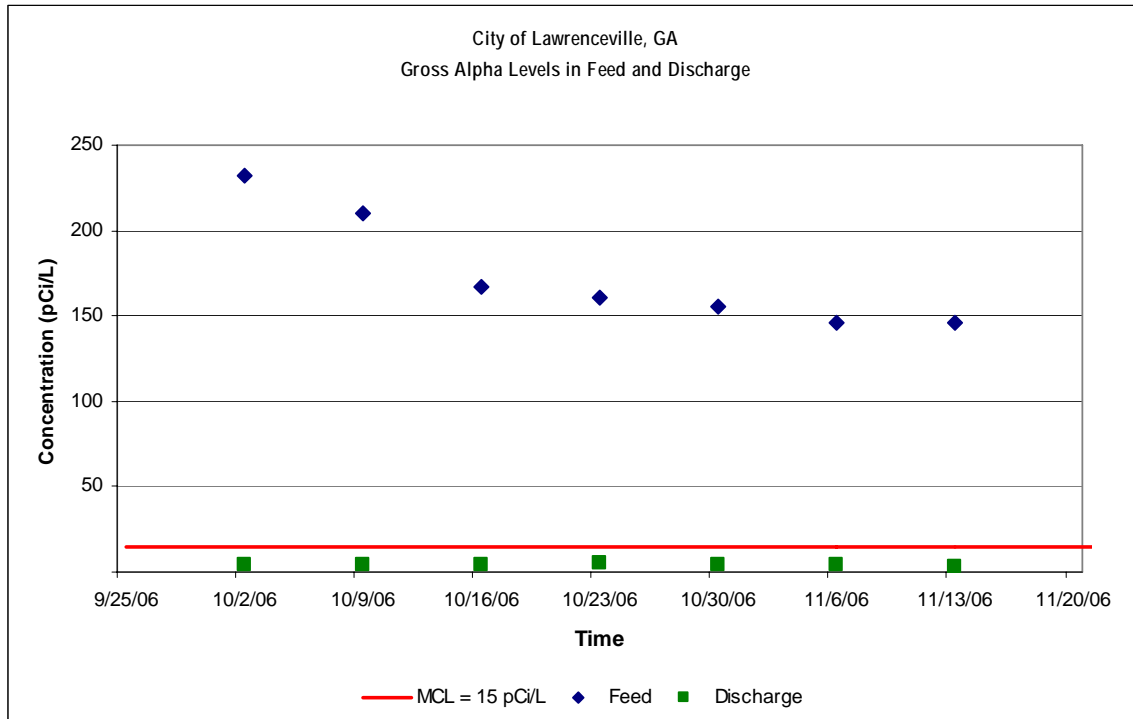


Figure 2

The results are also shown in Table 1. The average feed concentration of uranium, 177.8 pCi/L was reduced to 0.7 pCi/L after column 2 and has yet to exceed 1.1 pCi/L. The discharge concentrations were all well below the MCL of 20 pCi/L. The average feed concentration of gross alpha, 173.9 pCi/L was reduced to 4.2 pCi/L and has yet to exceed 5.1 pCi/L. The discharge concentrations were all well below the gross alpha MCL of 15 pCi/L

Table 1. Uranium levels in feed and discharge water.

URANIUM	Feed (pCi/L)	Discharge @ Column 2 (pCi/L)
Uranium MCL	NA	20
Average	177.8	0.7
Highest value	241.0	1.1
Lowest Value	145.3	<0.6
Gross Alpha	Feed (pCi/L)	Discharge @ Column 2 (pCi/L)
Gross Alpha MCL	NA	15
Average	173.9	4.2
Highest value	232.0	5.1
Lowest Value	146.0	3.1



Application Information

The City of Lawrenceville, Georgia is located in Gwinnett County, about 32 miles northeast of Atlanta. The City of Lawrenceville has a population of approximately 22,000 residents. The City currently purchases approximately 85 to 90% of their water from Gwinnett County, which is surface water from Lake Lanier. The remaining 10 to 15% is supplied by 11 wells. The water source for these wells is drawn from the Crystalline Rock Aquifer of the Piedmont region of Georgia. Ezzard Road Well No. 3 treatment facility was chosen for this pilot study. This well pumps an average of 130 gallons per minute and has a depth of approximately 450 feet.

Technology Overview

Water Remediation Technology's (WRT) Z-92™ Uranium Treatment Process utilizes proprietary adsorptive media in a series of up flow treatment vessels to reduce gross alpha and remove uranium from drinking water. The water is moved through the treatment system using the water pressure generated from the well source. No chemicals are added to the water for the treatment process. After the media is loaded with uranium, it is removed from the circuit and permanently disposed of in a licensed facility. WRT designs, manufactures and provides the equipment and media used in the facility. The handling and exchange of new media to replace spent media, as well as the shipping and disposal into licensed disposal sites, is handled by WRT. The treatment media is ANSI/NSF Standard 61 certified for use in drinking water.

Equipment Overview

The pilot equipment was installed at the City of Lawrenceville's Ezzard Road Well No. 3 treatment facility. The treatment system used consists of two 6-inch diameter by 30-inch vertical height treatment vessels, each containing 12-inches of process media. The source water enters the unit through a control valve and enters the bottom of the first treatment vessel. Both columns operate in an up-flow mode, with the flow exiting the top of the first column, then following the same flow path through columns 2 (see Figure 2). The last component in the system is a safety filter. Sample ports are located prior to the first vessel, and after the second vessel.

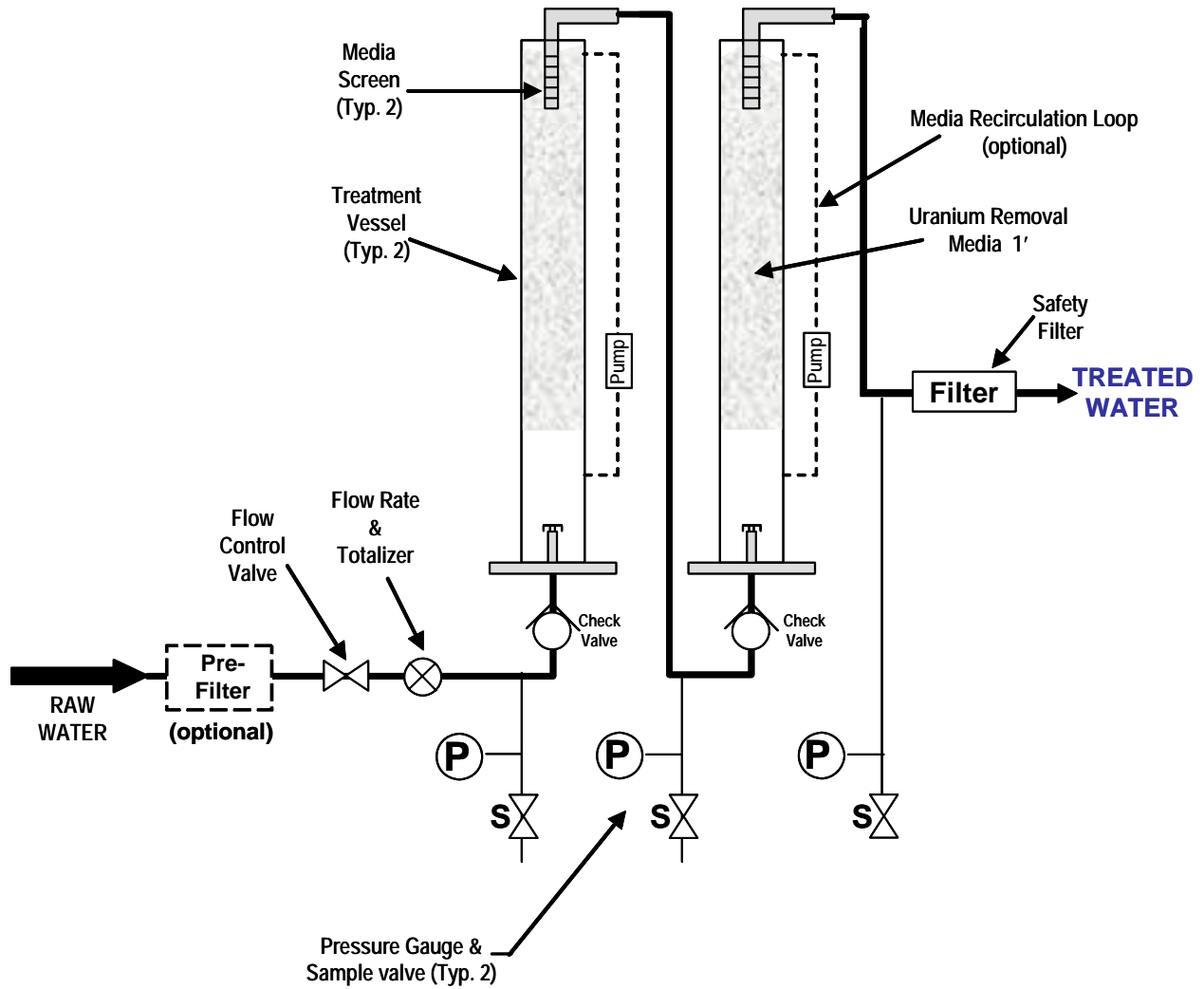


Figure 2. Simplified Process Flow Diagram

City of Lawrenceville's
Z-92™ treatment system





Statement of Purpose

The uranium levels in the raw water during the pilot study were as high as 241.0 pCi/L, exceeding the Environmental Protection Agency (EPA) mandated uranium MCL of 20 pCi/L.

The purposes of this pilot study are to:

- Demonstrate the ability of the WRT Z-92™ Uranium Treatment Process to consistently and effectively reduce the uranium and gross alpha content to below the MCL on this specific water.
- Demonstrate the reliability and ease of operation of the WRT Process.
- Comply with regulatory requirements.
- Develop Design Criteria for the Full-Scale System.

Delivery and Installation of the Treatment System

The treatment system was delivered and installed in the City of Lawrenceville Ezzard Road Well No. 3 treatment facility on September 25, 2006. Set up consisted of mounting the columns to a frame and connecting the water source and discharge line. The pilot study began the same day. Data was collected for 49 days prior to writing this report.

Operator training for system operation, monitoring and sampling was conducted on the day of installation and a schedule for sampling was established. Samples were collected by The City of Lawrenceville's personnel from sample valves located in the feed line and after discharge from each respective treatment vessel, at pre-determined sample intervals.

Analytical

The samples for uranium, gross alpha and radon analysis were delivered to Radiation Safety Engineering, Inc. in Chandler, Arizona. Samples for inorganic water quality analysis were delivered to Analytical Services, Inc. in Norcross, Georgia. Both laboratories are National Environmental Laboratory Accreditation Program certified laboratories. Methods for analysis were:

Uranium	00-07
Gross Alpha	600 / 00-02
Radon	7500-Rn

Results

The sampling results are shown in Table 2 and 3. Feed samples were collected immediately prior to the first treatment vessel. Intermediate column samples were collected immediately after column 1 and the final discharge sample was taken after column 2. Analytical laboratory certificates are attached as Appendix A. Figure 4 and 5 shows uranium and gross alpha levels in the feed water entering the treatment system, and treated water exiting the system. The graphs clearly show that the system consistently and successfully reduced the uranium and gross alpha in the treated water to levels significantly below the required MCL.

Table 2. Uranium Test Results

Uranium Date	Column Concentrations (pCi/L)			MCL
	Feed	C1	C2	
9/25/06				20.0
10/2/06	241.0	1.5	<0.6	20.0
10/9/06	206.0	<0.6	<0.6	20.0
10/16/06	177.0	<0.6	<0.6	20.0
10/23/06	167.0	<0.6	<0.6	20.0
10/30/06	158.0	<0.6	<0.6	20.0
11/6/06	150.0	4.8	1.1	20.0
11/13/06	145.3	2.5	<0.6	20.0

Figure 4 below, presents in graph format, the data in Table 2.

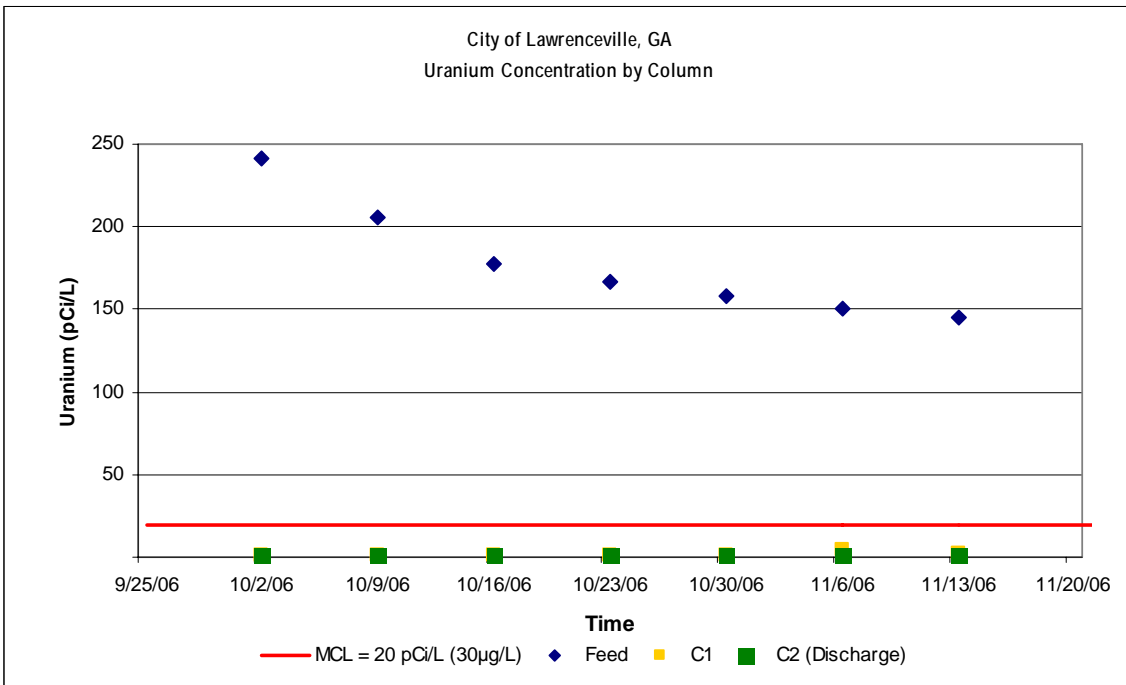
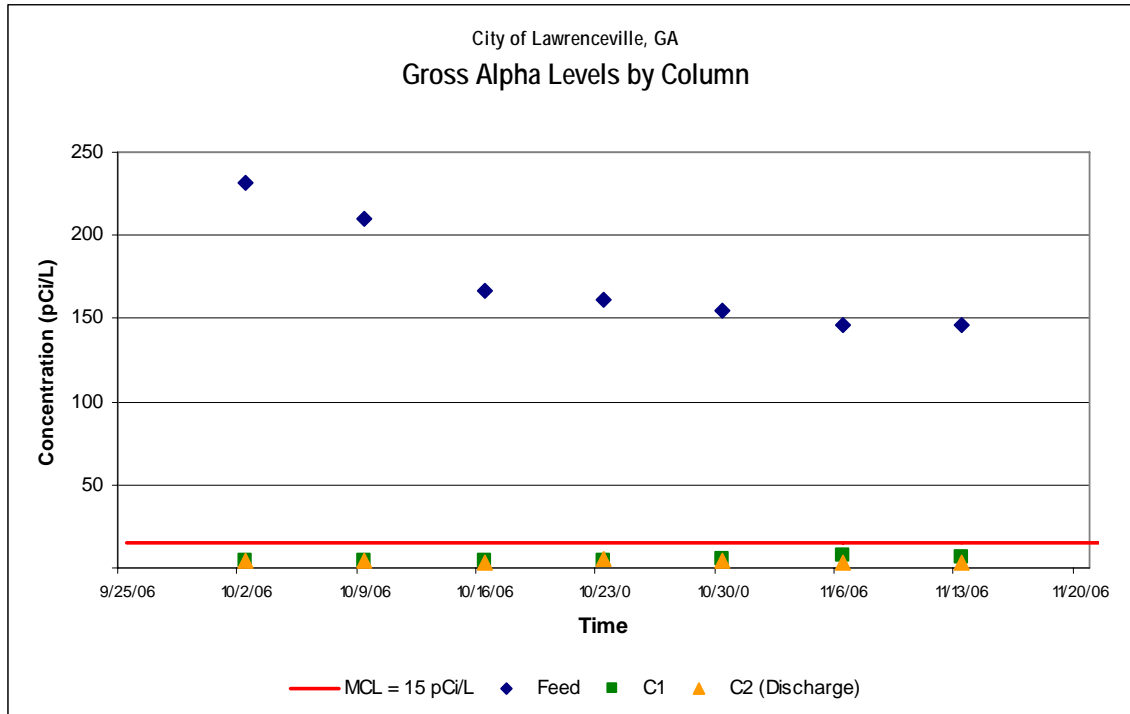


Figure 4

Table 3. Gross Alpha Test Results

Gross Alpha Date	Column Concentrations (pCi/L)			
	Feed	C1	C2	MCL
9/25/06				15.0
10/2/06	232.0	4.8	4.5	15.0
10/9/06	210.0	4.8	4.4	15.0
10/16/06	167.0	4.0	3.7	15.0
10/23/06	161.0	4.5	5.1	15.0
10/30/06	155.0	5.1	4.7	15.0
11/6/06	146.0	8.0	3.7	15.0
11/13/06	146	6.6	3.1	15.0

Figure 4 below, presents in graph format, the data in Table 2.





Water Quality

A water quality analysis was performed on feed water to the treatment system and on treated water exiting the WRT system to document any changes in water quality through the treatment process. The results of those tests are shown in Table 4. Other than the reduction of gross alpha, uranium and some reduction in iron and manganese, there is no significant change to the water quality. Support documentation for Table 4 is attached as Appendix B.

Table 4. Water Quality Test Results

City of Lawrenceville, GA – Water Quality Data			
Item	Pre WRT Process	units	Post WRT Process
Alkalinity	99	mg/L	100
Arsenic	ND	mg/L	ND
Bicarbonate Alkalinity	99	mg/L	100
Calcium	25	mg/L	25
Chloride	3.1	mg/L	3.1
Color	ND	Pt-Co Units	ND
Dissolved Sulfide	ND	mg/L	ND
Fluoride	0.7	mg/L	0.7
Free Carbon Dioxide	4.7	mg/L	4.5
Hydrogen Sulfide	ND	mg/L	ND
Iron	ND	mg/L	ND
Magnesium	5.3	mg/L	5.3
Manganese	0.1	mg/L	0.1
Nitrate Nitrogen	ND	mg/L	ND
Nitrite Nitrogen	ND	mg/L	ND
Nitrite-Nitrate Nitrogen	ND	mg/L	ND
Odor	16.9	threshold Odor N	11.8
pH	7.62	Units	7.65
Phosphorus	ND	mg/L	ND
Potassium	2.3	mg/L	2.3
Sodium	11	mg/L	11
Specific Conductance	238	umhos/cm	237
Sulfate	6	mg/L	7
Total Dissolved Solids	150	mg/L	150
Total Hardness	84	mg/L	84
Turbidity	ND	NTU	ND
Zinc	ND	mg/L	ND

Note: ND is non-detectable levels.

Hydraulic Loading Rate, EBCT

The treatment unit operates only when the deep well is providing water to the distribution system. The average flow rate through the treatment unit, when operating, was 1.50 GPM. The HLR at this flow rate is 7.6 GPM per square foot. The total gallons treated during the pilot study are summarized in Table 5 and Appendix D.

The EBCT at this HLR through three treatment vessels, each containing 15 inches of media, is 1.3 minutes each, for a cumulative EBCT of 2.5 minutes.

Table 5. Cumulative treated flow in gallons

Sample Data	Treated Flow in Gallons
9/25/06	57
10/2/06	13,997
10/9/06	28,603
10/16/06	43,244
10/23/06	57,273
10/30/06	10,753
11/6/06	25,501
11/13/06	40,234

Radon Results

Radon occurs in drinking water as a result of the radioactive decay process of uranium. Samples were collected during this study to determine if significant radon was generated by the capture of uranium by the WRT media and to evaluate the general level of radon in the product water. Table 6 contains the radon test results taken during the pilot study. These results indicate that the WRT process does not contribute a significant amount of radon to the water. Support documentation for Table 6 is attached as Appendix C.

Table 6. Radon Test Results

Radon Date	Column Concentrations (pCi/L)	
	Feed	C2
11/1/06	1643.0	1672.0



Radiation Safety

The treatment system is designed to collect uranium, a naturally occurring radioactive material, while in operation. Because of this action, it gradually becomes radioactive during normal operation. WRT both predicts and monitors the level of radiation present in the treatment system.

The total amount of radiation that members of the public can be exposed to is 2 mrem per hour and 100 mrem over the course of a year. WRT's maximum measured activity is less than half of the hourly exposure limit. Due to the limited amount of operator attention necessary for the pilot test, the annual exposure limit is also readily met.

WRT has prepared a safety plan for its tests that includes radiation level monitoring, logging time spent in proximity to a test unit, emergency procedures to be followed and an introduction to radiation safety for operators. Operators are instructed in radiation safety before the pilot test is started.

Any full scale system will include appropriate equipment, radiation level monitoring, and a corresponding safety plan approved by regulatory authorities.

Operational Results

An operation log was maintained during the pilot study, and is attached as Appendix D. The treatment system operated throughout the course of this test without any operational problems.

Conclusion

The WRT Z-92™ Uranium Treatment Process consistently reduced the uranium in the system discharge to levels well below the required MCL. The treatment system operated easily and reliably during the study. There were no equipment or operational problems of any kind.

WRT would like to thank the personnel and staff of the City of Lawrenceville for their cooperation and participation in this study.



Appendices available upon request