U.S. Department of Energy
Grand Junction Office
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WM-42

JUN 05 2002

Mr. Daniel M. Gillen, Chief
Fuel Cycle Facilities Branch, NMSS
Two White Flint North
11545 Rockville Pike
Mail Stop T8A33
Rockville, MD 20852-2747

Subject: Request for NRC Approval to Authorize Deletion of Institutional Controls (Area C at Canonsburg, Pennsylvania)

Dear Mr. Gillen:

This letter is concerning the Invitation to Bid for the purchase of the Canonsburg, Pennsylvania, 3.109-acre parcel of land, Area C, issued February 19, 2002.

Don Metzler, Program Manager for the Department of Energy, and I have recently spoken to Bill Von Till of your staff concerning the sale of this site. This is a rather urgent matter because the state has already advertised the property and obtained bids, pending approval of the DOE and NRC. The DOE believes that ground water standards for uranium have been met. In addition, there was a concern about potential drawdown from properties adjacent to Area C and its potential impacts on the purchased property. The DOE has made a calculation utilizing the Theis equation and reasonable parameters. The result of this calculation demonstrates that there would be negligible inflow toward the Area C property.

Enclosed with this letter is DOE's proposed quitclaim deed provisions and other supporting documentation. Also enclosed is a detailed memorandum on the justification of unrestricted use of ground water at Area C. Please have your staff and legal counsel review this information and provide me with an approval statement if the NRC concurs in this action.

If you have any questions, please contact me at 970/248-7620 or Don Metzler at 970/248-7612. Your cooperation in this matter is appreciated.

Sincerely,

Cooper H. Wayman, REM 9921
Senior Legal Counsel

Enclosures

NMSS08
A00

cc w/enclosures:
M. Schwartz, NRC, MS 15D21
W. Von Till, NRC, MS T7J8
E. Greybourne, DOE-GJO
Project File LCAN 1.3 (A. Garcia)
Legal File D4004.03I

cc w/o enclosures:
K. Walter, State of Pennsylvania
D. Metzler, DOE-GJO
R. Plieness, DOE-GJO

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Justification for Unrestricted Ground Water Use Beneath Area C -- Adjacent to the Canonsburg UMTRA Project Disposal Site

1.0 Introduction

The purpose of this document is to justify unrestricted use of ground water in the uppermost aquifer beneath Area C (parcel of land just east of Strabane Avenue and bordered by Chartiers Creek and the railroad) adjacent to the Canonsburg, Pennsylvania Uranium Mill Tailings Remedial Action (UMTRA) Project disposal site (Figure 1). Area C is currently owned by the Commonwealth of Pennsylvania, who is offering the property for sale. In the interest of not encumbering the deed to the property, an assessment of ground water conditions is presented along with a justification for unrestricted use. This designation will need the approval of the U.S. Nuclear Regulatory Commission (NRC) since ground water use restrictions are imposed through the Ground Water Compliance Action Plan (GCAP) (DOE 2000).

2.0 Ground Water Conditions

The uppermost aquifer consists of unconsolidated materials overlying bedrock of the Pennsylvanian Casselman Formation. The unconsolidated materials are composed of sandy loam to silty clay, clay, alluvium, and fill material up to 30 feet (ft) thick. These materials are heterogeneous and do not form discrete, continuous units. The permeability is variable because of the types and placement of the materials.

Ground water is present in the unconsolidated materials and shallow bedrock under unconfined conditions with a saturated thickness of approximately 10 ft. Ground water flows toward Chartiers Creek which is the normal discharge zone for the shallow ground water. Although some ground water is present in the unconsolidated materials and shallow bedrock beneath the site, neither unit is considered a viable aquifer from a water resource perspective, but only in the sense that the zone is capable of discharging to surface water (Appendix A to 10 CFR Part 40). Because the materials are not ideal for aquifer formation and the source of recharge to the shallow units is minimal, sustained yield to a well from these units would be limited.

Most of the residents in the area are connected to a municipal water system which is supplied by surface water. Shallow ground water is not normally used as a drinking water supply in the area.

3.0 Extent of Ground Water Contamination

Some site-related contamination is present in ground water in the uppermost aquifer downgradient from the disposal cell and adjacent to Chartiers Creek in the area of the main processing site, as well as in Area C just east of the main site. Uranium is the only constituent of

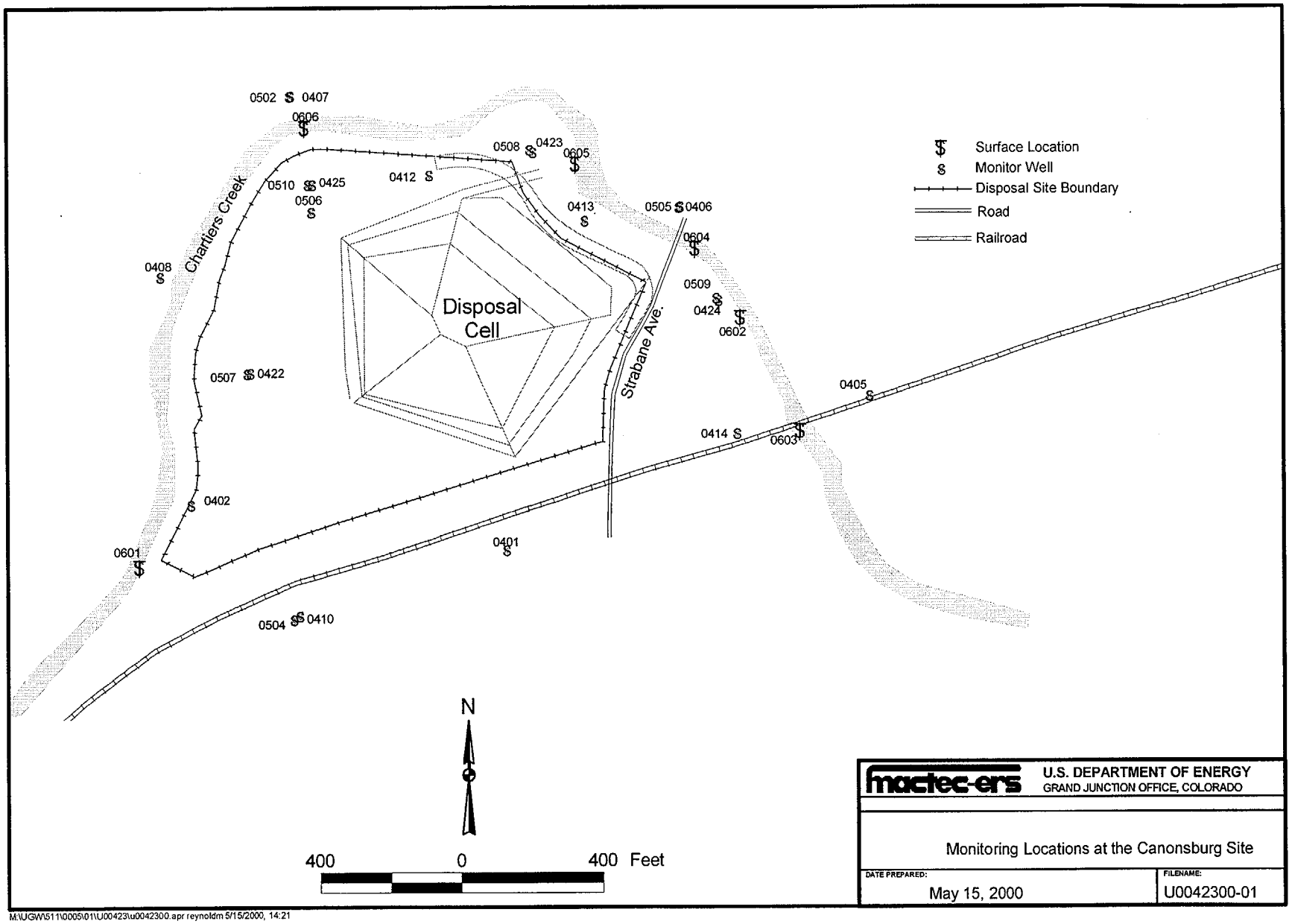

Figure 1. Monitoring Locations at the Canonsburg, Pennsylvania, Site

potential concern that exceeds the maximum concentration limit (MCL) in ground water. Characterization information from the past 18 years indicates that concentrations of other constituents in ground water have been relatively stable. No concentrations of any regulated constituents have been detected above the MCLs in surface water adjacent to the site.

Source areas for contaminant leaching to ground water existed in the main processing area and in Area C. The principal source areas were removed during remedial action from 1984 to 1986 and stabilized in the disposal cell onsite. Since that time, residual contamination in the saturated unconsolidated materials has presumably continued its migration toward Chartiers Creek, where the aquifer discharges. Elevated levels of uranium, manganese, selenium, and other constituents, have been identified at the site. With the exception of uranium, constituents that were elevated relative to existing standards or background in years past have decreased to, and remain at, acceptable levels. Distribution of contaminants in the unconsolidated materials is sporadic, and no well-defined contaminant plumes are apparent.

4.0 Ground Water Compliance Strategy and Monitoring Results

The ground water compliance strategy for the Canonsburg site is no remediation in conjunction with application of an alternate concentration limit (ACL) for uranium (DOE 2000). The compliance strategy includes ground water monitoring and institutional controls to ensure that the application of an ACL will continue to be protective of human health and the environment. The ACL for uranium is 1.0 milligram per liter (mg/L) at the point of compliance (POC) wells and 0.01 mg/L at the point of exposure (POE) in Chartiers Creek. POC well 0414 (recently replaced by well 0414A because well 0414 was destroyed) is in Area C (Figure 1). The U.S. Environmental Protection Agency (EPA) numerical standard for uranium is 0.044 mg/L (Table 1 to Subpart A of 40 CFR 192).

Ground water in the shallow unconsolidated materials downgradient from the Canonsburg disposal site has been monitored in the POC wells since 1986 with a maximum uranium concentration of 0.185 mg/L in POC well 0414 in the fall of 1995 (Figure 2). Since that time, uranium concentrations in ground water have generally been decreasing, as shown in all three POC wells (Figure 3). Concentrations of uranium in POC well 0414 have been at or below the MCL of 0.044 mg/L since the fall of 1998 and continue to decrease. This indicates that natural attenuation processes are working within the system as predicted (DOE 2000).

Monitoring of ground water in POC well 0414A in Area C will continue through late 2004 as specified in the GCAP (DOE 2000) and the revised Long-Term Surveillance and Maintenance Plan (LTSP) (DOE 2002 - revision in progress).

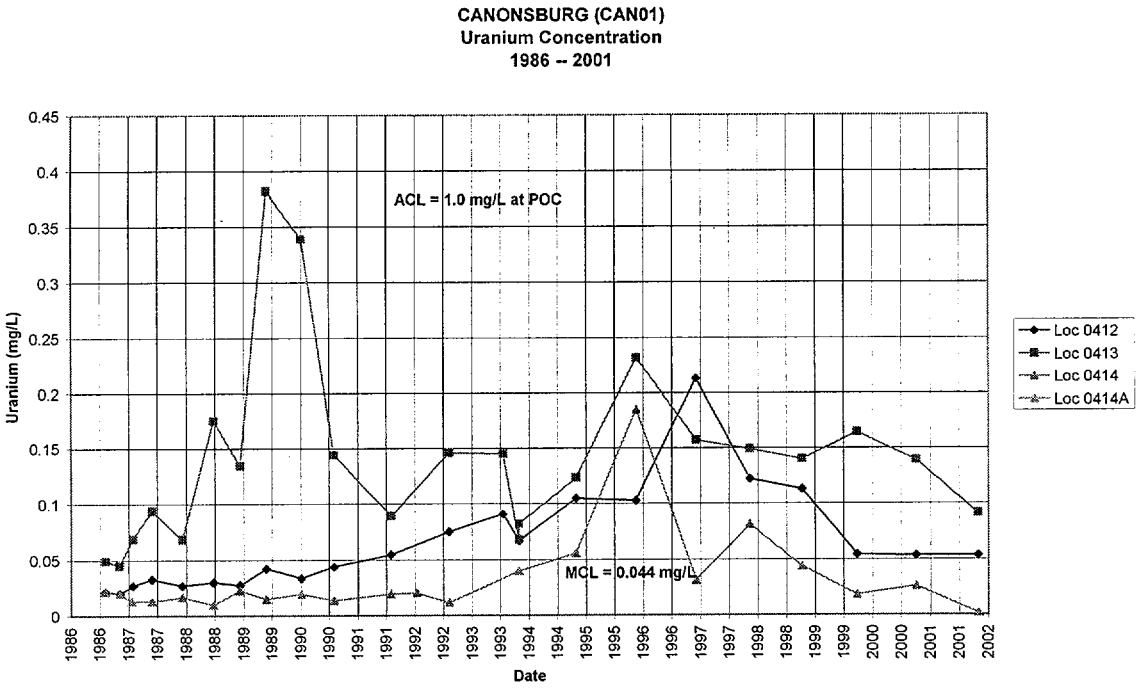

Figure 2. Uranium Concentration 1986–2001

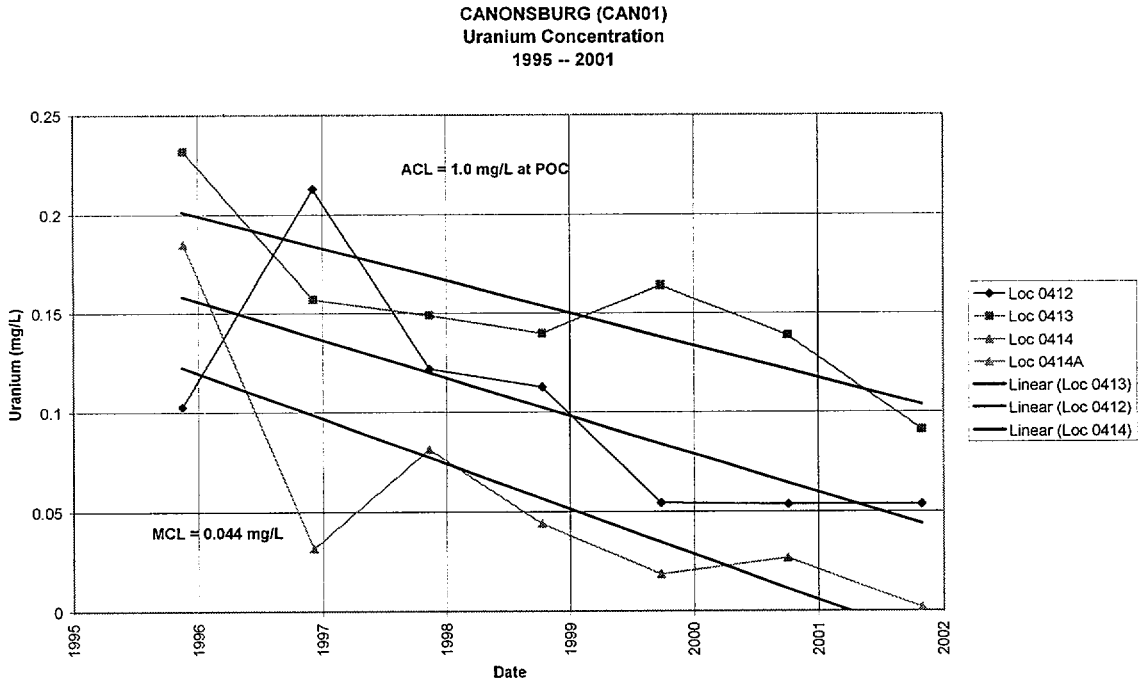

Figure 3. Uranium Concentration 1995–2001

5.0 Analytical Solution of Potential Drawdown in Area C

The analytical approach used here is the Theis Solution. This solution is for an ideal aquifer that is: (1) horizontal, (2) confined between impermeable formations on top and bottom, (3) infinite in horizontal extent, (4) of constant thickness, and (5) homogeneous and isotropic with respect to its hydrogeological parameters. This equation written in terms of drawdown, is

$$h_0 - h = \frac{Q}{4\pi T}\int_u^\infty \frac{e^{-u}du}{u}$$

where

$$u = \frac{r^2 S}{4Tt}$$

The integral is called the exponential integral. For the specific definition of u given above, the integral is known as the *well function, W(u)*. With this notation the equation becomes

$$h_0 - h = \frac{Q}{4\pi T}W(u)$$

However, Freeze and Cherry (1979), indicate that the same equation can be used for an unconfined aquifer "but with the argument of the well function defined in terms of the specific yield (S_y) rather than the storativity (S). The transmissivity (T) must be defined as $T=K_xb$, where K_x is the saturated hydraulic conductivity and b is the *initial* saturated thickness."

They also state "it can be observed that water-level drawdowns in piezometers adjacent to pumping wells in unconfined aquifers tend to decline at a slower rate than that predicted by the Theis solution." Therefore, the drawdown calculations will be conservative.

Freeze and Cherry (1979) indicate that the usual range of S_y is 0.01 to 0.30. The S_y is approximately equal to the effective porosity, therefore using a small value for S_y is conservative. The modeling study for the Canonsburg site uses a porosity value of 0.34 ("Documentation of Ground Water and Surface Water Modeling" -- Appendix C of the *Application for Alternate Concentration Limits for the Canonsburg, Pennsylvania, UMTRA Project Site* – DOE 2000). A realistic value for effective porosity (or S_y) would be 0.20.

Other parameter values needed for the equations are from Appendix C of DOE 2000 (see above reference). These are:

- Saturated hydraulic conductivity (K_x) – 9 to 25 ft/day.
- Saturated thickness (b) – 5 to 6 ft.
- Radial distance from well (r) – approximately 250 from property boundary to center of Area C.

The pumping rate (Q) used is 1 gal/min (192.5 ft^3/day). This is much less than the 7 gal/min at each of 3 wells in the pump-and-treat alternative discussed in Section 3.0 of the *Application for*

Alternate Concentration Limits for the Canonsburg, Pennsylvania, UMTRA Project Site – DOE 2000. However, that document also states "it is unlikely that the wells could sustain this yield for extended periods of time." This is primarily due to the limited saturated thickness of the aquifer.

The variable t is the pumping time in days. Drawdown at 1, 2, 4, 5, and 10 years will be provided for each set of parameter values.

From the equations above it is evident that:

- The smaller the S_y, the greater the drawdown.
- The smaller the T, (i.e. K_x and b, the greater the drawdown.
- The larger the t, the greater the drawdown.
- The larger the r, the less the drawdown.

The most conservative drawdown estimated will be with small S), small K_x, and small b. The table below provides some drawdown values for different combinations of parameter values. The most likely values for drawdown are in the last set of parameter values.

S_y	T (ft^2/day)	r (ft)	Q (ft^3/day)	t (day)	drawdown (ft)
0.30	45.	100.	192.5	365	0.870
0.30	45.	100.	192.5	730	1.098
0.30	45.	100.	192.5	1460	1.330
0.30	45.	100.	192.5	1825	1.405
0.30	45.	100.	192.5	3650	1.646
0.01	45.	100.	192.5	365	2.013
0.01	45.	100.	192.5	730	2.248
0.01	45.	100.	192.5	1460	2.484
0.01	45.	100.	192.5	1825	2.560
0.01	45.	100.	192.5	3650	2.796
0.01	150.	100.	192.5	365	0.727
0.01	150.	100.	192.5	730	0.797
0.01	150.	100.	192.5	1460	0.868
0.01	150.	100.	192.5	1825	0.891
0.01	150.	100.	192.5	3650	0.962
0.01	45.	200.	192.5	365	1.542
0.01	45.	200.	192.5	730	1.777
0.01	45.	200.	192.5	1460	2.013
0.01	45.	200.	192.5	1825	2.088
0.01	45.	200.	192.5	3650	2.324
0.01	45.	250.	192.5	365	1.391
0.01	45.	250.	192.5	730	1.626
0.01	45.	250.	192.5	1460	1.861
0.01	45.	250.	192.5	1825	1.937
0.01	45.	250.	192.5	3650	2.172
0.20	45.	250.	192.5	365	0.430
0.20	45.	250.	192.5	730	0.636
0.20	45.	250.	192.5	1460	0.856
0.20	45.	250.	192.5	1825	0.929
0.20	45.	250.	192.5	3650	1.159 ***

*** Expected drawdown (ft) for most likely and/or conservative parameter values.

In conclusion, it appears that a pumping well, with Q = 1 gal/min, in the approximate center of Area C, would have little if any affect on drawing contamination from the Canonsburg disposal site. The maximum drawdown that could be expected at the property line, that is approximately 250 ft from the center or Area C, is just over 1 ft. Recall from the discussion above that the Theis equation, which is for a confined aquifer, will overestimate the drawdown for an unconfined aquifer. In addition, because of the limited saturated thickness of the unconfined aquifer, it is doubtful that the aquifer could sustain even this small pumping rate for any period of time. Therefore, it is unlikely that any ground water pumping activity in Area C would have any influence on migration of the plume from beneath the Canonsburg disposal site, and adversely impacting ground water beneath Area C.

6.0 Justification for Unrestricted Ground Water Use

Results of ground water monitoring have shown that concentrations of uranium in ground water in the uppermost aquifer beneath Area C are decreasing, and all indications are that this trend will continue into the future (Figure 3). Concentrations of uranium have been at or below the MCL of 0.044 mg/L since 1998. DOE will continue to monitor ground water in this area for confirmation of the predicted trends, as required by the GCAP and LTSP (DOE 2000 and 2002).

Justification for unrestricted ground water use includes the following concepts: 1) the unconsolidated materials and shallow bedrock are not considered a viable aquifer from a water resource perspective because the materials are not ideal for optimal aquifer formation and the source of ground water recharge is minimal, 2) sustained yield from a well would be limited, 3) there is no historical use of ground water as a resource in this immediate area, 4) water for domestic purposes is readily available from the municipal water supply system, 5) concentrations of uranium have been at or below the MCL since fall of 1998, and (6) an analytical solution of potential drawdown in Area C shows that even if the aquifer could sustain a small pumping rate for any period of time, this would have little if any affect on drawing contamination from the Canonsburg disposal site.

Consequently, there is no need for DOE to restrict use of ground water beneath Area C, as concentrations of uranium are below the MCL and there is no unacceptable risk to human health and the environment.

7.0 References

Freeze, R.A., and J.A. Cherry, 1979. *Groundwater*, Prentice-Hall, Englewood Cliffs, NJ, 604 pp.

U.S. Department of Energy (DOE), 1995. *Long-Term Surveillance Plan for the Canonsburg, Pennsylvania, Disposal Site*, DOE/AL/62350-203, Rev. 0, October.

———, 2000. *Ground Water Compliance Action Plan for the Canonsburg, Pennsylvania, UMTRA Project Site*, Document Number U0035901, February.

———, 2002 (revision in progress). *Long-Term Surveillance Plan for the U.S. Department of Energy Canonsburg Uranium Mill Tailings Disposal Site, Canonsburg, Pennsylvania*, GJO-2002-xxx-TAR, Rev. 0.