

## **EXHIBIT LIST**

- Exhibit 1: Section 1: Area of Review, UIC Permit Application For Bittinger #1(fragment)  
*(part of administrative record item #3)*
- Exhibit 2: Section 1: Area of Review, UIC Permit Application For Bittinger #4 (fragment)  
*(part of administrative record item #4)*
- Exhibit 3: Statement of Basis for draft permit for Bittinger #1  
*(part of administrative record item #7)*
- Exhibit 4: Statement of Basis for draft permit for Bittinger #4  
*(part of administrative record item #8)*
- Exhibit 5: Responsive Summary to Public Comment  
*(administrative record item #13)*

## **EXHIBIT 1**

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Section 1



**TETRA TECH**

21335 Signal Hill Plaza, Suite 100, Sterling, VA 20164 703-444-7000 703-444-1685 (FAX)

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## **TECHNICAL MEMORANDUM**

**TO:** Dale Skoff, Tetra Tech NUS

**FROM:** Jeffrey Benegar

**DATE:** October 4, 2010

**RE:** Area of Review/Zone of Endangerment Analysis for Bittering #1 and #4 Well – Bear Lake Properties

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### **EXECUTIVE SUMMARY**

This technical memorandum (TM) summarizes the analytical modeling we have performed for the area of review/zone of endangerment analysis for the potential brine disposal injection wells, Bittering #1 and #4, located in Columbus Township, Warren County, Pennsylvania. The relevant parameters for our analysis were obtained from Bear Lake Properties, LLC or estimated in the absence of any information. Our analysis is described in more detail below.

### **OVERVIEW AND METHODOLOGY**

There are several methods proposed for calculating the zone of endangerment of an injection well. The most simplistic method is the use of a fixed radius, based on the type of injection well being permitted. Other methods involve calculation of the radius based on well and formation properties. Most regulatory agencies require the use of calculations to determine the zone of endangerment. The method used here is the graphical method first used by US EPA Region 6. It involves the calculation of the increase of pressure in the formation due to injection, then converting that pressure into equivalent feet of head. The increase in head in the formation due to injection is then compared to the equivalent head of the lowest most underground source of drinking water (USDW). When plotted graphically, the intersection of those two curves at some distance,  $r$ , determines the radius of the zone of endangerment.

The increase in pressure in the formation due to injection depends on the properties of the injection fluid and the formation, the rate of fluid injection, and the length of time of injection. The most common mathematical expression to describe this increase in pressure was developed by Matthews and Russell (1967). Matthews and Russell assume that, for a single well injecting

into an infinite, homogeneous and isotropic, non-leaking formation, the increase in pressure ( $\Delta p$ ) can be described as:

$$\Delta p = 162.6 Q\mu / kh * [(\log(kt / \Phi\mu Cr^2) - 3.23)] \text{ where:}$$

$\Delta p$  = pressure change (psi) at radius,  $r$  and time,  $t$

$Q$  = injection rate (barrels/day)

$\mu$  = injectate viscosity (centipoise)

$k$  = formation permeability (millidarcies)

$h$  = formation thickness (feet)

$t$  = time since injection began (hours)

$C$  = compressibility (total, sum of water and rock compressibility) ( $\text{psi}^{-1}$ )

$r$  = radial distance from wellbore to point of investigation (feet)

$\Phi$  = average formation porosity (decimal)

### PARAMETERS USED IN THE ANALYSIS

The following parameters were used in the zone of endangerment analysis. There are several parameters that are unknown, including injection rate and formation permeability. For injection rate, we used the average and maximum rates expected. For permeability, we estimated a value considered representative of the average of the upper and lower range of values for this parameter.

#### Bittinger #1 Medina Group Well

$Q$  = 1000 (average rate) or 2000 (maximum rate) barrels/day

$t$  = 10 years = 87,600 hours

$\mu$  = 1 centipoise

$k$  = 100 md

$h$  = 30 feet

$C$  =  $3.0\text{e-}06 \text{ psi}^{-1}$

$\Phi$  = 0.08

Specific gravity of injectate = 1.218

Surface elevation = 1518 feet

Depth to injection formation = 4210 feet

Base of lowest most USDW = 1218 feet in elevation (depth of 300 feet below surface)

Initial pressure at top of injection formation = 128 psi

#### Bittinger #4 Medina Group Well

$Q$  = 1000 (average rate) or 2000 (maximum rate) barrels/day

$t$  = 10 years = 87,600 hours

$\mu$  = 1 centipoise

$k$  = 100 md

$h$  = 30 feet

$C$  =  $3.0\text{e-}06 \text{ psi}^{-1}$

$\Phi$  = 0.08

Specific gravity of injectate = 1.218

Surface elevation = 1561 feet

Depth to injection formation = 4285 feet

Base of lowest most USDW = 1261 feet in elevation (depth of 300 feet below surface)  
Initial pressure at top of injection formation = 128 psi

## RESULTS

The Matthews and Russell equation was solved for various distances from the wellbore based on the parameters listed above. The distance between the Bittinger #1 and #4 wells is approximately ¼ mile. The Matthews and Russell equation was used to calculate the increase in pressure in the formation with only one of these wells injecting. The results are shown in Table 1 for the two scenarios simulated. This increase in pressure was added to the values of delta p and the existing pressure in the injection formation to obtain the total pressure in the formation when both wells are injecting.

Table 1. Increase in pressure in formation due to both Bittinger wells injecting.

Scenario	Increase in pressure (psi)
Q = 1000 bpd, k = 100 md	222
Q = 2000 bpd, k = 100 md	443

These values were then converted to feet of head of formation brine. The values are plotted against distance from the wellbore and are shown in Figure 1 for the Bittinger wells for the two scenarios simulated (*e.g.*, 2 unknowns: 2 injection rates and 1 permeability value). The plot shows the calculated pressure surface within the injection formation, measured as feet of head of formation brine above the top of the injection formation. Also shown is the head of the lowest most USDW. Where the two lines intersect, the radius of the zone of endangerment can be estimated. The increase in head in the formation due to injection will remain below the elevation of the lowest most USDW assuming even worst-case conditions (maximum injection rate of 2000 bpd).

As indicated above, certain input parameters (*e.g.*, permeability) were approximated due to lack of site-specific data. In order to validate the findings of the analysis presented above, Bear Lake Properties plans to monitor fluid levels in the monitoring wells designated below on a semiannual basis. The proposed monitoring wells were all completed in the Medina Group rocks, as were the two proposed injection wells.

Injection Well	Monitoring Well	Approximate Distance and Direction From Injection Well
Bittinger #1	Bittinger #4 (unless injection also being performed in Bittinger #4)	0.25 mi to the south
	R. Trisket 2	0.34 mi to the west
	Smith/Ras Unit 1	0.29 mi to the east
Bittinger #4	Bittinger #1 (unless injection also being performed in Bittinger #1)	0.25 mi to the north
	R. Trisket 1	0.33 mi to the west
	Joseph Bittinger 2	0.37 mi to the southeast

Should fluid levels in any of the monitoring wells rise to within 100 ft of the lowest most USDW (indicated above), then injection would cease, EPA notified and steps taken to adjust the injection rate to prevent fluid levels from rising to within 100 ft of the lowest most USDW in any of the monitoring wells.

### **CONCLUSIONS**

Our analysis of the area of review/zone of endangerment for the Bittering #1 and #4 wells injecting together is based on a methodology typically used by US EPA. Based on the results, we believe the wells are excellent candidates for use as brine disposal wells. The analysis indicates that the increase in head in the formation due to injection will remain below the elevation of the lowest most USDW. The standard fixed radius of ¼ mile can be used for the area of review/zone of endangerment for the Bittering #1 and #4 wells. As indicated above, Bear Lake Properties plans to perform monitoring of nearby wells to validate the results of this analysis.

### **REFERENCES**

Matthews, C.S., Russell, D.G., (1967) Pressure Buildup and Flow Tests in Wells, SPE Monograph Series, Volume 1, New York.

**FIGURES**

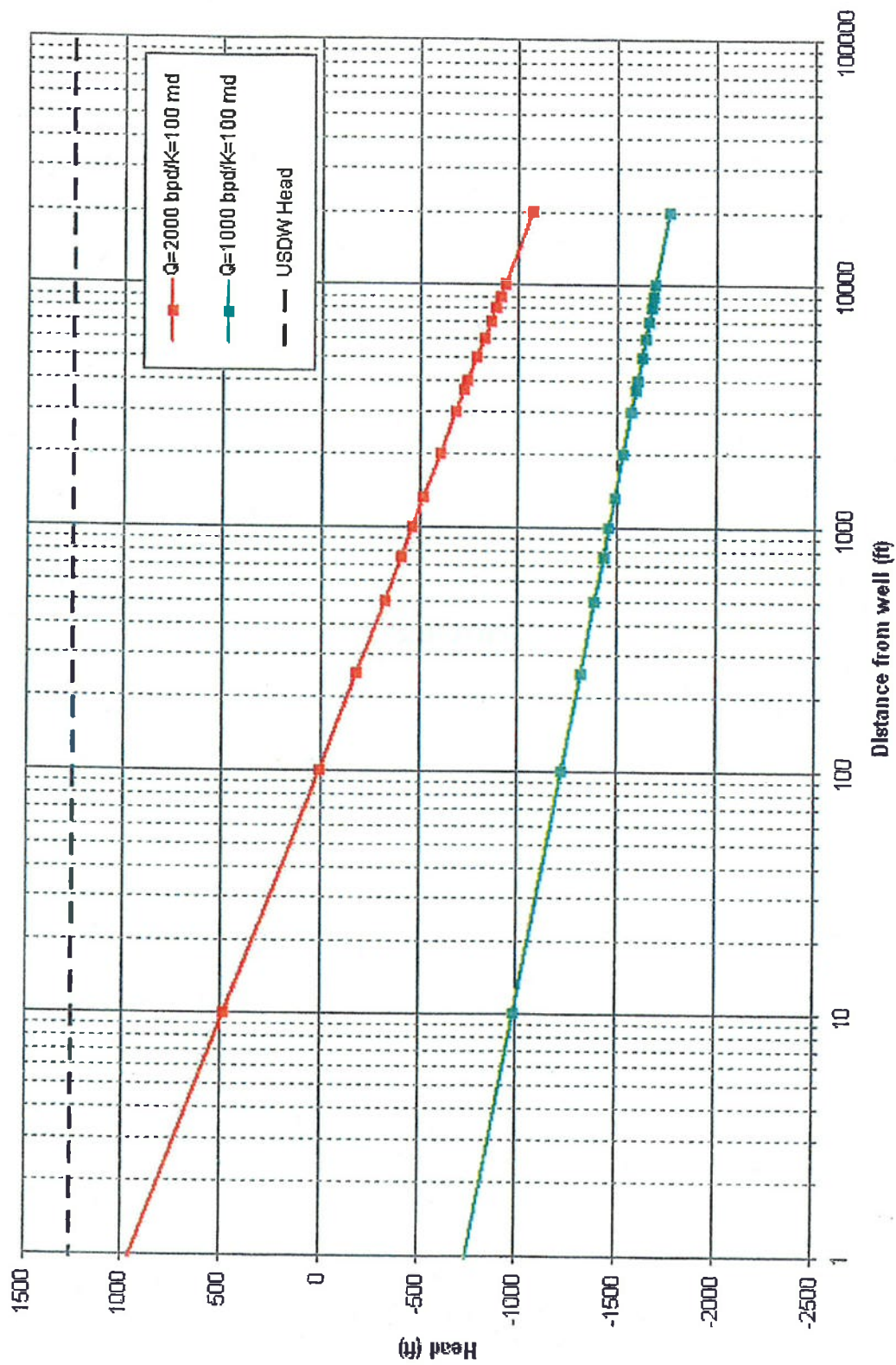


Figure 1. Feet of head of injection formation and USDW vs. distance from the well for Bittering #1 and #4 well when both wells are injecting.



TETRA TECH, INC.



## **EXHIBIT 2**



Section 1



**TETRA TECH**

21335 Signal Hill Plaza, Suite 100, Sterling, VA 20164 703-444-7000 703-444-1685 (FAX)

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### **OVERVIEW AND METHODOLOGY**

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The following parameters were used in the zone of endangerment analysis. There are several parameters that are unknown, including injection rate and formation permeability. For injection rate, we used the average and maximum rates expected. For permeability, we estimated a value considered representative of the average of the upper and lower range of values for this parameter.

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h = 30 feet

C =  $3.0\text{e-}06 \text{ psi}^{-1}$

$\Phi$  = 0.08

Specific gravity of injectate = 1.218

Surface elevation = 1518 feet

Depth to injection formation = 4210 feet

Base of lowest most USDW = 1218 feet in elevation (depth of 300 feet below surface)

Initial pressure at top of injection formation = 128 psi

#### Bittinger #4 Medina Group Well

Q = 1000 (average rate) or 2000 (maximum rate) barrels/day

t = 10 years = 87,600 hours

$\mu$  = 1 centipoise

k = 100 md

h = 30 feet

C =  $3.0\text{e-}06 \text{ psi}^{-1}$

$\Phi$  = 0.08

Specific gravity of injectate = 1.218

Surface elevation = 1561 feet

Depth to injection formation = 4285 feet

Base of lowest most USDW = 1261 feet in elevation (depth of 300 feet below surface)  
Initial pressure at top of injection formation = 128 psi

## RESULTS

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As indicated above, certain input parameters (e.g., permeability) were approximated due to lack of site-specific data. In order to validate the findings of the analysis presented above, Bear Lake Properties plans to monitor fluid levels in the monitoring wells designated below on a semiannual basis. The proposed monitoring wells were all completed in the Medina Group rocks, as were the two proposed injection wells.

Injection Well	Monitoring Well	Approximate Distance and Direction From Injection Well
Bittering #1	Bittering #4 (unless injection also being performed in Bittering #4)	0.25 mi to the south
	R. Trisket 2	0.34 mi to the west
	Smith/Ras Unit 1	0.29 mi to the east
Bittering #4	Bittering #1 (unless injection also being performed in Bittering #1)	0.25 mi to the north
	R. Trisket 1	0.33 mi to the west
	Joseph Bittering 2	0.37 mi to the southeast

Should fluid levels in any of the monitoring wells rise to within 100 ft of the lowest most USDW (indicated above), then injection would cease, EPA notified and steps taken to adjust the injection rate to prevent fluid levels from rising to within 100 ft of the lowest most USDW in any of the monitoring wells.

### **CONCLUSIONS**

Our analysis of the area of review/zone of endangerment for the Bittering #1 and #4 wells injecting together is based on a methodology typically used by US EPA. Based on the results, we believe the wells are excellent candidates for use as brine disposal wells. The analysis indicates that the increase in head in the formation due to injection will remain below the elevation of the lowest most USDW. The standard fixed radius of ¼ mile can be used for the area of review/zone of endangerment for the Bittering #1 and #4 wells. As indicated above, Bear Lake Properties plans to perform monitoring of nearby wells to validate the results of this analysis.

### **REFERENCES**

Matthews, C.S., Russell, D.G., (1967) Pressure Buildup and Flow Tests in Wells, SPE Monograph Series, Volume 1, New York.

**FIGURES**

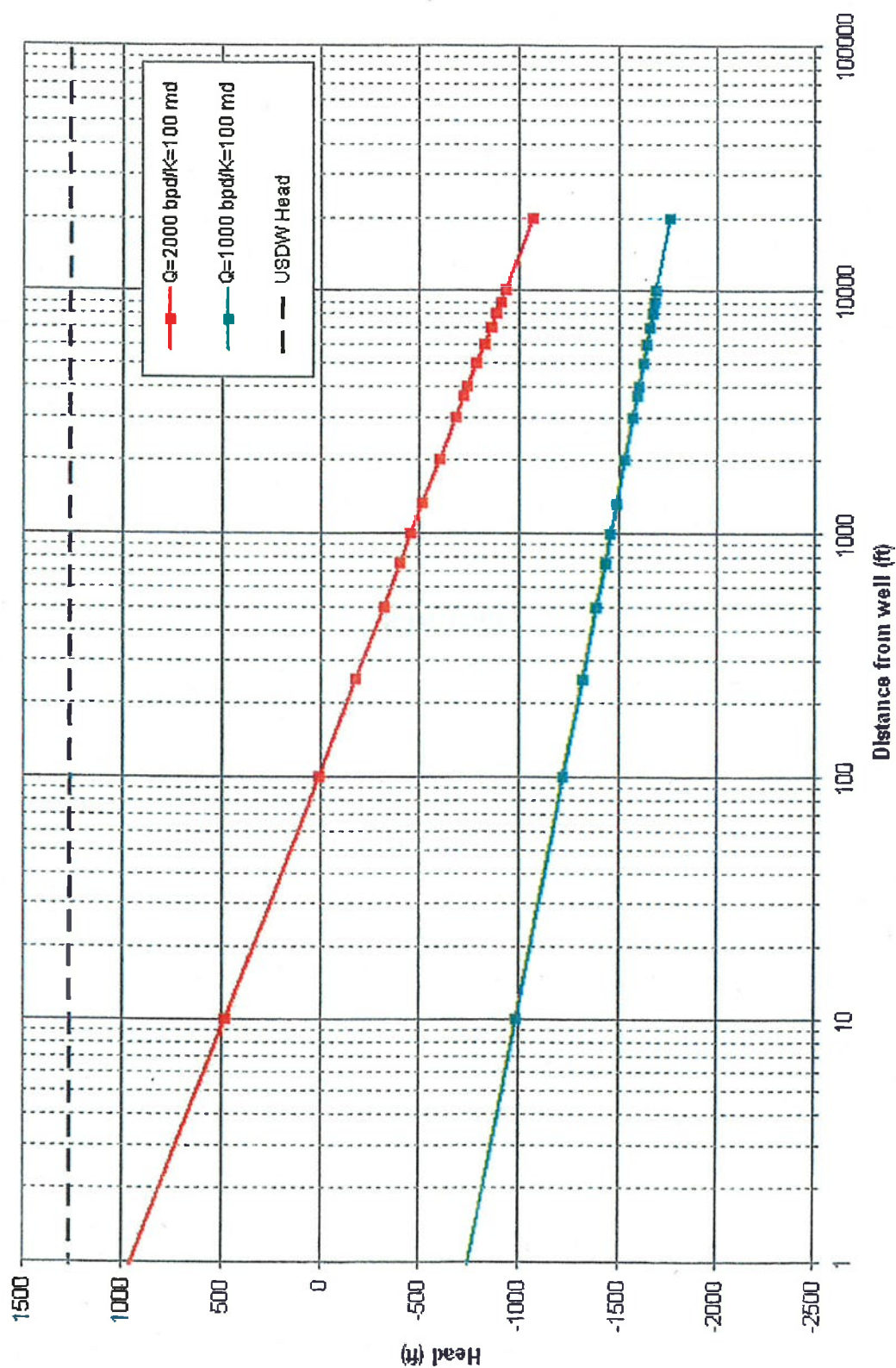


Figure 1. Feet of head of injection formation and USDW vs. distance from the well for Bittering #1 and #4 well when both wells are injecting.



TETRA TECH, INC.



## **EXHIBIT 3**





**UNITED STATES ENVIRONMENTAL PROTECTION AGENCY  
REGION III  
1650 Arch Street  
Philadelphia, Pennsylvania 19103-2029**

STATEMENT OF BASIS

FOR

U. S. EPA's UNDERGROUND INJECTION CONTROL (UIC) PROGRAM  
DRAFT CLASS IID PERMIT NUMBER PAS2D216BWAR

FOR

Bear Lake Properties, LLC  
3000 Village Run Road, Unit 103, #223  
Wexford, Pennsylvania 15090

FOR

A project consisting of one Class IID injection well used for the disposal of produced fluids (brine) associated with oil and gas production activities located at:

Bittinger #1  
Columbus Township  
Warren County, Pennsylvania

On October 29, 2010, Bear lake Properties, LLC submitted a UIC permit application for the construction and operation of the above referenced injection well. EPA has reviewed this application and has found it to be acceptable.

The draft permit specifies conditions for construction, operation, monitoring, reporting, and plugging and abandonment, which are specified so as to prevent the movement of fluids into an Underground Source of Drinking Water. General provisions for EPA UIC permit requirements are found at 40 CFR Parts 144 and 146. In addition, permit conditions specific to this project, are as follows:



**Area of Review:** This is an area surrounding the project or a well which the applicant must, first research, and then develop a program for corrective action to address any wells which penetrate the injection zone and which may provide conduits for fluid migration. Bear Lake Properties has provided documentation on the well population within the Area of Review and has calculated a zone of endangering influence based on geologic conditions at the site and anticipated operational parameters. After extensive research of local, county and state well records, no wells, other than Bear Lake Property gas production wells, were found which penetrate the injection zone within this Area of Review,. However, if another well is located at a future date, corrective action will be performed on that well in the form of plugging and abandonment of the well.

**Underground Sources of Drinking Water:** USDWs are defined by the UIC regulations as aquifers or portions thereof which contain waters that have 10,000 parts per million or less of Total Dissolved Solids and which are being or could be used as a source of drinking water. The permittee has identified the lowermost USDW's depth to be approximately 300 feet below surface elevation. The geologic name of this fresh water bearing formation is a part of the Chadaloine formation. The proposed construction of the injection well meets the regulatory criteria of 40 CFR §146.22 which requires surface casing to be placed to at least 50 feet below the lowermost USDW and cemented back to the surface. The Bittering #1 well's construction has surface casing cemented from its depth of 401 to the surface.

**Injection and Confining Zones:** Injection of fluids for disposal is limited by the permit to the Medina Formation in the perforated interval between 4210 feet to 4327 feet. This injection zone is separated from the lowermost USDW by an interval of approximately 3910 feet, while the confining zone, immediately adjacent to the injection zone, is comprised of approximately 520 feet of dolomite and salt formations.

**Injection fluid:** The permit limits this well to the disposal of produced fluids associated with oil and gas production activities with an expected maximum volume of 30,000 barrels per month.

**Maximum Injection Pressure:** The maximum allowable surface injection pressure for the permitted operation will be 1696 psi. The maximum bottom-hole pressure shall not exceed 3916 psi. Pressure will be continuously monitored. This pressure limitation will meet the regulatory criteria of 40 CFR § 146.23(a) and has been calculated using the upper perforated interval in the well, the specific gravity of the injection fluid, and the geologic information appropriate to the injection zone at this locality.

**Monitoring and Reporting Requirements:** The permittee will be responsible for monitoring injection pressure, annular pressure, flow rate and cumulative volume on a continuous basis and reporting this data to EPA on an annual basis. The permittee is also required to conduct a mechanical integrity test (MIT) once every two years. This test will provide EPA with an evaluation of the integrity of the casing and tubing in the well as well as documentation as to the absence of fluid movement into or between USDWs, thus helping to assure that USDWs are protected.

**Plugging and Abandonment:** The facility has submitted a plugging and abandonment plan that will result in an environmentally protective well closure at the time of cessation of operations. The permittee has also made a demonstration of financial responsibility that indicates adequate resources will be maintained for well closure and should preclude the possibility of abandonment without proper closure.

**Expiration Date:** A final permit, when issued, will be in effect for five years from the date of permit issuance. This proposed draft permit contains essentially the same conditions as the final permit will unless information is supplied to EPA which would warrant alternative conditions or actions on this permit application.

**Additional Information:** Questions, comments and requests for additional information may be directed to the contact person listed below. A public hearing has been tentatively scheduled for Tuesday, February 23, 2011, at 7:00 PM at the Youngsville High School auditorium, 227 College Street, Youngsville, Pennsylvania 16371. EPA reserves the right to cancel this hearing, and will hold this hearing, only if the Agency receives significant written expressions of public interest, specific to the proposed permit action, by February 16, 2011. In any case

the Administrative Record for this action will remain open for public comment until February 23, 2011. Requests for a public hearing should be directed to:

S. Stephen Platt  
Ground Water & Enforcement Branch (3WP22)  
U.S. Environmental Protection Agency  
1650 Arch Street  
Philadelphia, PA 19103-2029  
(215) 814-5464

## **EXHIBIT 4**







**UNITED STATES ENVIRONMENTAL PROTECTION AGENCY  
REGION III  
1650 Arch Street  
Philadelphia, Pennsylvania 19103-2029**

STATEMENT OF BASIS

FOR

U. S. EPA's UNDERGROUND INJECTION CONTROL (UIC) PROGRAM  
DRAFT CLASS IID PERMIT NUMBER PAS2D215BWAR

FOR

Bear Lake Properties, LLC  
3000 Village Run Road, Unit 103, #223  
Wexford, Pennsylvania 15090

FOR

A project consisting of one Class IID injection well used for the disposal of produced fluids (brine) associated with oil and gas production activities located at:

Bittinger #4  
Columbus Township  
Warren County, Pennsylvania

On October 29, 2010, Bear lake Properties, LLC submitted a UIC permit application for the construction and operation of the above referenced injection well. EPA has reviewed this application and has found it to be acceptable.

The draft permit specifies conditions for construction, operation, monitoring, reporting, and plugging and abandonment, which are specified so as to prevent the movement of fluids into an Underground Source of Drinking Water. General provisions for EPA UIC permit requirements are found at 40 CFR Parts 144 and 146. In addition, permit conditions specific to this project, are as follows:



**Area of Review:** This is an area surrounding the project or a well which the applicant must, first research, and then develop a program for corrective action to address any wells which penetrate the injection zone and which may provide conduits for fluid migration. Bear Lake Properties has provided documentation on the well population within the Area of Review and has calculated a zone of endangering influence based on geologic conditions at the site and anticipated operational parameters. After extensive research of local, county and state well records, no wells, other than Bear Lake Property gas production wells, were found which penetrate the injection zone within this Area of Review. However, if another well is located at a future date, corrective action will be performed on that well in the form of plugging and abandonment of the well.

**Underground Sources of Drinking Water:** USDWs are defined by the UIC regulations as aquifers or portions thereof which contain waters that have 10,000 parts per million or less of Total Dissolved Solids and which are being or could be used as a source of drinking water. The permittee has identified the lowermost USDW's depth to be approximately 300 feet below surface elevation. The geologic name of this fresh water bearing formation is a part of the Chadaloine formation. The proposed construction of the injection well meets the regulatory criteria of 40 CFR §146.22 which requires surface casing to be placed to at least 50 feet below the lowermost USDW and cemented back to the surface. The Bittering #4 well's construction has surface casing cemented from its depth of 506 to the surface.

**Injection and Confining Zones:** Injection of fluids for disposal is limited by the permit to the Medina Formation in the perforated intervals between 4285 feet to 4302 feet and from 4352 feet to 4365 feet. This injection zone is separated from the lowermost USDW by an interval of approximately 3985 feet, while the confining zone, immediately adjacent to the injection zone, is comprised of approximately 604 feet of shale and salt formations.

**Injection fluid:** The permit limits this well to the disposal of produced fluids associated with oil and gas production activities with an expected maximum volume of 30,000 barrels per month.

**Maximum Injection Pressure:** The maximum allowable surface injection pressure for the permitted operation will be 1726 psi. The maximum bottom-hole pressure shall not exceed 3984 psi. Pressure will be continuously monitored. This pressure limitation will meet the regulatory criteria of 40 CFR § 146.23(a) and has been calculated using the upper perforated interval in the well, the specific gravity of the injection fluid, and the geologic information appropriate to the injection zone at this locality.

**Monitoring and Reporting Requirements:** The permittee will be responsible for monitoring injection pressure, annular pressure, flow rate and cumulative volume on a continuous basis and reporting this data to EPA on an annual basis. The permittee is also required to conduct a mechanical integrity test (MIT) once every two years. This test will provide EPA with an evaluation of the integrity of the casing and tubing in the well as well as documentation as to the absence of fluid movement into or between USDWs, thus helping to assure that USDWs are protected.

**Plugging and Abandonment:** The facility has submitted a plugging and abandonment plan that will result in an environmentally protective well closure at the time of cessation of operations. The permittee has also made a demonstration of financial responsibility that indicates adequate resources will be maintained for well closure and should preclude the possibility of abandonment without proper closure.

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## **EXHIBIT 5**





**UNITED STATES ENVIRONMENTAL PROTECTION AGENCY  
REGION III  
1650 Arch Street  
Philadelphia, Pennsylvania 19103-2029**

**Responsiveness Summary to Public Comment  
For  
The Issuance of Underground Injection Control (UIC) Permits  
For  
Bear Lake Properties, LLC**

On January 10, 2011, the U.S. Environmental Protection Agency (EPA) Region III issued a public notice requesting comment and the opportunity for a public hearing for the proposed issuance of two Underground Injection Control (UIC) permits, PAS2D215BWAR and PAS2D216BWAR, for Bear Lake Properties, LLC. EPA received numerous requests to hold this hearing, but the hearing, scheduled for February 23, 2011, was postponed since EPA was unable to arrange for stenographic support in time for the hearing. EPA subsequently issued another public notice rescheduling the public hearing for March 23, 2011. On March 23, 2011, EPA held a public hearing at the Columbus Township Social Hall in Columbus, Pennsylvania. Over 200 people attended this public hearing and EPA received oral comments from 19 people in attendance at the hearing. EPA also extended the public comment period until March 30, 2011, during the hearing, inviting any additional written comments.

The responsiveness summary which follows provides answers to questions raised from over 350 people who either sent written public comment to the attention of EPA Region III, or who provided comments at the hearing. EPA wishes to thank the commenters for their informative and thoughtful comments and to thank the people from Columbus Township who assisted EPA in hosting the public hearing.

**1) EPA's jurisdiction and authority**

Many people raised concerns which the EPA UIC program does not have the regulatory jurisdiction to address. These included the potential for increased truck traffic, the potential for damage to the roads, increased noise, protection of wildlife, the protection of worker safety and the operator's development of health and safety plans and storm water management plans, among others. When making the decision whether to issue UIC permits for Bear Lake Properties, EPA's jurisdiction rests solely in determining whether the proposed injection operation will safely protect underground sources of drinking water (USDWs) (i.e., aquifer systems containing less than 10,000 milligrams per liter total dissolved solids). Although these other concerns may be relevant, they cannot be addressed within a UIC permit. The public would need to seek assistance through local Columbus Township or Warren County ordinances for traffic, road and noise concerns and state or federal agencies for concerns regarding wildlife protection, storm water management or health and safety.

It is important to note that every UIC permit, that EPA Region III issues, contains several conditions that require the permittee to meet all other local, state or federal laws that are in place. Part I. A. of the proposed permit contains a clause that states, " Issuance of this permit does not convey property rights or mineral rights of any sort of any exclusive privilege; nor does it

authorize any injury to persons or property, an invasion of other property rights or any infringement of State or local law or regulations". In addition, Part I. D. 12 of the proposed permit indicates, "Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities, or penalties established pursuant to any applicable state law or regulation". Therefore, EPA's UIC permit is only one of several authorizations that a permittee may be required to obtain before they are allowed to commence operation.

**2) EPA should require the operator to find another location for disposal**

Similar to the response above, EPA does not have the jurisdiction, to direct an operator to a particular geographic location. The location chosen by an operator is based on many factors: economics, property ownership, geologic suitability, etc. It is EPA's responsibility to review each UIC permit application it receives and make a determination as to whether USDWs will be protected from the proposed operation, not to identify suitable injection sites.

**3) Other possible disposal alternatives and other technologies available for the treatment of produced fluid**

EPA acknowledges that there are other alternatives for the disposal of produced fluid from oil and gas development as well as wastewater treatment technologies available for the treatment of produced fluid. Even though other disposal alternatives may exist and wastewater treatment technologies are available, the UIC program must determine whether underground injection can be implemented in a manner protective of USDWs. If underground injection is done in accordance with the UIC program requirements, it is one of the best alternatives available for the disposal of fluids produced in association with oil and gas production activities. EPA cannot deny an operator a UIC permit because other disposal alternatives or treatment technologies exist.

**4) Is this proposed injection activity in an earthquake prone area?**

EPA has no evidence the location proposed for this injection operation is located in an earthquake prone area. Evidence indicates that there are no deep-seated transmissive faults that intersect the proposed injection zone or that could be influenced by the proposed injection operation in the future. It is important to keep in mind that the reservoir proposed for injection, the Medina Formation, produced, and continues to produce, natural gas. Over the past three decades, natural gas has been removed from the pore space within this reservoir, depleting the formation of much of the natural gas it contained as well as reducing the formation's reservoir pressure. Earthquakes can occur when a geologic formation becomes under-pressurized (i.e., through geologic formation collapse causing the structure of the formation to shift) or when it becomes over-pressurized. The Medina Formation in this location is presently under-pressurized from decades of natural gas production and there has been no evidence of earthquakes due to the removal of this natural gas. In addition, the proposed injection operation will not over-pressurize the formation. Because of the removal of millions of cubic feet of natural gas, pore space has been created to accept the injection of fluid. The permits would also be conditioned to prevent the over-pressurization, or fracturing, of the formation.





**5) Are the fluids being injected toxic, hazardous and/or radioactive?**

Individual constituents within the fluid produced from an oil or gas production reservoir, or from the return flow of fluid used in a hydraulic fracturing process, can be determined to be toxic, hazardous or radioactive. However, these fluids when produced in association with oil and gas production are exempt from the hazardous waste regulation by Congress and are not classified as hazardous under the Resource Conservation and Recovery Act. Therefore, the UIC program does not regulate fluids produced in association with oil and gas production activities as hazardous waste. Disposal of these fluids is permissible down a Class II brine disposal injection well. Commenters raised the issue that the disposal of these fluids underground is not safe. However, a counterpoint to this comment, made by another commenter, indicated that the injection of these fluids deep underground is safer than allowing them to be discharged into a stream or a river or allowing them to overflow or seep into the ground from above-ground containment pits.

One of the major reasons behind the development of the UIC regulations was to provide a regulated alternative whereby oil and gas related fluids could be safely managed. Hazardous waste produced by the petrochemical industry, as well as other industries, has been safely injected underground since the UIC regulations went into effect in the early 1980's. These fluids are injected down Class I hazardous waste injection wells below the lowermost USDW. The mandate of the UIC program is to protect USDWs from the subsurface emplacement of fluids. This has been accomplished through strict well construction criteria, the testing and inspection of injection well operations, monitoring and reporting requirements, and plugging and abandonment requirements. As mentioned in an earlier response, the UIC program provides one of the safest methods for the disposal of any kind of fluid as long as it is done under the requirements imposed by the UIC regulations.

**6) Abandoned wells may pose a risk to drinking water supplies**

It is a fact that abandoned wells can pose a risk to USDWs by providing a conduit for the migration of fluid out of an injection zone. There are several requirements that the UIC regulations, as well as a UIC permit, impose on an operator to ensure that abandoned wells will not pose a risk to USDWs. The operator is required to conduct a review within a specified area around his proposed operation to determine whether any abandoned wells exist within that disposal area which could pose a threat to USDWs. The area of review can be a fixed radius of no less than one-quarter mile around an injection well or facility boundary (i.e., for an area permit) or may be a calculated "zone of endangering influence". The zone of endangering influence calculation is based on geologic parameters found in the injection zone, such as permeability, porosity, etc. and proposed operational conditions, such as injection volumes, rates, length of injection, etc. The operator must review all information of public record to determine whether any abandoned wells or other potential conduits exist within the area of review or zone of endangering influence, that penetrate the proposed injection zone, in this case, the Medina Formation. If abandoned wells are found to exist, then corrective action, in the form of plugging and abandonment of those wells, must be taken.

Bear Lake Properties chose to calculate the zone of endangering influence based on the simultaneous operation of both of the proposed injection wells. EPA conducted its own zone of endangering influence calculation to verify the calculation submitted by Bear Lake Properties and found the calculation acceptable. The only wells found that penetrate the Medina Formation, within the calculated zone of endangering influence, are production wells owned by Bear Lake Properties.



During the public hearing, commenters indicated to EPA that they did not think that all abandoned wells near the proposed injection site had been documented. It was unclear whether these wells might exist within the zone of endangering influence, outside of this area, or might be wells that do not penetrate the injection zone. EPA requested that Bear Lake Properties conduct another survey of the area surrounding the proposed injection operation, using information provided at the public hearing, to determine whether other abandoned wells did, in fact, exist. Public records, obtained by EPA subsequent to the public hearing, indicated no record of wells being drilled in the area of the proposed injection operation prior to the wells that are present today. The additional information and maps, submitted to EPA, provided information on all of the gas wells that are located within a two mile radius of the injection well site. This map confirmed the information submitted by Bear Lake Properties, that only gas production wells owned by Bear Lake Properties exist within the zone of endangering influence. The additional survey conducted by Bear Lake Properties indicated that only the Bittinger #1 and Bittinger #4 are contained within the area of review.

EPA has also required in the proposed permits monitoring of the fluid level in the injection zone during injection operations to ensure that pressure created by the injection operation will not cause migration of fluid up abandoned wells that could exist. By monitoring fluid level, and making sure that it remains safely below the lowermost USDW, then even if an abandoned well were to exist ( i.e., a well that might have been drilled in the past without having information of public record), the monitoring would detect and prevent fluid migration into the lowermost USDW. EPA Region III has a permit condition in the proposed Bear Lake Properties permits that requires the fluid level to be monitored during the injection operation. Until the Bittinger #1 or the Bittinger #4 are placed into operation, they will be used to monitor the fluid level or formation pressure during injection to determine reservoir response and ensure protection of USDWs. The R. Trisket 2, located 0.34 miles to the west of Bittinger #1 and the Smith/Raz Unit 1, located 0.40 miles to the east of Bittinger #1 will also be used as monitoring wells during the Bittinger #1's operation. During Bittinger #4's operation, the R. Trisket 1, located 0.33 miles to the west of Bittinger #4 and the Joseph Bittinger 2, located 0.37 miles to the east of Bittinger #4 will also be used as monitoring wells.

#### **7) Bear Lake Properties did not survey drinking water wells in New York State**

Written comments received by EPA as well as public testimony provided at the public hearing expressed concern that Bear Lake Properties did not adequately survey drinking water wells located in New York State. Subsequent to the public hearing, EPA requested that Bear Lake Properties conduct another survey of drinking water wells located within one mile of the proposed injection well facility. This one mile survey did include properties located in New York State. The revised survey map Bear Lake Properties provided to EPA, with GPS latitude/longitude locations, identified 10 private drinking water wells located in New York State, within one mile of the Bittinger #4 well, the closest well to the New York/Pennsylvania state line.

#### **8) Bear Lake Properties' well construction standards and mechanical integrity testing are not adequate**

Many comments that EPA received indicated that the proposed injection wells were not constructed properly and that well testing requirements contained within the draft permits were also inadequate.

The comments received provided a review of the Pennsylvania Department of



Environmental Protection's (PADEP) well casing standards (PADEP Chapter 78 regulations on production wells) and compared those to the proposed construction of the Bittering #1 and Bittering #4 wells under the UIC program requirements. Examples of some of the issues provided to EPA included, "gas migration stems from inadequate cement, cementing procedures", "the operator shall install casing that can withstand the effects of tension and prevent leaks...", "used casing may be approved for use as surface casing, intermediate or production casing but must be pressure tested..."

The Bittering #1 and Bittering #4 proposed UIC permits both require that surface casing be set 50 feet below the lowermost USDW (Note: **The UIC program defines a USDW as any aquifer system having less than 10,000 mg/l total dissolved solids (TDS), that is currently used, or could be used in the future. This definition is more stringent than the PADEP definition that requires protection of the "deepest fresh water".**). The surface casing must also be cemented to the surface. The lowermost USDW has been identified at a depth of 300 feet and the Bittering #1 and Bittering #4 wells have surface casing set at 401 feet and 506 feet, respectively. This is well below the "fresh water" that would be protected under the PADEP requirements. In addition, the proposed permits require production casing (also referred to as long string casing) to be set through, or above, the injection zone, located at approximately 4300 feet, and cemented back at least 100 feet above the injection zone. Injection tubing and packer is then set inside the production casing and injection occurs through the tubing and packer. This construction provides three layers of protection for the USDWs. PADEP requirements do not require the additional two layers of protection.

Prior to the operation of the wells, EPA requires that the wells be tested for mechanical integrity. Cementing records and logs are required to show that each well has adequate cement to prevent fluid migration out of the injection zone and an internal pressure test is required to ensure that the casing, tubing and packer will not leak during the well's operation. The internal pressure test requires the annulus of the well (the space between the production casing and the tubing and packer) to be pressure tested to ten percent above the permitted maximum injection pressure and held for at least 30 minutes, with no more than a five percent loss in pressure allowed.

The UIC program in EPA Region III has been utilizing the construction and testing standards discussed above for brine disposal injection wells in Pennsylvania since it started implementing the UIC program in June, 1985. PADEP does not have these requirements for mechanical integrity testing or logging. EPA finds that these requirements have effectively protected USDWs from the subsurface injection of fluids.

#### **9) Mechanical integrity tests must be conducted quarterly**

Many comments indicated that mechanical integrity of the injection wells should be done on a quarterly basis. The comments were based on a review of PADEP's Chapter 78 regulations, specifically Section 78.88 which is entitled, "Mechanical integrity of operating wells". This section of the PADEP regulation refers more to the frequency of well inspections and is not the same as the mechanical integrity testing requirements imposed by EPA. Section 78.88 indicates, "...that the operator shall inspect each operating well at least quarterly". It then goes into some detail about what must be inspected.

There is a significant difference between the inspection of a well and the mechanical integrity testing of an injection well. As stated in the previous comment, EPA requires that every injection well be tested before it operates to make sure that the casing, tubing and packer placed in the well do not leak. The proposed UIC permits for the Bittering #1 and Bittering #4 wells also require that the wells be tested for mechanical integrity every two years. In between the



testing, the wells are continuously monitored for injection pressure, annular pressure and injection volume to ensure that the wells maintain mechanical integrity continuously and operate in accordance with their permit conditions. Should a problem occur during the operation of either well, each well is designed with an automatic pressure shut-down device that will discontinue operation of the well. The continuous monitoring of the wells, as well as the presence of company employees on site, ensures that the wells operate in a safe and protective manner. EPA will also be conducting periodic routine compliance inspections between mechanical integrity testing cycles to verify all operating and recording devices are operational.

**10) Bear Lake Properties has not demonstrated financial resources should a well failure occur.**

Under the UIC regulations, owners and operators of injection wells are required to demonstrate financial responsibility in order to properly plug and abandon the injection well when the operation ceases and the well is no longer used for injection. Bear Lake Properties has submitted a \$60,000 letter of credit and standby trust agreement (\$30,000 for each injection well) for the plugging and abandonment of the Bittinger #1 and Bittinger #4 wells. This submission was reviewed and approved by EPA Region III.

Although a separate issue from the financial responsibility required as part of the UIC permit, EPA also has emergency authorities in place under the Safe Drinking Water Act (SDWA) if endangerment to USDWs should result from injection activities. Section 1431 under the SDWA allows EPA to take an action against an owner or operator if the potential for endangerment exists. This action can include a requirement that the owner or operator provide alternative drinking water to a citizen affected by the endangerment as well as require the remediation of any aquifer system affected by the injection operation.

**11) Wastewater entering the facility for injection should be more fully characterized.**

EPA believes that the conditions in Part II, C.3. and C.4., within the permit, are sufficient to adequately characterize and monitor the wastewater for injection purposes. If this wastewater were to be disposed in a different manner (i.e., disposed directly into the environment by stream discharge) then a more extensive characterization would be necessary. However, this wastewater will be injected almost one mile beneath the earth's surface into an environment similar in nature to where the wastewater was generated.

EPA has also added a new condition to the final permit. The condition, found in Part II, C.5., requires that, "The permittee to maintain a record of every load of brine received. The record shall include the hauler's name, the operator(s) name and location from whom the load was obtained, the volume of the load and whether the load of fluid delivered was a split load. If the load was a split load, each operator's name and location shall be listed and, if possible, the volumes of fluid received from each operator documented."

**12) The UIC permits are issued for a five year period. What happens after that, can the operator just walk away?**

The UIC permits would be in effect for five years from the date of issuance. After five years, the operator may apply to EPA Region III for permit reissuance. EPA will make a determination as to whether the permits should be reissued at that time. If a determination is made to reissue the permits, EPA would public notice the permit reissuance and offer an opportunity for a public hearing. If the operator determines that they no longer wish to operate the injection wells, the



wells must be plugged and abandoned in accordance with the UIC permit requirements and abide by all other closure requirements that have been imposed by local or state jurisdictions. The owner's financial responsibility is not released by EPA until the wells are properly plugged and abandoned.

### **Federal Underground Injection Control Program Permit Appeals Procedures**

The provisions governing procedures for the appeal of an EPA permitting decision are defined at 40 CFR Part 124.19. The appeals process allows for a written petition of appeal from any person who commented on the draft permit, either in writing during the comment period or orally at the public hearing. Persons who have not previously been involved in the comment period are limited in their appeal rights to those points which have been changed between the draft and final permits. Appeals may be made by citizens, groups, organizations, governments and the permittee within this procedural framework.

A petition for appeal must be filed within thirty (30) days of the date of the accompanying announcement of EPA's permit decision. Such written requests are to be addressed to EPA at the address listed below with a copy sent to EPA Region III.

The Administrator  
U.S. Environmental Protection Agency  
1200 Pennsylvania Avenue Northwest  
Washington, DC 20004

The petition should specify the reasons supporting the appeal of the permit and a demonstration that the petitioner had raised the issue previously during the comment period or at the hearing. If the appeal is based on a change between the draft and final permit conditions, it should be so stated explicitly. The petitioner must also state whether, in his or her opinion, the permit decision or the permit's conditions appealed are objectionable because of:

1. Factual or legal error, or
2. The incorporation of a policy consideration which the Administrator should, at his or her discretion review.

Within a reasonable time of receipt of the Appeals Petition, the Administrator will either grant or deny the appeal.

Denials are considered final agency action, upon which the permit becomes effective, and the Agency will so notify the petitioner. The petitioner may, thereafter, challenge the permit decision in Federal District Court.

If granted, EPA must so notify the public in accordance with the notification requirements of 40 CFR 124.10. The public notice shall set forth a timetable by which the person(s) making an appeal and EPA, as the permitting authority, must submit written briefs and shall also specify that any interested party may submit an amicus brief within these deadlines.

When a petition for appeal is granted, the permit conditions appealed are not deemed to be in effect and if these permit conditions are essential to the operation, the activity may not commence. Individually contested permit conditions are also stayed (not in effect) but other permit conditions are still in effect if they are legally severable from the contested condition.

The EPA Administrator will decide the appeal on the basis of the written briefs and the



total administrative record of the permit action. If the Administrator decides the appeal on its merits, he or she will direct the Region III office to implement his or her decision by permit issuance, modification or denial. The Administrator may order all or part of the permit decision back to the EPA Region III office for reconsideration. In either case, a final agency decision has occurred when the permit is issued, modified or denied and an Agency decision is announced. After this time, all administrative appeals have been exhausted, and any further challenges to the permit decision must be made to Federal District Court.

