Department of Energy
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July 6, 2006

Community Advisory Board Members

UNDERGROUND TEST AREA (UGTA) TECHNICAL WORKING GROUP (TWG) COMMENTS TO COMMUNITY ADVISORY BOARD (CAB) RECOMMENDATION FOR FUTURE NEVADA TEST SITE WELL LOCATIONS

Enclosed are the comments that I have received and reviewed from members of the TWG subcommittee tasked with reviewing the CAB Recommendation for Future Nevada Test Site Well Locations (memo to Steve Mellington, dtd February 10, 2006). Review comments were received from Sig Drellack, Gayle Pawloski, Rick Waddell, and Dave Finnegan. Each of the reviewers has brought their own unique perspectives to bear on the well proposals. Bullet summaries were prepared of what I believe to be the main points raised by each reviewer.

If you have any questions, please contact me at (702) 295-3188.

Bill Wilborn
UGTA Federal Sub-Project Director
Environmental Restoration Project

ERP:2167.BW

Enclosure:
As stated

cc w/encl:
Tim Murphy, NDEP, Las Vegas, NV

TECHNICAL WORKING GROUP

COMMENTS ON CAB WELL SITE RECOMMENDATIONS

CAB Site #1 Summary Comments

The stated objective for this well is to "intersect a contaminant plume which can be tied to the source test".

- CAB#1 is likely to fulfill the CAB's stated objective to intersect a contaminant plume. However, this location is too close to the ER-20-5 well cluster to provide much, if any, new hydrogeologic information. "Plume chasing" in fractured aquifers can be problematic (SLD).
- Plume chasing is a difficult, high-risk task; it is almost impossible to predict with confidence that a plume will be encountered. A drill hole this close to existing drill holes brings no new geologic, hydrologic, and chemical understanding to UGTA (GAP).
- A well drilled at the proposed location of CAB#1 may encounter radionuclides migrating solely from BENHAM, or it may encounter a mixture from TYBO and BENHAM. In the first case, the additional information gained is likely to be little more than a confirmation of the results from the ER-20-5 wells. In the second case, it may not be possible to interpret the results without considerable uncertainty (RW).
- Trying to track a plume can be extremely difficult. Just drawing a straight line from Benham through ER-20-5#1 to the proposed site looks good on paper but can lead to great disappointment in the field. That being said, I do like the idea of intercepting a contaminant plume, but the risks of not hitting the plume must be taken into account (DLF).

CAB Site #2 Summary Comments

The stated objective for this well is to "sample geochemistry, measure elevation of the water, and test for potential contamination".

- The CAB#2 location is not in an uncharacterized portion of the model. Consequently, the amount of new hydrogeologic data as desired by the CAB will not be that useful to the UGTA Project. This proximal down-gradient site would be a good "sentinel well" to monitor for contaminant movement from Pahute Mesa tests (SLD).
- A drill hole this close to existing drill holes brings little new [data] to UGTA. Locating the drill hole in the transition zone [caldera margin] cannot be a top technical reason for siting this hole where it is. The CAB must be willing to state clearly the low confidence and risk associated with this location, and strengthen the argument that the site is valuable even if it isn't optimally located in the transition zone. The idea of using the well as a monitoring site is attractive, but we won't know if this is an optimal monitoring location until we get to that stage of the program (GAP).
- It is recommended that CAB#2 (and CAB#1) sites would be more optimally located between the BENHAM and TYBO underground test locations because of the information already available from the ER-20-5 wells, an increased likelihood of obtaining info on a greater number of radionuclides at concentrations representing a greater health risk, and the avoidance of issues related to mixing of TYBO and BENHAM waters (RW).

- If a plume was intercepted, this would be a wonderful well, but the likelihood of intersecting the plume decreases with distance. One would need to look at the value of the well if the plume was not detected (DLF).

CAB Site #3 Summary Comments

The stated objective for this well is to "improve the understanding of the effect of the structure known as the Thirsty Canyon Lineament on groundwater flow".

- The CAB#3 site needs refinement, and the CAB acknowledges that additional work is necessary to precisely site this well. A focused study that reevaluates all the geophysical data specifically to help site a drill hole should be considered. However, pushing the geophysical data further may not be fruitful. The CAB#3 general location is in a geologically challenging and important down-gradient structural block. A borehole in this vicinity would provide useful information to the UGTA Project and better constrain subsequent modeling. Constructing an access road to this area is going to be challenging and costly (SLD).
- Many would agree that the Thirsty Canyon Lineament has a poorly understood effect on groundwater flow. However, a single drill hole probably will not supply sufficient information to understand the issue. Multiple drill holes and aquifer tests are not part of DOE's promise to drill a location for the CAB, and frankly, this issue is an important scientific question that should not be left to the CAB if it is to be investigated (GAP).
- A well in this general location will have utility from a long-term monitoring perspective. A single well will probably not be able to answer the geologic question concerning the "origin" of the Thirsty Canyon lineament. Thus, I would recommend that the well be sited to answer questions related to its hydrologic significance, through collection of water-level and geochemical data. I suggest additional discussions about the siting of this hole be considered prior to extensive planning (RW).
- This well would be an excellent location if there was a suitable place to drill it. This would be a sensible hole from the geology/geochemistry standpoint, but doesn't do much for [improving our understanding of] source term (DLF).

General Comments:

- Although justifications for the new drill-hole locations are fairly well defined by the CAB, details about drill-hole design, completion, and post completion objectives are not well developed (SLD).
- Locating a hole is only part of the issue, and may only be the tip of the iceberg. No comments are provided by the CAB for well completions, types of analyses to be performed, or post-completion sampling schedule (are the wells to be sampled regularly?) Are these holes automatically part of the monitoring network, even if not optimally located for monitoring?

COMMENTS RECEIVED FROM INDIVIDUAL TWG SUBCOMMITTEE MEMBERS

To: T. P. Rose
From: S. L. Drellack, Jr.
Subject: Comments on *Community Advisory Board for Nevada Test Site Programs (CAB) Recommendation for Future Nevada Test Site Well Locations, February 10, 2006*
Date: March 14, 2006

I have prepared the following comments in response to your request to assess the technical merit of the three drill sites recommended by the Community Advisory Board for NTS Programs (CAB) in their February 10, 2006 letter to Mr. Stephen Mellington. This review was conducted with two perspectives in mind: 1) From the CAB's perspective -- would these three proposed drill sites satisfy their stated objectives? and 2) From the UGTA Project perspective -- would these proposed locations, if drilled, yield important or significant new information useful to the UGTA Project?

My discussion starts with four general comments, followed by site-specific comments for each proposed well location.

General Comments

1. The top-priority objective of the CAB is to intersect a contaminant plume that can be tied to a particular source test. Understandably, they are particularly interested in western Pahute Mesa, which is immediately down-gradient of underground nuclear tests and up-gradient of stakeholders in Oasis and Amargosa Valleys. UGTA Well Cluster ER-20-5, drilled in 1995, did that. Encountering this contaminant plume at a location only slightly further down-gradient would not add significant new information. Also, "plume chasing" in fractured aquifers such as those at Pahute Mesa can be problematic.

2. Another top objective of the CAB is to collect important hydrogeologic data in "the critical focus area" (of western Pahute Mesa). Proposed sites CAB#1 and #2 are not far removed from existing drill holes that do provide substantial subsurface information. Though we can obtain some new information from virtually any new drill hole, this immediate area already has several good drill holes and is fairly consistent geologically. Hydrogeologic uncertainties as they relate to the PM-OV CAU framework model will not be reduced much by CAB#2 and not at all by CAB#1. CAB#3 (or a location nearby), on the other hand, does have the potential to provide information that would better constrain and enhance the model. Information that might affect transport uncertainty could be obtained from CAB#2 and #3 but not from CAB#1, particularly if CAB#1 encounters plume conditions similar to those at nearby Well Cluster ER-20-5.

3. The third objective of the CAB is to improve understanding of the Thirsty Canyon lineament (TCL), especially as to its affect on groundwater flow. Targeting buried, geophysically-inferred structures is also problematic, especially with only a single drill hole. The TCL is not well defined with hard data (e.g. drill holes). Though, we do have a half dozen or so holes (three pairs of boreholes) that help define it. Of course, this is a strong argument for making an effort to investigate it further. It was first recognized in 1999 by Grauch et al. as a geophysical anomaly. Its precise location varies with the geophysical method (e.g., aeromagnetic data vs. gravity). More discussion on this issue is presented in the site-specific section.

4. Justifications for the new drill-hole locations are fairly well defined by the CAB, however, details about drill-hole design, completion, and post completion objectives are not well developed. Two contaminated aquifers (two different contaminant plumes from perhaps two different tests) were encountered at Well Cluster ER-20-5. Groundwater samples from the Tonopah Spring aquifer (TSA) and a lava-flow aquifer (LFA) within the Calico Hills zeolitic composite unit (CHZCM) both have high tritium values. Does the CAB wish to investigate both with two separate completion zones? If no tritium plume is encountered, should the well be pumped in an attempt to draw in a nearby plume, or simply monitor for natural transport?

Site-Specific Comments

CAB#1

The proposed CAB#1 site is located about 270 m (885 ft) south-southeast of UGTA Well ER-20-5#1. This is about 480 m (1575 ft) southwest of the TYBO test conducted at U20y and about 5,000 ft south-southwest of the BENHAM test at U20c (the infamous source of radionuclides found at Well Cluster ER-20-5). The stated objective is to intersect a contaminant plume. Additionally, it would be desirable to detect "...radionuclides other than tritium so that contaminants maybe linked to a specific historical test." According to the CAB, focusing on a site behind the leading edge of the known ER-20-5 plume best fulfills these criteria. However, as stated in General Comment #1 above, Well Cluster ER-20-5 already did this. The 800-ft separation may not be enough to provide significant new information. It was possible to trace radionuclides from the BENHAM test, but are other possible source tests unique enough to "fingerprint?" This site, with its stated objective, may not be a cost-effective endeavor.

Access to this proposed site is excellent due to its proximity to an existing, recently drilled location. The terrain is accommodating for pad construction. Both of these attributes would be economic pluses. The CAB has also suggested the possibility for gaining further efficiencies by reusing the existing sumps at Well Cluster ER-20-5. This should be pursued. The proposed site would be very close to the southern group of sumps, #3 through #7. These lined sumps also would be useful to dispose potentially contaminated water from well development, pump tests, well purging, etc.

Targeting the TSA at 2,160- to 2,590-ft depth and the CHZCM lava-flow aquifer at 3,201- to 3,620-ft depth would necessitate two separate completion zones. I agree with the CAB that the

hole should TD within the tuff confining unit immediately underlying the target LFA. TD would therefore be at about 4,000 ft.

CAB#2

The suggested location for CAB#2 is about 3,600 ft south of Well ER-20-5#1 and in line with CAB#1. As the CAB points out, this is generally down-gradient of the TYBO and BENHAM tests. The potential to acquire new hydrogeologic information at this location also is not great, except perhaps near the bottom of the borehole. However, the potential for new transport data is better. Additionally, if no plume is encountered, this would be a favorable sentinel well, as intended by the CAB. The statement that "...contamination could be in this area by 2020" is intriguing. Where does this date come from, and what are the associated uncertainties?

As mentioned in General Comment #4, what are the completion and monitoring plans? Are two isolated completions desired? Monitoring and pumping objectives would be important aspects to achieving the overall scientific objectives for this well.

Access to the site is good and there are no topographical impediments to building a location at this site. For planning purposes hole construction and TD should be similar to CAB#1.

CAB#3

The location for the CAB#3 well is not yet firm. The primary objective is to improve understanding of the effect of the TCL on groundwater flow. As mentioned in General Comment #3, this feature is not well understood, and any effort to gather information in the vicinity of the TCL would contribute to the overall goals of the CAB and the UGTA Project. The UGTA base model (BN, 2002) depicts this feature not as a separate feature unto itself, but rather as the western edge of the two caldera complexes, though an alternative model depicts the TCL as a distinct and continuous structural feature. Mankinen, et al. 1999 describes the TCL as a 2- to 5-km wide fault zone. A compilation of traces representing this feature by various investigators using several geophysical tools is presented as Plate 2 in BN, 2002. Based on these traces, the CAB#3 location could be 600 to 900 m (2,000 to 3,000 ft) east-southeast of the TCL (Figure 1). The CAB's suggestion to conduct some additional geophysical survey(s) in order to refine this well location may not be as helpful as one would hope. This feature is defined by geophysical methods (specifically aeromagnetic, gravity and resistivity). The list of authors and coauthors who have studied this feature include: Grauch, Sawyer, Fridrich, and Hudson (1999); and Mankinen, Hildenbrand, Dixon, and McKee (1999); in addition to the UGTA modeling team (BN, 2002). A reevaluation of the existing geophysical data might help refine the prospective location. Ultimately the TCL will need to be drilled, and a core hole (ideally, two holes) would provide the maximum amount of geologic data to help characterize this feature.

As discussed above, we are not ready to precisely pick this site. However, a drill site in the vicinity of CAB#3 would definitely enhance the model, as the Timber Mountain Bench structural block has not been drilled. This block is directly down-gradient of tests conducted on Pahute Mesa and could play an important roll in controlling groundwater flow from Areas 19 and 20. A segment of the TCL forms the western edge of this block, providing additional incentives for drilling a CAB#3 location.

The proposed coordinates for the CAB#3 location given in the CAB letter would be very difficult and costly to access with regards to road construction.

Summary

CAB#1 is likely to fulfill the CAB's stated objective to intersect a contaminant plume. However, this location to too close to Well Cluster ER-20-5 to provide much, if any, new hydrogeologic information to the UGTA Project.

The CAB#2 location is not in an uncharacterized portion of the model. Consequently, the amount of new hydrogeologic data as desired by the CAB, will not be that useful to the UGTA Project. This proximal down-gradient site would be a good "sentinel well" to monitor for contaminant movement from Pahute Mesa tests.

Flow and transport modeling specific to this study might be used to help site another location that would address most of the objectives of both CAB#1 and #2 with only one well (i.e., somewhere between the two proposed locations).

The CAB#3 site needs refinement, and the CAB acknowledges that additional work (they suggest geophysical surveys) is necessary to precisely site this well. A focused study that reevaluates all the geophysical data specifically to help site a drill hole should be considered. However, pushing the geophysical data further (including additional surveys) may not be fruitful. The CAB#3 general location is in a geologically challenging and important down-gradient structural block. A borehole in this vicinity would provide useful information to the UGTA Project and better constrain subsequent modeling. Constructing an access road to this area is going to be challenging and costly.

If you need additional details, please feel free to call or e-mail me.

April 6, 2006

Comments on "CAB UGTA Well Location Recommendations", dated February 10, 2006, Gayle Pawloski, TWG Geology Subcommittee representative

I have reviewed the Community Advisory Board for Nevada Test Site Programs CAB UGTA Well Location Recommendations, which recommends three locations for new drill holes. I am following our instructions on commenting on the technical ability of the drill hole locations to meet their stated objectives, However, I cannot restrain myself from making other personal and program-based comments. I will clearly identify these as such.

CAB Well #1

The technical objective of this hole is to intersect a contaminant plume. It is stated that is would also be beneficial to detect radionuclides other than tritium to be linked to a specific test. If no contamination is found the hole will make an effective monitoring well for contamination and could still provide important data on indication of rate of flow in the area of concern.

The proposed location 244m downgradient of ER-20-5 #1 seems to be reasonable to meet these objectives, due to the appearance of contaminants found in the hole, and the positive association of plutonium from Benham. The proposed depth of the hole is reasonable, because it penetrates the HSU contamination was found in at ER-20-5 #1. The location of the hole would permit it to be a monitoring well in the future. Data would provide information on flow and transport rates or radionuclides.

Opinions – Plume chasing is a difficult, high-risk task. UGTA proved that when it drilled ER-20-5 looking for contaminants from nearby TYBO and found, much to our surprise, plutonium from distant Benham. Due to the fractured nature of the rock it is almost impossible to predict with confidence that a plume will be encountered. ER-20-6 (although a different rock type at the depth of interest) is also a good example of drilling close to a test and not finding much contamination. UGTA project management has steadfastly said the project will not do plume chasing.

A drill hole this close to existing drill holes brings no new geologic, hydrologic, and chemical understanding to UGTA. However, if the proposed hole is successful in finding contaminants, it will provide information only slightly further downgradient of the ER-20-5 holes that would be beneficial to UGTA small and intermediate scale transport models in understanding flow rates and how radionuclides moved from one location to another nearby location. Note that 244m would only be a maximum of a couple to several of grid blocks in the CAU model, and would provide information on radionuclide transport over a very short distance.

The CAB states that by focusing on a location behind the leading edge of the plume the potential for detecting a grater array of radionuclides may be increased. It is not clear if this is true or what the benefit of finding lots of radionuclides brings. The ability to detect radionuclides linked to a specific test is to be questioned also. Only a few isotopes can be fingerprinted to a specific test. This location downgradient of a larger number of Pahute Mesa underground tests may intersect a

"soup" of contamination that can not be deconvolved, or provide any site-specific source information. Even if plutonium from Benham is again sampled, this >$1M drill hole will simply show that contamination moved downgradient, which we presume is happening.

The idea that this well could be used as a monitoring site for the future is a cost-savings attraction. However, it may not be placed optimally from the UGTA perspective. We won't know if this is an optimal location for the monitoring network until we get to that stage of the program.

CAB Well #2

The technical objective of this hole is to sample geochemistry and elevation of groundwater and test for potential contamination downgradient of CAB Well #1. This well is proposed to be about 1100m from ER-20-5 #1 and be located within the transition zone between the caldera and the Timber Mountain Bench. This location would be favorable to a sentinel well, since contamination could reach this area by 2020.

Drilling a hole 1100m downgradient of ER-20-5 #1 should be straightforward. Ensuring it is within the transition zone between the caldera and the bench is difficult. First and foremost, the ability to located boundaries between these "geologic" features is difficult. All methods used to provide information have low resolution. If it is critical to be in the transition zone the data will only permit low confidence in identifying the potential spudding locations. Second, topography limits drill sites. If the CAB is willing to risk that the hole is not in the transition zone, this would be an acceptable site.

Opinions

With low resolution geophysical methods it is exceedingly difficult to locate the caldera edge, the bench, and the transition zone in between, with the accuracy to site a drill hole in the transition zone with high confidence. I know of no other methods to improve on locating the features other than drilling, and that is an expensive hit-and-miss option. Locating the drill hole in the transition zone cannot be the top technical reason for siting this hole where it is. If the CAB is desires to site the hole in the transition zone, they must be willing to state clearly the low confidence and the risk associated with this location, and strengthen the argument that the site is valuable even if it isn't optimally located in the feature.

A drill hole this close to existing drill holes brings little new geologic, hydrologic, and chemical understanding to UGTA. The data it provides would be useful, but I don't think UGTA would choose to site a hole this close to existing holes to obtain characterization data.

Where did the "contamination could reach this area by 2020" come from? I have no idea if it is technically correct or not. The idea that this well could be used as a monitoring site for the future is a cost-savings attraction. However, it may not be placed optimally from the UGTA perspective. We won't know if this is an optimal location for the monitoring network until we get to that stage of the program.

Since this hole is being used to investigate contamination downgradient from the ER-20-5 site, the targeted HSU at depth should be the same as CAB #1.

CAB #3

The technical objective of this hole is to improve the understanding of the effect of the Thirsty Canyon structure on groundwater flow along the west end of the Timber Mountain bench.

After written justification the CAB concluded "further study was needed to determine a practicable drill site for the objective of this well."

No review is necessary as the recommended site location was withdrawn.

Opinion

Many would agree that the Thirsty Canyon Lineament has a poorly understood effect on groundwater flow. However, a single drill hole probably will not supply sufficient information to understand the issue, and aquifer tests should be included to maximize understanding. Thus a large project must be undertaken to understand the effect of the Thirsty Canyon feature on groundwater flow. Multiple drill holes and aquifer tests are not part of DOE's promise to drill a location for the CAB, and frankly, the issue is an important scientific question that it should not be left to the CAB if it is to be investigated. Before a drill hole can be located to convincingly address the issue, the features in question must be better located (the CAB saw this also and put this site on hold).

Other Comments

Locating a drill hole is only part of the issue, and may only be the tip of the iceberg in many cases. For example, no comments are provided by the CAB for well completions for these holes. What types of analyses are included (both water and rock)? Does the CAB think that once the holes are drilled they will be sampled regularly? Are these holes automatically part of the monitoring network, even if not optimally located for monitoring? Are implied commitments being made but not spoken? These things should be taken into consideration and documented from the start so all know what the game plan is.

I am bothered that the CAB thinks it can propose three locations when one drill location was promised. Will their desires be higher than the technical project that is tasked with investigating the issue of contamination of groundwater at the NTS?

To: Tim Rose
From: Rick Waddell
Subject: Comments on Community Advisory Board for Nevada Test Site Programs (CAB) Recommendation for Future Nevada Test Site Well Locations, February 10, 2006
Date: April 6, 2006

Sig Drellack reviewed the proposed drilling locations from the perspective of the geology, site access, and the likelihood of obtaining information pertinent to radionuclide transport processes. Because of the quality and thoroughness of Sig's comments on the first two items, I will only provide some perspective with respect to transport processes.

In my view, the UGTA project would benefit from collection of additional data down gradient from underground tests, and the original intent of the wells drilled at the ER-20-5 site was to collect information relevant to the TYBO test. The drilling location was selected based on calculation of flow directions based on fracture orientation data and limited water-level data. The water-level data suggested, on a multi-fault block scale, that there was a strong westerly component to the hydraulic gradient. The Monte-Carlo analysis of flow directions indicated that a location southwest of the TYBO working point would have the greatest probability of intercepting radionuclides migrating from the TYBO cavity. This same analysis indicated that there was a large amount of uncertainty about the flow direction. It is now known that the Pu-isotopic data indicate that the radionuclides encountered in the saturated zone probably migrated from the BENHAM cavity. [Nuclides encountered in the unsaturated zone at ER-20-5 probably migrated in a gaseous phase above the water table from the TYBO chimney. There may also have been some "carry down" of radionuclides from the unsaturated zone into the upper part of the saturated zone.] These results suggest to me that the faults in the area of TYBO and BENHAM limit westerly flow and create higher westerly gradients across these northerly striking faults, but southerly gradients prevail within the fault block in which the TYBO and BENHAM tests were conducted. Therefore, I would expect radionuclides from TYBO to be migrating to the south from the TYBO cavity, not to the southwest as originally anticipated.

The original plan was to drill two additional wells down gradient of ER-20-5#1 following its completion and evaluation of data. However, a decision was made to drill deeper wells from the same location to collect information at greater depths. Radionuclides from BENHAM were also found in the deeper completion zone. As a result, it is generally believed that these wells have provided useful information on movement of a limited number of radionuclides moving attached to colloids. The concentrations that were detected were very low and below levels of concern with respect to health effects, and it would be expected that a greater number of radionuclides at higher concentrations would be encountered in water collected closer to the BENHAM cavity/chimney.

Why is this discussion pertinent to the locations proposed by the CAB? First, a well drilled at the proposed location of CAB#1 may encounter radionuclides migrating solely from BENHAM, or it may encounter a mixture from TYBO and BENHAM. In the first case, the additional information gained from the well is likely to be little more than a confirmation of the results from the ER-20-5 wells. In the second case, it may not be possible to interpret the results

without considerable uncertainty. If TYBO radionuclides are encountered at the proposed location, they are likely to be along the edge of a plume, rather than along the main or central part of the plume. Because of the many chemical and physical processes that affect transport, I believe that less equivocal results would be obtained from drilling in a more central part of the plume where higher concentrations would be encountered, and where the impacts from mixing from two different sources would be minimized. Therefore, I suggest alternative locations for CAB#1, such as either (1) north of TYBO, where it would provide information on more radionuclides migrating from BENHAM and without the complication of mixing of TYBO waters, or (2) south (rather than southwest) of TYBO, where it would likely provide information on many nuclides migrating from TYBO but with some complexity resulting from mixing of TYBO and BENHAM waters. In my view, both of these alternatives would provide better information than the currently proposed location.

The location of CAB#2 should be modified to reflect any changes that might result from the above discussion. I believe that moving both CAB#1 and CAB#2 between the BENHAM and TYBO locations would provide the best data set because of the information already available from the ER-20-5 wells, the greater likelihood of obtaining information on a greater number of radionuclides at concentrations representing a greater health risk, and the avoidance of issues related to mixing of TYBO and BENHAM waters. Another advantage of this approach is the previous work performed by LANL to simulate the movement of radionuclides from BENHAM.

I concur with Sig's evaluation of the CAB#3 location. I think that a well in this general location will have utility from a long-term monitoring perspective. I agree with Sig that a single well will probably not be able to answer the geologic question concerning the "origin" of the Thirsty Canyon lineament. Thus, I would recommend that the well be sited to answer questions related to its hydrologic significance, through collection of water-level and geochemical data. I suggest additional discussions about the siting of this hole be considered prior to extensive planning. These discussions should consider site access, proximity to other holes that provide geologic and hydrologic data, evaluations of alteration associated with the Black Canyon caldera and impacts on permeability, and geophysical data.

If there are questions about my comments, please contact me.

CAB Well Recommendations
Dave Finnegan
April 7, 2006

General comments
I think that the well sites proposed by the CAB are well thought out and planned and in general are reasonable. I think that the only problem with their sites is their lack of familiarity with the NTS and not understanding the difficulty in tracking contaminant plumes.

CAB Well #1
As we on the TWG are all aware, trying to track a plume can be extremely difficult. Just drawing a straight line from Benham through ER20-5#1 to their proposed site looks good on paper but can lead to great disappointment in the field. There is no guarantee that the radioactive plume will be intercepted since the water does not necessarily move in a straight line. That being said, I do like the idea of intercepting a contaminate plume, but the risks of not hitting the plume must be taken into account. As Sig said, we have plenty of geological data in this area, so a well that does intercept the plume would not be very useful.

CAB Well #2
I do like their idea of following a plume down gradient for more than a kilometer, but again, the likelihood of intersecting the plume decreases with distance. If the plume was intercepted this would be a wonderful well, however, one would need to look at the value of the well if the plume was not detected. According to Sig, this well (#2) would be more useful geologically so it may be a better choice than #1.

CAB Well #3
This well would be an excellent location if their was a suitable place to drill it. From the maps, their does not appear to be a relatively flat area close to their suggested location. If a reasonable area could be found, this would be a sensible hole from the geology/geochemistry standpoint. It doesn't do much for the source term folks (i.e. me.) I would prefer to be risky and drill either #1 or #2.

July 6, 2006

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