Peer Review of the Definition of Unusually Sensitive Areas (USAs)

By

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Introduction

The Department of Transportation (DOT) released a proposed rule providing a definition of Unusually Sensitivity Areas (USAs) (Federal Register, Vol. 64, No. 250, December 30, 1999). The proposed definition is based on both drinking water and ecological resource areas. USA means a drinking water or ecological resource area that is unusually sensitive to environmental damage from a hazardous liquid pipeline release. Damage to the geographical area means eradication or irreparable reduction in water quality or quantity from localized events occurring near the resource. On April 27-28, 2000, DOT held a public workshop on the proposed definition of USAs. Based on attendance at that workshop and review of materials provided at the workshop, a peer review of the drinking water portion of the definition of USAs is provided below. The peer review answers a series of questions asked of the peer review group.

Is the Model Academically Sound?

The model begins with a further refinement of the definition of USAs. For drinking water resources, the proposed definition of USAs encompasses three candidates: (1) the water intake for a Community Water System (CWS) or a Non-transient Non-community Water System (NTNCWS) that obtains its water supply from a **surface water source** and does not have an adequate alternative source of water; (2) the Wellhead Protection Area (WHPA) for a CWS or a NTNCWS that obtains its water supply from a **groundwater source** contained in a Class I or Class IIa aquifer and does not have an adequate alternative source of water; and (3) an area twice the WHPA for a CWS or a NTNCWS that obtains its water supply from a **groundwater source** primarily contained in a sole source Class I or Class IIa aquifer and does not have an adequate alternative source of water. The model consists of a geographical information system (GIS) application that implements this definition. The implementation is performed via a series of logic steps described in a flow chart. In effect, the process begins with a large group of environmentally sensitivity areas (ESAs), then uses a set of filters to reduce the ESAs to a subset of USAs.

Based on my review, this model is academically sound. The environmental resource is protected by numerous other environmental regulations. The purpose of the USAs, by definition, is to identify drinking-water intakes. If these intakes are near a hazardous liquid pipeline, then a risk assessment is triggered to evaluate if a potential release has the ability to impact the USA. Given

this purpose, the definition of USAs is appropriate. For many identified USAs, this definition is conservative because potential releases will not cause eradication or irreparable reduction in water quality or quantity. In the case of many surface water intakes, the release will flow downstream causing only a temporary impact. For groundwater, the impact has the potential to be longer term, but more localized than a release to surface water. Given the geographical distribution of USAs, the use of GIS for identifying USAs is appropriate.

Are Assumptions Valid?

The assumptions in the model mainly concern the filter criteria and notable exceptions used to reduce ESAs to a subset of USAs, and assumptions concerning the areal extent of the USA. The filter criteria and notable exceptions are as follows:

1. Transient noncommunity water systems are not considered USAs.

2. CWS and NTNCWS that obtain water supply primarily from surface water and have an adequate alternative source of water are not considered USAs.

3. CWS and NTNCWS that obtain water supply primarily from groundwater in other than Class I or Class IIa aquifers, or if they have an adequate alternative source of water, are not considered USAs.

4. CWS and NTNCWS that obtain water supply primarily from groundwater in a sole source aquifer and have an adequate alternative source of water are not considered USAs.

These criteria are primarily based on aquifer classification and the existence of an adequate alternative source of water. The groundwater classification relies on the work of Pettyjohn et.al. (1991), and is an appropriate approach. Screening by adequate alternative water sources also is appropriate, however, there may be data adequacy issues that are discussed in the next session.

Other assumptions used in the USA-determination process include:

5. Buffer for surface water intake point is a 5-mile radius.

6. If WHPA has fixed radius, the buffer for the groundwater intake is twice the radius.

7. If no fixed radius is available, the buffer for the groundwater intake is 2000 feet.

8. If depth is known and well is less than 50 feet deep, aquifer is considered Class I.

9. An adequate alternative water source is one that is readily available for up to a month.

10. If source aquifer for well can not be determined, the well falls out of the model (does not

become a USA) because USA candidacy cannot be determined due to insufficient data.

11. If an adequate alternative water source cannot be determined, the water intake falls out of the model because USA candidacy cannot be determined due to insufficient data.

The assumptions concerning the buffer distance are reasonable given that the purpose is to identify the USAs; not protect them. The assumption concerning the one-month timeframe for an adequate alternative water source may be appropriate for many surface water intakes, but is likely too short a timeframe for a groundwater intake. If a groundwater intake is contaminated, six to nine months will likely be required before a remedy such as wellhead treatment can be implemented. Most assumptions used to determine the source aquifer in which a well is completed (when not specified) are conservative and appropriate. The last two assumptions listed above (no. 10 and 11) are not conservative, and point out the importance of repeating this modeling process when databases on source aquifer and alternative water supplies are updated. Finally, it would be more transparent and helpful to the reader if all assumptions are explicitly listed in one location (for the pilot studies, this was performed).

In addition to peer review, validation of the assumptions (and the model) could be attempted using case studies where releases from pipelines have occurred near water-supply systems. The case studies could be used to see if the impacted water-supply system was identified in the modeling process as a drinking water USA. Case studies also could be used to further justify several of the assumptions. Time constraints may not permit this case study evaluation, but it could be conducted in the future as a validation test.

Are Adequate and Appropriate Data Used?

Because the scale to define USAs is nationwide, it is appropriate to use existing databases that are in electronic format. The pilot studies were performed at a state level, and available databases were obtained from the states. For some states, it may be necessary to obtain data from smaller regions than states. For example, Florida and California are subdivided into water districts that likely contained more detailed information on water-supply intakes than is available at the state level. Base maps were appropriately obtained from the U.S. Geological Survey.

At the workshop, it was pointed out that new information will become available as part of the source water assessment program. This new information will need to be incorporated into the USA determination process. In addition, as new water-supply intakes go online in the future, the USA determination process will need to be updated.

The definition of an adequate alternate water supply was discussed at the workshop. For the pilot studies, this information was generally missing from databases and had to be determined by contacting water system operators directly. The workshop discussion on this issue was confusing as to what questions were asked of the water system operators and whether they were the appropriate questions. This contact process needs to be well documented in order to establish

that an adequate alternate water supply actually exists and is documented. As indicated previously, the timeframe required for an alternative water source is likely different for surface water versus groundwater.

As pointed out at the workshop, the databases contained data of variable completeness, and perhaps quality. For some wells, the database specified the source aquifer. For other wells, as part of the modeling process, the source aquifer was assigned using a data evaluation process. As a result, USAs are identified that have different levels of confidence associated with them. Where possible and appropriate, a data flag should be used to indicate the level of confidence in the identified USA.

Are Data Collection and Manipulation Process and Procedures Sound?

Data collection or acquisition was discussed above. Obtaining data in electronic format from states and the U.S.G.S. is appropriate. The main data manipulation process is applying the filter criteria and the assignment of the source aquifer to wells where it is not specified in the databases. The data manipulation process is appropriate. This was demonstrated by the pilot state results.

Were the Results From the Pilot States Valid?

Pilot studies were presented for Texas, Louisiana, and California. The pilot studies demonstrated how additional information is used and how the logic rules in the model are applied. In addition to available databases, reports from the U.S. Geological Survey were utilized. The general logic rules were tailored for individual aquifers within the states. State-wide maps were produced that plot the USAs. Although the size of the USA helps distinguish between surface water and groundwater, a color difference would also help distinguish the two type of USAs. The maps produced appear to be valid. Here again, reference to case study examples would be helpful in justifying assumptions (e.g., timeframe of impacts to water supplies from past releases). Finally, evaluation of these pilot states would have been facilitated if statistics on ESAs and USAs had been provided. In addition, it would have been helpful if sensitivity scenarios were conducted where assumptions were modified and the resulting new statistics on USAs provided. That is, determine how changing assumptions changes the resulting number of USAs. For example, for Louisiana, wells screened deeper that 300 feet were assumed to be Class III. If the depth was changed to 500 feet, how does the number of USAs change?