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Water Solutions, Inc.

November 26, 2012

Office of Environmental Assessment
Attn: Carol Harrison
U.S. EPA, Region 10
1200 Sixth Avenue, Suite 900
OEA-095
Seattle, Washington 98101

Dear Ms. Harrison,

GSI Water Solutions, Inc. (GSI) is writing on behalf of the Washington State Dairy Federation to express our technical concerns with certain approaches used in the U.S. EPAs *Relation Between Nitrate in Water Wells and Potential Sources in the Lower Yakima Valley, Washington* report (USEPA 2012). This report draws conclusions regarding the apparent contribution from various land uses to high nitrate levels found in groundwater and residential drinking water wells. GSI is committed to a sound technical approach to the practice of hydrogeology and we strongly support groundwater antidegradation policies that promote wise management for sustainable and healthy groundwater systems. We disagree that there is sufficient technical certainty to support some of the conclusions drawn from this study because they were not established using customary standards of practice or technical guidelines for subsurface investigations and assessing environmental impacts. The limitations and uncertainties of the study – particularly with regard to the use of regional rather than local groundwater flow directions resulting from an apparent lack of site specific hydrogeologic characterization, lack of well completion and construction information, and results from one sampling event – are significant enough that the underlying conclusions are inappropriate.

An understanding of environmental processes taking place in the subsurface depends on adequate characterization of the subsurface system. Many standards (ASTM 1996 and 1998) along with State and Federal technical guidelines (USEPA 1986, 1991, and 1992; Ecology 2005) are available for subsurface investigations that have an environmental purpose. These are intended to improve consistency of practice, promote logical planning to assist in the design of such investigations, meet regulatory monitoring and quality assurance and control requirements, and guide the collection of data that is indeed representative of subsurface conditions.

The USEPA did develop a quality assurance project plan (QAPP) for the study, which identified certain quality assurance and control procedures. Assuming the QAPP was followed, the sample collection, handling procedures, and analytical methods used should result in an accurate assessment of concentrations in groundwater. For the following reasons however, an investigation relying on limited well information, inappropriate gradient determinations, and a single sampling event cannot provide results that support sound decision making:

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- Regional vs. Local Groundwater Movement – On a general level, the USEPA report cites U.S. Geological Survey work that describes the complexity of the aquifer system underlying the study area (USGS 2009) and the importance of understanding local (site specific) rather than regional (generalized) groundwater flow patterns when making any evaluation or assessment of aquifer conditions. Specifically, on pages 6 and 7 of the USEPA report the authors point to the importance of understanding preferential groundwater flow pathways and large differences in groundwater flow velocities expected under the variable subsurface conditions shown by the USGS regional work. Review of guidance documents prepared by the USEPA (USEPA 1986; 1992) and Washington Department of Ecology (Ecology 2005) for site characterization and groundwater monitoring projects also point to the importance of understanding such factors, especially on the site specific level. The USEPA (2012) study however, uses generalized flow directions to define up-gradient/down-gradient relationships at a local scale in place of site-specific, more definitive flow patterns and trends. Local groundwater flow conditions for the sites evaluated in the USEPA report were not defined despite the USGS report recognizing canal/lateral leakage, irrigation, drains, streams, pumpage, variations in recharge, perched water, spatial variations in hydraulic characteristics, and topographic setting as factors that can locally affect groundwater flow directions and gradients. Given these complicating factors, the report's acknowledgement of their importance, and USEPA and Ecology guidance for subsurface evaluation efforts, the use of regional rather than local groundwater flow directions at the sites evaluated is problematic, and leads us to question the designation of up- and down-gradient when describing groundwater movement and routes of contaminant migration and identifying potential sources of contamination.

- Lack of Complete Well Information – A recurring theme in the guidance documents referenced above is the importance of using monitoring wells that are completed in the same portions of the aquifer system, and differentiating between those completed in deeper and shallower portions of the aquifer system. These documents also point to the importance of well construction in preventing cross-contamination and resulting generation of false positive and false negative results. The USEPA report, building on earlier work done by Ecology where nitrate was shown to be more of a problem in the shallower aquifer system (Ecology 2010), seems to acknowledge the importance of well construction in selecting wells to be sampled. Yet, the USEPA report relies on data collected from many wells that lack information on construction and/or are completed in multiple aquifers. Over 60 percent of wells sampled (18 of 29) lack well construction information such as total depth, well screen or casing-perforated intervals, or open/uncased borehole. The lack of well construction information limits the ability to:

    - Characterize nitrate concentrations for distinct water-bearing units. Note that nitrate results shown in Figure 10 of the USEPA (2012) report do not distinguish whether concentrations are representative of shallow alluvial or deep basalt aquifer systems; and

    - Evaluate up-gradient/down-gradient relationships relative to potential contaminant source sites. Because there are differing elevation heads in the two systems, evaluating water levels from both water bearing units to determine up-

and down-gradient directions will result in conclusions that are imprecise at best, and more likely inaccurate.

The standard of practice typically used in determining groundwater gradient, flow direction, and contaminant sources, and which should be applied in this case, is that wells monitored for this assessment are constructed in the same portion of the aquifer system. When assessing concentration distribution, it is important that samples are collected near the same depth to remove the variability associated with different travel times, residence times, redox conditions, and heterogeneity that result in highly variable vertical distributions of solute. Guidance recommends that every effort should be made to ensure that the samples are representative of the particular zones of water being sampled. The USEPA study used existing drinking water wells for their study; no new similarly constructed, purpose-built monitoring wells were installed.

- One Sampling Event – Natural variability in groundwater quality over time arise from spatial or temporal fluctuations in groundwater recharge or discharge. Groundwater levels that change in response to temporal changes in recharge or discharge may affect groundwater flow rate and direction of movement, which may influence groundwater quality in the vicinity of a monitoring well as it may capture groundwater from different up-gradient areas seasonally and limit the ability to identify seasonal trends in the monitoring results. The USEPA report relies on sample results from a single event conducted over the course of two weeks between February 22 and March 6, 2010 to conclude cause and effect. Standard practice does not support drawing conclusions perceived as representative of the system over time from a single sampling event. Environmental guidance and standards of practice typically recommend multiple sampling events spaced over a water-year to capture temporal variability. In Washington State, the guidance we use (Ecology 2005) recommends a minimum of eight sampling events spaced at least a month apart before making conclusions about the cause and effect of groundwater conditions, including sources, flow paths, and impacts. The reasons for this are simple, being tied to all of the transient events that influence groundwater conditions, reasons such as canal/lateral leakage, irrigation, drains, streams, pumpage, and variations in recharge. These are all known to occur in the immediate vicinity of the Dairies and some of the other sites evaluated in the USEPA report. It is important that spatial and temporal fluctuations in groundwater levels and how these may or may not influence groundwater quality at sites monitored are well-understood before making a final determination as to trends, causes, effects, and sources.

- Others – There are other potential contaminant migration pathways that were not addressed, such as improperly abandoned or constructed wells. These may be contributing to the distribution of nitrate contamination as well, and obscure conclusions derived from multi-aquifer well networks.

The limitations and uncertainties discussed above are considered to have significant impacts on the conclusions of the study. The lack of well construction/completion information coupled with the lack of an adequate understanding of the groundwater system over time (i.e., natural variability in groundwater flow rate, direction, and quality) compounds the overall uncertainty and greatly limits the ability to identify routes of nitrate migration and potential sources of contamination. Given these factors, we feel that the nitrate concentrations reported in the study are more representative of a bulk aquifer system from contaminant sources originating from a

mix of land-use types. These uncertainties could all be addressed in true site specific characterization efforts that do not appear to have been conducted as part of the USEPA (2012) study. The USEPA states in the report that they are working to refine the results and further evaluate nitrogen fate and transport in a collaborative project between the USEPA and USGS, and that a report is due during the winter of 2012. While we strongly support this additional work, we were disappointed to hear at the October 18, 2012 Lower Yakima Valley Groundwater Advisory Committee Meeting, that no further work on nitrogen fate and transport will be conducted.

In closing, we strongly encourage the USEPA to: (1) pursue the collaborative project with the USGS to focus on better characterizing the sources of nitrogen applied to the land, and the relationship between changes in nitrogen loading on the land and levels of nitrate in drinking water wells and (2) perform site-specific groundwater characterization efforts that are recommended in all of the guidance documents typically used by environmental professionals. We encourage USEPA to continue efforts related to groundwater protection, and believe that additional resources applied to this issue will promote rational decision-making for addressing nitrate concerns and guide development of targeted programs to improve the health of the aquifer system.

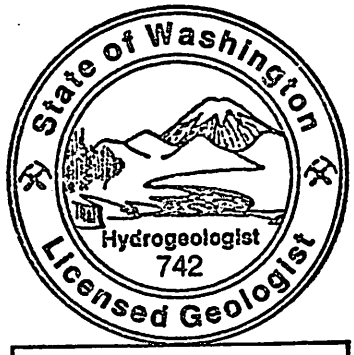
Thank you for your consideration of our comments and this opportunity to express our technical concerns with certain approaches used in the USEPA (2012) study.

Sincerely,

GSI Water Solutions, Inc.

Kevin Lindsey, PhD
Hydrogeologist, LHG

Kenny Janssen
Hydrogeologist



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