# Automotive Service Center Arsenic Investigation Silverdale, Washington

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## INTRODUCTION AND BACKGROUND

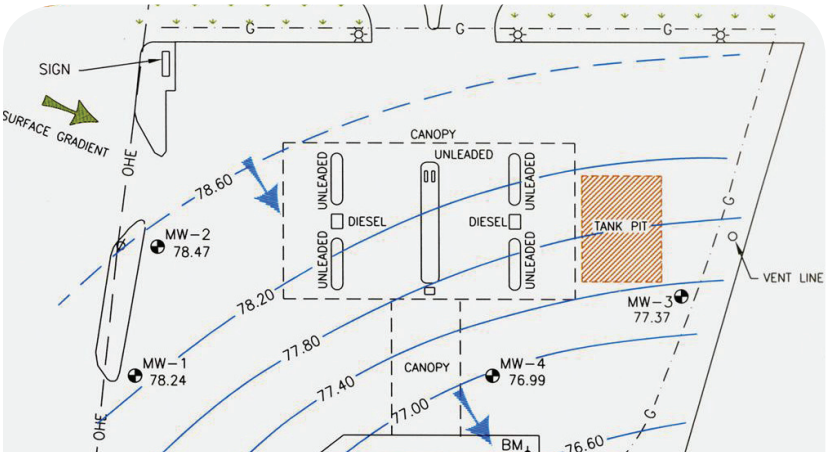
Knowing when a soil or groundwater investigation is routine or complex can be akin to fixing a toothache. It's not so much how it's fixed as figuring out what's wrong so the tooth can be fixed. Efficient closures of environmentally impacted sites are not much different. Sometimes we don't recognize that problem-solving starts with an analysis and clear understanding of the problem to determine if we're looking at a typical inquiry or one that requires its own unique path to resolution.

One of our customers, a tenant operating an auto service center, asked us to step into an ongoing environmental investigation to bring a new perspective to the project. The site, an auto service center near Bremerton, Washington, had two previous consultants. Both had performed familiar auto service center investigations for the location with routine groundwater surveys and sampling. Although Sierra Piedmont has obtained closure at hundreds of similar sites, we soon learned this was not like other projects.

## STATEMENT OF PROBLEM

The first challenge was that a routine measurement for groundwater flow direction could not be obtained. Numerous attempts were made and, in each case, the directions obtained were somewhat different than the previous results. Second, although a minor impact from petroleum compounds was expected and found, arsenic and other metals were also found. Some of the metals could be expected with the petroleum release. However, arsenic we felt was an anomaly.

The state of Washington would not grant closure because no consistent groundwater flow direction had been determined and a plausible source for arsenic had not been found. Further, the landowner's environmental consultant had lost hope that the tenant's consultant would gain sufficient understanding of site conditions to move the site to closure.

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## STRATEGY

Sierra Piedmont initiated site activities with a thorough reading of the local geologic literature and phone discussions with the regulatory project manager and property owner's consultant. It was critical that this communication be done quickly so a clear understanding and creation of common goals could be achieved by the stakeholders. Further, renewing everyone's commitments during a transition often gives adversaries an opportunity to wipe the slate clean.

After discussions with the stakeholders, it appeared that three matters of discord had to be cleared before this site could be closed: Consistent groundwater flow direction must be determined; an explanation for the dissolved arsenic in the groundwater; and faith had to be renewed between the parties to properly investigate and close the site.

## SOLUTION

Knowing about different types of physiographic provinces and groundwater conditions is valuable; doing a little research can be priceless. The location of the investigation falls in the Poulsbo Topographic Quadrangle. The site is 20 to 40 feet above mean sea level. Dyes Inlet, approximately 1,000 feet from the site, leads to Puget Sound. Typical soil types encountered were well-graded sands with a small percentage of fines, silty sands, sand-silt mixtures and clay. Groundwater stabilized at two to four feet below surface grade and the gradient was *.0090-.0099* $ft_v/ft_h$. This led to a conclusion: Groundwater conditions are likely being influenced by proximity to the tidal inlet.

Sierra Piedmont began a 24-hour groundwater gauging event, which showed two basic flow directions related to tidal influences. Without measurements over a 24-hour period, the changes to groundwater flow direction couldn't have been determined.

Based on our knowledge of the flow regime and contaminants involved, we modified the sampling protocol from the accepted petroleum routine - bail three well volumes and sample methodology - to include a 24-hour *rest* period after purging and utilization of a low-volume flow cell during which parameters - pH, temperature, oxidation-reduction potential, dissolved oxygen and conductivity - were continuously measured.

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Determining potential causes for dissolved arsenic was a little more challenging. And all too often as scientists, we look for definitive cause-and-effect relationships. And all to often, we simply don't have the budget in commercial projects to do this. However, it's not always necessary to spend a lot of money. In this case, we simply had to show there was a more likely source for the arsenic than the tenant.

Sierra Piedmont began researching the U.S.G.S. records and found a report, "Ambient Quality of Ground Water in the Vicinity of Naval Submarine Base Bangor, Kitsap County, Washington" (1995). This study documented elevated concentrations of arsenic in ground water within an 80 square mile area surrounding the naval base. The Bangor (Washington) base was approximately 4.5 miles *upgradient* of the subject property. The study was conducted to provide the U.S. Navy with background levels of selected constituents to plan and manage cleanup activities on the base. According to the report, the 90th percentile concentrations for arsenic ranged from *4 µg/L to 12µg/L* which were statistically similar to conditions found at our site.

Although the specific source of the arsenic was unknown, the fact that it existed four miles *upgradient* of our site was ample evidence that we were the *affected* party. And, with a little research, we found that arsenic can often be attributed to normal weathering of volcanic rock and sulfide mineral deposits, which would be common in this geologic setting.

## CONCLUSION

Once our report was submitted to the state explaining the groundwater flow direction variance and the possible alternate source of the arsenic, the site was quickly awarded a "No Further Action" status.

Sometimes, working with routine methods is appropriate. Sometimes, the necessity for true geologic research and broader thinking is warranted. The trick is knowing which one applies.