

# GROUNDWATER

Building an understanding of groundwater  
at Santa Susana Field Laboratory



## Parking Lot Questions

Question	Response
<b>Session 1:</b>	
1. Do we finally have an order that will force DTSC to direct the cleanup?	DTSC prepared a handout that was made available at Session 2 explaining the Administrative Order on Consent. For further questions about the Administrative Order on Consent, please contact Yvette LaDuke at DTSC at <a href="mailto:yladuke@dtsc.ca.gov">yladuke@dtsc.ca.gov</a> .
2. Effects of fault and water along Runkle Canyon?	Dave McWhorter explained during Session 4 (Groundwater flow at SSFL) that a very small part of the Runkle Canyon watershed extends onto the SSFL in the far northwest corner. Water level contours in this area indicate a north-northeast direction of groundwater flow, not into the Runkle Canyon area.
3. Aquifer system in the San Fernando Valley?	Groundwater U was designed to focus on SSFL groundwater. Matt Becker explained during Session 3 (Groundwater Remediation Approaches) that groundwater investigations typically search outward from the source of contamination.
4. Does tritium move faster or slower than water?	<p>Tritium is a radioactive form of the element hydrogen. A very small proportion of the hydrogen in water molecules in the groundwater at SSFL is tritium. In the northwest part of the site (near Building 4010), there is also a defined plume of tritium in groundwater that was caused by historical reactor operations. In addition, a small amount of the tritium at SSFL originated from radioactive fallout (resulting from atmospheric testing of nuclear weapons, which ended in 1963).</p> <p>Water molecules containing tritium as a portion of the hydrogen (called "tritiated water molecules") do not travel at the same speed as the water. Generally, tritiated water molecules behave like other contaminants and move more slowly than water.</p> <p>In fractured, porous rock like that found beneath the SSFL, tritium travels slower than the average water flow in the fractures. The retardation of the movement (relative the average rate of water flow) is due to the effect of a process known as diffusion that binds the tritium to the gaps within the rock (the process the Groundwater Panel referred to as "matrix diffusion"). As a result, nearly all of the tritium is contained beneath the site, and a portion of that tritium has decayed through normal radioactive decay processes.</p>
<b>Session 2:</b>	
5. How safe is blended water?	For concerns about the general safety of drinking water in your area, you may want to contact the California Department of Public Health ("DPH"). For the Ventura County area – which is the DPH's District 6, the contact telephone number is (805) 566-1326.

Question	Response
6. Where is the historic groundwater contamination now? For example, tritium?	<p>Nearly all of the contaminants (including trichloroethylene, metals, perchlorate, and tritium) are still present in the geologic formation that lies under the SSFL. For all groundwater contaminants, the highest concentrations occur close to the historical operation areas where the chemicals were used. A majority of the contamination remains within the boundaries of the site.</p> <p>Detailed information about the results of investigations of SSFL groundwater is presented in the 2009 Sitewide Groundwater Remedial Investigation Report.</p>
7. Do we know about the background of groundwater? <sup>1</sup>	<p>Groundwater U was designed to help the public prepare to review the Sitewide Groundwater Remedial Investigation Report by providing general information on:</p> <ul style="list-style-type: none"> <li>• Groundwater, fate and transport of groundwater contamination, and different groundwater contamination remediation approaches</li> <li>• Groundwater flow, contaminant sources, and contaminant fate and transport at SSFL.</li> </ul> <p>The quality of groundwater in Simi Valley was not within the scope of Groundwater U.</p>
8. Could rocket testing cause fractures?	<p>Dave McWhorter explained during Session 4 (Groundwater Flow at SSFL) that rocket testing certainly causes the ground to shake. If any fracturing results, it is very local. It is extremely difficult to fracture rock, even when attempted by dynamite, or in one case, by nuclear explosion.</p>
<b>Session 3:</b>	
9. Have we attended these meetings under false pretenses?	<p>The full comment associated with this question indicated that the speaker was concerned that decisions had already been made in regards to the groundwater at the SSFL and that the intent of the Groundwater U was to inform the public of the decisions made. On the contrary, the sessions of the Groundwater U had two very different objectives.</p> <p>The objective of the first three sessions was to provide a basic understanding of groundwater movement, contaminant movement within groundwater, and remediation alternatives for groundwater contamination.</p> <p>The objective of the second three sessions was to present the findings included in the Groundwater Remedial Investigation Report that is currently under review by DTSC.</p> <p>Very soon, DTSC will be announce a formal public comment period on this document and conduct a public meeting to discuss the document. The information presented during the Groundwater U will assist the public in their review of the document and facilitate thoughtful and insightful discussion and comments. Public comments are an important part of the decision making process at DTSC.</p>

<sup>1</sup> Based on a conversation after the 2<sup>nd</sup> session, it is believed that the person who asked this was focused on the quality of the groundwater in Simi Valley rather than at SSFL.

Question	Response
10. Do we have enough information yet to make informed decisions? For example the rate of flow through bedrock? If we see that a technology may work, so that adequate buffer zone can be planned? <sup>2</sup>	DOE, NASA, and Boeing believe they do have enough information to make informed decisions. DTSC is conducting its review of the Sitewide Groundwater Remedial Investigation Report.
11. We think a site specific study to consider the options will be important.	The sponsors of Groundwater U and the Groundwater Panel agree. Site specific studies, including treatability studies to evaluate each feasible remedial alternative, will be conducted to support future decisions. The draft work plan for conducting treatability studies has been submitted to DTSC. The public will have an opportunity to review and comment on the treatability studies prior to DTSC approves implementation.
12. What does the local water district know about the quality of groundwater? <sup>3</sup>	<p>Contact your local water purveyor with questions about the quality of groundwater.</p> <p><b>Calleguas Municipal Water District</b> - <a href="http://www.calleguas.com/index.html">http://www.calleguas.com/index.html</a> posts their Annual Water Quality Report at: <a href="http://www.calleguas.com/awqr.pdf">http://www.calleguas.com/awqr.pdf</a>. They can be reached at 805.526.9323.</p> <p><b>Golden State Water Company</b> – <a href="http://www.gswater.com">www.gswater.com</a> posts the Water Quality Report for Simi Valley at: <a href="http://www.gswater.com/csa_homepages/documents/SimiValley061110.pdf">http://www.gswater.com/csa_homepages/documents/SimiValley061110.pdf</a>. (There are links to reports for numerous locations at: <a href="http://www.gswater.com/water_quality_annual_report.html">http://www.gswater.com/water_quality_annual_report.html</a>). They can be reached at: 800.999.4033</p> <p><b>Metropolitan Water District of Southern California</b> (Jensen Treatment Plant) – <a href="http://www.mwdh2o.com/">http://www.mwdh2o.com/</a> posted the 2010 Annual Drinking Water Quality Report at <a href="http://www.mwdh2o.com/mwdh2o/pages/yourwater/WQ-Report/index.html">http://www.mwdh2o.com/mwdh2o/pages/yourwater/WQ-Report/index.html</a>. They can be reached at 213.217.6000.</p> <p><b>Los Angeles Department of Water &amp; Power</b> – <a href="http://www.ladwp.com">www.ladwp.com</a> posted the 2009 Annual Water Quality Report <a href="http://www.ladwp.com/ladwp/cms/ladwp013475.pdf">http://www.ladwp.com/ladwp/cms/ladwp013475.pdf</a>. They can be reached at 800.342.5397.</p>

<sup>2</sup> After the 3<sup>rd</sup> Session, Groundwater U sponsors sought clarification from the individual who asked this question. She responded by asking “Do we have enough information yet to make informed decisions? For example, do you have the rate of flow of the identified contaminants through bedrock? If there is NOT a feasible technology that will work to remove the contaminants to the goal level, could we instead leave the contaminants in place, or constrain it to stay where it is, and then set up buffer zones as a backup containment strategy. We could basically wait until science catches up with the needs of the SSFL clean-up goals.”

<sup>3</sup> The questioner clarified this question later by stating that the water district reports overall averages. Can they provide that information on a finer level of detail?

Question	Response
<p>13. About tracers... will any be used at SSFL?</p>	<p>The term "tracer" in the context of groundwater refers to the use of constituents in groundwater to gain insights concerning the nature of the groundwater system. There are two categories of tracers used in groundwater investigations: those that are introduced into the system by site investigators and those that are naturally present in the groundwater system before the groundwater investigations occur.</p> <p>Both types have been used at the SSFL.</p> <p>In the first category, a volume of chloride (salty) water was injected into a well at a fault. Other wells were used to monitor the movement of the chloride.</p> <p>In the second category, two types of tracers have been used</p> <ol style="list-style-type: none"> <li>1) atmosphere-derived isotopes including tritium, oxygen-18, deuterium, and carbon-14</li> <li>2) contaminants present in SSFL groundwater.</li> </ol> <p>Where contaminant plumes are delineated, actual distributions of contaminants viewed as tracers provide insights about the nature of the fracture network and rock matrix.</p>
<p>14. Is there any form of bioremediation that can address rad contamination in groundwater? Also, TCE and perchlorate?</p>	<p>Bioremediation will be considered as part of the feasibility studies.</p>
<p><b>Session 4:</b></p>	
<p>15. Is the water in Simi Valley safe for use in a community garden?</p>	<p>Groundwater U was designed to help the public prepare to review the Sitewide Groundwater Remedial Investigation Report by providing general information on:</p> <ul style="list-style-type: none"> <li>• Groundwater, contaminant fate and transport of groundwater contamination, and different groundwater contamination remediation approaches</li> <li>• Groundwater flow, contaminant sources, and contaminant fate and transport at SSFL.</li> </ul> <p>The quality of groundwater in Simi Valley was not within the scope of Groundwater U.</p>

Question	Response
<p>16. Where has testing been done for surface contamination?</p>	<p>As the regulator for cleanup at SSFL, DTSC divided the investigations into two “operable units” including 1) the surficial media operable unit, comprised of soil, soil vapor, sediment, surface water, near-surface groundwater, air, biota, and weathered bedrock and 2) the Chatsworth Formation Operable Unit, which includes vadose zone bedrock, deep saturated bedrock, and groundwater.</p> <p>The Remedial Investigation Reports for the Surficial Media Operable Unit reported on sample collection and analytical testing. The sampling locations were focused in areas where historical site operations were performed that resulted in surface contamination (rocket testing for example). In addition, there has been significant effort to investigate areas leading away from the known contamination areas, particularly in drainages, and many samples have been collected both on and off site to assess surface contamination. To date, there have been a total of about 24,000 soil, soil vapor, sediment and surface water samples collected from about 13,000 locations on and off the SSFL site. There have been over one million analyses performed on these samples, and the results of these analyses have been reported in eleven different reports that are currently under DTSC review.</p>
<p>17. Why is the focus of Groundwater U on groundwater only?</p>	<p>There have been numerous investigations of all media (including soil, soil gas, groundwater, and surface water) at SSFL over a number of years. The focus of Groundwater U was on groundwater because a draft Sitewide Groundwater Remedial Investigation Report and Site Conceptual Model was recently prepared and submitted to DTSC for review. DTSC will soon announce a formal public comment period and a public meeting for these documents.</p>
<p>18. Will there be an opportunity to learn more about contamination beyond groundwater?</p>	<p>We appreciate the community’s interest! Given the public enthusiasm for education, the various parties are discussing a number of additional educational opportunities regarding contaminants and media (e.g., soil and surface water) at the SSFL. We encourage everyone to join our mailing lists and to regularly check our websites (listed in other Groundwater U materials) so that we can notify you of future opportunities to participate.</p>
<p>19. Will the responsible parties and DTSC consider doing a similar educational series on surface water?</p>	<p>You also may suggest additional educational subject areas related to cleanup at the SSFL for the parties’ consideration.</p>
<p>20. What about airborne particulates?</p>	

Question	Response
<b>Session 5:</b>	
21. Will the responsible parties consider doing three more sessions to allow the critics to present?	<p>Over the last few years, extensive new information has been collected, which is presented in detail in the 2009 Sitewide Groundwater Remedial Investigation Report. The 2006 report referred to during the question session was developed prior to the availability of this new information.</p> <p>The Department of Toxic Substances Control (DTSC) expects to notify the community of the formal public comment period this summer, and encourages the community as well as interested technical experts to review and comment on the 2009 Sitewide Groundwater Remedial Investigation Report. Questions about the report can be submitted to Tom Seckington, DTSC at <a href="mailto:TSeckington@dtsc.ca.gov">TSeckington@dtsc.ca.gov</a>.</p> <p>Comments on the report should be submitted to Buck King at <a href="mailto:bking@dtsc.ca.gov">bking@dtsc.ca.gov</a>. All comments submitted to DTSC in writing during the public comment period will be responded to and made available to the public.</p>
22. Information about modeling of the transport of radionuclides <sup>4</sup>	<p>Section 7.4.3, "Extent of Radiological Contamination to Groundwater" (p. 7-63) of the Sitewide Groundwater Remedial Investigation Report refers to atmospheric fallout (caused by atmospheric testing of atomic weapons conducted prior to 1963) as one source of radiological contamination of the ground surface of SSFL. The nature and extent of contamination of sediments and how the sediments may have been redistributed by erosion were addressed through investigations for the Surficial Media Operable Unit.</p> <p>EPA is currently conducting a radiological characterization survey. DOE will look at transport of radionuclides both as a result of the information obtained by the EPA as it relates to groundwater and additional work that the Groundwater Panel is conducting as part of their on-going work. DOE is committed to cleaning up radiological contamination in both the surficial media and the groundwater.</p>
Individuals who attended the 5 <sup>th</sup> Session asked that the following questions be added to the Parking Lot after the session ended.	
23. Could perchlorate contamination in Dayton Canyon have been caused by activities at SSFL?	<p>A drainage extending from the Happy Valley area of the SSFL property discharges through Dayton Canyon. This pathway was studied as a possible pathway for perchlorate contamination from the SSFL property into the Dayton Canyon area. Results of this investigation have been reported to DTSC and to the public. The initial detections of perchlorate in Dayton Canyon were not reproducible in subsequent sampling events and no link could be identified to past SSFL activities. For further information, please contact Yvette LaDuke at DTSC at <a href="mailto:yladuke@dtsc.ca.gov">yladuke@dtsc.ca.gov</a>.</p>

<sup>4</sup> The sponsors of Groundwater U sought clarification from the individual who asked this question. He explained that his concern is about the possibility that atmospheric radiation fallout has sorbed to sediment and remain in the surficial media. He asked "Does this pose risk of contamination to groundwater or should it more properly be addressed by cleanup actions directed at cleanup of surface soils?"

Question	Response
<p>24. Could the panel characterize the risk of offsite groundwater sources in terms of human health impacts?</p>	<p>Although a groundwater contaminant plume does exist off-site, the Groundwater Panel has not found any evidence that any SSFL groundwater contamination poses any risk to any off-site receptors (including humans). The Groundwater Panel only studied groundwater contamination resulting from historical SSFL activities and has not studied any other possible offsite sources of contamination.</p>
<p><b>Session 6</b></p>	
<p>25. Has anything been done to evaluate the seeps/springs in Box Canyon?</p>	<p>The geology of and seeps in Box Canyon have been included in the studies directed by the Groundwater Panel. Four seeps (FDP-444, FDP-580, FDP-581, and FDP-871) were identified. All of these were sampled for natural groundwater chemistry twice between 2004 and 2006 and three (FDP-444, FDP-580, &amp; FDP-581) were sampled in 2006 for contaminants, as reported on in the 2009 Sitewide Groundwater Remedial Investigation Report. No contaminants were found in Box Canyon seeps. An additional sampling event for the seeps in the Box Canyon area is scheduled in 2011 during the “dry season”. Also, the seeps drilling plan includes the drilling of a monitoring well cluster at one of the Box Canyon seeps.</p>