

**Response to Radiological Study Technical Workgroup Comments**  
**to**  
**Draft Gamma Radiation Scanning Sampling and Analysis Plan (November 2009, Revision 1)**  
**Area IV Radiological Study, Santa Susana Field Laboratory,**  
**Ventura County, California**  
**January 21, 2009**

<b>Comment Number</b>	<b>Section</b>	<b>Comment</b>	<b>Response</b>
<b>1</b>	Title Page	Can you give an explanation on the Kansas EPA's (Region 7) involvement and who have we met from the team that is representing Kansas EPA?	Contractual constraints required EPA Region 9 based in San Francisco to retain contractor services through EPA Region 7 based in Kansas City, Kansas. No changes to the SAP were required.
<b>2</b>	Title Page	The involvement of Region 7, out of Kansas, would be helpful to explain; the community will otherwise find it puzzling.	See response to Comment 1.
<b>3</b>	General	DOE appreciates the efforts of EPA and its consultants in preparing a SAP that outlines the nuances and complexities of conducting gamma surveys particularly for the type of terrain at SSFL. However, as the SAP indicates, the SAP is missing key information and details such as SOPs, statistical approaches, specific sensitivity testing methodology, QC limits, calibration processes, etc. DOE would appreciate the opportunity to review the missing information prior to EPA initiating the survey.	The requested documents will be developed as needed and will be made available for review.
<b>4</b>	General	The SAP is missing a schedule for implementation of the study. DOE would appreciate EPA presenting a detailed schedule during the December 8, 2009 meeting on this SAP. The schedule should present completion of acquisition of all survey equipment, construction, testing, calibration, and initiation of work.	An implementation schedule was presented at the December 8, 2009, SSFL Radiological Study Technical Workgroup meeting. No changes to the SAP were required.
<b>5</b>	General	I also have concern about outside-study-area "known radiological contamination" such as the cesium in Area	At this time, the scope of the Area IV Radiological Study is restricted to within the boundaries of Area IV and the

**Response to Radiological Study Technical Workgroup Comments (Continued)**  
**to**  
**Draft Gamma Radiation Scanning Sampling and Analysis Plan (November 2009, Revision 1)**  
**Area IV Radiological Study, Santa Susana Field Laboratory,**  
**Ventura County, California**  
**January 21, 2009**

Comment Number	Section	Comment	Response
		<p>It that was recently found and there seems to be a hold on how to deal with the issue. I think it demonstrates the potential for discoveries during this process that might lead you beyond those boundaries to specifically chase down the higher concentrated drainage areas.</p>	<p>Northern Buffer Zone, collectively known as the Area IV Study Area. No changes to the SAP were required.</p>
<p><b>6</b></p>	<p>General</p>	<p>I think it is really important to acknowledge that this isn't just ancient history. They used the burnpits until the nineties and we continue to find surprises wherever we look. Just recently in the ISRA [Interim Source Removal Action] removal [in Area I] at Happy Valley they found a "hatch" [metal tank cover] that wound up being a giant holdup [void] in bedrock, the cracked bedrock.</p>	<p>The Historical Site Assessment (HSA) being conducted by EPA will assist with identifying as many locations of potential contamination as possible. Regardless of the HSA findings, 100 percent of accessible areas of the Area IV Study Area will be surveyed for gamma radiation. In addition, soil and water samples will be collected for radiochemical analyses to identify potential contamination not detected from the surface gamma radiation surveys. However, EPA will review data collected by implementation of this SAP in conjunction with the HSA and analytical data to determine if additional scanning activities should be performed. Section 2.2 of the SAP has been updated.</p>
<p><b>7</b></p>	<p>General</p>	<p>I feel comfortable based on my conversations with Gregg Dempsey that every effort will be made to scan in and around the rocks as much as possible as reactive storage was often in out of the way places for that very reason while balancing the need to protect the endangered plant and animal species along the way, understanding the limitations due to accessibility, etc.</p>	<p>We appreciate your confidence in EPA's staff.</p>

**Response to Radiological Study Technical Workgroup Comments (Continued)**  
**to**  
**Draft Gamma Radiation Scanning Sampling and Analysis Plan (November 2009, Revision 1)**  
**Area IV Radiological Study, Santa Susana Field Laboratory,**  
**Ventura County, California**  
**January 21, 2009**

Comment Number	Section	Comment	Response
<b>8</b>	Figure 1.2	Area IV and property boundaries are misplaced.	The boundaries shown on Figures 1.1, 1.2, and 6.1 of the SAP were adjusted based on digital maps provided by Boeing.
<b>9</b>	Figure 1.2	The study area does encompass the "sliver" of Area III and just to the edge of the Area II operational area, owned by NASA. I appreciate the willingness to "overlap the edge" of these boundaries to make sure we can satisfy ourselves that the decision to focus only on Area IV was sound a decision.	Figure 1.2 has been revised to show the adjusted boundaries based on digital maps provided by Boeing. This figure clearly defines the border between Area IV and III. Area III is not included in the current study. See response to Comment 5.
<b>10</b>	2.0	The term "background" is used in this Sampling and Analysis Plan (SAP) perhaps too interchangeably and appears to reflect the authors' familiarity with the term and its various and different uses. However, this usage tends to overlook a commensurate lack of such familiarity on the part of other readers, especially the public. The term's use for Section 2.0 is fine as the traditional, informational, site background. However, subsequent uses are potentially confusing, covering both the background derived from the reference areas (RBRAs) and background counts associated with detection system instrumentation, or "natural background." As cumbersome as it may seem, a better way to keep these concepts separate and distinct needs to be used throughout, to avoid possible confusion. Especially confusing are the references to natural background - as will be measured on site, not at the RBRAs - and the discussions in Section 6. Section 6.3.3	There are various sources of background radiation, but basically there are four categories: terrestrial, cosmic, objects, and instrumentation. Terrestrial sources are based on geological formations and gamma radiation is emitted from nearly all types of soil and rocks (and for all practical purposes includes the contribution from radioactive fallout, radon gas, etc.). Therefore, each of the two geological formations (RBRAs) will be measured for terrestrial background. Cosmic radiation is fairly constant, does not change based on terrestrial influences, and for all practicable purposes is the same from one location to another within the Study Area. Virtually all objects emit some amount of gamma radiation including concrete, asphalt, vegetation, humans, animals, etc. depending on the exact composition of the object. Finally, instrument electronic noise and gamma radiation from construction materials make up the instrument background which remains very consistent regardless of location. The

**Response to Radiological Study Technical Workgroup Comments (Continued)**  
**to**  
**Draft Gamma Radiation Scanning Sampling and Analysis Plan (November 2009, Revision 1)**  
**Area IV Radiological Study, Santa Susana Field Laboratory,**  
**Ventura County, California**  
**January 21, 2009**

Comment Number	Section	Comment	Response
		does perhaps a better job along these lines, but it does so late in the document.	combination of all these natural sources of gamma radiation is considered background. Section 6.3.3 and other sections that refer to background have been clarified.
<b>11</b>	2.1	The year the northwestern buffer zone was purchased was 1993 not approximately 10 years ago.	The date the Northern Buffer Zone was purchased by Boeing has been corrected to January 23, 1998 (per Boeing).
<b>12</b>	2.1	The northwestern buffer zone should receive more attention than other areas because of allegations of off-site dumping in this area.	As specified in the SAP, 100 percent of accessible areas within Area IV and the Northern Buffer Zone (the Area IV Study Area) will be scanned. All locations within the Area VI Study Area will receive the same level of scrutiny. No revision to the SAP was required.
<b>13</b>	2.1	DOE no longer leases any land in Area IV.	During the SSFL Radiological Study Technical Workgroup meeting on December 8, 2009, a Boeing representative stated that DOE allowed its lease of Area IV property to expire. The cited section has been revised accordingly.
<b>14</b>	2.1, 4 <sup>th</sup> Bullet	Probably should change “several” to “ten” reactors, plus nuclear critical facilities, associated plutonium and uranium fuel fabrication facilities, a hot lab, and other laboratories within this area. Should also indicate, after “contractors”, “and Boeing’s predecessors” as Rocketdyne and AI conducted non-DOE/non-AEC radioactive operations in Area IV. I note that Phil in his comments asserts that DOE doesn’t lease any land in Area IV. Before that is changed, we should discuss the matter.	Historical facts will be verified and documented by the HSA. The text of the SAP that discusses the historical text has been simplified.

**Response to Radiological Study Technical Workgroup Comments (Continued)**  
**to**  
**Draft Gamma Radiation Scanning Sampling and Analysis Plan (November 2009, Revision 1)**  
**Area IV Radiological Study, Santa Susana Field Laboratory,**  
**Ventura County, California**  
**January 21, 2009**

Comment Number	Section	Comment	Response
<b>15</b>	2.2.1, 1 <sup>st</sup> Bullet	North American Aviation did not purchase the SSFL site property in the late 1940s. The Area I property was leased in March 1947 then purchased in 1954. Areas II, III, and IV were purchased after 1954 by North American Aviation and the United States Air Force.	See response to Comment 14.
<b>16</b>	2.2.1, 2 <sup>nd</sup> Bullet	Strike “part of,” I am not aware that part was set aside, rather than AI using Area IV for reactor development work.	See response to Comment 14.
<b>17</b>	2.2.1, 3 <sup>rd</sup> Bullet	ETEC was not a division of Rocketdyne, but rather the name of the area where the Department of Energy conducted work. Rocketdyne and its successors managed ETEC on the behalf of DOE.	See response to Comment 14.
<b>18</b>	2.2.1, 3 <sup>rd</sup> Bullet	I don’t believe this is correct. Energy Systems Group was a division of Rockwell International (technically it was Rockwell Energy Systems Group); I am not sure that the Rocketdyne rocket testing operation merged with RESG, and I don’t believe RESG was composed of AI and ETEC. ETEC was DOE’s facility at SSFL.	See response to Comment 14.
<b>19</b>	2.2.2	With regard to classing the various zones, the areas that have already been demolished were done so under much less stringent standards and circumstances, and therefore entire historical use of each area is particularly important. It would be useful if the off-site debris study that was recently done by DTSC be overlaid so scanning and/or sampling of these small discrete areas can also be accomplished.	See response to Comment 6.

**Response to Radiological Study Technical Workgroup Comments (Continued)**  
**to**  
**Draft Gamma Radiation Scanning Sampling and Analysis Plan (November 2009, Revision 1)**  
**Area IV Radiological Study, Santa Susana Field Laboratory,**  
**Ventura County, California**  
**January 21, 2009**

Comment Number	Section	Comment	Response
20	2.2.3, 1 <sup>st</sup> Sentence	Strike “a” and make “plant” plural.	See response to Comment 14.
21	2.2.3	The text indicates that there were multiple burn pits within Area IV. DOE is aware of only one burn pit. DOE is interested in knowing where else EPA has discovered burn pits within Area IV.	See response to Comment 14.
22	3.1	I don’t think this accurately describes the Study Area. Much of Area IV, and in particular the areas where the nuclear work was done, are flat plateaus, with pretty easy access.	Text has been clarified to describe the range of terrain.
23	3.1.1	We need to discuss more fully how the survey – gamma scan as well as soil sampling – will handle the issue of obstacles such as buildings and asphalt roads. This is important.	Soil beneath a building is considered an inaccessible location and will be categorized as CIX. Soil beneath asphalt is considered restricted access because gamma radiation scanning can be conducted over the asphalt but at reduced sensitivity. This is true of other materials that may cover soil, such as concrete. Surveys of these types of locations are only a preliminary determination of gamma radiation levels. EPA presumes the soil beneath these features will be investigated after they are removed. For clarification, a new category has been created for restricted access location and will be categorized as CRA. Section 5.1 of the SAP has been revised to reflect the addition of this new restricted access location category and clarify the sampling regime with respect to obstacles. In addition, soil samples beneath a hard surface can be collected for analysis if a GRAY is suspected; Section 3.1.1 has been updated to reflect this clarification.

**Response to Radiological Study Technical Workgroup Comments (Continued)**  
**to**  
**Draft Gamma Radiation Scanning Sampling and Analysis Plan (November 2009, Revision 1)**  
**Area IV Radiological Study, Santa Susana Field Laboratory,**  
**Ventura County, California**  
**January 21, 2009**

<b>Comment Number</b>	<b>Section</b>	<b>Comment</b>	<b>Response</b>
<b>24</b>	3.1.2	Spelling “off-sire.”	The word “off-sire” has been changed to “off-site.”
<b>25</b>	3.1.2	The priority list is unclear.	Text has been clarified to state the list is in descending order of priority.
<b>26</b>	3.3	Why are mule feces going to be removed from the site? Cows wander over the site, grazing and dropping cow pies; deer wander as well.	EPA has been requested by Boeing and wildlife regulatory agencies to remove mule dung. Boeing is concerned that the contribution of nitrates in the dung could cause an exceedance of their National Pollutant Discharge Elimination System (NPDES) permit. Wildlife agencies are concerned that seeds in the mule feed can introduce non-indigenous vegetation via deposition in dung. Text has been clarified.
<b>27</b>	4.0	This section provides parameters for each of the scanning instrument types. DOE is interested in knowing how the detectability of radionuclides in soil changes with each instrument type. That is, the expected soil concentration that each instrument may detect. This is important for the overall sensitivity of the survey, and the amount of area disturbance we may anticipate to meet detection levels.	The quantification of radionuclide concentrations in soil is complex and problematic with field-based radiation instruments. At this time, EPA does not intend to quantify the concentration of radionuclides for each instrument with the exception of the HPGe detection system as described in the SAP. No revision to the SAP was required.
<b>28</b>	4.2, Table 4.2	Controlling the MMGS speed to 6 inches per second may be difficult.	The speed of each detector system, including the MMGS will be determined in accordance with the procedures detailed in Section 6.3.4. Additional text has been added to clarify the expected scanning rate range as 6 to 18 inches per second.
<b>29</b>	4.4, Table 4.4	The standard 44-20 detector is 3.7 pounds which is manageable during prolonged hand-held use. The	Concur. Project staff will rotate operating the HHGS to reduce fatigue. In addition, a supportive shoulder “sling”

**Response to Radiological Study Technical Workgroup Comments (Continued)**  
**to**  
**Draft Gamma Radiation Scanning Sampling and Analysis Plan (November 2009, Revision 1)**  
**Area IV Radiological Study, Santa Susana Field Laboratory,**  
**Ventura County, California**  
**January 21, 2009**

Comment Number	Section	Comment	Response
		addition of a 1/4 inch lead sleeve increases the weight of the detector plus shield to 14.4 pounds which may be impractical for prolonged hand-held use.	for the detector may be used to reduce arm fatigue. No revision to the SAP was required.
<b>30</b>	4.4, Table 4.4	Should the detector be optimized for Cs-137?	All detection systems will be operated to detect the maximum range of gamma radiation energies possible. This will ensure the greatest number of gamma emitting radionuclides may be detected as possible. No revision to the SAP was required.
<b>31</b>	4.5, 3 <sup>rd</sup> Paragraph	The advantage to field measurement is that a much larger area can be measured than can be sampled. Therefore heterogeneity problems are a bigger problem from sampling than for in-field measurements. Suggest recasting of this paragraph to include the advantages and not just disadvantages.	Advantages of the HPGe detection system have been added to Section 4.5.
<b>32</b>	4.6	How will you suspect that x-ray radiation from americium-241 or plutonium-238 are present? Why are they not on Table A-1?	Gamma spectrometry can sometimes indicate the presence of x-ray radiation created when large activities of americium-241, plutonium-238, and plutonium-239 undergo alpha radiation decay. At low activities, the x-rays are masked by the Compton radiation. These three radionuclides have been added to the cited section and Table A-1.
<b>33</b>	4.6, 2 <sup>nd</sup> Paragraph	The FIDLER is also useful for enhanced detection of Uranium from the U-235 low energy gammas. Suggest inclusion of that in the list.	U-235 has been added to the cited paragraph and to Table A-1.
<b>34</b>	5.1.1	DOE would like to know when EPA will be ready to discuss the statistical process for identifying an anomaly.	A gamma radiation anomaly (GRAY) will be identified by several techniques. Measurements greater than the Gamma

**Response to Radiological Study Technical Workgroup Comments (Continued)**  
**to**  
**Draft Gamma Radiation Scanning Sampling and Analysis Plan (November 2009, Revision 1)**  
**Area IV Radiological Study, Santa Susana Field Laboratory,**  
**Ventura County, California**  
**January 21, 2009**

Comment Number	Section	Comment	Response
			<p>Background Threshold Value (GBTV) will be flagged as a potential GRAY. The calculation of the GBTV will be based on the same statistical analyses proposed for the Radiological Background Study. However, a proposed approach will be presented to the Workgroup for consideration after the data has been collected and evaluated.</p> <p>Maps of the measurements will be created using kriging and isopleths techniques to show data trends. Radiological time graphs can be used to show data trends in combination with field observations documenting localized conditions that may influence the gamma radiation measurements. If necessary, a location specific GBTV can be developed based on field measurements. EPA is also reviewing other techniques employed by EPA and DOE using similar detection systems; i.e., K factor stripping. Finally, other techniques will be used as appropriate to identify all GRAYs within the limitations of this study. Section 5.1 has been clarified.</p>
<b>35</b>	5.1.1	<p>The draft SAP merely says that “Radiological Background Reference Area [sic—should be Area] background gamma radiation data will be used to develop gamma background threshold values (GBTV).” There is no real discussion of how these GBTV will be developed, and we have not agreed on the statistical method at present, nor had buy-in. This is a key matter.</p>	<p>See response to Comment 34.</p>

**Response to Radiological Study Technical Workgroup Comments (Continued)**  
**to**  
**Draft Gamma Radiation Scanning Sampling and Analysis Plan (November 2009, Revision 1)**  
**Area IV Radiological Study, Santa Susana Field Laboratory,**  
**Ventura County, California**  
**January 21, 2009**

<b>Comment Number</b>	<b>Section</b>	<b>Comment</b>	<b>Response</b>
<b>36</b>	5.1.1	Spelling “Are.”	The word “Are” in “Radiological Background Reference Are” was changed to “Area.”
<b>37</b>	5.1.1, 1st Paragraph	Different GBTV values should be developed for different types of surfaces, with different gamma background characteristics, such as soil, gravel, concrete, asphalt, sediment, and rock out-croppings. The RBRA areas do not contain all of these types of areas. How will the impact of these be determined and accounted for? It will be very difficult to rely of professional judgment to make decisions relative to how much of an increase in background is appropriate. If no adjustment in background is considered, all of these types of surfaces will be anomalies and will require increased sampling. Recommend developing backgrounds for each of these types of surfaces.	Natural background will vary depending on the composition of the material; i.e., rock, soil, asphalt, concrete, etc. because virtually all materials contain some amount of radioactivity. The natural radioactivity within each type of material can vary significantly. For example, the natural radioactivity of concrete will change depending on the particular aggregate used in the mixture and the total gamma radiation count rate can vary by many times between different concrete mixes. There were likely numerous concrete mixtures used in Area IV which would require finding representative, uncontaminated concrete locations with the same compositions as found on site—a difficult challenge. In lieu of establishing a GBTV for each type of material, EPA proposes to identify GRAYs as described in response to Comment 34. No revision to the SAP was required.
<b>38</b>	5.1.2	Can you please state the preference when small anomalies are found, isn't it better to be sure to remove it (under a specified size or volume)?	The objective of this study is to identify GRAYs. Remediation options are beyond the scope of this study. No revision to the SAP was required.
<b>39</b>	5.1.2, Step 3	Will EPA be developing a decision tree that will be used to determine what steps/methods it will use in anomaly determination?	Quantifying or describing all the possible decisions and circumstances that could be encountered in the field is not possible. All GRAYs will be identified as described in response to Comment 34.

**Response to Radiological Study Technical Workgroup Comments (Continued)**  
**to**  
**Draft Gamma Radiation Scanning Sampling and Analysis Plan (November 2009, Revision 1)**  
**Area IV Radiological Study, Santa Susana Field Laboratory,**  
**Ventura County, California**  
**January 21, 2009**

Comment Number	Section	Comment	Response
40	5.1.2, Step 3	Step 3 as described is problematic and needs to be discussed further. Verification seems to consist of a second measurement, with the presumption that if the first was high and the second lower the first will be ignored. Additionally, second "measurements" are described as potentially not measurements at all but "modeling the anomaly with a MicroShield software program." I'm not comfortable with this, and the whole issue of verification needs to be discussed.	See response to Comment 34.
41	5.1.2 1st Paragraph	It is not clear how a less sensitive technology will help determine reproducibility. Suggest providing a better explanation.	See response to Comment 34.
42	5.2	Terrain accessibility - we ask that a second "ground-truth" process in the field be done to provide maximum coverage possible.	A map of the Study Area depicting areas of accessibility was presented during EPA's SSFL Radiological Study Technical Workgroup meeting on December 8, 2009. After a thorough survey of the entire Study Area in the field and after each detection system is tested on each type of terrain, a more accurate map will be created. No revision to the SAP was required.
43	5.2	NBZ - I am very concerned to see this written as "time and resource permitting" the deal was to include the northern buffer zone and needs to do so. I understand the priority, but this is coverage is primary to our goal of protecting human health since there is a camp just below and we have seen the eighty barrels in the drainage, etc.	The current strategy is to complete Area IV first then move to the NBZ. If staff and equipment resources are available during the survey of Area IV, then surveys in the NBZ will be conducted simultaneously. The SAP has been clarified to reflect this update to the proposed approach.

**Response to Radiological Study Technical Workgroup Comments (Continued)**  
**to**  
**Draft Gamma Radiation Scanning Sampling and Analysis Plan (November 2009, Revision 1)**  
**Area IV Radiological Study, Santa Susana Field Laboratory,**  
**Ventura County, California**  
**January 21, 2009**

<b>Comment Number</b>	<b>Section</b>	<b>Comment</b>	<b>Response</b>
<b>44</b>	5.2	States that “a less sensitive scanning technology may be used to determine whether the suspected gamma anomaly can be reproduced.” I may be missing something, but this seems to invite using a technique that can’t see what the first technique saw.	See response to Comment 34.
<b>45</b>	5.2	The matter of the detector height needs to be discussed. It is unclear from the text how one will compare measured values at different heights with background, which was taken at one height, let alone compare onsite values with each other.	Section 6.1 of the SAP discusses the uncertainties associated with detector height. No revision to the SAP was required.
<b>46</b>	5.3	Inaccessible locations - with regard to the NPDES discharge locations, please be sure to get right up to them, especially down-gradient from each system.	All locations will be scanned in accordance with the constraints and limitation stated in the SAP, including scanning as close to all inaccessible areas as possible and feasible. No revision to the SAP was required.
<b>47</b>	5.3, Item 3	Replace “Waste Management Handling Facility” with “Radioactive Material Handling Facility and Hazardous Waste Management Facility.”	Text has been corrected.
<b>48</b>	5.3, Item 4	Add “unsafe slopes and rock outcrops.”	Text has been added.
<b>49</b>	5.4	Concrete swales should have particular scrutiny as they modified where the potential contamination went. These areas often had to be rebuilt so the downgradient areas of all concrete swale and channel structures should be carefully considered.	All locations will be scanned in accordance with the constraints and limitation stated in the SAP, including scanning concrete swales if possible and feasible. No revision to the SAP was required.

**Response to Radiological Study Technical Workgroup Comments (Continued)**  
**to**  
**Draft Gamma Radiation Scanning Sampling and Analysis Plan (November 2009, Revision 1)**  
**Area IV Radiological Study, Santa Susana Field Laboratory,**  
**Ventura County, California**  
**January 21, 2009**

Comment Number	Section	Comment	Response
<b>50</b>	5.3, 3 <sup>rd</sup> Paragraph, Last Sentence	Needs to be discussed in some detail. What is the plan for subsequent survey of soil beneath potentially contaminated structures and beneath asphalt?	See response to Comment 23.
<b>51</b>	5.5	This section does not explain for what purpose one is attempting to correlate gamma scan measurements with lab analytical results. Furthermore, we need to see and be able to comment on the SOP.	Correlation of gamma radiation measurements to soil concentrations for specific radionuclides can provide quantitative data, albeit at higher detection limits than an analytical laboratory. However, this type of field screening analysis can assist in reducing the number of soil samples collected for laboratory analyses, which optimizes the project budget while providing real-time data to focus characterization efforts. The results can also assist with indicating the need to collect more samples in an area suspected of contamination. As stated in response to Comment 3, SOPs will be made available for review.
<b>52</b>	6.0	This section has a number of yet to be determined items. Can EPA be prepared to discuss the open ended items during the SAP meeting?	EPA provided responses to all verbal questions raised during the December 8 SSFL Radiological Study Technical Workgroup meeting. Remaining questions are included in this Response to Comments table. No revision to the SAP was required.

**Response to Radiological Study Technical Workgroup Comments (Continued)**  
**to**  
**Draft Gamma Radiation Scanning Sampling and Analysis Plan (November 2009, Revision 1)**  
**Area IV Radiological Study, Santa Susana Field Laboratory,**  
**Ventura County, California**  
**January 21, 2009**

Comment Number	Section	Comment	Response
53	6.1	Merely states that the GBTVs will be calculated, but not how; a key matter we still need to resolve. Then it is proposed to use, not the background data set or location, but a “similar” location on Area IV, for “background conditions.” This is troubling and needs to be discussed at some length. We have gone to significant efforts to <i>not</i> use parts of SSFL, which can be contaminated, for background; and the phrase “similar” is very squishy.	See response to Comment 34 for a discussion on the GBTV. Establishing a Field Quality Control Area (FQCA) is necessary to avoid schedule delays if a new background data set is needed for any detector system. The word “similar” has been clarified to mean statistically similar. The statistical analyses to compare the data sets for the FQCA to the RBRA’s will be the same as proposed for the Radiological Background Study. No revision to the SAP was required.
54	6.1	Although it may be beyond the SAP’s specific scope, the question as to what fully are the implications stemming from the Rocky Peak RBRA not being scanned needs to be addressed, especially with the Area IV Radiological Study Technical Workgroup. Presumably, the mention that - in this instance - “an alternative plan will be developed in consultation with the Area IV Radiological Study Technical Workgroup” is meant to address this issue. However, what options are there that may serve as the alternative plan? These need to be discussed.	It is unfortunate the restricted access to the Rocky Peak RBRA prevents collection of background data—EPA cannot control this matter. However, the Lang Ranch RBRA, which is in the same geological formation as Rocky Peak, should be adequate to establish a background data set for each detector system for the Chatsworth formation. The “alternative plan” referenced in the comment is beyond the scope of this SAP, thus no revision to the SAP was required.
55	6.1	How will “an area with a statistically similar data set ... located on the SSFL, preferably in Area IV or near the on-site field office” actually be found? This needs to be fully explained.	Areas unlikely to be contaminated will be scanned and the data compared to the RBRA data sets. When an area passes the statistical analyses as described in the response to Comment 54 then the area will be marked as the FQCA. The text of the SAP has been revised to clarify this approach.

**Response to Radiological Study Technical Workgroup Comments (Continued)**  
**to**  
**Draft Gamma Radiation Scanning Sampling and Analysis Plan (November 2009, Revision 1)**  
**Area IV Radiological Study, Santa Susana Field Laboratory,**  
**Ventura County, California**  
**January 21, 2009**

Comment Number	Section	Comment	Response
56	6.1	How may such on-site data be considered to represent "background conditions," especially if the on-site field office is located outside Area IV? Or, does this get back to the confusion about using the term "background" as discussed above? If this is meant to refer to natural background – as suggested by "operational and QC checks" – then what is meant by "statistically similar?"	The text of the SAP has been revised to clarify the issues raised in the comment.
57	6.1	The discussion in this Section also suggests that statistical analyses will have been conducted on both the RBRA background data and the scan data from on site (Area IV or near the field office). How will this subsequent data collection and analysis fit into or affect the gamma survey study's schedule (Section 8.1)?	No impact to the gamma survey schedule is anticipated by this activity. In addition, a detailed schedule was presented at the December 8 SSFL Radiological Study Technical Workgroup meeting. No revision to the SAP was required.
58	6.2	Why does the procedure – to generate a sensitivity vs. depths profile - involve the "Radiological Background Study Technical Workgroup" as opposed to the "Area IV Radiological Study Technical Workgroup?" Despite apparent similarities between the two (Section 8.1), shouldn't it be the latter?	"Radiological Background Study Technical Workgroup" has been corrected to "SSFL Radiological Study Technical Workgroup."
59	6.2.1	The procedure for calculating $MDCR_{surveyor}$ that is extracted from MARSSIM assumes that the "background" of 25,000 cpm is a "fixed" quantity with only Poisson-based statistical variability. The $MDCR_{surveyor}$ is therefore relatively small, ~10% of background in this example. As has been acknowledged elsewhere in the SAP, gamma count rates will also be variable both spatially and temporally. This added	As discussed in the SAP, all Gamma Radiation Anomalies (GRAYs) will be verified as discussed in the response to Comment 34. The proposed methodology for determining a GRAY is different than the methodology employed for the Radiological Background Study, which did not require the same precision and accuracy as described in this SAP. Therefore, the definition of a gamma anomaly and the methodology employed for identifying a gamma anomaly

**Response to Radiological Study Technical Workgroup Comments (Continued)**  
**to**  
**Draft Gamma Radiation Scanning Sampling and Analysis Plan (November 2009, Revision 1)**  
**Area IV Radiological Study, Santa Susana Field Laboratory,**  
**Ventura County, California**  
**January 21, 2009**

Comment Number	Section	Comment	Response
		variability will likely significantly exceed +/- 10%. Therefore the theoretical $MDCR_{surveyor}$ calculated here may not be of much practical value. Using the theoretical $MDCR_{surveyor}$ as a "location marked for further investigation" will likely result in numerous false positives with associated impact on schedule. This method of identifying "anomalies" is also in conflict with the method identified in the SOP 35 of the background FSP which defined an anomaly as twice background or 100% over background.	as described in the Radiological Background Study SAP is not appropriate for on-site gamma scanning. No revision to the SAP was required.
<b>60</b>	6.2.1, Step 1	Replace A with D in the equation. Define D = diameter of elevated activity area in inches.	Text has been corrected.
<b>61</b>	6.2.1, Step 2	Correct $b_i$ to $b_i$ . Correct $R_b$ to $R_b$ .	Text has been corrected.
<b>62</b>	6.2.1, Step 3	Correct $S_i$ to $S_i$ . Correct $b_i$ to $b_i$ . Correct 3.29 to 3.28. Correct last equation at end of page 6-3.	Text has been corrected.
<b>63</b>	6.2.1, Step 3	Square root in $S_i$ equation should not extend over "=134 counts"	Text has been corrected.
<b>64</b>	6.2.1, Step 4	Correct $S_i$ to $S_i$ . Correct I to i.	Text has been corrected.
<b>65</b>	6.2.1, Step 5	Delete p from second $MDCR_{surveyor}$ equation.	Text has been corrected.

**Response to Radiological Study Technical Workgroup Comments (Continued)**  
**to**  
**Draft Gamma Radiation Scanning Sampling and Analysis Plan (November 2009, Revision 1)**  
**Area IV Radiological Study, Santa Susana Field Laboratory,**  
**Ventura County, California**  
**January 21, 2009**

<b>Comment Number</b>	<b>Section</b>	<b>Comment</b>	<b>Response</b>
66	6.2.1, Step 5	The discussion in this section assumes that the survey technician will use judgment to interpret an audible signal to decide when to stop and perform static measurements. However, only scanning at constant rates has been discussed above. If both are to be use, suggest determination and inclusion of MDC for both techniques and clarification of which steps apply to which. Step 5 is not necessary if judgments are not made and section 6.2.2 only applies to static measurements.	A survey technician does not need to rely solely on audible indications of a gamma radiation signal because the proposed detection systems have a visual output the technician can use to determine when the MDCR value is exceeded. In addition, other data reviewers will review and analyze the data to determine the presence of any gamma radiation anomalies. Both MDCR and MDC values will be determined and used as appropriate. No revision to the SAP was required.
67	6.3.1	The issue of soil moisture impacts and how it will be addressed should be discussed more.	If soil moisture exceeds 15 percent, then no measurements will be collected in a particular sub-survey area (SSA). Testing of an SSA will occur after precipitation events and will continue on subsequent days until the SSA of interest passes the criterion. A soil moisture content of 15 percent or less is considered a dry soil. The gamma radiation measurements from soil will typically decrease as soil moisture increases with the exception of uranium-238. Due to radon emanation, which is also dependant on soil type, increasing or decreasing secular equilibrium conditions can cause gamma measurements to increase or decrease with increasing soil moisture. Calculations have shown that gamma measurements for uranium do not increase until soil saturation reached over 60 percent. At that point, gamma radiation emitted from all other radionuclides of concern will be significantly attenuated. EPA will conduct an empirical test to determine the difference between a GRAY gamma radiation flux at 15 percent soil moisture and the

**Response to Radiological Study Technical Workgroup Comments (Continued)**  
**to**  
**Draft Gamma Radiation Scanning Sampling and Analysis Plan (November 2009, Revision 1)**  
**Area IV Radiological Study, Santa Susana Field Laboratory,**  
**Ventura County, California**  
**January 21, 2009**

Comment Number	Section	Comment	Response
			flux at less than and greater than 15 percent soil moisture. The cited section has been clarified.
<b>68</b>	6.3.2	DOE is not clear on the objective and intent of this paragraph. How do PRGs and discrete particles affect the interpretation of data?	To select the best detection methodology, the characteristics of contamination must be known before conducting field measurements. This is not possible for this study. Therefore, a conservative investigation strategy to detect GRAYs has been selected. The cited section has been clarified.
<b>69</b>	6.3.2	Please specify the default depth and areal extent that EPA uses for the assumed uniform distribution in its calculation of radionuclide PRGs.	This issue is beyond the scope of this SAP. Stuart Walker, with the EPA's Office of Radiation and Indoor Air, who has developed the radionuclides PRGs may be contacted for additional information. No revision to the SAP was required.
<b>70</b>	6.3.4	Six inches per second is approximately 0.34 mph or one tenth walking speed and may be a difficult speed to maintain for both the MMGS and the ERGS.	See response to Comment 17.
<b>71</b>	6.3.4	It is not clear that "it can be assumed that large planar sources are not present within the Study area...only point sources or small areas of contamination." If there were airborne releases, for example, or spills with migration versus surface water flow, one could readily have planar sources. Also not clear what is meant by "small areas of contamination." One shouldn't prejudge the data.	Determining a scanning rate is a combination of theoretical calculations and practical constraints. Amongst the many variables used in the theoretical calculations includes the physical size of the contamination of interest. For large planar sources, the scanning rate is not important and fast scanning rates are preferred for efficiency purposes. Fast scanning rates can miss point sources or small areas of contamination. Therefore, a survey design to detect point sources or small areas of contamination is more conservative resulting in a slower scanning rate. An

**Response to Radiological Study Technical Workgroup Comments (Continued)**  
**to**  
**Draft Gamma Radiation Scanning Sampling and Analysis Plan (November 2009, Revision 1)**  
**Area IV Radiological Study, Santa Susana Field Laboratory,**  
**Ventura County, California**  
**January 21, 2009**

<b>Comment Number</b>	<b>Section</b>	<b>Comment</b>	<b>Response</b>
			example calculation for the detection of a small area of contamination (2 feet diameter area) is illustrated in Section 6.2.1. Typically, scan rates are set so that the hypothetical small area of contamination can be detected within a 3 second time period; i.e., the detector moves at a rate that the detector is over the area of contamination for 3 seconds. See additional discussion in the response to Comments 34. The cited section has not been modified based on this comments but the definition of a point source and a planar source has been clarified.
<b>72</b>	7.2 and 7.3	Detectors can be damaged or lost in the field. I am pleased to hear that the detectors can be cross used amongst the various detection equipment and hope that a few extras will be on hand to prevent the possibility of a "stop work" situation in the field due to loss or damage of the detector.	It is unlikely detectors will be lost in the field. However, damage can occur and the current strategy is to have extra equipment available to replace damaged or malfunctioning equipment. No revision to the SAP was required.
<b>73</b>	Section 8.1, Step 1	Has the Area IV Radiological Study Technical Workgroup been formed? If so, when was it formed and what individuals comprise this Workgroup? If not, then when will it be formed and what individuals are being invited to join? Moreover, despite what may be alluded to within this SAP (e.g., Section 6.1), what are the Area IV Workgroup's mission and charter?	"Area IV Radiological Study Technical Workgroup" has been changed to the "SSFL Radiological Study Technical Workgroup" which has included the current individuals and organizations who have attended the Technical Workgroup meeting related to both of EPA's projects related to the SSFL: the Radiological Background Study and the Area IV Radiological Study.

**Response to Radiological Study Technical Workgroup Comments (Continued)**  
**to**  
**Draft Gamma Radiation Scanning Sampling and Analysis Plan (November 2009, Revision 1)**  
**Area IV Radiological Study, Santa Susana Field Laboratory,**  
**Ventura County, California**  
**January 21, 2009**

Comment Number	Section	Comment	Response
74	8.2	We need to discuss these goals, as I am not sure that the draft goals are indeed quite right. I thought the goal was to identify potential anomalies that might merit more intensive soil sampling. And I am concerned that setting the goal as determining whether the surface soil in the study Area exceeds background levels will be misinterpreted. As indicated below, I am troubled by the reference to background being determined by the 95% confidence limit of the 95% upper limit, for example; we haven't yet agreed on statistical tests, and such as these would skew the background value upward. If not carefully expressed, such a goal also could be used by some to claim that EPA found the whole site, or portions of it, to be "clean," when that goes beyond what the data would show.	The concerns in the comment are acknowledged as EPA has similar concerns. The goal of this SAP is to identify gamma radiation anomalies within the Study Area by the methods described in the SAP. See response to Comment 34.
75	8.2, Step 2	Per the above discussion, the term background as used here needs to be specified (despite the references in Sections 8.3 and 8.4).	See response to Comment 10.
76	8.3, Step 3	Does "Methodologies for collection of data will be developed after the various gamma scanning systems are developed and sensitivity tests completed" mean that this SAP will be amended with this information prior to its implementation? Or will this information be part of the Field Sampling Plans mentioned in Section 8.7? To avoid confusion, Section 8.3 should be modified accordingly.	The SAP will be amended as needed to include SOPs for the specific detection systems acquired to perform the scanning survey. The cited section has been clarified.

**Response to Radiological Study Technical Workgroup Comments (Continued)**  
**to**  
**Draft Gamma Radiation Scanning Sampling and Analysis Plan (November 2009, Revision 1)**  
**Area IV Radiological Study, Santa Susana Field Laboratory,**  
**Ventura County, California**  
**January 21, 2009**

<b>Comment Number</b>	<b>Section</b>	<b>Comment</b>	<b>Response</b>
<b>77</b>	8.5	Since the 3 RBRAs were limited to 1 acre each of relatively uniform flat ground, it is unlikely that the background radiation distribution will reflect the spatial variability likely to be found at SSFL that will include areas of potentially higher radiation (e.g. rock outcrops, drainages and ravines) and areas of potentially lower radiation (e.g. roadways, and parking lots).	Section 5.1 of the SAP discusses how natural variability will be addressed. No revision to the SAP was required.
<b>78</b>	8.5	Analytical Approach - since so much discussion has occurred about these concerns, we look forward to participating in these discussions as preliminary data is made available to the statistician. We would like to be a part of those early findings and discussion on approach as these decision statements are developed.	All members of the SSFL Radiological Study Technical Workgroup will have an opportunity to review findings and participate in discussions on interpretation of the findings. No revision to the SAP was required.
<b>79</b>	8.5	Again, we haven't agreed on statistical tests; I disagree with the characterization in this paragraph of how we will examine these issues; and the referenced Singh paper was just an introduction to us of how such issues could possibly be considered, not a proposed method nor one that was agreed to. This is important.	See the response to Comment 34.
<b>80</b>	8.5, 1 <sup>st</sup> Paragraph	These parameters are significantly different from each other. Why are all three listed here? Which one will be used to define the Investigation Level? The UCL should only be used if evaluating the mean of a population of measurements while the other two parameters can be used to evaluate individual measurements. Will both approaches be utilized in that way? If so, when will the UPL be utilized versus the UTL? If "statistics" will	See the response to Comment 34.

**Response to Radiological Study Technical Workgroup Comments (Continued)**  
**to**  
**Draft Gamma Radiation Scanning Sampling and Analysis Plan (November 2009, Revision 1)**  
**Area IV Radiological Study, Santa Susana Field Laboratory,**  
**Ventura County, California**  
**January 21, 2009**

Comment Number	Section	Comment	Response
		not be used to make decisions for further investigation, how will those decisions be made and why is this section included here?	
<b>81</b>	8.5, 3rd Paragraph, 1 <sup>st</sup> Sentence	Again can be misinterpreted. Perhaps at minimum add “gamma scan” before “surveys.”	Text has been clarified.
<b>82</b>	Section 8.6	The discussion here refers to decisions on individual measurements. The acceptance criteria for that were set above in the definition of the Investigation Level with error rates set at 0.05. Will other statistical test be performed to which these statements apply? Will hypothesis testing be performed for populations? If “statistics” will not be used to make decisions for further investigation, how will those decisions be made and why is this section included here?	See the response to Comment 34.
<b>83</b>	9.0	Data Verification - while MARSSIM is followed to a degree, each of those decision points need to be weighed with the fact that this is not a final status survey and we are using this process as a tool in part, to find contamination, not confirm it is not there. The difference in approach can mean the difference between finding something it or not and we therefore appreciate the effort to weigh these considerations carefully during the process with those differences in mind.	Comment noted. Section 8.6 of the SAP states the null hypothesis of this study. No revision to the SAP was required based on this comment.

**Response to Radiological Study Technical Workgroup Comments (Continued)**  
**to**  
**Draft Gamma Radiation Scanning Sampling and Analysis Plan (November 2009, Revision 1)**  
**Area IV Radiological Study, Santa Susana Field Laboratory,**  
**Ventura County, California**  
**January 21, 2009**

<b>Comment Number</b>	<b>Section</b>	<b>Comment</b>	<b>Response</b>
<b>84</b>	9.0	Data Verification, Validation, and Quality Assessment (Page 9-1). Add the word “that” before the “has,” following “documenting data.”	Text has been corrected.
<b>85</b>	Section 9.1, Last Sentence	Is not this part to the QAPP? Where are the validation procedures?	Text has been corrected. The validation procedures refer to SOPs which will be developed after the detection systems are constructed and tested. These SOPs will be included as Addenda to the SAP in Appendix C. Section 9.0 has been clarified.
<b>86</b>	Section 9.2.3	The statistical tests that will be used have not been defined. What statistical test will be used? If “statistics” will not be used to make decisions for further investigation, how will those decisions be made and why is this statement included here?	See the response to Comment 34.
<b>87</b>	9.2.4 and 9.2.5	This is very vague about statistical tests; nothing specific; and we have agreed to nothing. It is very important to not imply agreement nor resolution; we have yet to address the statistical tests.	See the response to Comment 34.
<b>88</b>	Table A-1	It is important that we talk through this table. It looks pretty short, compared to our overall list. I would like us to discuss it to make sure it is not missing key radionuclides. Furthermore, the title should be altered to not imply these are the only gamma emitting radionuclides of concern, but rather the ones capable of detection with the field instrumentation being used, as opposed to soil sampling which will be able to see many more.	The title has been changed to “Gamma Emitting Radionuclides of Concern Potentially Detectable with Project Field Radiological Instrumentation.” The table has been reviewed by an expert in gamma spectroscopy and reflects the radionuclides of potential concern that could be detected with the proposed field radiological instrumentation. No revision to the SAP was required.

**Response to Radiological Study Technical Workgroup Comments (Continued)**  
**to**  
**Draft Gamma Radiation Scanning Sampling and Analysis Plan (November 2009, Revision 1)**  
**Area IV Radiological Study, Santa Susana Field Laboratory,**  
**Ventura County, California**  
**January 21, 2009**

<b>Comment Number</b>	<b>Section</b>	<b>Comment</b>	<b>Response</b>
<b>89</b>	Table A-1	Suggest inclusion of U-235 in this list of process related gamma emitters and discussion of possible interferences with Ra-226 in the Technical Comments section.	U-235 has been added to Table A-1. The quantification of U-235 will not be subject to Ra-226 interference. No revision to the SAP was required.
<b>90</b>	Table A-1, Actinium-227	Although the ancestors of Ac-227, U-235 and Th-231 are Radionuclides of Concern, Ac-227 should not be considered process related due to the long half-life of the intermediate, Pa-231, which prohibits significant production of Ac-227 from process material in the time frame since separation. However, it will be present in background and onsite at background levels. Why is this analyte included in the target list?	Actinium-227 is included on the table because it was included as a potential radionuclide of concern in the Radiological Background Study. No revision to the SAP was required.
<b>91</b>	Table A-1, Cadmium-133m	As noted above, Ac-227 should only be present on site at background levels, which should be small (in equilibrium with naturally occurring U-235). The impact of background levels should be calculated and any signal above that should be considered Cd-133m.	Soil sampling and analysis will determine the concentration of any radionuclides present within the Area IV Study Area. This soil sampling effort will be conducted in accordance with the Area IV and Northern Buffer Zone Soil SAP. No revision to the SAP was required.
<b>92</b>	Table A-1, Cesium-137, Barium-137m	All data uses will assume the equilibrium between Cs-137 and Ba-137m. Therefore, the reporting of Ba-137m separately should not be required.	Barium-137m is reported separately for clarity. No revision to the SAP was required.
<b>93</b>	Table A-1, Radium-226, Bismuth-214, Lead-214, Radon-222	Although the ancestors of these radionuclides, U-234, Pa-234, and Th-234, are Radionuclides of Concern, these should not be considered process related due to the long half-life of the intermediate, U-234, which prohibits significant production of these radionuclides from process material in the time frame since separation. However, they will be present in background and onsite at	See response to Comment 90.

**Response to Radiological Study Technical Workgroup Comments (Continued)**  
**to**  
**Draft Gamma Radiation Scanning Sampling and Analysis Plan (November 2009, Revision 1)**  
**Area IV Radiological Study, Santa Susana Field Laboratory,**  
**Ventura County, California**  
**January 21, 2009**

Comment Number	Section	Comment	Response
		background levels. There is no documented use of Ra-226 on the site. It is assumed that your proposed use of HPGE detector for confirmation of elevated scan readings will be to investigate if the elevation is due to these radionuclides or site related radionuclides. Why are this analytes included in the target list?	
<b>94</b>	Table A-1, Tin-126	Replace 1st instance of antimony-126 with tin-126.	Text has been corrected.
<b>95</b>	Table A-1, Thorium-234	This is acceptable. However, it is recommended that the 64 keV peak be used for quantification of Th-234 to avoid other interferences in the 92 keV region.	Both peaks (64 and 92 keV) are subject to interference. Consequently, the use of multiple supporting photopeaks is prudent. Conventional gamma spectrometry software can be configured such that the identification of both peaks is required for a true confirmation. Another detriment to the reliance on the 64 keV peak for detection in soil is that the Compton background may be significantly higher in that region than in the 92 keV region, which would significantly elevate the limits of detection. Suspected Th-234 identification will be reviewed by a project gamma spectroscopist to ensure that the two peaks return approximately equivalent activity results, to guard against interference-related bias. No revision to the SAP was required.