Runkle Canyon Response Plan
Simi Valley, California

December 4, 2008

Prepared for:
Runkle Canyon, LLC
27240 Turnberry Lane, Suite 100
Valencia, CA 91355

Prepared by:

Dade Moeller & Associates®

1835 Terminal Drive, Suite 200
Richland, WA 99354

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Summary

Runkle Canyon is the site of a proposed residential development adjacent to existing neighborhoods at the southern edge of Simi Valley, California. The development would consist of approximately 1,595 acres that would include a mix of residence types (senior housing and single-family homes), open space, a neighborhood park, and a multiuse trail system. Residences would cover approximately 140 acres in the northern portion of the project area, and 1,456 acres would be for open space and recreational uses. Runkle Canyon, LLC is the developer.

Runkle Canyon has been the subject of extensive environmental investigation, including investigations of potential radiological contamination from activities at the Santa Susanna Field Laboratory (SSFL), with reports of environmental consultants dating back to 1999. The California Department of Toxic Substances Control (DTSC) conducted a review of forty-one (41) documents submitted by Runkle Canyon, LLC in connection with the Standard Agreement for participating under California's Land Reuse and Revitalization Act (CLRRA) Program effective April 23, 2008. In a letter dated October 17, 2008, DTSC commented on the documents reviewed, prescribed additional work necessary in DTSC's opinion to complete the assessment of environmental conditions at Runkle Canyon, and requested Runkle Canyon, LLC to prepare a plan to respond to certain issues raised by DTSC. In this letter, DTSC ruled out any need for further investigation related to the groundwater at Runkle Canyon and instead focused its request for additional information and/or actions from Runkle Canyon, LLC on the following:

1. Further confirmation that there is no health risk from strontium-90 (^{90}Sr) and cesium-137 (^{137}Cs) in the soil.

2. The disposal of tar material at the site that poses a potential threat to human health because benzo(a)anthracene concentrations exceed acceptable levels.

3. Allowing DTSC access to the property for assessment of a "white precipitate" material (This independent collection and analysis was undertaken by DTSC with negative results for any material or metal of concern).

This document contains Runkle Canyon, LLC's proposed response plan to address DTSC's request to better define the environmental conditions at the site. Runkle Canyon, LLC proposes to take the following actions in response to DTSC's requests:

- Conduct additional soil sampling for ^{90}Sr and ^{137}Cs in certain areas of Runkle Canyon.
- Remove the tar material from the drainage area of Runkle Canyon.

Runkle Canyon, LLC will implement the soil sampling plan (attachment A) under direct observation of DTSC personnel in the field. Split samples will be collected and provided to DTSC for comparison purposes.

Runkle Canyon, LLC will remove the tar material from the site in accordance with Attachment B. DTSC is invited to observe the performance of this work if desired.

1.0 Introduction

Runkle Canyon is a proposed residential development adjacent to existing neighborhoods at the southern edge of Simi Valley, California, with access from the southern end of Sequoia Avenue. The project site consists of approximately 1,595 acres that would include a mix of residence types, open space, a neighborhood park, and a multiuse trail system. Runkle Canyon, LLC proposes residential development on approximately 140 acres in the northern portion of the project area and open space and recreational areas for the remaining approximately 1,456 acres. A total of 461 residences are approved for the site and would include 138 senior housing units (62 of which would be affordable housing), 298 single-family homes, and 25 single-family estate homes (City of Simi Valley 2004).

In 2004, the City of Simi Valley prepared a final environmental impact report (EIR) in accordance with the California Environmental Quality Act to evaluate the potential environmental impacts of the development activities (City of Simi Valley 2004). The EIR was certified on April 26, 2004. It provides a detailed environmental characterization of the site and of proposed activities.

The Radiologic Health Branch (RHB) of the California Department of Public Health and, more recently, the Department of Toxic Substances Control (DTSC) have continued to investigate the potential for presence of the radionuclide strontium-90 (^{90}Sr) in the soil of Runkle Canyon. Since the EIR certification there have been two soil sampling surveys. One survey resampled at the locations of the five highest ^{90}Sr soil concentrations from the previous studies, and the other was a comprehensive soil survey of the proposed residential area. Section 2.0 discusses the surveys.

A radiological health risk assessment from the potential presence of ^{90}Sr in the soil of Runkle Canyon was conducted in 2005 (Dade Moeller & Associates 2005a). Section 3.0 summarizes this assessment and discusses it in light of more recent sampling information.

This response plan addresses the requests made by DTSC upon the completion of its review of Runkle Canyon documents pursuant to the Standard Agreement under the California Land Reuse and Revitalization Act (CLRRA). In a letter to representatives of Runkle Canyon, LLC on October 17, 2008, DTSC requested that Runkle Canyon, LLC prepare a response plan to address the following issues:

1. An explanation of the apparent decrease in residual strontium-90 (^{90}Sr) activity in soils samples from 1998 to 2007.

2. A justification for the conclusions in one report that there is no health risk from ^{90}Sr in Runkle Canyon soil and that no further sampling is necessary with consideration of additional radionuclide testing.

3. An explanation of why cesium-137 (^{137}Cs) was not present (above background) when ^{90}Sr was identified.

4. A request for collection and analysis of samples for metals concentrations and mineral composition to verify chromium concentrations in a white crystalline material to assess the potential health hazard of this material.

5. A request to remove and properly dispose of tar material at the site that poses a potential threat to human health because benzo(a)anthracene concentrations exceed acceptable levels.

Section 4.0 discusses these issues and provides specific responses to them. Section 5.0 discusses the actions Runkle Canyon, LLC will undertake to in response to DTSC's requests. Attachments A and B are specific plans to address DTSC's requests and contain additional detail.

2.0 History of Radionuclide Soil Sampling in Runkle Canyon

Sampling for radionuclides in the surface soil of Runkle Canyon began in late 1998. Strontium-90 (^{90}Sr), cesium-137 (^{137}Cs), and tritium (^{3}H) have been the radionuclides of interest. A major point of comparison has been the background levels of these radionuclides from the U.S. Environmental Protection Agency (EPA 1995) for the area around the Santa Susana Field Laboratory (SSFL). Table 1 lists those values. Of particular interest have been the values for average local background concentration (fourth column), which were about 7 percent and 12 percent, respectively, of the typical U.S. background concentration for ^{90}Sr and ^{137}Cs (the last column). The local background concentration for tritium was consistent with the typical U.S. background concentration. None of these 1995 background samples were conducted at Runkle Canyon.

Table 1. Comparison of radionuclide concentrations (EPA 1995).

Radionuclide	Sampling Area on Brandeis-Bardin	Average Soil Concentration	Average Local Background Concentration	Typical U.S. Background Concentration
Strontium	RMDF Watershed	0.103 pCi/g	0.052 pCi/g	0.7 pCi/g
Cesium	Bldg 59 Watershed	0.20 pCi/g	0.087 pCi/g	0.7 pCi/g
Tritium	Bldg 59 Watershed	2,250 pCi/L	~140 pCi/L	100-300 pCi/L

pCi/g = picocuries per gram; pCi/L = picocuries per liter; RMDF = Radioactive Material Disposal Facility at SSFL

Sampling campaigns were conducted to determine if the Runkle Canyon site was contaminated with radionuclides that originated at SSFL. Sampling for ^{3}H is not included because it has not been detected above background levels. Similarly, ^{137}Cs has not been detected at elevated concentrations; however, ^{137}Cs is included in the following description because ^{137}Cs and ^{90}Sr are produced in nuclear reactors and atmospheric weapons testing in a ratio of about 1.6 to 1. During the earlier soil sampling campaigns, the ^{90}Sr concentration appeared to be somewhat elevated and the characteristic ^{137}Cs to ^{90}Sr ratio that would be indicative of either atmospheric fallout or nuclear reactor origin was not observed.

The following is a chronological history and description of ^{90}Sr and ^{137}Cs soil sampling in Runkle Canyon.

December 1998. QST Environmental collected four soil samples at three locations on December 23, 1998 (QST 1999). Sampling locations were all in proposed nonresidential areas in the southern 715-acre parcel of the property or at the extreme southern edge of the eastern 550-acre parcel. The sampling location closest to SSFL was about 440 meters west-southwest of the property line. Sample locations were selected to maximize the possibility of finding contamination and were not based on methods of the Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM; EPA 2001). The samples were analyzed for ^{90}Sr, ^{137}Cs, and tritium (^{3}H). Table 2 summarizes the results. The study concluded, "It would appear there may have been some impact of radionuclides to the site from the SSFL facility. Consequently, a more extensive site investigation appears to be necessary to the [*sic*] determine the lateral and vertical impact of radionuclides in the soil."

Table 2. Summary soil sampling statistics in December 1998 (QST 1999).

Result	^{90}Sr (4 samples)		^{137}Cs (4 samples)	
	Samples	**MDC**	**Samples**	**MDC**
Average (pCi/g)	0.59	0.21	0.028	0.17
Median (pCi/g)	0.62	0.19	0.017	0.14
Minimum (pCi/g)	0.25	0.19	-0.03	0.14
Maximum (pCi/g)	0.86	0.22	0.11	0.22
Std. deviation (pCi/g)	0.30	0.01	0.06	0.03
Results > MDC	4 of 4		0 of 4	

pCi/g = picocuries per gram; MDC = minimum detectable concentration.

June–July 1999. Foster Wheeler Environmental collected soil samples at 58 sampling locations determined using the MARSSIM process from June 28 to July 2, 1999 (Foster Wheeler 1999). The company collected an additional 9 discretionary samples and duplicates at three MARSSIM sample locations. Final results included 70 ^{90}Sr results and 67 ^{137}Cs results. The sampling locations were all in the eastern 550-acre parcel of the property and were split between residential and nonresidential areas of this parcel. Radionuclides analyzed were ^{90}Sr, ^{137}Cs, and ^{3}H. Table 3 lists the summary soil sampling statistics for ^{90}Sr and ^{137}Cs.

Table 3. Summary soil sampling statistics in June–July 1999 (Foster Wheeler 1999).

Result	^{90}Sr (70 samples)		^{137}Cs (67 samples)	
	Samples	**MDC**	**Samples**	**MDC**
Average (pCi/g)	1.33	0.75	0.09	0.08
Median (pCi/g)	1.07	0.75	0.09	0.08
Minimum (pCi/g)	-0.29	0.56	-0.05	0.05
Maximum (pCi/g)	12.34	0.99	0.3	0.12
Std deviation (pCi/g)	1.63	0.08	0.08	0.01
Results > MDC	52 of 70		29 of 67	
DCGL[a](pCi/g)	1.229		2.857	
Results > DCGL	18 of 70		0 of 70	

pCi/g = picocuries per gram; MDC = minimum detectable concentration.
a. DCGL = derived concentration guideline level; based on 7.5 millirem per year per radionuclide and a risk of 4.5 x 10^{-6} per year per radionuclide.

Foster Wheeler determined the MARSSIM critical value would be 38, where the soil concentration in 38 of the 58 MARSSIM samples must exceed the determined DCGL (derived concentration guideline level) for the soil concentration of the sampled area to be considered above the DCGL. Thirteen of the 58 samples for ^{90}Sr and none of the samples for ^{137}Cs were above the DCGL, which led to the report's conclusion that the site was "non-contaminated for the radionuclides detected." Each of the DCGLs was based on 7.5 millirem per year, so that the total radiation dose from all radionuclides would be less than the EPA standard of 15 millirem per year (or less than an annual risk of 9×10^{-6}). However, the Foster Wheeler report did not make a statement as to whether the area was considered to be Survey Class 1, 2, or 3. The critical value is appropriate for a Class 1 area, but no samples would be expected to be above the DCGL for Class 2 or 3 areas. There is therefore some uncertainty about the appropriateness of the DCGL (it could be too low) or the analytical detection capability of the analysis (which could be too high). The average ^{90}Sr concentration was slightly above the DCGL, as was the concentration of 18 of the 70 soil samples. However, the 4.9×10^{-6} risk from the average soil concentration was still well within the EPA acceptable annual risk range; and the 4.9×10^{-5} risk from the highest soil sample was also well within that range. Annual risk from the average ^{137}Cs concentration was very low, at 1.4×10^{-7}.

September 2000. Nineteen samples were collected at 17 locations on September 23, 2000 (Harding ESE 2000). Sampling locations were all in nonresidential locations in the southern (Rancho Simi) 720-acre parcel. There were 2 blind duplicates (SS-18 and SS-19) at locations SS-3 and SS-7. Harding ESE conducted a limited surface soil sampling program "that would evaluate certain areas of the Property with the highest probability of being impacted by run-off [of radionuclides] from the [SSFL] facility." Therefore, this was not a MARSSIM-based sampling plan.

Table 4. Summary statistics for soil sampling in September 2000 (Harding ESE 2000).

Result	^{90}Sr (19 samples)		^{137}Cs (19 samples)	
	Samples	**MDC**	**Samples**	**MDC**
Average (pCi/g)	0.96	0.66	0.015	0.11
Median (pCi/g)	0.39	0.65	0.015	0.12
Minimum (pCi/g)	-0.32	0.47	-0.09	0.07
Maximum (pCi/g)	4.76	0.79	0.09	0.14
Std. deviation (pCi/g)	1.49	0.10	0.04	0.02
Results > MDC	7 of 19		1 of 19	

pCi/g = picocuries per gram; MDC = minimum detectable concentration.

The report compared sample results to the DCGL values that were calculated in Foster Wheeler (1999). The concentrations of ^{90}Sr in four samples exceeded the DCGL; none of the ^{137}Cs results exceeded the DCGL. This report concluded that "Harding ESE cannot make a definitive conclusion regarding the presence or absence of strontium-90 in the soil, without additional data."

March 2003. Miller Brooks Environmental conducted a survey on March 13 and 14, 2003 (Miller Brooks 2003a,b,c). The company collected 13 soil samples and conducted one soil boring to 7 feet in the southern 715-acre parcel, collected 6 soil samples and conducted five soil borings to a depth of 7 feet in the 550-acre eastern parcel, and collected 4 soil samples from the 350-acre western parcel. Three offsite samples were collected. The analytical laboratory analysis of these soil samples for ^{90}Sr and the data reporting of an "analyte reporting limit" – presumably a minimum detectable concentration (MDC) – that ranged from 2 to 2.8 picocuries per gram, which was too high to be of value in comparison to the earlier sampling results that had lower MDCs. In addition, most of the results were not reported quantitatively but rather as "not detected at the reporting limit." Only 2 of the 49 sample results (including samples at depth) were reported quantitatively (2.1 ± 1.2 and 2.2 ± 1.2 picocuries per gram). These data are not considered useful or representative for the presence of ^{90}Sr in the soil of Runkle Canyon when considered together with both the earlier and later sampling results. There was no analysis for ^{137}Cs.

June 2005. At the request of the State of California Department of Public Health Radiologic Health Branch (RHB), resampling for ^{90}Sr was conducted at the sample locations of the five highest ^{90}Sr soil sample results (Dade Moeller & Associates 2005b). Samples were collected as close as possible to the original five sample locations with representatives of the ownership group, Dade Moeller & Associates, and the State of California RHB present as samples were physically collected by an independent environmental contractor. The samples were split for independent analysis by both a contracted analytical laboratory and a California state laboratory RHB uses. Both laboratories showed ^{90}Sr concentrations to be much lower than the original results; the state laboratory results were the lowest. There was no analysis for ^{137}Cs because it had not been detected or was present only at very low concentrations in previous surveys. Table 5 lists the results.

Table 5. Strontium-90 in the five highest soil samples in June 2005 (Dade Moeller & Associates 2005b).

Sample	Original[a] Results (pCi/g)		Contracted Laboratory A (pCi/g)		CA State Laboratory (pCi/g)	
	Result	**MDC**	**Result**	**MDC**	**Result**	**MDC**
GP-29	5.13±0.69	0.84	0.140±0.167 -0.065±0.185	0.280 0.327	0.068±0.242	0.399
GP-44	6.38±0.79	0.99	0.247±0.180	0.293	0.013±0.179	0.299
GP-52	12.34±0.86	0.59	0.423±0.177	0.273	0.137±0.192	0.306
SS-3	3.64±0.62	0.75	0.215±0.150	0.244	-0.022±0.206	0.348
SS-6	4.76±0.63	0.64	0.173±0.170	0.282	0.056±0.265	0.439

pCi/g = picocuries per gram; MDC = minimum detectable concentration.
a. GP-29, GP-44, GP-52 from Foster Wheeler (1999); SS-3, SS-6 from Harding ESE (2000).

The results seemed to indicate that the earlier, higher results were anomalous and could have been caused by cross-contamination or analytical or counting issues in the laboratories. The results from the State of California laboratory were even lower, and they are more consistent with the results of sampling in 2007 (discussed below). The report concluded that an already low potential health risk from ^{90}Sr was likely even lower based on the results. The report further concluded that no additional ^{90}Sr sampling and analysis was necessary.

October 2007. At the direction of Runkle Canyon LLC, Dade Moeller & Associates developed a MARSSIM-based soil sampling plan for ^{90}Sr in the soil of the proposed residential area in the eastern parcel and, at the request of the RHB, included the northwest quadrant of the site (Dade Moeller & Associates 2007a). The entire project site was considered a Class 3 survey area, and no results above the DCGL of 1 picocurie per gram were expected. An independent environmental firm was contracted to collect 63 soil samples from October 3 to 8, 2007. There were 57 surface sample locations (0 to 6 inches depth) and 6 locations where samples were collected at a depth of 6 to 12 inches. Unlike the early sampling campaigns, and at the urging of the RHB, a different analytical laboratory was contracted, one which had a ^{90}Sr MDC in soil of 0.03 to 0.05 picocuries per gram, which is significantly lower than earlier sampling analyses. Table 6 lists summary sampling statistics from the survey. These 2007 results showed there was no indication of ^{90}Sr in the proposed residential areas of Runkle Canyon and that the levels were much closer to the local background level of 0.052 picocuries per gram (EPA 1995). Because radioactive decay would have occurred and resulted in a nearly 40 percent decrease in the background level between background sampling in late 1994 and the 2007 sampling, and because the uncertainty of the original EPA value was 0.052 ± 0.031 picocuries per gram[1], these 2007 sample results are very similar to the expected background.

Table 6. Summary statistics for soil sampling (Dade Moeller & Associates 2007a; City of Simi Valley 2007).

Samples	Contracted Laboratory B		City of Simi Valley[a]	
	63 samples	**MDC**	**10 samples**	**LLD[b]**
Average (pCi/g)	0.014	0.019	0.011	0.013
Median (pCi/g)	0.012	0.019	0.012	0.013
Minimum (pCi/g)	-0.010	0.008	-0.002	0.009
Maximum (pCi/g)	0.078	0.033	0.027	0.02
Std deviation (pCi/g)	0.015	0.008	0.0082	0.0041
Results > MDC	19 of 63		5 of 10	
DCGL[c](pCi/g)	1		Not applicable	
Results > DCGL	0 of 63		0 of 10	

pCi/g = picocuries per gram; MDC = minimum detectable concentration.
a. City of Simi Valley laboratory results are not included in the 2007 report.
b. LLD = lower limit of detection; LLD and MDC are comparable statistics.
c. DCGL = derived concentration guideline level; based on 7.5 millirem per year per radionuclide and a risk of 4.5×10^{-6} per year per radionuclide.

The City of Simi Valley also collected split soil samples during the sampling campaign and had 10 samples analyzed for ^{90}Sr. Table 6 shows those results in comparison with the Dade Moeller & Associates (2007a) results. The table shows that the contracted laboratory and the City of Simi Valley samples are very similar and are much lower than the earlier (pre-2007) results. Table 7 compares only the 10 split samples. Again, the results are very similar. Both are much lower than the pre-2007 results, and both are consistent with background levels expected in 2007.

[1] Calculated independently from the original report data because EPA (1995) does not provide an uncertainty estimate.

Table 7. Summary statistics for the 10 split soil samples (Dade Moeller & Associates 2007a and City of Simi Valley 2007).

	Contracted Laboratory B		City of Simi Valley	
	Samples	**MDC**	**Samples**	**LLD[a]**
Average (pCi/g)	0.015	0.015	0.011	0.013
Median (pCi/g)	0.013	0.013	0.012	0.013
Minimum (pCi/g)	-0.0003	0.008	-0.002	0.009
Maximum (pCi/g)	0.042	0.027	0.027	0.02
Std deviation (pCi/g)	0.014	0.006	0.0082	0.0041
Results > MDC	4 of 10		5 of 10	
DCGL[b](pCi/g)	1		Not applicable	
Results > DCGL	0 of 10		0 of 10	

pCi/g = picocuries per gram; MDC = minimum detectable concentration.
a. LLD = lower limit of detection; LLD and MDC are comparable statistics.
b. DCGL = derived concentration guideline level; based on 7.5 millirem per year per radionuclide and a risk of 4.5 x 10^{-6} per year per radionuclide.

3.0 Radiological Health Risk Assessment

A radiological health risk assessment was conducted in 2005 (Dade Moeller & Associates 2005a) to consider the sampling data from 1998 to 2003 (QST 1999; Foster Wheeler 1999; Harding ESE 2000, Miller Brooks 2003a, 2003b, 2003c). The assessment concluded that the potential risk to future residents of Runkle Canyon would be very low, near the lower bound of the acceptable annual risk range of 1×10^{-6} to 1×10^{-4} for even those potentially highly exposed residents in the proposed suburban land use area[2]. Typical residents and individuals who would use the nonresidential areas would have even lower risks – less than 1×10^{-6} per year in all cases. The parameter values and approaches of this assessment were generally consistent with those the National Committee on Radiation Protection and Measurements (NCRP) used to derive suburban and no food suburban (no home-grown vegetables) soil screening limits in Report 129 (NCRP 1999). The EPA Preliminary Remediation Goal (PRG) default scenario (EPA 2004) does not apply to Runkle Canyon because the proposed land use is well known and does not fit the default scenario.

Since 2003, soil sampling has indicated that the ^{90}Sr soil concentrations are even lower than indicated by the earlier sampling (Dade Moeller & Associates 2005b, 2007a). The exact reason for this decrease is not known, but it is likely due to bias in methods or counting protocols in the laboratories that performed the earlier analyses. Section 4.0 discusses this issue in more detail. As Section 2.0 discusses, the later sampling indicates the ^{90}Sr soil concentrations in Runkle Canyon are more indicative of the local background level.

Therefore, when considering the new sampling data in context of the previous radiological health risk assessment, it is likely that the potential radiological risk to all residents and visitors of Runkle Canyon would be much less than 1×10^{-6} per year in all cases.

[2] Ingestion of home-grown vegetables is the dominant exposure pathway. See NCRP 1999.

4.0 Actions Requested by the Department of Toxic Substances Control

This section addresses the actions DTSC requested of Runkle Canyon, LLC as part of its CLRRA review and includes the company's responses to these requests. The DTSC requests are shown in *italics* with the Runkle Canyon, LLC response following thereafter. For clarity in the responses, the issues have been numbered from 1 to 5, and issue 2 has been split into 2 parts.

> *Based on its review of the 41 documents, DTSC concludes that additional work is necessary to better define environmental conditions at the site and to address one or more potential threats to public health and the environment. DTSC requests that Runkle Canyon, LLC prepare a Response Plan addressing these needs. Here is DTSC's prescription for that Response Plan:*

Issue 1

> ***Radionuclide Testing***
> *(1) Explain the reason(s) for the apparent decrease in residual Sr-90 soil activity from 1998 to 2007.*

Response. Some of the decrease in the detected level of ^{90}Sr in the soil of Runkle Canyon is a result of radioactive decay. The first survey occurred in December 1998 and the most recent in October 2007, almost 9 years later. Strontium-90 has a half-life of 29.1 years. Over this time the activity would decrease about 20 percent. Decay does not however account for the entire apparent decrease to the very low levels in the 2007 survey. The most recent independent results from three independent laboratories – the State of California laboratory in 2005 (Table 5), the City of Simi Valley in 2007, and Contracted Laboratory B in 2007 (Tables 6 and 7) – were much lower than earlier results, were consistent with one another, and were consistent with the expected local background. The likely explanation of the discrepancy between the earlier and the later results is that the analytical laboratories for the earlier surveys suffered from some type of bias[3] in the analytical method or the counting technique. In fact, Contracted Laboratory A (Table 5), which analyzed five samples, was the same laboratory that analyzed the earlier Foster Wheeler samples in 1999 (Table 3), although the laboratory had changed ownership and name in the intervening period.

In summary, the apparent decrease in results is likely due to analytical or counting bias in the earlier sample analysis. This statement is partly speculative because any definitive statement would require extensive examination of laboratory protocols and data. The results from the 2007 sampling are likely more representative of the true level of ^{90}Sr in the soil of Runkle Canyon because of the consistency among the results from Contracted Laboratory B (which has NUPIC[4] certification), the State of California laboratory, and the independent laboratory the City of Simi Valley used.

[3] Bias is a persistent difference between the measured result and the true value of the quantity being measured, which does not vary if the measurement is repeated. (MARLAP Manual, USEPA, USNRC 2004)
[4] NUPIC = Nuclear Procurement Issues Committee.

Issue 2a

> (2) *Provide additional justification for statements made in Document #7 that "The overall conclusion is that there is effectively no health risk from Sr-90 in Runkle Canyon soil," and "No further sampling of soils at Runkle Canyon for the detection of Sr-90 is necessary." The information you provide should address MARSSIM area classification(s), the justification(s), sample density calculations, and non-parametric statistics.*

Response. Document #7 is *Strontium-90 Soil Sampling in Runkle Canyon, Simi Valley, California* (Dade Moeller & Associates 2007a). The earlier Dade Moeller & Associates report, *Radiological Health Risks from Strontium-90 in the Runkle Canyon Development Simi Valley, California* (Dade Moeller & Associates 2005a) provides much of the basic justification for these statements. Using soil sampling data available at that time, the report showed that the potential annual risk to a highly exposed resident would be about 1×10^{-6} (1 in 1 million) and less than that risk level for a typical resident. The newer soil sampling data from 2007 showed a factor of 10 reduction in average concentration of ^{90}Sr in soil, and so the risk would also be reduced in direct proportion. The recommended limits for ^{90}Sr in soil in NCRP Report 129, *Recommended Screening Limits for Contaminated Surface Soil and Review of Factors Relevant to Site-Specific Studies*, for the suburban and no-food suburban exposure scenarios also provide indication that the potential risk is at or below the lower limit of the acceptable risk range. It should be emphasized that the default PRG value for ^{90}Sr should not be applied because the default land use scenario is not consistent with the proposed Runkle Canyon use. At the conclusion of the soil sampling Runkle Canyon, LLC proposes in the response to issue 2b below, the company will prepare a report that considers the new sampling results to further evaluate the potential health risk.

In relation to the soil sampling parameters DTSC requested, this information is included in the report, *Soil Sampling Plan for the Runkle Canyon Main and Northwest Grading Areas* (Dade Moeller & Associates 2007b), which has been provided to DTSC. In summary, this sampling area was considered MARSSIM Class 3, the DCGL was set at 1 picocurie per gram (which corresponds to an annual risk of less than 1×10^{-6}), and the estimated sample standard deviation was 0.172 picocurie per gram, resulting in 57 samples for the residential sampling area. None of the sample results were greater than the DCGL.

Issue 2b

> *Runkle Canyon, LLC should consider including provisions for additional radionuclide testing in the Response Plan. This aspect of the Response Plan should at a minimum, specify sample locations, the number of samples to be collected at each location, the analytical methods to be used, the detection limits to be used, and a justification for the proposed level of sampling.*

Response. In accordance with DTSC's request, Runkle Canyon, LLC will agree to perform additional ^{90}Sr soil sampling in those nonresidential areas of Runkle Canyon closest to the SSFL. Attachment A to this response plan is the soil sampling plan for that area and includes all of the requested information. In summary, this sampling area is considered MARSSIM Class 3 and the

DCGL is set at 1.7 picocuries per gram, which corresponds to an annual risk of 1×10^{-7} based on the no-food suburban exposure scenario in NCRP Report 129 (NCRP 1999). Using the MARSSIM methodology, 14 sample locations were randomly selected within a triangular grid over the sampling area that was generated by the VSP software program[5]. Analytical capability will have a detection limit of 0.05 picocurie per gram or lower for ^{90}Sr, which is similar to that for the 2007 sampling. Upon request Runkle Canyon, LLC will collect split soil samples and provide to DTSC for analysis of ^{90}Sr.

Issue 3

(3) Explain why Cs-137 soil radioactivity was not present (above background) when Sr-90 was identified. If no reasonable explanation can be given, the Response Plan should include provisions for testing to identify Cs-137 and determine ratios of Cs-137 to Sr-90 in soil.

Response. Cesium-137, as a gamma-emitting radionuclide, is much easier to detect than ^{90}Sr, and no radiochemical separation is needed. In reviewing the historical sampling information it can be seen that the detection limits for ^{137}Cs are much lower than those for ^{90}Sr. Therefore, the discrepancy is not due to error in detection of ^{137}Cs but rather to limitations in the detection of ^{90}Sr in the earlier laboratory analysis (as noted in the response to issue 1). None of the previous sample analyses showed any indication of the presence of ^{137}Cs. However, Runkle Canyon, LLC will agree to take additional tests for the presence of ^{137}Cs in the soil at Runkle Canyon. Each of the soil samples for ^{90}Sr will also be analyzed for ^{137}Cs. Upon request Runkle Canyon, LLC will collect split soil samples and provide to DTSC for analysis of ^{137}Cs. The sampling plan in Attachment A includes analysis for ^{137}Cs.

Issue 4

White Crystalline Material

The white crystalline material appears to be sulfate salts leaching out of the mined aggregate stockpiles. Because the material on the rock obtained form the "Radiation Rangers," containing elevated Cr, the material on-site should be collected and analyzed for metals concentrations and mineral composition to verify Cr concentrations in the material and provide a positive identification of the material. DTSC plans to independently collect and analyze representative samples of the white material for those purposes. If the results are positive, it will then be necessary for Runkle Canyon, LLC to map the location(s) and extent of the material, prior to the 2008-2009 rainy season, in preparation for possible removal and disposal or other corrective action. If the results confirm Cr or other metals are present at concentrations deemed actionable and the material cannot be mapped ahead of the forthcoming wet season, DTSC will direct that measures be taken to prevent the material from dissolving and washing away. Such measures could include removal, or placement of a suitable temporary cover. The Response Plan should address this contingency.

[5] Visual Sample Plan (VSP) software version 5.3. Software and documentation available at http://dqo.pnl.gov/vsp. Software copyright 2008 Battelle Memorial Institute. All rights reserved.

Response. The DTSC Environmental Chemistry Laboratory has analyzed the white precipitate samples. Two sets of samples were collected by DTSC on August 27, 2008 and September 24, 2008. None of the samples contained elevated chromium concentrations. Final results were received on November 3, 2008. Table 8 summarizes the results.

Table 8. Results of white precipitate chemical analysis by DTSC (milligram per kilogram).

	Sample Identification[a]				Reference Criteria	
Chemical	**RC-1**	**RC-2**	**RC-3**	**RC-4**	**CHHSL**	**TTLC**
Silver	<10	<10	<10	<10	380	500
Arsenic	<10	<10	**11**	<10	0.07	500
Barium	**49**	**14**	**29**	**30**	5,200	10,000
Beryllium	<1.0	<1.0	<1.0	<1.0	150	75
Cadmium	<1.0	<1.0	<1.0	<1.0	1.7	100
Cobalt	**13**	<10	<10	<10	660	8,000
Chromium	**12**	<10	<10	<10	170	2,500
Copper	**16**	<10	<10	<10	3,000	2,500
Molybdenum	<10	<10	<10	<10	380	3,500
Nickel	**30**	**28**	**66**	**28**	1,600	2,000
Lead	**19**	**12**	**10**	**12**	150	1,000
Antimony	<10	**15**	**36**	<10	3,000	500
Selenium	<10	<10	<10	<10	380	100
Thallium	<10	<10	<10	<10	5	700
Vanadium	**39**	<10	**13**	**27**	530	2,400
Zinc	**41**	<10	<10	**24**	2,300	5,000

CHHSL = California human health screening level; TTLC = total threshold limits concentration (a hazardous waste criteria).

a. Bold numbers indicate results above the minimum detectable concentration (MDC).

Because laboratory analysis showed arsenic levels above the California human health screening level (CHHSL) and the total threshold limits concentration (TTLC) (a hazardous waste criteria), which is a common occurrence, DTSC had a contracted analytical laboratory perform metals analysis on the precipitate to determine arsenic concentrations, and x-ray diffraction testing to determine the mineral composition, and verify that it was a naturally occurring mineral. Based on this testing, the precipitate consists of common naturally occurring minerals and does not contain elevated concentrations of metals, including arsenic. The DTSC reported the following information:

> *The minerals were identified as quartz and feldspars, which are rock forming minerals along with calcite, gypsum, hexahydrite and blodite. The last four are evaporite minerals that form by water dissolving materials in rock or soil and then leaving behind crystals as the water evaporates. Calcite is calcium carbonate ($CaCo_3$) while the gypsum, hexahydrite and blodite are all sulfate minerals. The sulfate minerals consist of a sulfate group (SO_4) attached to an*

anion, calcium for gypsum and magnesium and sodium for hexahydrite and blodite. These are all naturally occurring minerals very similar to epsom salt.

These results indicate that the white precipitate is composed of naturally occurring minerals. Therefore, no additional action is required.

Issue 5

Tar Material
The tar material encountered at the site poses a potential threat to human health because benzo(a)anthracene concentrations exceed the PRG. The tar material should be removed from the site and either properly recycled or disposed. The Response Plan should address the removal of this material.

Response. Runkle Canyon, LLC will remove the tar material. Attachment B provides details of the proposal.

5.0 Actions To Be Taken by Runkle Canyon, LLC

The following actions will be taken by Runkle Canyon, LLC in response to the DTSC requests and in consideration of the specific responses to these requests in Section 4.0 of this response plan:

1. Runkle Canyon, LLC will conduct additional MARSSIM-based soil sampling for the presence of ^{90}Sr and ^{137}Cs in Runkle Canyon areas closest to SSFL but excluding the proposed residential areas Runkle Canyon, LLC has already sampled. Attachment A contains the proposed soil sampling plan. Once the sampling results are complete, Runkle Canyon, LLC will provide a report to DTSC.

2. Runkle Canyon, LLC will remove the tar material from the surface drainage area of Runkle Canyon. Attachment B contains the proposed plan for removal of this material. Prior to beginning this work Runkle Canyon, LLC will notify DTSC to coordinate any desired oversight.

These actions, in combination with the responses in Section 4.0, address the requests DTSC stated in its October 17, 2008 letter.

6.0 References

Document reference numbers from the CLRRA Standard Agreement are shown in brackets where applicable.

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[5] Dade Moeller & Associates. 2005a. *Radiological Health Risks from Strontium-90 in the Runkle Canyon Development Simi Valley, California*. DMA-TR-14. Dade Moeller & Associates, Inc., Richland Washington.

[6] Dade Moeller & Associates. 2005b. *Supplemental Soil Sampling for Strontium-90 in the Runkle Canyon Development, Simi Valley, California*. DMA-TR-15. Dade Moeller & Associates, Inc., Richland Washington.

Dade Moeller & Associates. 2007a. *Soil Sampling Plan for the Runkle Canyon Main and Northwest Grading Areas*. DMA-TR-30. Dade Moeller & Associates, Inc., Richland Washington.

[7] Dade Moeller & Associates. 2007b. *Strontium-90 Soil Sampling in Runkle Canyon, Simi Valley, California*. DMA-TR-34. Dade Moeller & Associates, Inc., Richland Washington.

[24, 25, 26, 27] Foster Wheeler Environmental Corporation. 1999. *Runkle Ranch Site Investigation , Simi Valley, California*. Final Report. Foster Wheeler Environmental Corporation, Costa Mesa, CA.

[8] Harding ESE. 2000. *Results of Limited Soil Sampling, Rancho Simi Property. APN 6850-130-180, Simi Valley, California*. November 3, 2000. Harding ESE, Phoenix, AZ.

[14] Miller Brooks Environmental, Inc. 2003a. *Site Investigation Report of Western 350-Acre Parcel; GreenPark Runkle Canyon, LLC Runkle Canyon Property in Simi Valley, California*. September 17, 2003. Miller Brooks Environmental, Inc., Huntington Beach, CA.

[15] Miller Brooks Environmental, Inc. 2003b. *Site Investigation Report of 550-Acre Parcel; GreenPark Runkle Canyon, LLC Runkle Canyon Property in Simi Valley, California*. September 17, 2003. Miller Brooks Environmental, Inc., Huntington Beach, CA.

[13] Miller Brooks Environmental, Inc. 2003c. *Site Investigation Report of Southern 715-Acre Parcel; GreenPark Runkle Canyon, LLC Runkle Canyon Property in Simi Valley, California*. September 17, 2003. Miller Brooks Environmental, Inc., Huntington Beach, CA.

National Council on Radiation Protection and Measurements (NCRP). 1999. *Recommended Screening Limits for Contaminated Surface Soil and Review of Factors Relevant to Site-Specific Studies*. NCRP Report 129, National Council on Radiation Protection and Measurements, Bethesda, MD.

[38] QST Environmental, Inc. 1999. “Results of Preliminary Soil Samples at Runkle Ranch in Simi Valley, California.” Letter Report from John S. Kim to Ms. Marina Robertson, GreenPark Ventures, LLC, dated February 5, 1999.

U.S. Environmental Protection Agency (EPA) 1995. EPA Update July 1995. U.S. Environmental Protection Agency Region IX, San Francisco, California. http://www.etec.energy.gov/Health-and-Safety/Brandeis-Bardin.html

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U.S. Environmental Protection Agency (EPA). 2004. *Preliminary Remediation Goals for Radionuclides.* http://epa-prgs.ornl.gov/radionuclides/, updated August 4, 2004. U.S. Environmental Protection Agency, Washington, DC.

Attachment A
Soil Sampling Plan for Proposed Non-Residential Eastern and Southeastern Areas of Runkle Canyon

DMA-TR-38

Dade Moeller & Associates, Inc.
Technical Report

Soil Sampling Plan for Proposed Non-residential Eastern and Southeastern Areas of Runkle Canyon

Tracy A. Ikenberry, CHP
Clark B. Barton, CHP

December 2008

Prepared for
Runkle Canyon, LLC
Los Angeles, CA 90024

Dade Moeller & Associates, Inc.
1835 Terminal Drive, Suite 200
Richland, WA 99354

LIMITATIONS

Dade Moeller & Associates prepared this soil sampling plan pursuant to the directions received from Runkle Canyon, LLC. Our work is based on information available at the time of publication.

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1.0 INTRODUCTION

Runkle Canyon is a proposed residential development adjacent to existing neighborhoods at the southern edge of Simi Valley, California accessed at the end of Sequoia Avenue. The California Department of Toxic Substances Control (DTSC) reviewed the Runkle Canyon soil sampling documentation with respect to the California Land Reuse and Revitalization Act (CLRRA) agreement between DTSC and the property owner Runkle Canyon, LLC. DTSC requested that additional soil sampling for ^{90}Sr be conducted on the site.

Several soil sampling campaigns had been earlier been conducted as part of the environmental characterization of the site (QST 1999; Foster Wheeler 1999; Harding ESE 2000, Miller Brooks 2003a, 2003b, 2003c). The sampling conducted in 1998, 1999 and 2000 appeared to indicate the presence of strontium-90 (^{90}Sr) in surface soil; there was no indication of other radionuclides analyzed in the samples – cesium-137 (^{137}Cs) and tritium (^{3}H). Subsequent sampling conducted at the locations of five highest samples (Dade Moeller & Associates 2005b) showed much lower ^{90}Sr levels than initially indicated. In addition, a MARSSIM-based sampling of the proposed residential area commissioned by Runkle Canyon, LLC in 2007 showed the levels to be even lower and consistent with the local background for ^{90}Sr (Dade Moeller & Associates 2007, USEPA 1995). The State of California analyzed split soil samples from the 2007 sampling and showed lower results consistent with the later sampling.

Runkle Canyon, LLC has agreed to conduct additional MARSSIM-based soil sampling in proposed non-residential eastern and southeastern portions of the site. These areas are closest to the Santa Susana Field Laboratory (SSFL). Runkle Canyon, LLC has also agreed to have samples analyzed for both ^{90}Sr and ^{137}Cs to see if additional information can be gained on the ratios of these radionuclides in soil.

This sampling plan directs the collection of additional samples from the eastern and southeastern areas of the Runkle Canyon site which will be proposed non-residential areas – no homes will be built in this area and no or minimal grading will take place. The objective of this additional sampling is to provide further quantitative information to ensure that the potential risk to members of the public remains well below acceptable risk guidelines.

2.0 FUNCTIONS AND REQUIREMENTS

Soil sampling of the Runkle Canyon area includes the following work functions to be performed by an environmental sampling firm and an analytical laboratory contracted by Runkle Canyon, LLC. Dade Moeller & Associates will provide oversight and technical direction as requested by Runkle Canyon, LLC and will prepare a report on the analytical results.

A contracted environmental sampling firm will:

- Review this Plan and develop a soil sampling protocol that that is consistent with ASTM C998-05 “Standard Practice for Sampling Surface Soil for Radionuclides,” subject to additional requirements noted in Section 4.0.
- Notify Runkle Canyon, LLC of all planned departures from the Plan.

- Identify potential hazards during sampling and develop controls. Provide safety briefings for sampling personnel.
- Provide all required safety and personal protective equipment.
- Perform soil sampling.
- Document all survey activities and observations in a controlled logbook or equivalent.
- Package samples and ship to the analytical laboratory in a manner that meets all chain-of-custody requirements.

A contracted analytical laboratory will:

- Perform requested sample analyses for ^{90}Sr and ^{137}Cs and provide requested data as stated in Section 5.0 of this plan.
- Interpret the analytical data and prepare a final report on the analytical results.

3.0 NUMBER OF SAMPLES AND LOCATIONS

Determination of the number of sampling locations described below was developed using methods discussed in the *Multi-Agency Radiation Survey and Site Investigation Manual* (EPA 2001). The areas to be sampled are considered to be Class 3 areas using the MARSSIM criteria. Class 3 areas are those considered to be uncontaminated or minimally affected by contaminants. This has been demonstrated by the previously noted sampling reports.

A site-specific radiological risk analysis of the Runkle Canyon area (Ikenberry 2005a) estimated that even "highly exposed" residents of Runkle Canyon would have an annual risk level of 1 x 10^{-6} (one in one million) at a concentration of about 1.1 pCi/g of ^{90}Sr if it was assumed to be distributed evenly throughout the surface soil. Typical residents of Runkle Canyon and visitors to the undisturbed open spaces would experience much lower levels of risk. MARSSIM requires a Derived Concentration Guideline Level (DCGL) as one of the parameters to establish the number of samples required. For the non-residential areas in this sampling campaign soil screening limits from the National Council on Radiation Protection and Measurements Report No. 129 (NCRP 1999) were used. Because this is a non-residential area, the "No Food Suburban" exposure scenario was used; a DCGL was established at 1.7 pCi/g, which corresponds to an annual risk of 1 x 10^{-7} for a "highly exposed" individual at the 95th percentile.

The number of samples required was determined using the Visual Sample Plan (VSP) software version 5.3 (Battelle Memorial Institute 2008; see Appendix A). VSP incorporates the MARSSIM method; Appendix A contains the VSP output. Table 1 shows a summary of the sampling parameters. A total of 14 samples were determined to be adequate (with 20% allowance) with α and β errors each set to 5%. Figure 1 shows the Runkle Canyon main and northwest grading areas with the overlaid soil sampling grid. Table 2 shows the sample locations and coordinates.

The sampling area was selected to include non-residential area closer to the SSFL than the proposed residential area sampled in 2007; the residential area previously sampled was excluded. In addition, the sampling areas was selected to include all of the "higher" samples from earlier analyses (Dade Moeller & Associates 2005b). To accomplish this, a small separate sampling area was included to the west of the main sampling area and directly south of the previously sampled residential area as shown in Figure 1. This area will be the location of sample N14 as noted in Table 2.

Table 1. Sampling parameters for the eastern and southeastern non-residential area.

Parameter	Value	Comments
Survey class	3	No significant contamination expected
DCGL	1.7 pCi/g ^{90}Sr	Based on NCRP #129 *No Food Suburban*; 1 x 10^{-7} yr^{-1} risk
Std deviation	0.015 pCi/g	Based on 2007 sampling
α and β errors	5 %	Typical
Samples	14	Includes 20% overage (3 samples)
Area	267 acres	

Table 2. Sample Location Coordinates and Sample Designation.

Area: Runkle Canyon eastern & southeastern non-residential area					
Latitude (North)	**Longitude (West)**	**Label¹**	**Value**	**Type**	**Historical**
34°13'26.82"	-118° 43'21.51"	**N 01**		Systematic	
34°13'25.49"	-118° 43'09.51"	**N 02**		Systematic	
34°13'34.95"	-118° 43'28.05"	**N 03**		Systematic	
34°13'35.12"	-118° 43'15.43"	**N 04**		Systematic	
34°13'42.05"	-118° 43'32.37"	**N 05**		Systematic	
34°13'43.02"	-118° 43'20.56"	**N 06**		Systematic	
34°13'52.56"	-118° 43'39.01"	**N 07**		Systematic	
34°14'00.69"	-118° 43'46.43"	**N 08**		Systematic	
34°14'09.75"	-118° 43'52.44"	**N 09**		Systematic	
34°14'08.02"	-118° 43'39.57"	**N 10**		Systematic	
34°14'27.10"	-118° 43'43.47"	**N 11**		Systematic	
34°14'35.63"	-118° 43'34.77"	**N 12**		Systematic	
34°14'47.58"	-118° 43'24.37"	**N 13**		Systematic	
34°13'55.74"	-118° 44'05.75"	**N 14**		Systematic	

¹: Labels start in the lower lefthand (southeast) corner of the grid in Figure 1 and move north, west to east except for N14, which is last since it is in a separate sampling area.

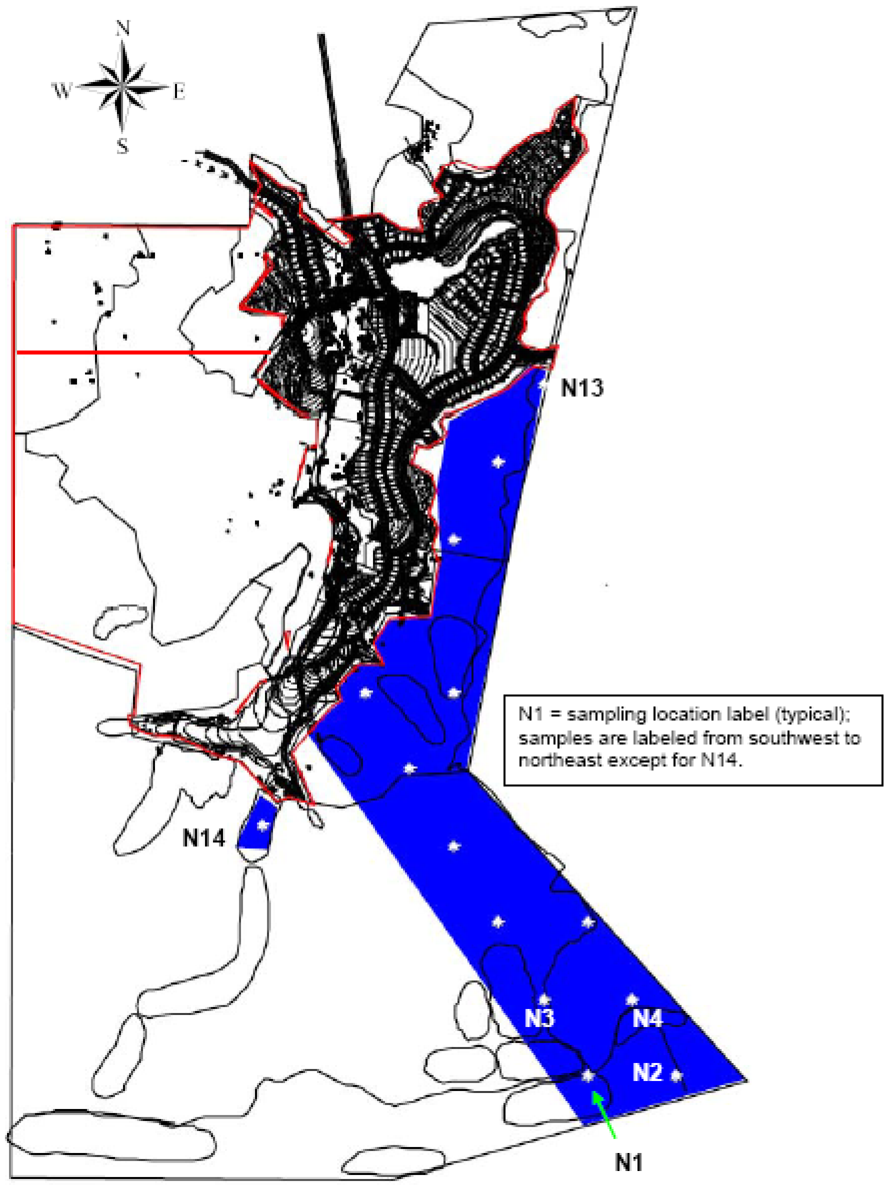

Figure 1. Sampling area and sample locations for the non-residential Runkle Canyon area.

4.0 SAMPLE COLLECTION AND HANDLING

Collection of soil samples is required to determine the concentration of the radionuclide strontium-90 in soil. The soil sampling protocol will follow ASTM C998 "Standard Practice for Sampling Surface Soil for Radionuclides" or equivalent with the following modifications: one 1-m^2 area will be cleared and sampled rather than two 1-m^2 areas (with 5 cores or plugs rather than 10); and surface soil samples will be taken from a depth of 0 to 6 inches (0 to 15 cm) if possible.[a] Shallower samples (0 to 3 inches) are acceptable if soil conditions prevent deeper sampling, with appropriate documentation in the sampling logbook. Samples shall be taken as close to the locations in Table 1 as feasible. Actions shall be taken to prevent cross-contamination between samples. Soil will be sieved using a 10 mesh sieve to remove vegetation and pebbles; if there is difficulty using 10 mesh a slightly larger mesh size (4) may be considered. A minimum of 500 ml aliquots (approximately 1 kg each) will be taken and provided to the analytical laboratory using standard chain of custody procedures and forms. Samples shall be collected by qualified individuals using the appropriate equipment and procedures. Upon request by DTSC, split soil samples will be collected and provided to DTSC for independent analysis for the presence of radionuclides.

All sample media, personal protective equipment, and other materials or equipment used during the sampling may be properly disposed as sanitary waste. The waste is <u>not</u> considered radioactive waste.

Activities associated with the soil sampling should be planned and monitored to assure that the health and safety of those performing the sampling and other personnel are adequately protected. Health and safety concerns at this undeveloped site may include heat or cold depending upon the time of year, sharp objects, falling objects, tripping hazards, and biological hazards such as insects and snakes. It is expected that environmental sampling firm will conduct all sampling tasks consistent with their policies and procedures for health and safety. All personnel should be briefed on potential safety hazards prior to performing or observing tasks.

5.0 SAMPLE ANALYSIS

The analytical laboratory shall have written procedures that document its analytical capabilities for ^{90}Sr in soil, and a Quality Assurance/Quality Control (QA/QC) program that ensures the validity of the analytical results. The laboratory shall have the following minimum detectable concentration (MDC) capabilities:

- 0.05 pCi/g or lower for ^{90}Sr in soil
- 0.18 pCi/g and preferably less than 0.1 pCi/g for ^{137}Cs in soil.

The laboratory should have performance evaluation results from a recognized laboratory accreditation program, and should be able to provide QA audits or other records to verify its ability to produce valid results. Equipment calibrations shall be performed using National Institute of Standards and Technology (NIST) traceable reference radionuclide standards. For

[a] One of the purposes of ASTM C998 is to provide samples for analysis of radionuclides following a recent airborne release, and to account for associated variability in surface soil deposition. These conditions do not apply for Runkle Canyon soil sampling; therefore modifications to the soil sampling procedure are applicable.

any sample result greater than 0.5 pCi/g ^{90}Sr, another analysis shall be performed of that soil sample. A complete analytical report shall be provided documenting the above information and providing quantitative numerical sample results (regardless if positive, negative or below the MDC), total propagated uncertainty, and the MDC. An explanation of total propagated uncertainty and the calculation of the MDC shall be provided. Additional requirements shall be in force as agreed with Runkle Canyon, LLC.

6.0 REPORTING

Upon completion of the sampling and laboratory analysis, Dade Moeller & Associates will prepare a report interpreting and analyzing the data.

7.0 REFERENCES

Foster Wheeler Environmental Corporation. 1999. *Runkle Ranch Site Investigation , Simi Valley, California*. Final Report. Foster Wheeler Environmental Corporation, Costa Mesa, CA.

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URL: www.epa.gov/radiation/marssim/obtain.htm

APPENDIX A. SYSTEMATIC SAMPLING LOCATIONS FOR COMPARING A MEDIAN WITH A FIXED THRESHOLD (NONPARAMETRIC - MARSSIM)

Summary

This report summarizes the sampling design used, associated statistical assumptions, as well as general guidelines for conducting post-sampling data analysis. Sampling plan components presented here include how many sampling locations to choose and where within the sampling area to collect those samples. The type of medium to sample (i.e., soil, groundwater, etc.) and how to analyze the samples (in-situ, fixed laboratory, etc.) are addressed in other sections of the sampling plan.

The following table summarizes the sampling design developed. A figure that shows sampling locations in the field and a table that lists sampling location coordinates are provided as **Figure 1** and **Table 1**, respectively, in the main text of this sampling plan.

SUMMARY OF SAMPLING DESIGN	
Primary Objective of Design	Compare a site mean or median to a fixed threshold
Type of Sampling Design	Nonparametric
Sample Placement (Location) in the Field	Systematic with a random start location
Working (Null) Hypothesis	The median(mean) value at the site exceeds the threshold
Formula for calculating number of sampling locations	Sign Test - MARSSIM version
Calculated total number of samples	14
Number of samples on map [a]	14
Number of selected sample areas [b]	2
Specified sampling area [c]	11,645,000 ft^2 (267 acres)
Size of grid / Area of grid cell [d]	973 feet / 820,500 ft^2 (19 acres)
Grid pattern	Triangular

[a] This number may differ from the calculated number because of 1) grid edge effects, 2) adding judgment samples, or 3) selecting or unselecting sample areas.
[b] The number of selected sample areas is the number of colored areas on the map of the site. These sample areas contain the locations where samples are collected.
[c] The sampling area is the total surface area of the selected colored sample areas on the map of the site.
[d] Size of grid / Area of grid cell gives the linear and square dimensions of the grid used to systematically place samples.

Primary Sampling Objective

The primary purpose of sampling at this site is to compare a site median or mean value with a fixed threshold. The working hypothesis (or 'null' hypothesis) is that the median (mean) value at the site is equal to or exceeds the threshold. The alternative hypothesis is that the median (mean) value is less than the threshold. VSP calculates the number of samples required to reject the null hypothesis in favor of the alternative one, given a selected sampling approach and inputs to the associated equation.

Selected Sampling Approach

A nonparametric systematic sampling approach with a random start was used to determine the number of samples and to specify sampling locations. A nonparametric formula was chosen because the conceptual model and historical information (e.g., historical data from this site or a very similar site) indicate that typical parametric assumptions may not be true.

Both parametric and non-parametric equations rely on assumptions about the population. Typically, however, non-parametric equations require fewer assumptions and allow for more uncertainty about the statistical distribution of values at the site. The trade-off is that if the parametric assumptions are valid, the required number of samples is usually less than if a non-parametric equation was used.

Locating the sample points over a systematic grid with a random start ensures spatial coverage of the site. Statistical analyses of systematically collected data are valid if a random start to the grid is used. One disadvantage of systematically collected samples is that spatial variability or patterns may not be discovered if the grid spacing is large relative to the spatial patterns.

Number of Total Samples: Calculation Equation and Inputs

The equation used to calculate the number of samples is based on a Sign test (see PNNL 13450 for discussion). For this site, the null hypothesis is rejected in favor of the alternative one if the median(mean) is sufficiently smaller than the threshold. The number of samples to collect is calculated so that if the inputs to the equation are true, the calculated number of samples will cause the null hypothesis to be rejected.

The formula used to calculate the number of samples is:

$$n = \frac{(Z_{1-\alpha} + Z_{1-\beta})^2}{4(SignP - 0.5)^2}$$

where

$$SignP = \Phi\left(\frac{\Delta}{s_{total}}\right)$$

- $\Phi(z)$ is the cumulative standard normal distribution on $(-\infty, z)$ (see PNNL-13450 for details),
- n is the number of samples,
- S_{total} is the estimated standard deviation of the measured values including analytical error,
- Δ is the width of the gray region,
- α is the acceptable probability of incorrectly concluding the site median(mean) is less than the threshold,
- β is the acceptable probability of incorrectly concluding the site median(mean) exceeds the threshold,
- $Z_{1-\alpha}$ is the value of the standard normal distribution such that the proportion of the distribution less than $Z_{1-\alpha}$ is $1-\alpha$,
- $Z_{1-\beta}$ is the value of the standard normal distribution such that the proportion of the distribution less than $Z_{1-\beta}$ is $1-\beta$.

Note: MARSSIM suggests that the number of samples should be increased by at least 20% to account for missing or unusable data and uncertainty in the calculated value of n. VSP allows a user-supplied percent overage as discussed in MARSSIM (EPA 2000, p. 5-33).

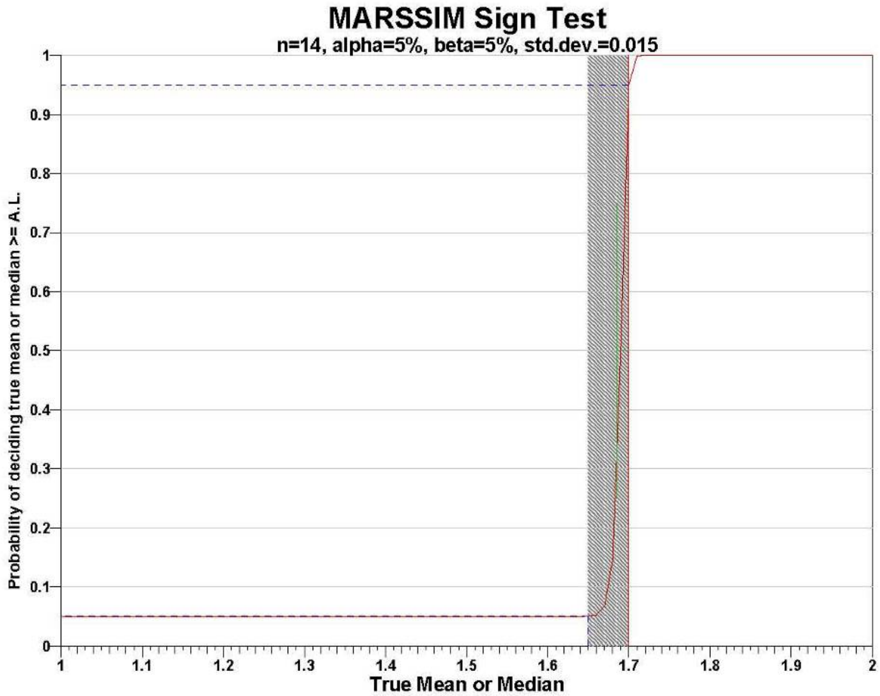
The values of these inputs that result in the calculated number of sampling locations are:

Analyte	n[a]	Parameter					
		S	Δ	α	β	$Z_{1-\alpha}$ [b]	$Z_{1-\beta}$ [c]
	14	0.015	0.05	0.05	0.05	1.64485	1.64485

[a] The final number of samples has been increased by the MARSSIM Overage of 20%.
[b] This value is automatically calculated by VSP based upon the user defined value of α.
[c] This value is automatically calculated by VSP based upon the user defined value of β.

The following figure is a performance goal diagram, described in EPA's QA/G-4 guidance (EPA, 2000). It shows the probability of concluding the sample area is dirty on the vertical axis versus a range of possible true median(mean) values for the site on the horizontal axis. This graph contains all of the inputs to the number of samples equation and pictorially represents the calculation.

The red vertical line is shown at the threshold (action limit) on the horizontal axis. The width of the gray shaded area is equal to Δ; the upper horizontal dashed blue line is positioned at 1-α on the vertical axis; the lower horizontal dashed blue line is positioned at β on the vertical axis. The vertical green line is positioned at one standard deviation below the threshold. The shape of the red curve corresponds to the estimates of variability. The calculated number of samples results in the curve that passes through the lower bound of Δ at β and the upper bound of Δ at 1-α. If any of the inputs change, the number of samples that result in the correct curve changes.



Statistical Assumptions

The assumptions associated with the formulas for computing the number of samples are:

1. the computed sign test statistic is normally distributed,
2. the variance estimate, S^2, is reasonable and representative of the population being sampled,
3. the population values are not spatially or temporally correlated, and
4. the sampling locations will be selected probabilistically.

The first three assumptions will be assessed in a post data collection analysis. The last assumption is valid because the gridded sample locations were selected based on a random start.

Sensitivity Analysis

The sensitivity of the calculation of number of samples was explored by varying the standard deviation, lower bound of gray region (% of action level), beta (%), probability of mistakenly concluding that μ > action level and alpha (%), probability of mistakenly concluding that μ < action level. The following table shows the results of this analysis.

Number of Samples							
AL=1.7		α=5		α=10		α=15	
		s=0.03	s=0.015	s=0.03	s=0.015	s=0.03	s=0.015
LBGR=90	β=5	14	14	11	11	10	10
	β=10	11	11	9	9	8	8
	β=15	10	10	8	8	6	6
LBGR=80	β=5	14	14	11	11	10	10
	β=10	11	11	9	9	8	8
	β=15	10	10	8	8	6	6
LBGR=70	β=5	14	14	11	11	10	10
	β=10	11	11	9	9	8	8
	β=15	10	10	8	8	6	6

s = Standard Deviation
LBGR = Lower Bound of Gray Region (% of Action Level)
β = Beta (%), Probability of mistakenly concluding that μ > action level
α = Alpha (%), Probability of mistakenly concluding that μ < action level
AL = Action Level (Threshold)

Recommended Data Analysis Activities

Post data collection activities generally follow those outlined in EPA's Guidance for Data Quality Assessment (EPA, 2000). The data analysts will become familiar with the context of the problem and goals for data collection and assessment. The data will be verified and validated before being subjected to statistical or other analyses. Graphical and analytical tools will be used to verify to the extent possible the assumptions of any statistical analyses that are performed as well as to achieve a general understanding of the data. The data will be assessed to determine whether they are adequate in both quality and quantity to support the primary objective of sampling.

Because the primary objective for sampling for this site is to compare the site median(mean) value with a threshold value, the data will be assessed in this context. Assuming the data are adequate, at least one statistical test will be done to perform a comparison between the data and the threshold of interest. Results of the exploratory and quantitative assessments of the data will be reported, along with conclusions that may be supported by them.

This report was automatically produced* by Visual Sample Plan (VSP) software version 5.3.
Software and documentation available at http://dqo.pnl.gov/vsp

* - The report contents may have been modified or reformatted by end-user of software.

Attachment B
Response Plan for Removal of Tar Material

GEOCON
INLAND EMPIRE, INC.
ENVIRONMENTAL ■ GEOTECHNICAL ■ MATERIALS

Project No. A8314-77-03
November 28, 2008

VIA EMAIL

Mr. Chuck Heffernan
Runkle Canyon, LLC
27240 Turnberry Lane, Suite 100
Valencia, CA 91355

Subject: RUNKLE CANYON
SIMI VALLEY, CALIFORNIA
RESPONSE PLAN FOR REMOVAL OF TAR MATERIAL

Mr. Heffernan:

In accordance with your request on behalf of Runkle Canyon, LLC (the Client), we are providing this Response Plan for the removal of the tar-like material present within the drainage area of Runkle Canyon (the Site).

1.0 Site Description

Runkle Canyon is located at the terminus of Sequoia Avenue in the City of Simi Valley, California. The property consists of three parcels totaling approximately 1,615 acres; a northeast 550 acre parcel, a northwest 350 acre parcel, and a southern 715 acre parcel. There is no known street address for the property.

The Site is generally a north-south trending valley extending though the central part of the 550 acre parcel. A small intermittent stream, which appears to drain the majority of the 550-acre parcel and the 715-acre parcel, meanders northward across the valley floor. East of the stream channel are rolling hills that comprise the majority of the 550-acre parcel. West of the stream channel is a steep ridge line that comprises the eastern portion of the 350-acre parcel. The portion of the 350-acre parcel west of the ridgeline appears to drain through an unnamed north-south trending canyon to the west of Runkle Canyon. Drainage from the 715-acre parcel appears to flow onto the southern end of the 550-acre parcel along three drainage courses. The area where the three drainages converge on the 550-acre parcel has been referred to as the “Fish Tail” area of the Site.

Surface mining was historically performed at the Site for sand and gravel products. Large volumes of semi-processed sand and gravel material from the former quarry operation have been placed within the Fish Tail area of the Site. The piles of material from the quarry appear to be in excess of 30 feet think in areas where the stream has eroded channels through them. Miscellaneous debris, currently exposed in the stream channel walls, was observed to have been buried by the aggregate material placed in the Fish Tail area. The debris included items such as, pipes of various diameter, length, and material, concrete and asphalt rubble, long sheets of rubber material presumed to be remnants of the former conveyor system, tires, and a black solid to very viscous tar like substance.

2.0 Project Description and Objective

A tar material has been observed to be buried within piles of mined aggregate (sand and gravel) within the "Fish Tail" area of the Site. Seeps of the tar material are exposed within a section of the east wall of the stream channel that has been cut trough the piles of mined aggregate. During the summer months the viscous tar flows from the seeps down the embankment and collects in pools at the bottom of the slope. Other areas of the channel walls within the vicinity of the seeps have been reported to contain similar material mixed with varying amount of sand and gravel.

In August 2005 Geocon conducted an assessment of the tar material. Seven exploratory trenches, labeled T1 through T7, were excavated to depths ranging from 10 to 13 feet using a rubber-tired backhoe equipped with a 24-inch bucket. The first trench, T1 was excavated adjacent to where the material could be seen seeping out of the stream channel wall. The tar was encountered at depths ranging from 7 to 12 feet in T1.

Six additional trenches were excavated, T2 through T7, encompassing T1 to the north, south, and east. The western extent of the material was defined by the wall of the stream channel. The tar material was encountered in trench T1 only. The volume of material observed in T1 was estimated to be approximately 12 cubic yards.

In a letter dated October 17, 2008 the California Department of Toxic Substances Control (DTSC) directed that the tar material be removed from the Site and properly recycled or disposed.

3.0 Tar Material Excavation and Disposal

The following sections present the recommended technical and logistical aspects of implementing remedial excavation and offsite disposal of the tar material.

Pre-Field Activities

- Identify, and obtain pre-approval from, an appropriately licensed landfill or recycling facility for acceptance of the waste materials.
- The Contractor should provide a minimum of 48 hours notice prior to the start of the soil excavation activities to subscribing local public utilities via Underground Service Alert (USA). Field meetings with public utility USA subscribers and utility potholing may be necessary to adequately delineate subsurface public utilities and conduits in proximity to the proposed remedial excavation locations.
- Meet with representatives from the California Department of Fish and Game and Army Corps of Engineers to discuss potential impacts to the stream channel that may occur during excavation activities.

Field Activities

- Removal of trees, brush, and other rubble may be required to access portions of the mined aggregate piles where the tar material is reportedly buried. Grading of an access road to allow equipment to enter the stream cut channel may also be required.
- Excavation of the tar material from the mined aggregate piles will be performed with a track-mounted excavator.

- Excavation of the tar material will be based on visual observations. Effort will be made to minimize the amount of clean aggregate material transported off site.

- When possible the excavated materials will be loaded directly into haul trucks. The haul trucks will be covered with tarps prior to transport to the designated landfill/recycling facility. Temporary stockpiling of the waste materials may be performed on the west side of the stream cut channel if conditions prevent access of haul trucks near the excavation.

- The Contractor will implement effective dust control measures including watering the active work area to prevent visible dust. Work will be suspended if weather conditions, including wind speeds or gusts exceeding 25 miles per hour, prevent effective dust control. Excavation equipment will be inspected and cleaned (if necessary) prior to leaving the Site.

- Site restoration activities will be dependant on the extent of the excavation but at a minimum will include returning the bottom of the stream cut channel to near its original elevation and hydro-seeding the excavated area to comply with California Department of Fish and Game requirements.

The activities outlined above are designed to address the tar material known to be present within a limited area of the mined aggregate piles at the Site. It is possible that similar material may be buried within the aggregate piles elsewhere at the Site. Development plans for the Site include the mass grading and removal of the aggregate piles within the "Fish Tail" area. If additional tar material is discovered during future grading activities it will be managed appropriately.

Please contact the undersigned at your convenience if you have any questions regarding this letter or if we may be of further service.

Sincerely,

GEOCON INLAND EMPIRE, INC.

PROFESSIONAL GEOLOGIST
MICHAEL P. CONKLE
NO. 7624
Exp. 9/30/10
STATE OF CALIFORNIA

Michael Conkle, PG
Senior Geologist

MPC:am

(1) Addressee