MEMORANDUM FOR FILE

April 10, 2014
Revised May 28, 2015

SUBJECT: Assessment of Radiological Events at the Mesa

EXECUTIVE SUMMARY

During the 1980s, radioactive material that had been inappropriately transferred from the site was discovered at the Mesa. That material was primarily contamination on tools and equipment that had been inadvertently released from the site as a result of a material release program that lacked the necessary rigor and was not well enough implemented to intercept all contaminated items among the thousands of items moved to the Mesa.

Since the Part 50 license did not include the Mesa, the receipt, storage, or use of radioactive material was not permitted there. Consequently, the discovery of anything with radioactive contamination required immediate and complete removal; contaminated items were immediately secured, transferred back to the site, and the area was verified to be free of residual contamination.

This assessment was accomplished through a review of historical records and through interviews with current and former San Onofre employees who have knowledge of the Mesa. The intent of this assessment is to identify those locations at the Mesa that were affected by the inappropriate presence of radioactive materials. In addition, this assessment supports a foundation that will assist in determining, for each specific event and location, whether or not additional radiological surveys are appropriate to confirm the complete cleanup of radioactive materials before termination of appropriate land leases and eventual turnover to the Department of the Navy.

INTRODUCTION

Principle Nuclear Regulatory Commission (NRC) regulations that govern the planning for and decommissioning of a commercial nuclear power plant are 10 CFR 20.1401-1406 “Radiological Criteria for License Termination,” 10 CFR 50.82 “Termination of License” and 10 CFR 50.75 (g) “Reporting and Recordkeeping for Decommissioning Planning.” Implementation of the radiological assessment requirements are described in NUREG-1575, Rev 1 “Multi- Agency Radiation Survey and Site Investigation Manual (MARSSIM)”. MARSSIM Chapter 3 provides guidance for performing a Historical Site Assessment (HSA.)

The Mesa and its facilities were never part of the Part 50 license for the San Onofre Nuclear Generating Station (SONGS) and therefore not intended for receipt, storage, or use of any radioactively contaminated tools, materials, or equipment. As such, the discovery of anything with radioactive contamination required immediate and complete removable with an acceptance criterion of “no detectable.” The only acceptable result for each event was

the immediate transfer of the radioactive material to the site and complete decontamination of the area to levels indistinguishable from background.

A dose-based standard, as utilized in license termination proceedings, is not appropriate since the area was not described by a license. Derived Concentration Guideline Levels are not applicable because there is no dose-based acceptance criterion. Therefore, the MARSSIM survey process is not applicable. However, while not applicable, the MARSSIM survey process provides a well-structured approach for any confirmatory surveys that may be necessary to ensure that removal of radioactive materials was complete.

OBJECTIVE

The objective of the HSA is to collect existing information describing a site's history; an early step in the graded radiation survey and site investigation process as defined in MARSSIM. For the area under consideration, the Mesa and its facilities that supported construction and operation of SONGS, the HSA methodology provides an appropriate well-structured approach.

While this document is not technically an HSA, it was researched and assembled with the same level of rigor. Like an HSA, existing information was assembled to allow evaluation of the events in which radioactive materials were inappropriately transferred from SONGS to the Mesa and identification of the specific locations involved. In addition, the evaluation supports a foundation that will assist in determining, for each specific event and location, whether or not additional radiological surveys are appropriate to confirm the complete cleanup of radioactive materials.

The objectives for this assessment support the standardized MARSSIM approach, that is:

1. State the problem – a history of radioactive material discoveries at the Mesa

2. Identify the decision – was the removal of radioactive materials from the area adequate for each event

3. Identify inputs to the decision – interviews and documents associated with each event

4. Define study boundaries – what areas of the Mesa were affected by each event. Are those areas sufficiently intact today such that a confirmatory survey will provide useful information

5. Develop a decision rule – is there sufficient documentation to support a decision that removal of radioactive materials from each area was complete, was any survey or decontamination performed to ensure that no residual contamination remained. The decision rule is "no detectable."

6. Specify limits on decision errors – statistical-based decision errors (such as 95% confidence for Type I errors) are not applicable. If the documentation and/or interview information cannot support a determination that removable of radioactive materials was adequate, then the area should be considered for inclusion in a confirmatory survey.

METHODOLOGY

This assessment was accomplished through a review of historical records and through interviews with current and former San Onofre employees who have knowledge of the Mesa. The Unit 1 HSA and the Interim Units 2 and 3 HSA were referred to extensively. Information contained there was borrowed quite liberally in the preparation of this document.

Relevant documents (including the U1 HSA and the Interim U2/3 HSA) and databases were searched electronically or manually to identify items of potential interest. All documents or items judged to be of potential interest were evaluated. Information that may be of use was extracted, summarized, and evaluated.

The U1 HSA and the Interim U2/3 HSA included a number of interviews of long-experienced SONGS personnel. Those interviews containing information related to the Mesa were evaluated and included in this report. Several additional and follow up interviews were conducted where appropriate.

BRIEF HISTORY OF MESA FACILITIES

San Onofre's involvement at the Mesa began in the early 1970s when it was used as a repository for the significant amount of excavated material from construction of Units 2 and 3. Early structures under the control of Bechtel Power Company were situated in the Northeast corner of the Mesa. Among those was Warehouse "B." Those buildings were eventually removed and replaced by Buildings G-48, G-49, and G-50.

By the late 1970s several facilities had been established on the Mesa. Among those facilities germane to this report were the Mesa Fabrication Shop and the Generation Retrofit Improvement Project (GRIP) Facility. Both of those facilities were established in 1979 and located on Parcel 4 known as the Lower Mesa located along El Camino Real between that road and Interstate-5. Following completion of TMI and seismic upgrades at Unit 1, the GRIP Facility was re-designated the Special Tools and Rigging (STAR) Yard. The Mesa Fabrication Shop later served as the Unit 1 Steam Generator Sleeving Mockup Training Facility.

The Ameron Laydown Area was so named because it was used by the Ameron Company for fabrication of the Units 2 and 3 circulating water system concrete pipelines. After Ameron Company's exit, that area gradually became a storage location for materials no longer needed at the units.

By 1986-1987 the facilities at the Lower Mesa were closed. The STAR Yard was moved to its final location in the Southeastern portion of the Mesa and expanded to include the Ameron Laydown Area. During late 1987 the Mesa lease was renegotiated and the Lower Mesa, designated Parcel 4, consisting of 7.8 acres, left Edison's control. Soon after that, the Navy re-contoured that entire area into a series of percolation ponds. The area is no longer intact, the surface soil having experienced significant disruption.

The Seaweed Drying Pad was established in the 1992-1994 timeframe near the southern boundary of the Mesa. Benthic material from the Units 2 and 3 intake was released via the pad to reduce the moisture content to required specifications. De-watered seaweed was also more cost effective to dispose of due to weight reduction. During the Units 2 and 3 Steam Generator Replacement (SGR) Outages, the drying pad was temporarily moved approximately 50 yards to the East to allow reconfiguring the area as an overflow parking lot for employee automobiles. The pad was re-established in its original location after completion of the Unit 3 SGR outage. There was significant disruption of the surface soil as a result.

Throughout SONGS history, the layout of the Mesa was under constant change to better support the changing needs of the units. Buildings would come and go, replaced by new structures. Surviving buildings would see changes in their craft tenants and entire areas were re-purposed. Attached maps show the areas described above.

INADVERTENT RELEASES OF RADIOACTIVE MATERIALS

Most of the radiological concern for the Mesa stems from inadvertently released radioactive material. For completeness, the SONGS radioactive material control program is briefly described below.

Until April of 1977, station procedures allowed items to be released from Unit 1 without evaluation for fixed contamination. The author recalls discussions with early Unit 1 Chem-Rad Techs describing how they would smear tools and equipment, and finding no activity would release the items for unconditional use, all without evaluation for fixed contamination. By 1980, the release limit was 0.25 mR/hr measured at one inch. While those release procedures were consistent with industry standards at that time, those criteria exceeded the evolving release standards.

In May of 1981 IE Circular No. 81-07: Control of Radioactively Contaminated Material was issued and the SONGS release program was revised to incorporate that guidance. Evaluation for both fixed and removable contamination was required before the unconditional release of suspected items. The initial version of the procedure allowed some discretion and applied only to suspect items. By the end of the 1980s, the program had been strengthened such that all items were monitored at the Radiologically Controlled Area (RCA) exit point. Hand-carried personal items (e.g. lunch box, thermos, and jacket) and the individual were again monitored by a portal monitor at the Protected Area/Restricted Area

(PA/RA) boundary. Large items must exit through the unit hold-down points. Vehicles and their contents were inspected and monitored at the hold-down area before exiting PA/RA.

In spite of those efforts, items with low level contamination occasionally escape detection and pass into the unrestricted area. Such items typically contain very low levels of contamination and have no impact on the environment or on humans. When contaminated tools or equipment were discovered outside the RCA, qualified Health Physics (HP) Technicians would confiscate the item, return it to the site, and verify that the area was free of further contaminated items and residual radioactive material.

The HP Technician present at the time of the initial contaminated item discovery had two distinct advantages over any follow up surveyor. First, knowing the exact location of the contaminated item allowed the Technician to focus additional scrutiny on that spot while surveying the surrounding area for residual activity. Second, after thirty years a significant portion of the contaminant has decayed to levels well below detectability.

DESCRIPTION OF RADIOLOGICAL EVENTS AT THE MESA

Following is a description of 11 events or time periods summarized in the attached Table 1 in which radiological contamination was traced from the Protected Areas at SONGS to the Mesa. The list of events was assembled from actual documentation and/or from recollections obtained from personnel interviews where no documentation could be located.

1. **Mesa Intersection -- Contaminated Unit 1 Excavation Materials**

   Summary
   In December of 1980, approximately 100 cubic yards of contaminated soil, asphalt, and concrete were excavated from an area close to the Unit 1 containment structure and transferred to the Mesa. The material was dumped on the North side of Mesa Road just east of the intersection with El Camino Real and North of Building E-50.

   Discovery
   During a December 18, 1980 exit interview for IE Inspection 50-206/80-33, an NRC inspector explained that, based on survey records, trace quantities of radioactive material were likely present in material excavated at Unit 1. He warned that the aggregate sum of the material may have exceeded the levels allowed for disposal by burial in soil.

   Magnitude
   On January 7, 1981 a direct radiation survey was performed at the intersection using a Ludlum Model 19 micro-R-meter. General background was determined to range between 8 to 12 uR/hr. Twenty-five measurements were taken on and around the materials ranging from 8 to 25 uR/hr. 13 samples were collected and the highest activity sample was sent for Geli radiometric analysis by an off-site vendor laboratory with the following results: K-40 at 16.6 ± 0.8 pCi/g; Mn-54 at 2.2 ± 0.1 pCi/g; Co-58 at 3.9 ± 0.2 pCi/g; Co-60 at 29 ± 1.0 pCi/g; Cs134 at 8.8 ± 0.4 pCi/g; Cs-137 at 26 ± 1.0 pCi/g; and Ce-144 at 3.5 ± 0 .2 pCi/g.

All of the excavated material was removed from the Mesa by January 15, 1981. Shipping records indicated that 390 fifty-five gallon drums, with a total of 7.5 mCi of licensed material in 108 cubic yards of soil, were shipped from the Mesa to a licensed burial facility in January of 1981.

After the soil was removed, the area was re-surveyed at 5-10 μR/hr. Surface samples revealed the following levels of residual activity: Mn-54 at 0.04 ± 0.02 pCi/g; Cs-137 at 0.53 ± 0.27 pCi/g; Co-60 at 0.57 ± 0.29 pCi/g; and Cd-109 at 0.1 ± 0.05 pCi/g. Inspection Report 50-206/81-02, dated February 13, 1981, describes the NRC Inspector's independent direct radiation survey of 30 locations with levels ranging from 5 to 10 uR/hr. NRC analysis of a soil sample he obtained led the Inspector to conclude that the excavated material containing trace quantities of radionuclides had been effectively removed. The inspection item was closed. No item of noncompliance was identified.

As a direct result of this incident, San Onofre took the precautionary measure of prohibiting future disposal of excavated material from Unit 1 at the Mesa.

Evaluation
Direct radiation levels at the Mesa Intersection site were indistinguishable from background following remediation in January 1981. More than 30 years have passed since then. Residual Co-60 has undergone nearly 6 half-lives diminishing its potential presence to a level below detectability. Any remaining activity due to Cs-137 will have decayed to a level consistent with background.

The Unit 1 HSA concluded that there should be no residual contamination at the Mesa Intersection site. (Unit 1 HSA, Inspection Reports 5-206/80-33 and 81-02, 2012 SONGS Radiological Environmental Operating Report)

2. **Old Highway 101 Landfill – Unit 1 Excavation Materials**

Summary
A large amount of soil, asphalt, and concrete was excavated from the Unit 1 facility and disposed of at the "Old Highway 101 Land Fill," located approximately 1.5 miles south of Building E-50, the Edison Training and Education Center (TEC/EOF.) (It should be noted that the landfill was never part of the Mesa lease but is included here for completeness.) The removal and transfer of the soil to the landfill occurred during the 1976 and 1977 Unit 1 outage when the Sphere Enclosure and Diesel Generator buildings were constructed. It was discovered, four years later, that the excavated material might contain radioactive material.

Discovery
In 1980 and 1981, TMI retrofit projects at Unit 1 required excavation and removal of soil from the restricted area. Analysis of that material revealed the presence of low level radioactive contamination. Consequently, disposal practices for previous excavations at Unit 1 were investigated to determine whether or not contaminated soil might have been inadvertently released. It was discovered that the only significant excavation was conducted during the construction of the Diesel Generator and Biological Shield structures, during the October 1976 through March 1977 outage. The soil had been removed and transferred to the Old Highway 101 Landfill. That discovery prompted an extensive radiological survey.

Magnitude
In February 1981, a three-day effort was launched to obtain direct radiation measurements obtained with a Ludlum Model 19 micro-R-meter at 60 discrete survey points at the Old Highway 101 Landfill. Those measurements revealed no evidence of radioactive contamination above the normal range for natural background radiation. Although the radiation survey map showed a localized area with slightly elevated readings (14-15 μR/hr), these readings were determined to be the result of natural radioactivity from the concrete of the road.

Three samples of the transferred material were obtained and sent to an off-site vendor laboratory for GeLi radiometric analysis. Natural activity was detected in all three samples. The samples showed no cobalt or cesium activity above an LLD of 0.01 pCi/g. Strontium-90 was observed in two of the samples but at environmental levels.

Individual Task Assignment (ITA) #84311 describes a 1984 confirmation of the conclusions reached in the 1981 survey effort.

Evaluation
The Mesa Lease never included the area of the Old Highway 101 Landfill and there was never any indication of contamination as a result of early Unit 1 soil excavation. The 1981 direct radiation survey was extensive and thorough. Off-site analysis of the three soil samples found no cobalt or cesium activity using appropriate LLDs. The Unit 1 HSA concluded that there is no residual contamination in the landfill. (Unit 1 HSA, ITA #84311.)

3. **Contaminated Material Found at Lower Mesa -- 1981**

Summary
In October, 1981, workers at the Lower Mesa notified HP of some yellow bags in their work area. HP responded and found the bags to be free of radioactive contamination. However, while there the HP Technician performed a search for other suspect items and located a 1" galvanized pipe elbow in a tool storage box contaminated with approximately 0.14 uCi of Cs-137.

Expanded surveys of the work area were performed and located two additional items: a forklift battery with 400 cpm/100 cm^2 removable contamination, and several metal pre-filters with a maximum of 300 cpm/100 cm^2 of removable contamination.

The contaminated items were returned to the site leaving no residual contamination. The remainder of the surveyed area was found to be free of detectable contamination by direct frisk.

Evaluation
The contaminated items were found at the Lower Mesa. See the Evaluation of Event Number 4 regarding materials found at the Lower Mesa facilities.

4. **Contaminated Tools and Equipment Discovered at Mesa Facilities 1983 & 1984**

Summary
Until 1980, the release limit was 0.25 mR/hr measured at one inch. While those release procedures were consistent with industry standards at that time, those criteria exceeded

the evolving release standards. Between outages at Unit 1, tools and equipment were routinely stored around the reservoir. When the reservoir was cleared for installation of training trailers, some of those materials found their way to the Off-Shore Pad and the Mesa.

In July, August and September of 1983, a comprehensive effort was made to survey all Mesa storage facilities and a Bechtel warehouse in La Mirada, CA for contaminated tools and equipment. The GRIP Facility, the Bechtel Fabrication Shop and part of the Ameron Laydown area were all included in the Mesa survey. In response to a Notice of Violation (NOV) issued as a result of the NRC Inspection 50-206/80-23 conducted on September 26-30, 1983, a subsequent radiological impact evaluation was also conducted.

Discovery
On July 14, 1983, a contaminated heliarc-welding stand was found at the Bechtel Fabrication Shop at the Mesa with 1,300 cpm/100cm^2. On July 20, 1983, an empty gang box sent from the Mesa GRIP Facility back to Unit 1 was found to have fixed contamination on the inside of the box at 2,100 cpm/100 cm^2. As a result of those two findings and suspecting that more radioactively contaminated material may be present at the Mesa, a comprehensive radiation and contamination survey was initiated of storage areas that could have received materials from Unit 1.

Magnitude
An extensive survey of affected areas at the Mesa was initiated and included the GRIP Facility and Fabrication Shop (20 items found), the Ameron laydown areas (84 items), the Mesa Training center, E-50 (1 item), the Units 2 and 3 laydown area (67 items), Warehouse “B” (1 item), the Paint and Sandblast yard (3 items), and the Edison Warehouse (7 items.) With very few exceptions, when detected the items had fixed, but no accessible removable surface contamination. Most items were found in tool or gang boxes and thus protected from the weather. In all cases the contaminated items were confiscated, returned to the site, and the area was verified by direct frisk to be free of residual contamination.

Over 90 person-months were expended during this effort to detect and recover any and all radioactively contaminated items. Major changes were made to strengthen the material release program.

A letter from Mr. P.J. Knapp, HP Manager to Mr. P.A. Croy, Compliance Manager dated March 21, 1984 provided a final summary of contaminated items found at the Mesa and other locations. This information was forwarded by Mr. C.W. McCarthy, SCE Vice President, to Mr. F.A. Wenslawski, Chief Radiological Safety Branch, NRC Region V on March 29, 1984.

Evaluation
The GRIP Facility, Fabrication Shop, and Training Center were located on the Lower Mesa when the twenty-one items were discovered. As described above, following each discovery, the areas were verified to be free of residual contamination by direct frisk. The lower Mesa was released from Edison control during the late 1980s and was subsequently significantly re-contoured into percolation ponds. The area is no longer intact. Additional survey will not provide useful or meaningful information.

Warehouse “B” was replaced by Building G-49 by the mid-1980s. Only one item with fixed contamination and no removable activity was found there. The building is no longer intact. Additional survey will not provide useful or meaningful information.

Only three items with low levels of fixed contamination and no removable contamination were found at the original Paint/Sandblast Yard. The Paint Shop and the Yard are no longer intact. That area is now paved and houses Buildings G-40 and G-46. Additional survey will not provide useful or meaningful information.

A total of seven contaminated items were found in the Edison Warehouse, Building W-50, during its existence at the Mesa. Two of those items contained removable activity. While areas were verified free of residual contamination by direct frisk following discovery of contaminated items there. This area is considered to have a low probability for detectable residual radioactive contamination.

Sixty-seven contaminated items were discovered in the Units 2 and 3 Laydown. With few exceptions, those items contained only fixed contamination. While it is believed that most items were contained in tool and gang boxes, available data do not make that clear. Exposure to the weather was likely a factor there. Although areas were verified free of residual contamination following discovery of contaminated items, those verifications may not have been as sensitive as modern techniques. Additional survey of this area would provide definitive assurance that no residual contamination remains.

Additional contaminated items were discovered in the Ameron area following the eighty-four described above. See Event Number 6 for further discussion of that area.

5. **Contaminated Pipe Discovered at Lower Mesa – 1986**

Summary

In early December of 1985, the turbine crossover pipe from Unit 1 was removed. This pipe was part of the secondary plant, outside the RCA. Because the pipe came from a system that was presumed to be clean, release surveys in the Unit 1 hold down area were limited to accessible portions of the pipe. At this point, the pipe was found to be free of contamination and was released for storage at the STAR Yard on the Lower Mesa. This area was formerly known as the GRIP Facility.

Discovery

On February 6, 1986, an anonymous letter (86-RV-A-010) alleged that the crossover pipe had been shipped offsite because the craft giving the order was not qualified. As a result of this letter, SCE conducted an investigation. Surveys of other secondary piping revealed contamination inside of the pipes up to 1,000 cpm/100 cm^2, so the crossover pipe stored at the GRIP Facility was resurveyed.

Magnitude

Localized fixed contamination of up to 800 cpm/100 cm^2 was identified inside the pipe near the right angle weld. There was no detectable removable contamination. The pipe was returned to the site and the storage area was verified to be free of residual contamination.

Evaluation
The Unit 1 HSA concluded that there would be no residual contamination from the presence of the pipe. Further, this was a Lower Mesa location as explained in Event Number 3. The area is no longer intact. Additional survey will not provide useful or meaningful information.

6. **Contaminated Tools and Equipment Discovered at STAR Yard 1988-1989**

Summary
In May 1988, SONGS received a refurbished 2,000-pound pressurizer relief valve from Wyle Laboratories. The relief valve was sent back to SONGS contaminated with 93.3 uCi. A month later, a QA Inspector found that contaminated valve in the STAR Yard. The valve was still in the shipping box. The contaminant was fixed with no removable avtivity. (By this date, the STAR Yard had been relocated from the Lower to the Upper Mesa.)

In September, the same QA Inspector identified a fire hose contaminated to a level of 500 ccpm. That hose had been transferred to Building G-20 from the AWS Machine Shop.

As a result of those findings, QA issued Corrective Action Report (CAR) SO-P-1171 that addresses issues specific to the HP organization. CAR SO-P-1177 was issued later that month to address problems with Station support of the release program. The response to that document described corrective actions taken by the Health Physics organization and includes a list of 14 additional contaminated items found outside the Restricted Area during September. The documentation does not specify where the items were discovered nor does it describe whether or not removable contamination was present.

During a routine quarterly radiation survey in March 1989, contaminated items were discovered in several locations within the STAR Yard. It was determined that this material had been inappropriately released in February from Unit 1.

Continued survey in the STAR Yard later in March resulted in a find of additional contaminated items on a wooden pallet that had come from Units 2 and 3. In April, six more items associated with stored refueling equipment were found and were noteworthy in that cobalt particles were present. Because of the continuing discoveries of contaminated items, QA issued a Stop Work Order to prevent further releases from the site and the Mesa until corrective actions were implemented.

By Mid-April, 44 additional contaminated items had been found at the STAR Yard and returned to the site.

Unlike Event Number 4 that resulted from legacy items released with inadequate controls and practices, the series of events described for this time period represented an on-going unresolved problem. As a result of a Root Cause Evaluation and much work to satisfy the QA concerns, the release program and implementation of the program was significantly strengthened. Inadvertent releases to the Mesa essentially stopped.

Evaluation
The Upper Mesa STAR Yard suffered the largest number of contaminated item discoveries. Including the earlier findings in the Ameron Laydown area detailed in Event

Number 4, more than 140 items were found there. (Recall that the Upper Mesa STAR Yard included the area formerly known as Ameron.) While the majority of those items had no removable contamination and were found in gang boxes, buildings, or cargo containers, many items were found exposed to the weather. For many of the discovered items the data are incomplete. Several of the interviewed employees recalled that as many as four HIC shields had been stored in the Yard. There was some recollection, but no documentation, that one of the shields may have contained fixed contamination and was possibly decontaminated there. Additional survey of this area would provide definitive assurance that no residual contamination remains.

Boundaries of the STAR Yard at the Upper Mesa have varied over the years. The most heavily affected portion lies along the existing Construction Way cul-de-sac and then extends southeast to include what was originally the Ameron Area. That area is displayed on the attached map as a double cross-hatch area.

An element to the Station's response was to initiate a comprehensive survey of the Mesa. That survey included all areas at the Mesa that contained tools and equipment. Following that survey, Health Physics personnel maintained a presence at the Mesa to survey material transfers to and from the Mesa. Key Mesa locations and facilities were added to the schedule of routine radiation surveys. Those steps were taken to ensure that no items were present at the Mesa that had not be surveyed.

7. Contaminated Items Found at Mesa Salvage Yard

Summary

The Salvage Yard was located in the west end of what was most recently Camp Mesa. A large fenced area, approximately 150 yards by 25 yards, contained scrap materials. During a 1992 radiological survey effort to qualify the material for release, the following items were found to be slightly contaminated: two four-inch pipe sections, two wheels, and one Flexiatallic gasket.

Discovery

During May and June of 1992, the scrap material stored in the Salvage Yard was being evaluated for release. The materials were thought to be free of radioactive contamination. As a precaution the material was evaluated for residual radioactive contamination. The items identified above were found to contain low levels of contamination.

Magnitude

ITA 92-115 describes the two pipe sections reading 360 ccpm each with no removable contamination. GeLi radiometric analysis revealed the source of the activity to be entirely Pb-214, a natural occurring radionuclide. Consequently, the pipe sections are eliminated from further consideration. Two wheels showed 1600 and 1800 ccpm by direct frisk and no removable activity. A Flexiatallic gasket measured 4500 ccpm by direct frisk and was also free from removable contamination. Those three items showed plant produced contaminants. Consistent with protocol, the items were transferred back to the site and the area was verified to be free of residual contamination by direct frisk.

The fence on the East side of the area was removed when it was included as the Western end of Camp Mesa. A significant amount of large size gravel was added to the surface at that time.

Evaluation
Only three items were found in the Salvage Yard. The items demonstrated low level fixed contamination and no removable activity. The area was verified free of residual contamination by direct frisk following removal of the items. This area is considered to have a very low probability for detectable residual radioactive contamination.

8. **Transfer of Seaweed to Mesa Drying Pad**

Summary
Detection of low but statistically significant levels of plant produced radionuclides in Units 2 and 3 intake sludge were reported as early as 1983. Initially, radwaste discharges were suspected to be the source of that activity. Later analysis identified the source to be ocean bottom sediment. Steam generator blowdown from Unit 1 was released to the ocean. Whenever there was primary-to-secondary leakage at Unit 1 there was a strong potential for benthic material to demonstrate levels of activity that would be detectable at Units 2 and 3 just down the coast from Unit 1.

Benthic material was sampled before release. Waste found to contain radio-cesium and/or cobalt was disposed of as radwaste or in accordance with a State of California exemption obtained for specific landfill disposal. Waste showing only I-131 was allowed to decay, be re-sampled, and then disposed of in a landfill.

Following the permanent shutdown and defueling of Unit 1, the release process was modified to allow removal of benthic material without the sampling requirement. (The procedure contained a safeguard that required sampling of benthic releases if the secondary activity of either operating unit exceeded a specified threshold level.)
In the early 1990s, the Seaweed Drying Pad was established in the southern portion of the Upper Mesa. Benthic material from the Units 2 and 3 intake was released via the pad to reduce the moisture content to required specifications. De-watered seaweed was also more cost effective to dispose of due to weight reduction.

The SONGS Annual Radiological Environmental Operating Reports were reviewed from 1984 to the present. Before the shutdown of Unit 1 in 1992 kelp and ocean bottom sediment samples showed low levels of Cs-137 and Co-60. Since the shutdown of Unit 1, ocean bottom sediment samples are free of detectable plant produced activity and kelp samples show only I-131. Incidentally, the levels of I-131 since 1988 have typically been higher in control samples than those associated with the plant. The source of the radioiodine is almost certainly due to sewerage discharges of medical administrations. (SONGS Annual Radiological Environmental Operating Reports.)

Evaluation
Radioiodine was likely present in benthic material deposited at the Seaweed Drying Pad. The source of that radioiodine was sewerage discharges of medical administrations. A decay time exceeding two months would reduce any I-131 to levels below detectability. The material has been free of detectable plant produced radionuclides since the station began using the Drying Pad and is included in this assessment for completeness.

9. **Damaged Exempt Cl-36 Source in HP Classroom in Building G-48**

Summary

Classroom 105 in Building G-48 was used for initial and continuing training of HP Technicians. Several interviewees recalled that an exempt chlorine-36 source was damaged in the classroom and decontamination was required.

The exempt quantity radioactive check source was being used to support instrument training. Once the damage was discovered, the source was secured and the classroom was decontaminated and returned to service. Reportedly, a portion of the carpet was removed before the classroom was declared free of contamination. This event was thought to have occurred in the 1993-1994 time frame. No supporting documentation was found. Personnel that identified or corroborated this information include: Paul Elliott, John Scott, Todd Adler, and Al Gray.

Evaluation

Those interviewed about this event described a small, button source on which the mylar covering had become partially detached. The interviewees described a thorough effort conducted by seasoned HP Technicians to recover the classroom and to ensure that no residual activity remained. While only direct frisking was performed, the Cl-36 beta would have been easily detected. This area is considered to have a very low probability for detectable residual radioactive contamination.

HP Classroom 105 in Building G-48 warrants further consideration.

Though not directly related to the event described above, personnel interview also revealed the existence of a floor safe used to store training's radioactive check sources in what is now known as the Joint Operation Center (JOC.) The floor safe is located in a small adjoining room in the northwest corner of the JOC. That floor safe should be verified free of residual contamination before release of Building E-50.

10. **Contaminated Pliers Found in Building G-44**

Summary

During a late 2001 site-wide sweep for magenta marked items and associated radiological survey, four suspect tools were found in the Building G-44 Mesa Paint Shop. Of those four hand tools, only the pliers were found to be slightly contaminated: 250 ccpm fixed and no removable contamination. All four hand tools were returned to the site.

Evaluation

Only a single hand tool was found with low level fixed contamination and no removable activity. The worker who initially found the pliers and the surrounding area were both frisked and showed no residual activity above background. There was no spread of contamination from the event.

11. **Contaminated Air Hose Found in Building G-40**

Summary

In November 2003 two HVAC workers were assigned to prepare equipment stored at the mesa. A sealed 55-gallon drum was retrieved from storage in a cargo container at the STAR Yard and opened in the G-40 Sheet Metal Shop. When the workers noticed a 12' long ½" diameter air hose with magenta markings in the drum they stopped and contacted Health Physics.

Field surveys verified that the hose contained low level fixed contamination, <600 ccpm by direct frisk. No removable contamination was found on the hose, in the drum, in the work area, or on the HVAC Technicians. The hose and all of the other materials in the drum were returned to the plant for additional surveys. Follow-up surveys of the G-40 shop and the four other HVAC cargo containers were negative, as were surveys of the additional contents of all four drums.

Investigation determined that the drum had been sealed, released from the site, and placed in the Mesa cargo container following a 1998 replacement of the charcoal in the Units 2 and 3 Fuel Handling Building Post Accident Cleanup (PACU) Units.

Evaluation

There was no spread of contamination from the hose to the involved personnel or the surrounding area.

RESULTS OF HISTORICAL INFORMATION SEARCHES

Documents and databases that were reviewed include the Annual Radiological Environmental Reports (1984 - 2013), Health Physics Division Individual Task Assignments (ITAs) (1982 - 2011), PJK Log assignments (1982 – 1990), Integrated Health Physics System (IHPS) database of radiation surveys (1996 - present), the Action Request (AR) system in MOSAIC (1990 – 2008), Nuclear Notifications in SAP (2008 – present), and the Topic Information Server (TIS) database for mention of radioactive material at the Mesa (1987-present.)

The most useful information came from reviewing the ITAs. ITAs were used in the Health Physics Division to document assignments and results beginning in 1982 and remained active through 2011. The first two numbers of an ITA designate the year in which the assignment was made. This system was extensively used by Health Physics to document problems, issues, analyses and practices. Only a hardcopy index remains for the documents maintained there. The hardcopy index was manually reviewed for information about legacy radioactive material at the Mesa. Use of the ITA system declined as the AR system developed into the site-wide method for documenting problems and actions.

The AR system in MOSAIC became the preferred station-wide tool for documenting problems in 1999. Use of the ITA system continued within Health Physics for documentation of items such as technical studies, new equipment evaluations, dose evaluations and some internal audits. The AR system was replaced by the SAP Nuclear Notification system in 2008.

Following is a brief description of the relevant items from the ITA and AR systems:

ITA 82059

This item identifies the presence of three decon showers located on the Mesa. One shower is located in the EOF and two decon showers are located in the Mesa Medical facility. The decon showers all drain to a common 2000 gallon holding tank. Provision for use of the showers is contained in SO123-VIII-40.3, the procedure for the EOF Health Physics Leader. Periodic testing has shown the showers to be operable. The showers have never been used to decontaminate a person, hence, this item is closed.

ITA 83221

This item includes a description of initial contaminated item discoveries of contaminated items at the Lower Mesa and the ensuing investigation. Finding through September 1983 are reported and initial corrective actions are described. (Event Number 4.)

ITA 84311

Confirmation of the results from a radiological survey performed in 1981 of excavated material from Unit 1 that had been transferred to an area southeast of the site called the Old 101 Landfill. (Event Number 2.)

ITAs 84295 and 84331

Some items with low level contamination were discovered on the Mesa and their presence gave cause for issuance of an NRC Notice of Violation in September 1983. The items were believed to have been released between March 1977 and May 1982 as a result of a material release program that lacked the necessary rigor and was not well enough implemented to intercept all contaminated items among the thousands of items moved to the Mesa. The potential impact to the public was evaluated and found to be well below any level of concern. Contained is a final list of contaminated items found through February 1984 for transmittal to the NRC. (Event Number 4.)

ITA 84386

Contaminated items had been found at some previously surveyed locations at the Mesa. Material flow was investigated and traced from SONGS Unit 1 to the Off-Shore Pad, through Units 2 and 3, and eventually to the Mesa. Additional corrective actions were specified. (Event Number 4.)

ITA 89045

This item documents the unintended release from U2/3 of a flatbed truck with equipment and a release of some tools to the STAR yard. The incident was quickly detected, the items were surveyed, and contaminated items were returned to U2/3. Inadequate communication and incorrect assumptions were responsible for the incidents. A formal

root cause evaluation is included. The material release program was further strengthened. (Event Number 6.)

ITA 89061

Documents a business analysis on the cost associated with release of salvage material under the control of the Edison Warehouse. (Event Number 6.)

ITA 92115

This item documents the discovery of three contaminated items in the Salvage Yard. That location was later included in the establishment of Camp Mesa. (Event Number 7.)

ITAs 83181, 84319, and 84485

The items document the presence of plant produced radionuclides in seaweed and intake sludge. Disposal options and recommendations are specified. (Event Number 8.)

ITAs 88020 and 90039

Document the discovery of I-131 in benthic material collected at all three units in February 1988. Recommended decay times are calculated and specified. (Event Number 8.)

ITA 92123

This item documents the last transfer of benthic waste to the Otay Mesa Landfill under a State of California exemption. (Event Number 8.)

ITA 94267

This item documents an evaluation to allow the release of fish collected during operation of the plants for use as teaching aids. The evaluation References a November 1984 analysis on disposal of Benthic Material. That analysis showed that since the shutdown and defueling of Unit 1, only I-131 was detected in Units 2 and 3 benthic material. The likely source of which is sewerage releases of medical administration of radioiodine. (Event Number 8.)

ITA 94268

This item documented a validation that appropriate Station organizations had made necessary procedure changes to allow disposal of benthic material without further analysis. (Event Number 8.)

ITAs for 1995-2012

No ITAs associated with the Mesa were found from 1995 to 2012.

AR #010901163-6

This AR documented a Root Cause Evaluation of several failures in the material release program. Most of those involved non-contaminated but magenta marked tools found outside the RCA. Among those items was the description of four hand tools found at the

Mesa Paint Shop, Building G-44. Only the pliers were found to contain low level fixed contamination. The other items were not contaminated. (Event Number 10.)

AR #031100334-1

This AR describes the discovery of an air hose with low level fixed contamination and no removable activity in the Sheet Metal Shop, Building G-40. The hose was believed to have been released from Units 2 and 3 after the equipment was last used there early in 1998. Between that time and its discovery, the hose had stored in a sealed 55-gallon drum in a cargo container at the Mesa. (Event Number 11.)

INTERVIEW RESULTS AND CORROBORATION

Eight interviews that were completed for the U1 HSA and the Interim U2/3 HSA contained recollections of the Mesa. Those interviews are included in this assessment. An additional six interviews and two follow up interviews were conducted specific to findings at the Mesa. The interview results are documented and organized in a separate binder. The results of the interviews are summarized below, as well as any corroboration found during the records review.

Interviews from U1 HSA and the Interim U2/3 HSA:

E. Bennett:	Contaminated items found in Mesa laydown area
W. Frick:	Mesa Unit 1 Steam Generator Sleeving Mockup Training Facility
S. Medling:	Mesa Unit 1 Steam Generator Sleeving Mockup Training Facility
M. Sullivan:	Mesa storage areas
R. Warnock:	Contaminated construction fill at the Mesa
B. McWey:	Stop Work Order for contaminated items found at the STAR Yard
T. Adler:	Contaminated HIC shield at the STAR Yard;
	Damaged exempt Cl-36 source in HP Classroom
P. Elliott:	Contaminated tools and equipment at the STAR Yard
	Damaged exempt Cl-36 source in HP Classroom
A. Gray	Damaged exempt Cl-36 source in HP Classroom 105, Building G-48

Additional and follow up interviews:

S. Folsom:	Validation of survey results for Old Highway 101 Landfill
E. Rinhart	Bechtel Warehouse “B”
	Establishment of Edison Warehouse at Building W-50 location
J. Scott:	Presence of HIC shields at the STAR Yard
	Damaged exempt Cl-36 source in HP Classroom 105 of Building G-48;
	Presence of floor safe in E-50 used to store training check sources
P. Edmonds:	Presence of four HIC shields at the STAR Yard
D. Webb:	Experience as an HP Technician who worked to survey the Mesa in the late 1980s and early 1990s
K. Coffman	Experience as an HP Technician who worked to survey the Mesa in the mid to late 1990s
P. Elliott:	Follow up – contaminated HIC Shield may have been decontaminated at the STAR Yard
A. Gray:	Follow up – confirmed that the Cl-36 event occurred in HP Classroom 105 of Building G-48

CONCLUSIONS

Most of the radiological concern for the Mesa stems from inadvertently released radioactive material. The items occasionally and inadvertently released from SONGS units typically displayed very low level contamination and had no impact on the environment or on humans.

The items were believed to have been inappropriately released between 1977 and 1989 as a result of a material release program that initially lacked necessary rigor and later was not well enough implemented to intercept all contaminated items among the thousands of items moved to the Mesa. By 1989, the release program had been sufficiently strengthened to essentially stop inadvertent releases to the Mesa. Only a very few isolated events occurred after 1990.

With few exceptions, the items contained only fixed contamination and no removable activity. A majority of items were found in tool and gang boxes or cargo containers. Those factors would mitigate concerns over the spread of contamination. However, weather exposure is a potential concern for some of the discovered items. Unfortunately, available data do not allow definitive identification of those cases.

When contaminated items were found, the situation was corrected at the time of occurrence. Discovered items were confiscated and immediately transferred back to the site. The area was searched for additional contaminated items and the area was direct frisked to ensure the area was free of detectable residual activity.

Based upon the records review and the interviews, the following areas summarized in the attached Table 2 were affected by the presence or potential presence of radioactive materials inappropriately transferred to the Mesa:

a. Mesa Intersection -- where contaminated excavation material from Unit 1 was dumped and subsequently removed. That event is covered as Event Number 1. This area was remediated and verified free of residual radioactive material upon its discovery. The adequacy of the 1981 survey effort is documented in a separate memorandum.

b. Old Highway 101 Landfill – where non-contaminated excavation from Unit 1 had been transferred during the late 1970s. That event is covered as Event Number 2. The Mesa Lease never included the area of the Old Highway 101 Landfill and there was never any indication of contamination as a result of early Unit 1 soil excavation. It is included in this assessment only for completeness. The adequacy of the 1981 survey effort should be evaluated and documented by separate memorandum.

c. Lower Mesa – former site of the GRIP Facility/STAR Yard and the Fabrication Shop/Unit 1 Sleeving Mockup Training Facility. Discoveries of contaminated items there are covered in Event Numbers 1, 3, 4, and 5. That location is not a part of the current Mesa. The area has been re-contoured and re-purposed by the Navy. The area is no longer intact. Additional survey will not provide useful or meaningful information.

d. Bechtel Warehouse "B" – where only one item was discovered with low level fixed contamination and no removable activity. The location has been substantially re-

purposed. Covered in Event Number 4. The building is no longer intact. Additional survey will not provide useful or meaningful information.

e. Paint/Sandblast Yard – where only three items with low levels of fixed contamination and no removable contamination were found. The original Paint Shop and the Paint/Sandblast Yard in no longer intact. Additional survey will not provide useful or meaningful information.

f. Edison Warehouse, Building W-50 – where seven contaminated items were discovered. Two of the items contained removable activity. Those discoveries are covered in Event Number 4. Although this area is considered to have a low probability for detectable residual radioactive contamination, it should be included in the confirmatory survey.

g. Units 2 and 3 Laydown Area – where sixty-seven contaminated items were discovered. Those discoveries are covered in Event Number 4. Additional survey of this area would provide definitive assurance that no residual contamination remains. Hence, it should be included in the confirmatory survey.

h. STAR Yard and Ameron Laydown Area – where the majority of inadvertently released contaminated items were discovered. More than 140 contaminated items were found there. Those discoveries are covered in Events Numbers 4 and 6. Additional survey of this area would provide definitive assurance that no residual contamination remains. Hence, it should be included in the confirmatory survey.

i. Mesa Salvage Yard – where only three items with no removable contamination were found. The area was later included as the western end of Camp Mesa. Those discoveries are covered in Event Number 7. Although this area is considered to have a very low probability for detectable residual radioactive contamination, it should be included in the confirmatory survey.

j. Seaweed Drying Pad – where benthic material collected at the site was de-watered before disposal. The material deposited there was free of detectable plant produced radionuclides. The area is included in this assessment only for completeness. Covered in Event Number 8. Further consideration of this area is not warranted.

k. Classroom 105, Building G-48 – where an exempt Cl-36 source was damaged requiring decontamination of the room. Covered as Event Number 9. Although this area is considered to have a very low probability for detectable residual radioactive contamination, it should be included in the confirmatory survey.

l. HP Lab, Building E-50 – personnel interview revealed the existence of a floor safe used to store training radioactive check sources in what is now known as the Joint Operation Center (JOC.) That floor safe should verified free of residual contamination before release of Building E-50. Hence, it should be included in the confirmatory survey.

m. Mesa Paint Shop, Building G-44 – where a pair of pliers with fixed contamination was discovered. Covered as Event Number 10. Further consideration is not warranted.

n. Sheet Metal Shop, Building G-40 – where a contaminated air hose was discovered in a sealed drum. Covered as Event Number 11. Further consideration is not warranted.

RECOMMENDATIONS

1. Evaluate and document in a separate memorandum the adequacy of the 1981 radiological surveys for locations a & b and specify any additional necessary actions.

2. Prepare a Mesa Confirmatory Survey Plan to address affected locations f,g,h,i,k, and l listed above.

DEVELOPMENTAL RESOURCES

NRC Information Circular 81-07: CONTROL OF RADIOACTIVELY CONTAMINATED MATERIAL , May 14, 1981**.**

NUREG-1575, Rev1; EPA 402-R-97-016, Rev 1; DOE/EH-0624, Rev 1; "Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM); August 2000

Unit 1 Historical Site Assessment, Part I: Historical Site Assessment Report; Part II: Interview Documentation, and Part III: Supporting Documentation.

Interim Historical Site Assessment for Units 2 and 3, Part I: Interim Historical Site Assessment Report; Part II: Interview Documentation; Part III: Supporting Documentation.

Health Physics Procedure SO123-VII-8, "Control of Radiological Material."

Health Physics Procedure SO123-VII-20.9, "Radiological Surveys."

Health Physics Procedure SO123-VII-20.9.2, "Material Release Surveys."

Health Physics Procedure SO123-VII-20.9.3, "Surveys for Release of Liquids Sludges, Slurries, and Sand."

ATTACHMENTS

1. Table 1 – Record of Radiological Events at the Mesa
2. Table 2 – Summary of Affected Areas at the Mesa
3. Mesa Map 1
4. Mesa Map 2

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