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FINAL
TASK-SPECIFIC PLAN FOR THE DRYDOCK 5 AND 7 SCOPING SURVEYS

Prepared under the
HUNTERS POINT SHIPYARD
BASE-WIDE RADIOLOGICAL WORK PLAN
May 17, 2006
DCN: ECSD-RACIV-06-0205

Prepared by: Brian Henderson — Date: 5/17/2006
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TETRA TECH EC, INC.

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FROM: Edwin Neil Hart
Neil Hart, Program Manager

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Base-Wide Radiological Work Plan

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TETRA TECH EC, INC.

May 18, 2006
ECSD-RACIV-06-0205
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Base Realignment and Closure
Program Management Office West
Attn: Pat Brooks
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SUBJECT: FINAL TASK SPECIFIC PLAN FOR THE DRYDOCK 5 AND 7 SCOPING SURVEY, HUNTERS POINT SHIPYARD, SAN FRANCISCO, CALIFORNIA

Reference: Contract N62473-06-D-2201, Environmental Remedial Action Contract For Sites Southern California, Arizona, New Mexico, and Southern Nevada

Dear Pat Brooks

Enclosed is Final Task Specific Plan for the Drydock 5 and 7 Scoping Surveys, Hunters Point Shipyard, San Francisco, California dated May 17, 2006. If you have any questions or require additional information, please contact me at (619) 471-3544.

Sincerely,

Ryan Ahlersmeyer
Project Manager

Enclosures: Final Task Specific Plan for the Drydock 5 and 7 Scoping Surveys

TASK-SPECIFIC PLAN
FOR THE
DRYDOCK 5 AND 7 SCOPING SURVEYS

This Task-specific Plan (TSP) provides task-specific details for the scoping survey of the structures at Drydocks 5 and 7 at Hunters Point Shipyard (HPS). The survey will be conducted in accordance with the general approach and methodologies that are given in the *Base-wide Radiological Work Plan* (Base-wide Plan) (Tetra Tech FW, Inc. [TtFW], 2005a) and the Standard Operating Procedures (SOPs). The survey activities will conform to the requirements of the Base-wide Health and Safety Plan (HSP) (TtFW, 2004) and the Building-specific Health and Safety Plan (BHASP), which will be prepared for the site. No exceptions to the Base-wide Plan, SOPs, or HSP are noted.

This survey is being performed to determine if residual radioactivity is present at the site. The survey has been designed as a *Multi-Agency Radiation Survey and Site Investigation Manual* (MARSSIM) (NUREG-1575, 2000) Class 1 and Class 2 survey. This methodology will allow the use of the survey data to support the Final Status Survey (FSS) if no contamination is found to exceed the release criteria.

1.0 SITE DESCRIPTION AND HISTORICAL SUMMARY

Located in Parcel B at HPS, Drydocks 5 and 7 were built in 1943 and 1944 by the Department of the Navy (DON) to service submarines, destroyers, and other small vessels. Each drydock is identical in dimension—approximately 420 feet by 60 feet (128 meters by 18 meters)—with a maximum depth of 21 feet at mean low-low water (MLLW). The drydock was dewatered by use of four 20,000-gallon per minute pumps—two on each side—located near the entrance to the drydock from the sea. The caissons are of the flap gate type and have no un-watering pumps or other equipment; air was obtained from the yard supply system, and operation of these gates took approximately 10 minutes. Both drydocks sit unused and open into San Francisco Bay. The physical locations of the caissons are unknown. A small boat ramp has been installed at the west side of Drydock 7 and is in a state of disrepair; no historical document can be located to give a date of installation. The drydocks are both non-operational, and significant repair would be necessary to return them to an operational status. Figure 1-1 identifies the locations of the Drydock 5 and 7 sites. The total area of Class 1 survey units at each drydock is 797.41 square meters (m^2), while the total area of Class 2 survey units at each drydock is 907.26 m^2; the total area of all survey units is approximately 1,704.67 m^2.

The Historical Radiological Assessment (HRA), Volume II (Naval Sea Systems Command [NAVSEA], 2004), states that Drydocks 5 and 7 were previously used for the following purposes:

- Decontamination drydocks for ships from OPERATION CROSSROADS
- Ship repair (submarines)

Drydocks 5 and 7 are impacted as a result of the possible decontamination from OPERATION CROSSROADS, creating a potential pathway for migration of radioactive materials. The planned future use identified in the San Francisco Redevelopment Agency (SFRA) Reuse Plan (SFRA, 1997) is as an "open space – hard surface" area.

As identified in the HRA, the isotopes of concern at the Drydock 5 and 7 sites are cesium-137 (^{137}Cs), strontium-90 (^{90}Sr), plutonium-239 (^{239}Pu), and radium-226 (^{226}Ra).

2.0 SURVEY DESCRIPTION

The primary use of this TSP is to conduct a scoping survey designed as a Class 1 and 2 MARSSIM survey, so that if no contamination is found, the resulting data may be used as a FSS. Secondary objectives involve survey of equipment, materials, and debris to attempt to release them for unrestricted disposition. Tertiary goals involve the survey of the Drydock 7 Boat Ramp to attempt to release it to unrestricted disposition as a material.

Drydocks 5 and 7 may be surveyed independently of each other. This TSP is designed for use with either drydock, as long as the survey is performed to completion for each drydock. Two reports will be generated upon conclusion of this TSP: one for Drydock 5 and one for Drydock 7. Data fully supporting a release for unrestricted use will be presented as a FSS Report at the conclusion of work. Data not fully supporting a release for unrestricted use will be presented as a scoping survey, including recommendations for remediation, at the conclusion of work.

The survey of the discharge piping of Drydocks 5 and 7 will be in accordance with a separate *Task-specific Plan for the Drydocks 5, 6, and 7 Discharge Piping Survey*. No other action is required for drydock dewatering systems and in pump chamber rooms once associated discharge piping surveys have been performed.

2.1 Equipment and Materials

Many alcoves containing pier-side services for ships under repair can be found in each drydock, and will be surveyed as equipment and materials, using SOP HPO-Tt-006, *Radiation and Contamination Surveys* (TtFW, 2005b). One hundred percent scan surveys for alpha and beta radiation will be conducted on the accessible surfaces of equipment and materials. Biased static alpha and beta measurements will be collected from the surfaces. A minimum of 1 static measurement will be collected at the location exhibiting the highest alpha/beta radiation measurement on each piece of equipment. Additional measurements will be collected at locations where the investigation level is exceeded. Materials identified as having contamination present above the levels specified in Table 2-1 may be decontaminated using SOP HPO-Tt-016, *Decontamination of Equipment and Tools* (TtFW, 2005c), if practicable, or the contaminated portions may be removed and packaged for subsequent storage and disposal. Safety items (e.g., hand rails) and ship mooring devices need not be removed if released for unrestricted disposition.

The small keel blocks that are scattered on the walkway of Drydock 7 will be removed and surveyed using *Final Keel Block Radiological Survey Work Instruction* (TtFW, 2005d). Disposition results from keel block surveys will be submitted as required using the above Work Instruction and need not be included with the Final Drydock 7 Report.

2.2 Drydock 7 Boat Ramp

A one hundred percent scan surveys for alpha and beta radiation will be conducted on the accessible surfaces above MLLW of the installed boat ramp at Drydock 7, using SOP HPO-Tt-006, *Radiation and Contamination Surveys* (TtFW, 2005b). Sixteen static measurements will be collected at the location exhibiting the highest alpha/beta radiation measurement. Additional measurements will be collected at other locations where the investigation levels are exceeded. Smear samples will be taken at locations where static alpha and beta measurements were taken. Materials identified as having contamination present above the levels specified in Table 2-1 will be decontaminated using SOP HPO-Tt-016, *Decontamination of Equipment and Tools* (TtFW, 2005c), if practicable, or the contaminated portions

may be removed and packaged for subsequent storage and disposal; any removed subsurface portions of the boat ramp will be surveyed to the maximum extent practicable. Documentation regarding the boat ramp disposition will accompany the Final Report for Drydock 7.

2.3 Characterization of Drydock Surfaces

The spatial boundaries for the Drydock 5 and 7 scoping survey, including the accessible concrete portions along wing walls (both wall surfaces and walkways) above MLLW, will be defined as MARSSIM Class 1 structure survey units. The horizontal accessible areas around each drydock, extending for the first accessible 2 meters of concrete will be defined as MARSSIM Class 2 structure survey units. Areas of the drydock below MLLW, suction piping, and caissons will be considered outside the scope of this survey and may be considered with studies/surveys of Parcel F at HPS. The spatial boundaries for this survey are shown in Figure 2-1.

2.3.1 Release Criteria

This survey is being performed to assess if residual radioactivity above the established release criteria, as defined in Table 2-1, is present in the area. The site will be modeled using radionuclide concentrations to evaluate total dose at the completion of survey activities.

2.3.2 Survey Units

Fifteen survey units shall encompass each drydock. The length of wall, approximately 8 feet (2.43 meters) high inside the wing wall of each half of each drydock will be divided into four Class 1 survey units—starting from the northeasternmost wing wall of each drydock, sequentially numbered SU1 to SU8. The front of the drydock wall will also be a Class 1 survey unit designated as SU15, covering an area of 60.57 m^2. Class 1 wall survey units are illustrated in Figure 2-1 and cover an area of approximately 532.83 m^2. The walkways of each wing wall will be divided into two Class 1 survey units—starting from the northeasternmost wing wall, sequentially numbered SU9 to SU12—are illustrated in Figure 2-2, covering an area of approximately 204.01 m^2. Two Class 2 survey units will encircle each drydock, starting from the northeasternmost point above the wing wall, to the centerline marker at the end of the drydock, measuring 2 meters back, the designation being SU13 and SU14. The Class 2 survey units extend only to the adjacent concrete structures, including rail lines, and do not include any areas covered by asphalt or other materials. The Class 2 survey units are also shown in Figure 2-2, covering an area of about 907.26 m^2.

The survey units will be identified as 06NDD5SU1-001 where 06 is the Contract Task Order number, N is for New World Technology (NWT), DD5 is for Drydock 5 (or DD7 for Drydock 7), SU1 is for Survey Unit 1, and -001 is the sequential sample location inside the survey unit. Relative locations of survey units are shown in Figure 2-1 and Figure 2-2. Systematic data collection locations, based on a random start point, have been generated for all survey units and are identified in Figure 2-3.

2.3.2.1 Wilcoxon Rank Sum Test

Regulatory guidance, as identified in MARSSIM (NUREG-1575, 2000), recommends use of the Wilcoxon Rank Sum test to conservatively evaluate surveillance results that will be obtained from this survey. This test application will be used to evaluate, as applicable, alpha and beta measurement data. Positive findings will result in solid sample collection and/or additional analysis within the area(s) of concern.

2.3.2.2 Number of Data Points

Since the radionuclides of concern are present in background, N is calculated in the manner specified for the Wilcoxon Rank Sum test (Equation 5-1 from the Base-wide Plan).

Equation 5-1 from the Base-wide Plan

$$N = \frac{\left(Z_{1-\alpha} + Z_{1-\beta}\right)^2}{3\left(P_r - 0.5\right)^2}(1.2)$$

Where:

$Z_{1-\alpha}$ = 1.645 Type I decision error level
$Z_{1-\beta}$ = 1.645 Type II decision level
P_r = 0.921319 random measurement probability [from Table 5.1 in MARSSIM (NUREG-1575)]
(1.2) = 20% increase in number of samples over the minimum

Variables used to calculate N not already specified in the Base-wide Plan (TtFW, 2005a) are Δ and σ. The values used for these parameters were 100 disintegrations per minute (dpm) and 50 dpm, respectively. The value for Δ was derived using ½ of the release criterion for ^{226}Ra and ^{239}Pu, which have the most conservative release criterion for the drydock sites. The estimated value for σ is based on half of the value for Δ. Using Equation 5-1 from the Base-wide Plan, N is calculated as 26 total surveillance points, 13 surveillance points from the survey unit, and 13 surveillance points from the reference area. In order to further increase the power of the statistical tests that will be performed using the data and to provide for the possibility of lost or invalid data, a minimum of 16 systematic points will be collected from each area.

The data collection locations of horizontal surfaces, shown in Figure 2-3, will be placed in the field using global positioning system (GPS) technology. Vertical surfaces will be placed using standard measuring techniques, and the vertical plane containing static surveillance points will be field located using GPS, that is defined without regard to z elevation.

2.3.3 Release Criteria

This survey is being performed to assess if residual radioactivity above the established release criteria, as defined in Table 2-1, is present in the area. The site will be modeled using radionuclide concentrations to evaluate total dose.

2.3.4 Reference Area

The reference (background) area for this survey is Building 258. Building 258 is a concrete structure, and was constructed in or about 1956. Located in Parcel C at HPS, the HRA shows that the building was used as a pipefitting shop and is considered non-impacted (NAVSEA, 2004). Due to its similar composition to the Drydock 5 and 7 sites—also made of concrete—Building 258 is an appropriate reference area. Preliminary reference area measurements are identified in Table 2-2.

2.3.5 Investigation Levels

The investigation level for gamma scan surveys will be established at the reference area mean plus three standard deviations (sigma). Investigation levels for alpha and beta scan surveys will be established at the limits given in Table 2-1 for structures. Investigation levels for gross alpha and beta loose surface contamination are set at 20 dpm per 100 square centimeters (cm^2) for alpha, and 200 dpm/100 cm^2 for beta.

2.3.6 Scan Measurements

Scan measurements are performed to identify elevated areas of radioactivity on drydock surfaces. Alpha and beta scans will be effective for identifying elevated concentrations of the isotopes of concern. One hundred percent of Class 1 survey units and 50 percent of Class 2 survey units will be scanned with Ludlum 43-68 flow-proportional detectors coupled to Ludlum Model 2360 data loggers.

2.3.6.1 Alpha Scan Measurements

Preliminary survey data indicate that the alpha count rate on various surfaces in Building 258 averages less than 2 counts per minute (cpm) with a Model 43-68 detector. When using a 126 cm^2 or smaller detector, scanning for alpha emitters differs in that the expected background response of most alpha detectors is very close to zero. Since the time a contaminated area is under the probe varies and the background count rate of some alpha instruments is less than 1 cpm, it is not reasonable to determine a fixed minimum detectable concentration (MDC) for scanning. Instead, it is more practical to determine the probability of detecting an area of contamination at a predetermined derived concentration guideline level (DCGL) for given scan rates.

For alpha survey instrumentation with backgrounds ranging from less than 1 to 3 cpm, a single count provides a surveyor sufficient cause to stop and investigate further. Assuming this to be true, the probability of detecting given levels of alpha surface contamination can be calculated by use of Poisson summation statistics.

Given a known scan rate and a surface contamination release limit, the probability of detecting a single count while passing over the contaminated area is given by Equation 7-2 of the Base-wide Plan (TtFW, 2005a):

Equation 7-2 from the Base-wide Plan

$$P(n \geq 1) = 1 - e^{-\frac{GEd}{60v}}$$

Where:

$P(n \geq 1)$ = probability of observing a single count = 69.24%
G = contamination activity dpm = 100
E = detector efficiency (4π) = 0.06975
d = width of detector in direction of scan (centimeter [cm]) = 14.4
v = scan speed (centimeters per second [cm/s]) = 1.42

Once a count is recorded and the guideline level of contamination is present, the surveyor should stop and wait until the probability of getting another count is at least 90 percent. This time interval can be calculated by Equation 7-3 of the Base-wide Plan (TtFW, 2005a):

Equation 7-3 from the Base-wide Plan

$$t = \frac{13,800}{CAE}$$

Where:

t	=	time period for static count(s) = 15.70
C	=	contamination guideline (dpm/100 cm^2) = 100
A	=	physical probe area (cm^2) = 126
E	=	detector efficiency (4π) = 0.06975

Using the above equations found in the Base-wide Plan and Chapter 6 of MARSSIM (NUREG-1575, 2000), the probability of detecting 100 dpm/100 cm^2 alpha was 69.24 percent, at a scan rate of 1.4 cm/s. Once an elevated area is identified, it is necessary to stop over the area and pause for 16 seconds to confirm the elevated reading. If elevated count rates are detected during this pause, then a static reading will be taken over the area in accordance with section 2.3.8.

2.3.6.2 Beta Scan Measurements

The minimum number of net source counts in the scan interval can be arrived at by multiplying the square root of the number of background counts (in the scan interval) by the detectability value associated with the desired performance (as reflected in *d'*) as shown in Equation 7-5 from the Base-wide Plan (TtFW, 2005a) as follows:

Equation 7-5 from the Base-wide Plan

$$MDCR = d'\sqrt{b_i}\left(\frac{60}{i}\right)$$

Where:

d'	=	index of sensitivity (α and β errors [performance criteria])
b_i	=	number of background counts in scan time interval (count)
i	=	scan or observation interval (s)

For beta scans:

d'	=	3.28
b_i	=	31.77 counts (based on a background of 188 cpm)
i	=	14.4 cm / 1.42 cm/s = 10.13 seconds

Beta scan MDCR = 109.4 cpm at a scan speed of 1.4 cm/s.

The scan minimum detectable concentration (MDC) is determined from the MDCR by applying conversion factors that account for detector and surface characteristics and surveyor efficiency. As discussed below, the MDCR accounts for the background level, performance criteria (d'), and observation interval. The observation interval during scanning is the actual time that the detector can respond to the contamination source. This interval depends on the scan speed, detector size in the direction of the scan, and area of elevated activity. The scan MDC for structure surfaces is calculated using Equation 7-6 from the Base-wide Plan (TtFW, 2005a) as follows:

Equation 7-6 from the Base-wide Plan

$$Scan\ MDC = \frac{MDCR}{\sqrt{p}\,\varepsilon_i \varepsilon_s \frac{W_A}{100\ cm^2}}$$

Where:

$MDCR$		is discussed above
p	=	surveyor efficiency factor
ε_i	=	instrument efficiency (count per particle)
ε_s	=	contaminated surface efficiency (particle per disintegration)
W_A	=	area of the detector window (cm^2)

For beta scans:

$MDCR$	=	109.4
p	=	0.50
ε_i	=	0.184
ε_s	=	0.25
W_A	=	126

Beta scan MDC = 2,669 dpm/100 cm^2 at a scan speed of 1.42 cm/s (about 0.5 inches/s).

2.3.7 Alpha and Beta Static Measurements

Two-minute alpha and beta static measurements will be performed at the specified systematic and biased locations in each of the survey units to achieve the MDC limits necessary for the isotopes of concern. Additional measurements may be collected if elevated radiation readings are identified while performing the scan surveys. Ludlum Model 43-68 gas-flow proportional detectors coupled to Ludlum Model 2360 data loggers will be used to perform alpha and beta static measurements.

The MDC for alpha measurements were calculated from preliminary Building 258 measurements identified in Table 2-2 using Equation 7-7 from the Base-wide Plan (TtFW, 2005a) as follows:

Equation 7-7 from the Base-wide Plan

$$MDC = \frac{3 + 4.65\sqrt{R_B T_B}}{\varepsilon_s \varepsilon_i \frac{W_A}{100} T_B}$$

Where:

3+4.65	=	constant factor provided in MARSSIM
R_B	=	Background Count Rate = 1.83 cpm
T_B	=	Background Count Time = 2 minutes
ε_i	=	Instrument Efficiency = 0.279

ε_s = Surface Efficiency Factor = 0.25
W_A = Probe Area Size = 126 cm^2

The calculated MDC (based on preliminary measurements) for alpha contamination is 67.68 dpm/100 cm^2, using a 2-minute static counting time.

The MDC for beta measurements were also calculated using Equation 7-7 from the Base-wide Plan (TtFW, 2005a) as follows:

Where:
3+4.65 = constant factor provided in MARSSIM
R_B = Background Count Rate = 188 cpm
T_B = Background Count Time = 2 minutes
ε_i = Instrument Efficiency = 0.184
ε_s = Surface Efficiency Factor = 0.25
W_A = Probe Area Size = 126 cm^2

The calculated MDC (based on preliminary measurements) for beta contamination is 803.7 dpm/100 cm^2, using a 2-minute static counting time. Counting time may be increased incrementally if actual instrument efficiency and background levels do not provide an MDC below the release limits specified in Table 2-1.

2.3.8 Gamma Scans

One-hundred percent of the of the Class 1 and 50 percent of the Class 2 survey units will be scanned with Ludlum Model 44-10 scintillation detectors coupled to Ludlum Model 2350-1 scaler/rate meters. The gamma scans will be performed in accordance with SOP HPO-Tt-006, *Radiation and Contamination Surveys* (TtFW, 2005b). A single detector will be used to perform gamma scans. Scans will be performed at a rate of approximately 0.08 meters per second (6-second scan observation) with the detector held approximately 10 cm (4 inches) above the ground, and it will be moved back and forth across the travel path while scanning, producing a serpentine scan pattern.

2.3.9.1 Minimum Detectable Count Rate for Gamma Surveys (2-inch by 2-inch NaI Probe)

MDCR is the minimum detectable number of net source counts in the scan interval, for an ideal observer, that can be arrived at by multiplying the square root of the number of background counts (in the scan interval) by the detectability value associated with the desired performance (as reflected in *d'*), as shown in Equation 7-5 from the Base-wide Plan (TtFW, 2005a):

Equation 7-5 from the Base-wide Plan

$$MDCR = d'\sqrt{b_i}\left(\frac{60}{i}\right)$$

Where, for ^{226}Ra and ^{137}Cs:
d' = index of sensitivity (α and β errors) = 3.28
b_i = number of background counts in scan time interval = 581 cpm
i = Scan or observation interval = 6 seconds

For this calculation, the observed background count rate of 5,806 cpm for ^{226}Ra and ^{137}Cs were used. It should be noted that a typical source will remain under the sodium iodide (NaI) probe for 6 seconds during the scan; therefore, the average number of background counts in the observation interval is 581 [b_i = 5,806 × (6/60)]. The required rate of true positives was 95 percent, and the rate of false positives was 5 percent. From Table 6.5 of MARSSIM (NUREG-1575, 2000), the value of *d'*, representing this performance goal, is 3.28. Using these inputs, the MDCR for Drydocks 5 and 7 are calculated as 791 cpm for ^{226}Ra and ^{137}Cs.

2.3.9.2 MDCR and Use of Surveyor Efficiency, Gamma (2-inch by 2-inch NaI Probe)

The $MDCR_{Surveyor}$ can be calculated assuming a surveyor efficiency (P) of 0.5 and the observed background count rate of 5,806 cpm for ^{226}Ra and ^{137}Cs using Equation 7-9 from the Base-wide Plan (TtFW, 2005a) as follows:

Equation 7-9 from the Base-wide Plan

$$MDCR_{SURVEYOR} = \frac{MDCR}{\sqrt{P}} = \frac{791}{\sqrt{0.5}} = 1{,}118\,cpm$$

2.3.10 Static Gamma Measurements

Static gamma measurements will be collected at the specified systematic locations in horizontal and vertical survey units. Additional biased measurements may be collected if elevated gamma scan survey results identify areas above the investigation level. The gamma and exposure rate measurements will be performed in accordance with SOP HPO-Tt-006, *Radiation and Contamination Surveys* (TtFW, 2005b).

For gamma surveys, MDC is calculated in cpm. Equation 7-12 from the Base-wide Plan (TtFW, 2005a) is used to calculate the MDC.

Equation 7-12 from the Base-wide Plan

$$MDC = \frac{3 + 4.65\sqrt{R_B T_B}}{T_B}$$

Where:

3+4.65	=	constant factor provided in MARSSIM
R_B	=	background count rate (cpm) = 5,806
T_B	=	background counting time (minute) = 1

Using the inputs observed in the reference area (listed above) in Equation 7-12, the calculated MDC for the Ludlum Model 2350-1 is 357 cpm for ^{226}Ra and ^{137}Cs.

2.3.11 Exposure Rate Measurements

Exposure rate measurements will be collected from the specified systematic locations in each of the Class 1 and Class 2 survey units. Additional measurements will be collected if elevated areas are identified while performing the gamma scan surveys. Ludlum Model 19 scintillation detectors will be used to perform the measurements.

2.3.12 Media Sampling

Smear samples will be collected at all static surveillance points, once static measurements have been obtained. Samples will be analyzed using NWT's SOP for analysis of gross alpha and beta. Additional measurements and solid samples may be collected if elevated radiation readings are identified while performing the scan and/or static surveys. Samples will be collected using SOP HPO-Tt-009, *Sampling Procedures for Radiological Surveys* (TtFW, 2005e)

Samples will be analyzed in the field laboratory by gamma spectroscopy. Ten percent of the samples will then be forwarded to an outside laboratory for quality assurance verification of gamma spectroscopy analysis. Samples may be obtained for ^{90}Sr, if identified contamination is encountered during field surveillance activities, and analyzed using NWT's SOP for analysis of ^{90}Sr. Additional samples will be analyzed for ^{90}Sr if elevated levels of ^{137}Cs are identified during field laboratory gamma spectroscopy analysis. If elevated ^{137}Cs, Americium-241 (^{241}Am) (daughter product of ^{239}Pu), and/or ^{90}Sr are identified during the sample analyses, these samples will also be analyzed by alpha spectroscopy.

3.0 QUALITY CONTROL

The data quality objectives for the survey are provided in Table 3-1.

Definable features of work (DFW) establish the measures required to verify both the quality of work performed and compliance with project requirements. The DFW for this task is radiological surveys.

A description of this DFW and the associated phases of quality control are presented in Table 3-2.

4.0 ENVIRONMENTAL PROTECTION

Environmental protection-driven requirements not already addressed in the Base-wide Plan do not apply.

5.0 REFERENCES

The following additional references not already in the Base-wide Plan are cited in this TSP:

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TtFW. 2005c. Final Hunters Point Shipyard Project Standard Operating Procedure. *Decontamination of Equipment and Tools*. HPO-Tt-016. DCN: FWSD-RAC-05-1237. Revision 0. May 26.

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TtFW. 2004. *Final Base-wide Health and Safety Plan*. Hunters Point Shipyard, San Francisco, California.

Tetra Tech EC, Inc. (TtEC). 2006. *Task-specific Plan for the Drydocks 5, 6, and 7 Discharge Piping Survey*. DCN: ECSD-RACIV-06-0172. May 9.

TABLES

TABLE 2-1

DRYDOCK 5 AND 7
PRIMARY RADIATION PROPERTIES AND RELEASE CRITERIA FOR RADIONUCLIDES OF CONCERN

Radionuclide	Primary Radiation Properties		Release Criteria		
	Half-life	Type	Equipment, Materials, and Structures		Release Criteria for Industrial Reuse Solid Samples [b] (pCi/g)
			Total Surface Activity [a]	Removable Activity [a]	
Radium-226	1600 y	Alpha Gamma	100	20	1.0[c]
Plutonium-239	24,065 y	Alpha	100	20	14.0
Strontium-90	28.6 y	Beta	1,000	200	10.8
Cesium-137	30.17 y	Beta Gamma	5,000	1,000	0.113

Notes:

[a] Units are disintegrations per minute (dpm) per 100 square centimeters (cm^2), and are based on 25 mrem/yr, using RESRAD-Build Version 3.3 or *Regulatory Guide 1.86*, whichever is lower.

[b] U.S. Environmental Protection Agency (EPA) Preliminary Remediation Goals (PRGs) for soil, except as noted

[c] Limit is 1 pCi/g above background, per agreement with EPA.

mrem/yr – millirem per year
pCi/g – picourie per gram
y – year

TABLE 2-2

BUILDING 258
REFERENCE AREA ALPHA AND BETA STATIC MEASUREMENTS

Ludlum Model 2360 S/N: 164680		Detector 43-68 S/N: PR082054		Cal Due: 9/13/2006			
Sample #	**Count Time**	**Alpha Counts**	**Beta Counts**	**Alpha cpm**	**Beta cpm**	**Alpha dpm**	**Beta dpm**
1	120 seconds	4	399	2	199.5	22.76	3442.03
2	120 seconds	4	384	2	192	22.76	3312.63
3	120 seconds	3	403	1.5	201.5	17.07	3476.54
4	120 seconds	4	371	2	185.5	22.76	3200.48
5	120 seconds	4	375	2	187.5	22.76	3234.99
6	120 seconds	4	349	2	174.5	22.76	3010.70
7	120 seconds	3	384	1.5	192	17.07	3312.63
8	120 seconds	4	386	2	193	22.76	3329.88
9	120 seconds	3	375	1.5	187.5	17.07	3234.99
10	120 seconds	2	361	1	180.5	11.38	3114.22
11	120 seconds	3	372	1.5	186	17.07	3209.11
12	120 seconds	4	368	2	184	22.76	3174.60
13	120 seconds	4	407	2	203.5	22.76	3511.04
14	120 seconds	3	350	1.5	175	17.07	3019.32
15	120 seconds	5	380	2.5	190	28.45	3278.12
16	120 seconds	5	366	2.5	183	28.45	3157.35
	Mean	3.69	376.88	1.84	188.44	20.98	3251.16

Notes:

- These values are preliminary data collected from the site. The actual investigation level will be based on the data collected during the reference area survey conducted in accordance with this Task-specific Plan.
- Alpha and beta dpm were calculated using total efficiencies of 0.06975 and 0.046 and respectively.

cpm – count per minute
dpm – disintegration per minute

TABLE 3-1

SUMMARY OF DATA QUALITY OBJECTIVES

STEP 1	STEP 2	STEP 3	STEP 4	STEP 5	STEP 6	STEP 7
Statement of Problem	**Decisions**	**Inputs to the Decisions**	**Boundaries of the Study**	**Decision Rules**	**Limits on Decision Errors**	**Optimize the Sampling Design**
Drydocks 5 and 7 are listed as areas impacted by radiological activities. Isotopes of concern are: ^{137}Cs, ^{226}Ra, ^{239}Pu, and ^{90}Sr. It must be determined if the site-specific release criteria for these isotopes have been met or if remediation is warranted.	The primary use of the data expected to result from completion of this TSP is to support the Final Status Survey of both Drydocks 5 and 7. Therefore, the decision to be made can be stated as, "Do the results of the survey meet the release criteria?	Radiological surveys required to support the scoping surveys of Drydocks 5 and 7 will include: • 100 percent alpha, beta, and gamma scan and static surveys of the alcoves with equipment and materials. • 100 percent alpha, beta, and gamma scan surveys of the Class 1 survey unit. • 50 percent alpha, beta, and gamma scan surveys of the Class 2 survey unit. • A minimum of 16 systematic gamma, exposure rate, and smear samples will be collected in each Class 1 and Class 2 survey unit. • 100 percent of areas above MLLW on the Drydock 7 boat ramp alpha and beta scan surveys. A minimum of 16 static alpha and beta measurements will be obtained. • Additional biased measurement and sample data collected if investigation levels are exceeded.	The boundaries of each drydock are shown in Figure 1-1. The horizontal spatial boundaries for this survey effort are shown in Figure 2-2. Vertically, the spatial boundaries are shown in Figure 2-1.	If the results of the survey meet the release criteria, then the data will be used to support a Final Status Survey. Once the Drydock 7 boat ramp measurements are less than the release criteria, it will be released to unrestricted disposition. *Note*: if areas of elevated activity are observed, a separate plan will be prepared for the performance of characterization surveys and possible remedial action.	Limits on decision errors are set at 5 percent as specified in the Base-wide Plan.	Operational details for the radiological survey process have been developed. The theoretical assumptions are based on guidelines contained in MARSSIM. Specific assumptions regarding types of radiation measurements, instrument detection capabilities, quantities and locations of data to be collected, and investigation levels are contained in this TSP and the Base-wide Plan.

Notes:

^{137}Cs – cesium-137
MARSSIM – Multi-Agency Radiation Survey and Site Investigation Manual
MLLW – mean low-low water
^{239}Pu – plutonium-239
^{226}Ra – radium-226
^{90}Sr – strontium-90
TSP – Task-specific Plan

TABLE 3-2

DEFINABLE FEATURES OF WORK FOR RADIOLOGICAL SURVEYS

ACTIVITY	PREPARATORY (Prior to initiating survey activity)	DONE	INITIAL (At outset of survey activity)	DONE	FOLLOW-UP (Ongoing during survey activity)	DONE
Radiological surveys	• Verify that an approved TSP is in place. • Verify that the remedial Project Manager, the Radiological Site Manager, and Caretaker Site Office are notified about mobilization. • Verify that an approved RWP is available and has been read and signed by assigned personnel. • Verify that Base-wide Plan, BHASP, TSP, and AHAs have been reviewed. • Verify that assigned personnel are trained and qualified. • Verify that personnel have been given an emergency notification procedure. • Verify that workers assigned dosimetry have completed NRC Form 4. • Verify that the relevant SOPs and/or manufacturers' instructions are available and have been reviewed for equipment to be used for radiological surveys. • Verify that equipment is on site and is in working order (initial daily check).		• Verify that radiological instruments are as specified in the Base-wide Plan and TSP. • Inspect training records. • Verify that a qualified RCT and SHSS are present at active work areas. • Verify that site activities are being photographed. • Verify that the reference area measurements have been obtained using the procedure described in the Base-wide Plan, which states that the same survey methodology and instruments used to collect the background data will be used to perform measurements within survey units. • Verify that daily checks were performed on all portable survey instruments. • Verify that radiological instrument calibrations and setup are current. • Verify that required dosimetry is being worn. • Verify that field logbooks, proper forms, and chain-of-custody documents are in use. • Verify that samples and measurements are being collected in accordance with the TSP, the Base-wide Plan, and relevant SOPs. • Verify that sample handling and analyses are in accordance with the Base-wide Plan and applicable SOPs.		• Verify that site is properly posted and secured, if necessary. • Conduct ongoing inspection of material and equipment. • Verify that a qualified RCT and SHSS are present at active work areas. • Verify that daily instrument checks and background measurements were obtained and documented. • Verify that survey and sample analysis results are documented. • Verify that personnel have read and signed revised RWP, if revision is required. • Inspect sample chain-of-custody and survey log for completeness. • Verify that survey and analytical activities conform to the TSP. • Verify that survey instruments are recalibrated after repairs or modifications. • Verify that site activities are being photographed. • Verify that survey documentation is reviewed by the RTS.	

TABLE 3-2

DEFINABLE FEATURES OF WORK FOR RADIOLOGICAL SURVEYS

Notes:

AHA – Activity Hazard Analysis
BHASP – Building-specific Health and Safety Plan
NRC – Nuclear Regulatory Commission
RCT – Radiological Control Technician
RTS – Radiological Task Supervisor
RWP – Radiation Work Permit
SHSS – Site Health and Safety Specialist
SOP – Standard Operating Procedure
TSP – Task-specific Plan

FIGURES

FIGURE 1-1

DRYDOCKS 5 AND 7 WITH REFERENCE AREA

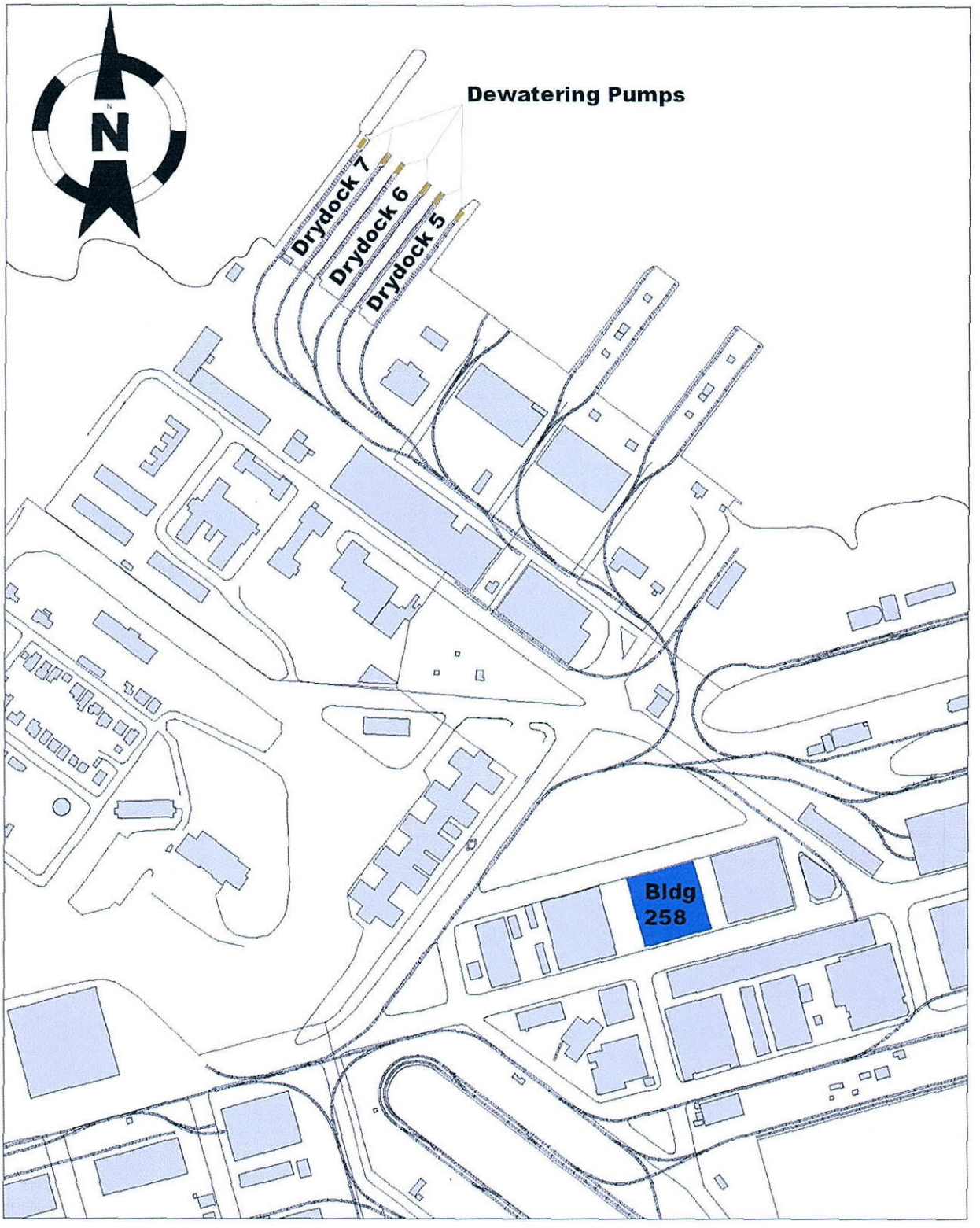

FIGURE 2-1

TYPICAL DRYDOCK 5 AND 7 CLASS 1 VERTICAL SURVEY UNIT ARRANGEMENT

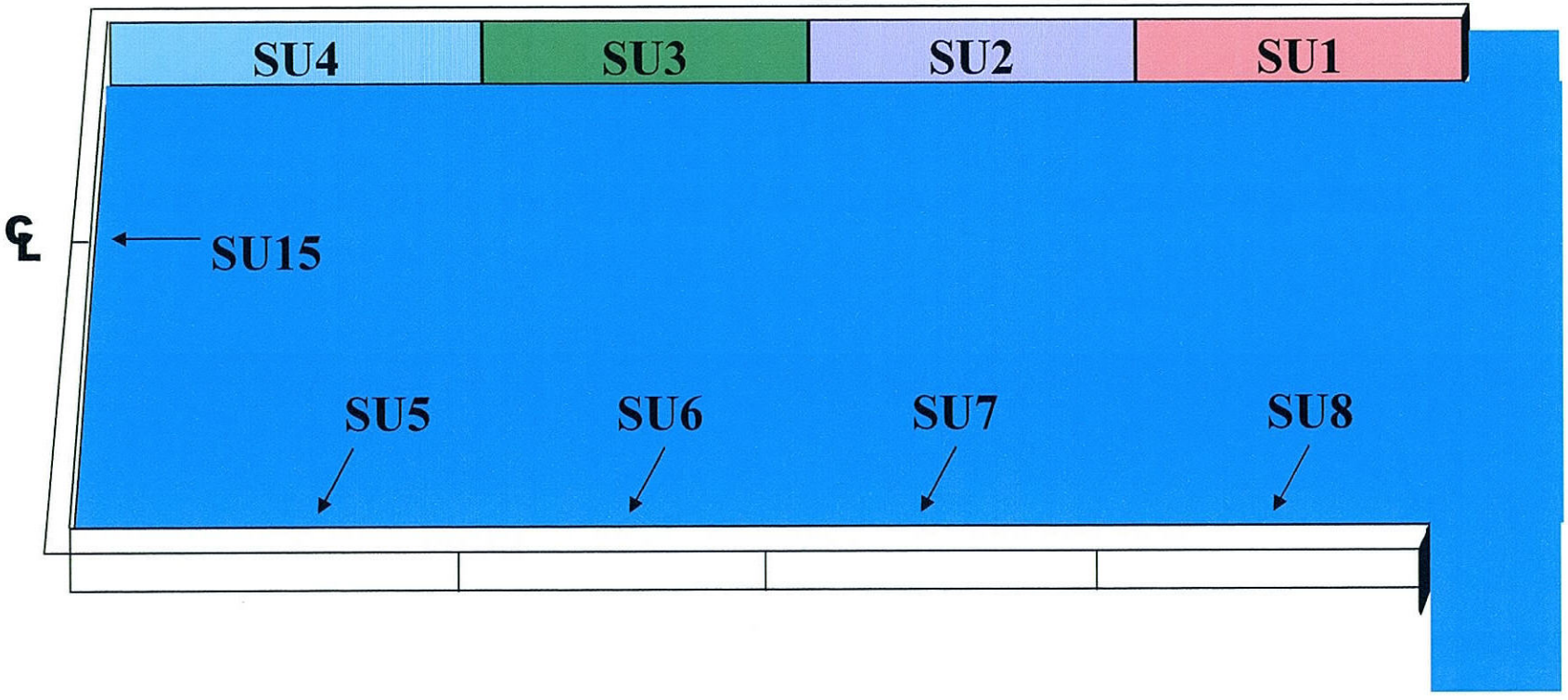

FIGURE 2-2

TYPICAL DRYDOCK 5 AND 7 CLASS 1 AND CLASS 2 HORIZONTAL SURVEY UNIT ARRANGEMENT

FIGURE 2-3

DRYDOCK 5 AND 7 CLASS 1 AND CLASS 2
SURVEILLENCE POINT ARRANGEMENT