DEPARTMENT OF THE NAVY
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5090
Ser BPMOW.jtc/0030
October 16, 2006

Mr. Manny Alonzo
Section Chief
Southern California Base Closure and Reuse Unit
California Department of Toxic Substances Control
5796 Corporate Ave.
Cypress, CA 90630-4700

SUBJECT: CONFIRMATION RADIOLOGICAL SURYVEY RESULTS, FORMER MARINE CORPS AIR STATION EL TORO, CALIFORNIA

Mr. Alonzo:

The purpose of this letter is to provide a narrative of the results obtained during the California Department of Health Services (DHS) September 14, 2006 confirmation radiological survey of Building 319 at Former Marine Corps Air Station (MCAS) El Toro, California (Enclosure). In addition, we are presenting results obtained by the Navy in support of this effort, which was overseen by the Navy's Radiological Affairs Support Office (RASO). Results from radiological surveys conducted to date do not indicate the presence of residual Radium-226 contamination in Building 319 due to previous Marine Corps activities.

The Navy's radiological survey and sampling data collected to date indicates that Building 319 is suitable for unrestricted release. It is our hope that upon the submission of the Navy's written explanation of elevated alpha readings, DHS will provide a release for Building 319 and a path forward for the release of the remaining buildings at former MCAS El Toro.

Thank you for your continued support in this program. Should you have questions or need additional information, please contact Jim Callian, Project Manager, at (619) 532-0779 or me at (619) 532-0963.

Sincerely,

DARREN NEWTON
BRAC Environmental Coordinator
By direction of the Director

Enclosure: 1. Confirmation Radiological Survey Results Narrative, Building 319, Former Marine Corps Air Station El Toro, California dated October 13, 2006

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Email/Trans Bldg 319 Conf Rad Survey MCAS El Toro 10-10-06.doc

CONFIRMATION RADIOLOGICAL SURVEY RESULTS NARRATIVE
BUILDING 319
FORMER MARINE CORPS AIR STATION EL TORO, CALIFORNIA
October 13, 2006

A confirmation radiological survey of Building 319 at Former Marine Corps Air Station (MCAS) El Toro was performed by California Department of Health Services (DHS) on the afternoon of September 14, 2006. On September 13, 2006, the Navy's contractor, Weston Solutions, Inc. (Weston) prepared a total of 35 sampling locations in Building 319 and in Building 318, the reference area building. On September 14, 2006, prior to DHS arriving on-site, Weston measured and recorded gross alpha and beta radiation in the two buildings in the morning (between approximately 0800 and 1000), and then later in the afternoon (between approximately 1200 and 1400) in conjunction with DHS confirmation survey. Weston's activities in support of the DHS confirmation radiological survey were reviewed and approved by the Navy's Radiological Affairs Support Office (RASO). Based on the morning measurements, Weston concluded that Building 319 did not have residual radium-226 (Ra-226) contamination and the building was suitable for unrestricted release. None of the measurements exceeded the release criteria (See attached report). However, during the DHS confirmation survey in the afternoon, two sampling locations had radiation levels that exceeded the alpha release criterion (See discussion below).

On the afternoon of September 14, 2006, elevated gross alpha measurements were noted by DHS at two locations (DJ-3 and DJ-4) within Building 319. Weston also measured elevated alpha levels at the same locations during the conformation survey and previously during the final status survey of Building 319 in March 2004[1]. During the DHS confirmation survey multiple alpha measurements were recorded at these two sampling locations using three different instruments (two DHS and one Weston instrument). Elevated gross alpha measurements at these two locations varied from approximately 10 to 50 counts per minute (cpm). The elevated alpha readings were not consistent or repeatable, sometimes varying by factor of three from one reading to the next. However, alpha measurements taken by Weston in the morning were not elevated and did not fluctuate. DHS, Weston, and Navy representatives all noted holes in the cracks and seams in the concrete slab floor that penetrate to the unventilated void space below the building. Therefore, Navy concludes that radon gas is emanating from the space below into the building. The air pressure in the building being slightly lower than the ground and void below the concrete floor, draws the radon into the building.

Ra-226, the radionuclide of concern at MCAS El Toro and at Building 319, is a naturally occurring constituent in the soil at the site and in the aggregate used in the raised slab floor of the building. As it naturally decays, Ra-226 emits alpha radiation and Radon-222 (Rn-222). Rn-222 is a colorless, odorless gas that is slightly heavier than air, and also emits alpha radiation as it decays. Because Rn-222 is a gas, it readily dissipates from areas that are well ventilated; in closed areas such as basements however, terrestrial Rn-222 can accumulate and become concentrated. As the ambient temperature increases (and/or as barometric pressure decreases), the gas will expand and be more likely to penetrate upward from the unventilated void space below and seep through cracks in the floor and into the building above. Alpha radiation detection is commonly used to determine the presence of Rn-222 gas.

Rn-222 is considered the most likely cause of the elevated alpha readings found at two sampling locations within Building 319 because of the following:

1. Gross alpha and beta radiation readings in Buildings 318 and 319 were all within background on the morning of September 14, 2006.

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[1] Draft Final Radiological Release Report for Buildings 242, 243, 295, 319, 360, 787, 832, and 1789, Former MCAS El Toro which was transmitted to the agencies for review and concurrence in June 2005. The final electronic version of this document was sent to the agencies in October 2005.

2. Elevated gross alpha readings only occurred in the afternoon when the ambient temperature was approximately 10 to 20 degrees warmer than in the morning.
3. Elevated gross alpha readings occurred at two locations in Building 319 only where penetrating holes were found in the seams and cracks of the raised concrete floor.
4. Rn-222 gas is a naturally occurring decay product of Ra-226 which occurs both in the soil beneath the buildings and in the aggregate used in the concrete flooring. Rn-222 could become concentrated in this unventilated space and emanate into the building.
5. Rn-222 emits alpha radiation
6. The inconsistency of alpha measurements in the afternoon, using several instruments, is indicative of an intermittent discharge of radon gas seeping through the floor, especially in the afternoon when ambient and building temperatures were at a peak.

In summary, the intermittent emanation of Rn-222 gas through penetrating holes and cracks in the raised concrete floor at two locations in Building 319 is considered the cause of elevated gross alpha radiation measurements at these locations in the afternoon of September 14, 2006. Therefore, the elevated alpha readings at these two locations are not due to technically enhanced naturally occurring radioactive material (TENORM) Ra-226 contamination. Consistent with the Navy's radiological release report (October 2005) and results from this confirmation radiological survey, Building 319 is suitable for unrestricted release.

MCAS El Toro – Buildings 318 and 319

Radiation Survey Report of Data Collected During
Weston Solutions Inc. Support of CADHS Confirmation Surveys
Contract N68711-01-D-6010 / 0002, Modifications 9 and 10

On September 13 and 14, 2006, Weston Solutions Inc. (Weston) supported the subject surveys as requested by BRAC PMO West.

The Weston support of the confirmation surveys consisted of the following:

1. As directed by BRAC PMO, Weston determined survey grid point locations and laid out 14 survey grid points at the reference area Building 318 (11 inside and 3 outdoors on the loading dock, see attached Figure 1) . Weston prepared each survey grid location in accordance with the procedure for preparing surfaces for survey contained in Table 4 of the Health and Safety Plan of the MCAS El Toro Radiological Sampling Amendment (Weston 2004) to permit measurement of background reference area alpha and beta radiation.

2. Using the California Department of Health Services (CADHS) survey grid point locations previously provided by BRAC PMO on 8/18/06, Weston laid out 21 survey grid points at Building 319 (20 inside and 1 outdoors on the loading dock, see attached Figure 2). These points were then prepared in accordance with the procedure for preparing surfaces for survey contained in Table 4 of the Health and Safety Plan of the MCAS El Toro Radiological Sampling Amendment (Weston 2004) to permit the measurement of survey confirmation alpha and beta radiation by CADHS.

3. On the morning of September 14, 2006, from approximately 0800 to 1000, prior to CADHS collecting survey measurements, Weston response checked alpha/beta survey instrument (Ludlum Model 2224-1) with probe (Ludlum Model 43-89) in accordance with SOP (ISOLAB-10) contained in MCAS El Toro Radiological Sampling Amendment (Weston 2004) and then measured and recorded alpha and beta radiation readings in counts per minute (cpm) at each of the reference area points at Building 318 and at each survey confirmation grid location at Building 319 (see Tables 1 and 2).

Temperatures in the buildings during this time were in the approximate range of the high 50s to low 60s degrees Fahrenheit.

Subsequent to the survey, using the alpha and beta efficiencies applicable to the radiation detection instrument used for the Weston surveys and subtracting the background radiation measured in Building 318, the readings were converted to disintegrations per minute (dpm) per 100 cm^2 (see Tables 3 and 4 for alpha radiation results indoors and outdoors respectively and Tables 5 and 6 for beta radiation results indoors and outdoors respectively).

4. Conclusion: Based on the data collected and presented in Tables 3, 4, 5 and 6, Weston concludes that the net alpha measurements at Building 319 do not exceed the permissible average alpha and beta radiation levels for surface contamination specified in NRC REGUIDE 1.86.

Table 1

Building 318 (Reference Area - 2006)

Grid Point Number	Alpha Readings (cpm)***	Beta Readings (cpm)***	X, Y Coordinates (feet)*
CR-6	3*	302	-113, 131
CR-7	3*	299	-58, 131
CR-8	1*	339	-3, 131
CR-9	2*	325	-195, 76
CR-10	2*	365	-140, 76
CR-11	3*	338	-85, 76
CR-12	2*	357	-30, 76
CR-13	4*	337	-168, 21
CR-14	1*	353	-113, 21
CR-15	2*	358	-58, 21
CR-16	3*	342	-3, 21
CRO-1	8**	358	385, 208
CRO-2	5**	335	368, 204
CRO-3	15**	378	353, 211

* Using the instrument alpha efficiency determined during calibration, the average direct alpha indoor background measurement of 2.4 cpm is approximately equal to 25 dpm/100 cm^2

** Using the instrument alpha efficiency determined during calibration, the average direct alpha outdoor background measurement of 9 cpm (average of grid points CRO-1, CRO-2 and CRO-3) is equal to 93 dpm/100 cm^2

***The temperature inside the building during the alpha and beta measurements was in the high 50 to low 60 degrees Fahrenheit range.

Table 2

Building 319 (Confirmation Surveys)

Grid Point Number	Alpha Readings (cpm)***	Beta Readings (cpm)***	X, Y Coordinates (feet)*
DJ-1	4	346	40, 30
DJ-2	1	382	190, 90
DJ-3	2	334	80, 107
DJ-4	1	322	80, 103
DJ-5	3	325	54, 67
DJ-6	2	345	356, 46
DR-1	2	331	96, 45
DR-2	2	307	49, 71
DR-3	3	357	310, 35
DR-4	4	412	239, 0
DR-5	7*	382	193, 130
DR-6	6	340	66, 173
DR-7	3	327	-79, 30
DR-8	3	349	20, 175
DR-9	1	237	28, 2
DR-10	1	322	181, 126
DR-11	9**	330	333, 208
DR-12	4	339	-169, 162
DR-13	1	321	141, 126
DR-14	3	320	120, 1
DR-15	2	355	17, 143

* Using the instrument alpha efficiency determined during calibration and subtracting the Building 318 (reference area building - 2006) average alpha indoor background level, a direct alpha measurement of 7 cpm is approximately equal to 47 dpm/100 cm^2 (REGUIDE 1.86 limit for alpha contamination averaged over one square meter is 100 cpm/100 cm^2).

** Using the instrument alpha efficiency determined during calibration and subtracting the Building 318 (reference area building - 2006) average alpha outdoor background level, a direct alpha measurement of 9 cpm (grid point DR-11) is approximately equal to 0 dpm/100 cm^2 (REGUIDE 1.86 limit for removable alpha contamination is 20 cpm/100 cm^2 and for alpha contamination averaged over one square meter is 100 cpm/100 cm^2).

***The temperature inside the building during the alpha and beta measurements was in the high 50 to low 60 degrees Fahrenheit range.

Table 3 - MCAS El Toro, Building 319 - Data Conversion and Uncertainty Calc for Alpha Direct Rdg Confirmation (indoors)

Gross Bkgd Measurements (Bldg 318)						*B-319*	*Gross Survey Measurements (Bldg 319)*						*Net Activity*			*Date*
Time for each measurement was 1 minute						Grid	Time for each measurement was 1 minute									*Surveyed*
avg cpm	Probe	ε_i	ε_s	W_A/S_A	dpm/100 cm^2	Point	cpm	Probe	ε_i	ε_s	W_A/S_A	dpm/100 cm^2	dpm/100 cm^2	*	Note 1	
2.4	A	0.308	0.25	1.26	24.7	DJ1	4	A	0.308	0.25	1.26	41.2	16.5	±	3.6	9/14/06
2.4	A	0.308	0.25	1.26	24.7	DJ2	1	A	0.308	0.25	1.26	10.3	-14.4	±	2.6	9/14/06
2.4	A	0.308	0.25	1.26	24.7	DJ3	2	A	0.308	0.25	1.26	20.6	-4.1	±	3.0	9/14/06
2.4	A	0.308	0.25	1.26	24.7	DJ4	1	A	0.308	0.25	1.26	10.3	-14.4	±	2.6	9/14/06
2.4	A	0.308	0.25	1.26	24.7	DJ5	3	A	0.308	0.25	1.26	30.9	6.2	±	3.3	9/14/06
2.4	A	0.308	0.25	1.26	24.7	DJ6	2	A	0.308	0.25	1.26	20.6	-4.1	±	3.0	9/14/06
2.4	A	0.308	0.25	1.26	24.7	DR1	2	A	0.308	0.25	1.26	20.6	-4.1	±	3.0	9/14/06
2.4	A	0.308	0.25	1.26	24.7	DR2	2	A	0.308	0.25	1.26	20.6	-4.1	±	3.0	9/14/06
2.4	A	0.308	0.25	1.26	24.7	DR3	3	A	0.308	0.25	1.26	30.9	6.2	±	3.3	9/14/06
2.4	A	0.308	0.25	1.26	24.7	DR4	4	A	0.308	0.25	1.26	41.2	16.5	±	3.6	9/14/06
2.4	A	0.308	0.25	1.26	24.7	DR5	7	A	0.308	0.25	1.26	72.2	47.4	±	3.8	9/14/06
2.4	A	0.308	0.25	1.26	24.7	DR6	6	A	0.308	0.25	1.26	61.8	37.1	±	3.5	9/14/06
2.4	A	0.308	0.25	1.26	24.7	DR7	3	A	0.308	0.25	1.26	30.9	6.2	±	2.5	9/14/06
2.4	A	0.308	0.25	1.26	24.7	DR8	3	A	0.308	0.25	1.26	30.9	6.2	±	2.5	9/14/06
2.4	A	0.308	0.25	1.26	24.7	DR9	1	A	0.308	0.25	1.26	10.3	-14.4	±	1.4	9/14/06
2.4	A	0.308	0.25	1.26	24.7	DR10	1	A	0.308	0.25	1.26	10.3	-14.4	±	1.4	9/14/06
						DR11										outdoors
2.4	A	0.308	0.25	1.26	24.7	DR12	4	A	0.308	0.25	1.26	41.2	16.5	±	2.9	9/14/06
2.4	A	0.308	0.25	1.26	24.7	DR13	1	A	0.308	0.25	1.26	10.3	-14.4	±	1.4	9/14/06
2.4	A	0.308	0.25	1.26	24.7	DR14	3	A	0.308	0.25	1.26	30.9	6.2	±	2.5	9/14/06
2.4	A	0.308	0.25	1.26	24.7	DR15	2	A	0.308	0.25	1.26	20.6	-4.1	±	3.0	9/14/06

Minimum	**24.7**			**10.3**	**-14.4**
Maximum	**24.7**			**72.2**	**47.4**
Mean	**24.7**			**28.3**	**3.6** ± **17.0**
Std Dev (Total Uncertainty)	**0.0**			**17.0**	**17.0**

Legend:

Probe = Detector A

ε_i = Detector efficiency **(instrument calibration)**

ε_s = Surface efficiency **(ISO-7503-1, 1988)**

ε = Overall efficiency **(ε_i X ε_s X W_A/S_A)**

W_A/S_A = Working Area/Sensing Area of detector **(126 cm^2/100 cm^2)**

cpm = counts per minute

dpm/100 cm^2 = disintegrations per 100 square centimeters **(cpm/ε)**

***Note 1: The net activity of the individual measurements and the individual uncertainty was calculated as follows:**

$$R_S - \overline{R}_B \pm \sqrt{\frac{R_S}{T_S} + \frac{\overline{R}}{T_B}}$$

where :

R_S = gross activity of sample (dpm)

$\overline{R}_B$ = mean gross activity of background (dpm)

T_S = sample counting time (min)

T_B = background counting time (min)

Total uncertainty for all measurements is one standard deviation (see above)

Release Levels Based on NUREG 1.86

DCGL(Avg. over 1 sq. meter) = 100 dpm/100 cm^2 DCGL(Max) = 300 dpm/100 cm^2

INFORMATION REGARDING ABOVE TABLE:

To convert Gross Sample Measurements in "cpm" in the first column to "dpm/100 cm^2" and determine net activity, use following steps:

1. Determine the overall efficiency of each detector (probe) by performing the following steps -

Probe A - Multiply 0.308 X 0.25 X 1.26 = 0.097 (overall efficiency)

2. Multiply the gross measurement in the first column for the applicable detector by the overall efficiency calculated in step 1 above.
3. Subtract the mean gross background measurements in dpm/100 cm^2 from each gross survey measurement in dpm/100cm^2.

Table 4 - MCAS El Toro, Building 319 - Data Conversion and Uncertainty Calc for Alpha Direct Rdg Confirmation (outdoors)

Gross Bkgd Measurements (Bldg 318)						*B-319*	*Gross Survey Measurements (Bldg 319)*						*Net Activity*			*Date Surveyed*
Time for each measurement was 1 minute						Grid	Time for each measurement was 1 minute									
avg cpm	Probe	ε_i	ε_s	W_A/S_A	dpm/100 cm^2	Point	cpm	Probe	ε_i	ε_s	W_A/S_A	dpm/100 cm^2	dpm/100 cm^2	* Note 1		
9	A	0.308	0.25	1.26	92.8	DR11	9	A	0.308	0.25	1.26	92.8	0.0	±	6.1	9/14/06

Minimum	**92.8**	**92.8**	**0.0**
Maximum	**92.8**	**92.8**	**0.0**
Mean	**92.8**	**92.8**	**0.0 ± 6.1**
Std Dev (Total Uncertainty)	**N/A**	**N/A**	

Legend:

Probe = Detector A

ε_i = Detector efficiency **(instrument calibration)**

ε_s = Surface efficiency **(ISO-7503-1, 1988)**

ε = Overall efficiency **(ε_i X ε_s X W_A/S_A)**

W_A/S_A = Working Area/Sensing Area of detector **(126 cm^2/100 cm^2)**

cpm = counts per minute

dpm/100 cm^2 = disintegrations per 100 square centimeters **(cpm/ε)**

***Note 1: The net activity of the individual measurements and the individual uncertainty was calculated as follows:**

$$R_S - \overline{R}_B \pm \sqrt{\frac{R_S}{T_S} + \frac{\overline{R}}{T_B}}$$

where :

R_S = gross activity of sample (dpm)

$\overline{R}_B$ = mean gross activity of background (dpm)

T_S = sample counting time (min)

T_B = background counting time (min)

Total uncertainty for all measurements is one standard deviation (see above)

Release Levels Based on NUREG 1.86

DCGL(Avg. over 1 sq. meter) = 100 dpm/100 cm^2 DCGL(Max) = 300 dpm/100 cm^2

INFORMATION REGARDING ABOVE TABLE:

To convert Gross Sample Measurements in "cpm" in the first column to "dpm/100 cm^2" and determine net activity, use following steps:

1. Determine the overall efficiency of each detector (probe) by performing the following steps -

Probe A - Multiply 0.308 X 0.25 X 1.26 = 0.097 (overall efficiency)

2. Multiply the gross measurement in the first column for the applicable detector by the overall efficiency calculated in step 1 above.
3. Subtract the mean gross background measurements in dpm/100 cm^2 from each gross survey measurement in dpm/100cm^2.

Table 5 - MCAS El Toro, Building 319 - Data Conversion and Uncertainty Calc for Beta Direct Rdg Confirmation (indoors)

Gross Bkgd Measurements (Bldg 318)						*B-319*	*Gross Survey Measurements (Bldg 319)*						*Net Activity*			*Date*
Time for each measurement was 1 minute						Grid	Time for each measurement was 1 minute									*Surveyed*
avg cpm	Probe	ε_i	ε_s	W_A/S_A	dpm/100 cm^2	Point	cpm	Probe	ε_i	ε_s	W_A/S_A	dpm/100 cm^2	dpm/100 cm^2	*	Note 1	
338	A	0.359	0.50	1.26	1494.5	DJ1	346	A	0.359	0.50	1.26	1529.8	35.4	±	24.6	9/14/06
338	A	0.359	0.50	1.26	1494.5	DJ2	382	A	0.359	0.50	1.26	1689.0	194.5	±	25.2	9/14/06
338	A	0.359	0.50	1.26	1494.5	DJ3	334	A	0.359	0.50	1.26	1476.8	-17.7	±	24.4	9/14/06
338	A	0.359	0.50	1.26	1494.5	DJ4	322	A	0.359	0.50	1.26	1423.7	-70.7	±	24.2	9/14/06
338	A	0.359	0.50	1.26	1494.5	DJ5	325	A	0.359	0.50	1.26	1437.0	-57.5	±	24.2	9/14/06
338	A	0.359	0.50	1.26	1494.5	DJ6	345	A	0.359	0.50	1.26	1525.4	31.0	±	24.6	9/14/06
338	A	0.359	0.50	1.26	1494.5	DR1	331	A	0.359	0.50	1.26	1463.5	-31.0	±	24.3	9/14/06
338	A	0.359	0.50	1.26	1494.5	DR2	307	A	0.359	0.50	1.26	1357.4	-137.1	±	23.9	9/14/06
338	A	0.359	0.50	1.26	1494.5	DR3	357	A	0.359	0.50	1.26	1578.5	84.0	±	24.8	9/14/06
338	A	0.359	0.50	1.26	1494.5	DR4	412	A	0.359	0.50	1.26	1821.6	327.2	±	25.8	9/14/06
338	A	0.359	0.50	1.26	1494.5	DR5	382	A	0.359	0.50	1.26	1689.0	194.5	±	25.2	9/14/06
338	A	0.359	0.50	1.26	1494.5	DR6	340	A	0.359	0.50	1.26	1503.3	8.8	±	24.5	9/14/06
338	A	0.359	0.50	1.26	1494.5	DR7	327	A	0.359	0.50	1.26	1445.8	-48.6	±	24.2	9/14/06
338	A	0.359	0.50	1.26	1494.5	DR8	349	A	0.359	0.50	1.26	1544.9	50.4	±	24.7	9/14/06
338	A	0.359	0.50	1.26	1494.5	DR9	237	A	0.359	0.50	1.26	1047.9	-446.6	±	22.5	9/14/06
338	A	0.359	0.50	1.26	1494.5	DR10	322	A	0.359	0.50	1.26	1423.7	-70.7	±	24.2	9/14/06
						DR11										outdoors
338	A	0.359	0.50	1.26	1494.5	DR12	339	A	0.359	0.50	1.26	1499.8	5.3	±	24.5	9/14/06
338	A	0.359	0.50	1.26	1494.5	DR13	321	A	0.359	0.50	1.26	1419.3	-75.2	±	24.1	9/14/06
338	A	0.359	0.50	1.26	1494.5	DR14	320	A	0.359	0.50	1.26	1414.9	-79.6	±	24.1	9/14/06
338	A	0.359	0.50	1.26	1494.5	DR15	355	A	0.359	0.50	1.26	1569.6	75.2	±	24.8	9/14/06

Minimum	**1494.5**	**1047.9**	**-446.6**	
Maximum	**1494.5**	**1821.6**	**327.2**	
Mean	**1494.5**	**1493.0**	**-1.4**	**± 153.5**
Std Dev (Total Uncertainty)	**0.0**	**153.5**	**153.5**	

Legend: **Probe** = Detector A

ε_i = Detector efficiency **(instrument calibration)**

ε_s = Surface efficiency **(ISO-7503-1, 1988)**

ε = Overall efficiency **(ε_i X ε_s X W_A/S_A)**

W_A/S_A = Working Area/Sensing Area of detector **(126 cm²/100 cm²)**

cpm = counts per minute

dpm/100 cm² = disintegrations per 100 square centimeters **(cpm/ε)**

Note 1: The net activity of the individual measurements and the individual uncertainty was calculated as follows:

$$R_S - \overline{R}_B \pm \sqrt{\frac{R_S}{T_S} + \frac{\overline{R}}{T_B}}$$

where :

R_S = gross activity of sample (dpm)

$\overline{R}_B$ = mean gross activity of background (dpm)

T_S = sample counting time (min)

T_B = background counting time (min)

Total uncertainty for all measurements is one standard deviation (see above)

Release Criteria Based on NUREG 1.86

DCGL(Avg. over 1 sq. meter) = 1,000 dpm/100 cm² DCGL(Max) = 3,000 dpm/100 cm²

INFORMATION REGARDING ABOVE TABLE:

To convert Gross Sample Measurements in "cpm" in the first column to "dpm/100 cm²" and determine net activity, use following steps:

1. Determine the overall efficiency of each detector (probe) by performing the following steps -

Probe A - Multiply 0.359 X 0.5 X 1.26 = 0.226 (overall efficiency)

2. Multiply the gross measurement in the first column for the applicable detector by the overall efficiency calculated in step 1 above.
3. Subtract the mean gross background measurements in dpm/100 cm² from each gross survey measurement in dpm/100cm².

Table 6 - MCAS El Toro, Building 319 - Data Conversion and Uncertainty Calc for Beta Direct Rdg Confirmation (outdoors)

Gross Bkgd Measurements (Bldg 318)						*B-319*	*Gross Survey Measurements (Bldg 319)*						*Net Activity*			*Date Surveyed*
Time for each measurement was 1 minute						Grid	Time for each measurement was 1 minute									
avg cpm	Probe	ε_i	ε_s	W_A/S_A	dpm/100 cm^2	Point	cpm	Probe	ε_i	ε_s	W_A/S_A	dpm/100 cm^2	dpm/100 cm^2	* Note 1		
357	A	0.359	0.50	1.26	1578.5	DR11	330	A	0.359	0.50	1.26	1459.1	-119.4	±	24.6	9/14/06
Minimum					**1578.5**							**1459.1**	**-119.4**			
Maximum					**1578.5**							**1459.1**	**-119.4**			
Mean					**1578.5**							**1459.1**	**-119.4**	**±**	**24.6**	
Std Dev (Total Uncertainty)					**N/A**							**N/A**				

Legend:

Probe = Detector A

ε_i = Detector efficiency **(instrument calibration)**

ε_s = Surface efficiency **(ISO-7503-1, 1988)**

ε = Overall efficiency **(ε_i X ε_s X W_A/S_A)**

W_A/S_A = Working Area/Sensing Area of detector **(126 cm^2/100 cm^2)**

cpm = counts per minute

dpm/100 cm^2 = disintegrations per 100 square centimeters **(cpm/ε)**

Note 1: The net activity of the individual measurements and the individual uncertainty was calculated as follows:

$$R_S - \overline{R}_B \pm \sqrt{\frac{R_S}{T_S} + \frac{\overline{R}}{T_B}}$$

where :

R_S = gross activity of sample (dpm)

$\overline{R}_B$ = mean gross activity of background (dpm)

T_S = sample counting time (min)

T_B = background counting time (min)

Total uncertainty for all measurements is one standard deviation (see above)

Release Criteria Based on NUREG 1.86

DCGL(Avg. over 1 sq. meter) = 1,000 dpm/100 cm^2 DCGL(Max) = 3,000 dpm/100 cm^2

INFORMATION REGARDING ABOVE TABLE:

To convert Gross Sample Measurements in "cpm" in the first column to "dpm/100 cm^2" and determine net activity, use following steps:

1. Determine the overall efficiency of each detector (probe) by performing the following steps -

Probe A - Multiply 0.359 X 0.5 X 1.26 = 0.226 (overall efficiency)

2. Multiply the gross measurement in the first column for the applicable detector by the overall efficiency calculated in step 1 above.
3. Subtract the mean gross background measurements in dpm/100 cm^2 from each gross survey measurement in dpm/100cm^2.

Figures

MCAS El Toro Confirmation Surveys

Buildings 318 and 319

September 14, 2006

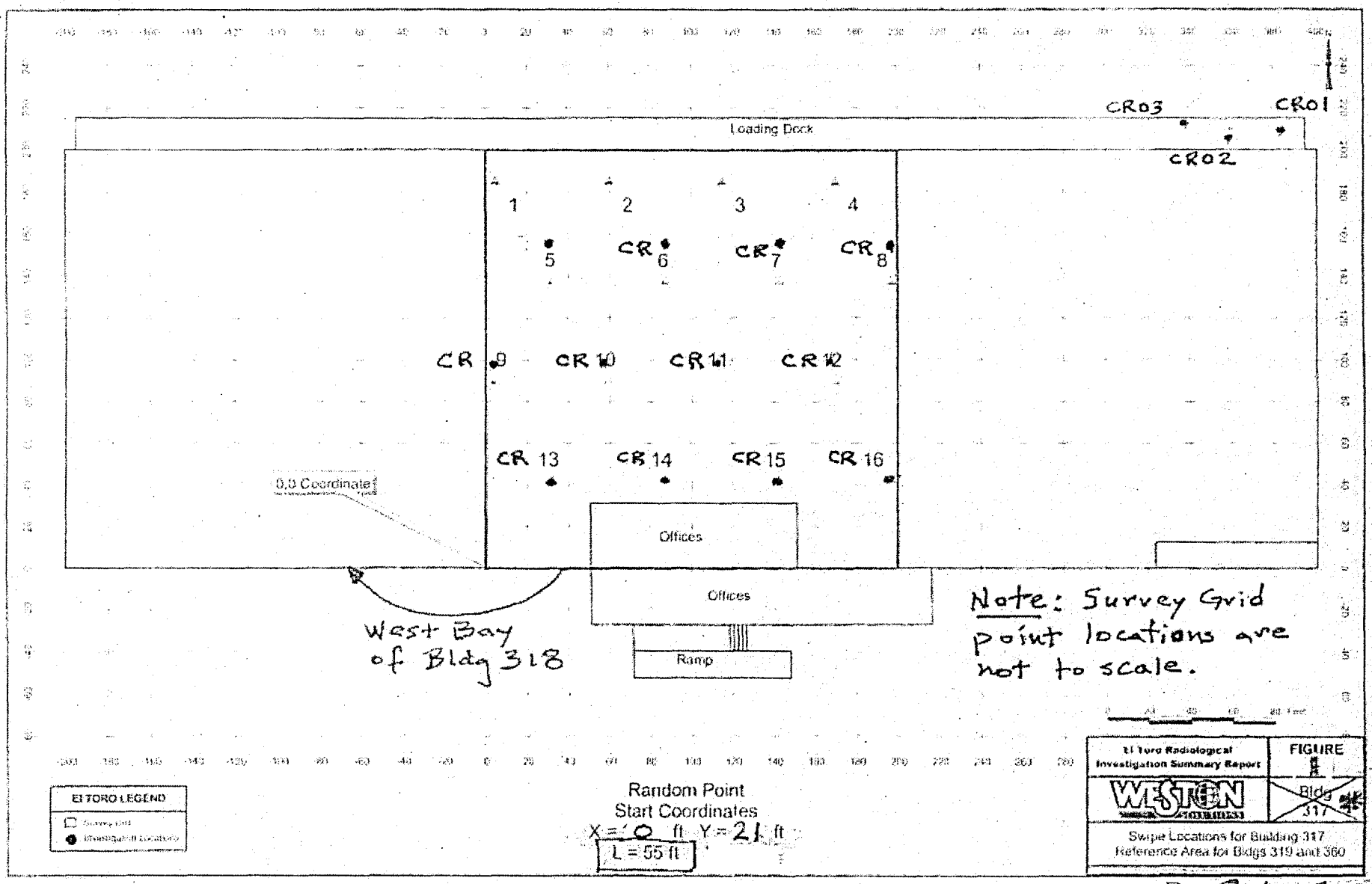
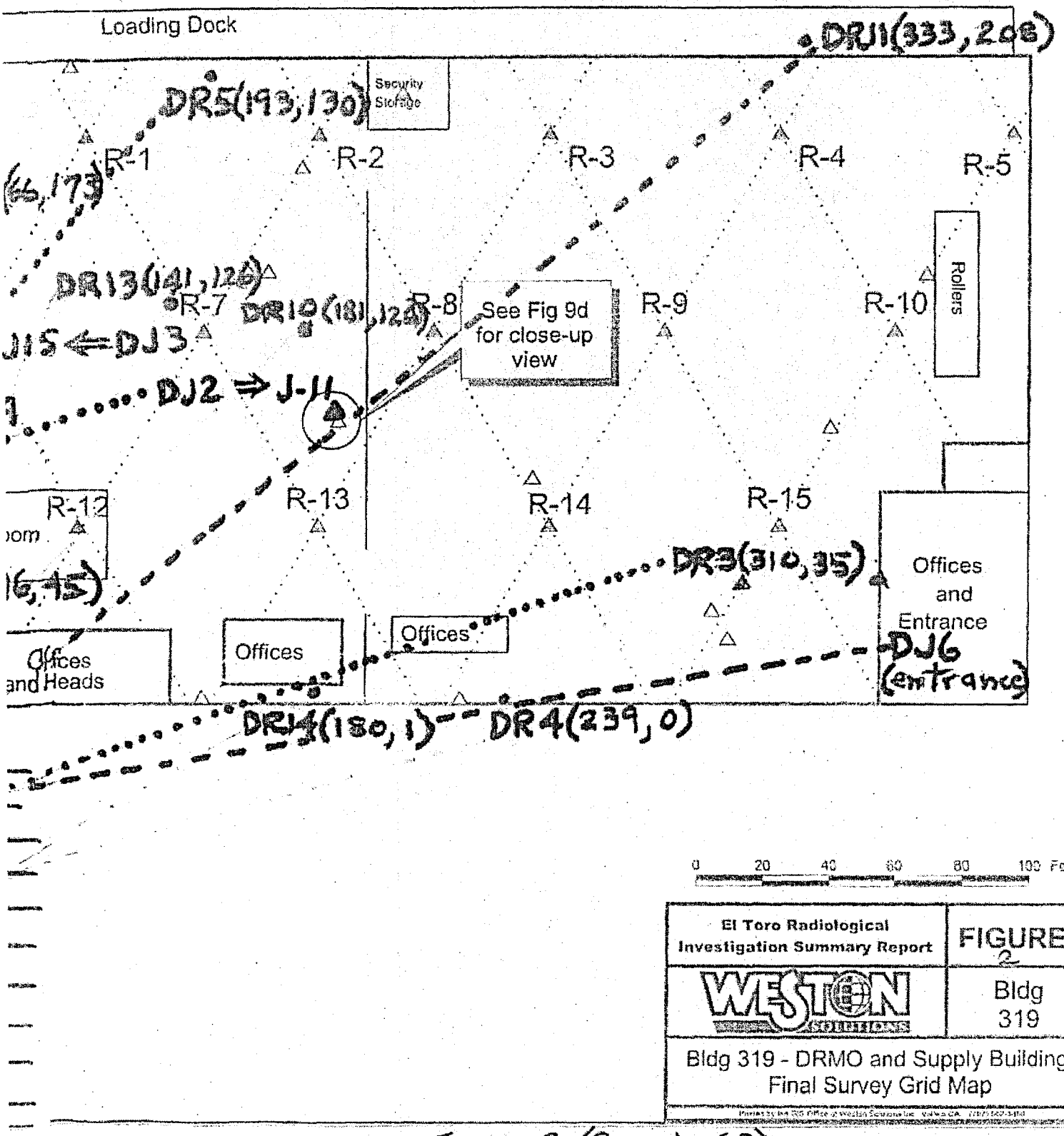


Figure 1

* Use for Bldg 318 West Bay



El Toro Radiological Investigation Summary Report	FIGURE 2
WESTON SOLUTIONS	Bldg 319
Bldg 319 - DRMO and Supply Building Final Survey Grid Map	

Figure 2 (Page 1 of 2)

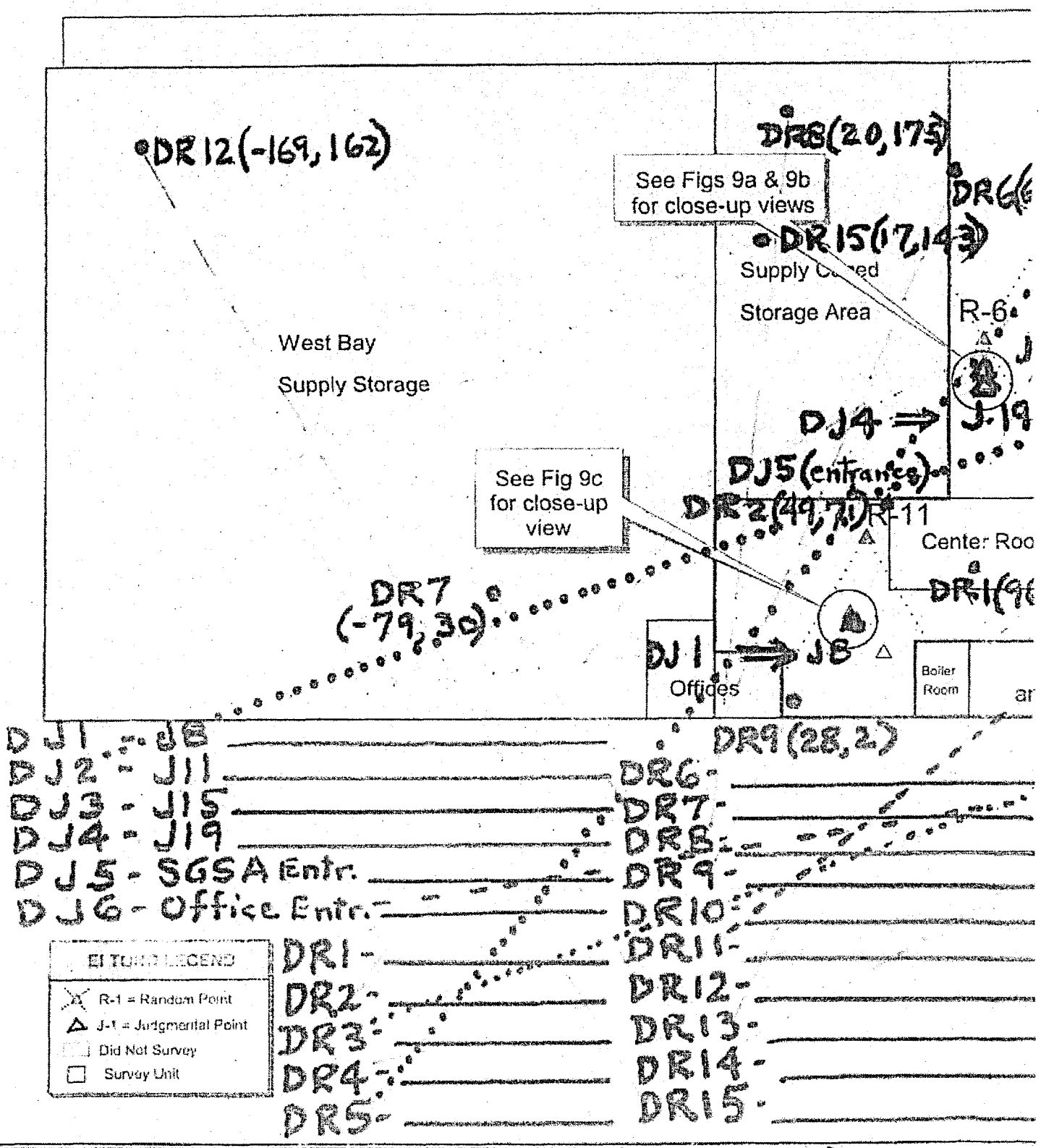


Figure 2 (Page 2 of 2)