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CNC CHARLESTON
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NAVAL NUCLEAR PROPULSION PROGRAM (NNPP) RADIOLOGICAL FINAL REPORT FOR DECOMMISSIONING VOLUME II CNC CHARLESTON SC

4/1/1996

RADIOLOGICAL ENGINEERING DIVISION

NAVY NUCLEAR PROPULSION PROGRAM (NNPP) RADIOLOGICAL FINAL REPORT FOR THE DECOMMISSIONING OF NAVAL BASE CHARLESTON

(VOLUME II)

Prepared by
Radiological Engineering Division
Charleston Naval Shipyard
Charleston, South Carolina

April 1, 1996

NAVAL NUCLEAR PROPULSION PROGRAM (NNPP)

RADIOLOGICAL FINAL REPORT

FOR THE DECOMMISSIONING OF

NAVAL BASE CHARLESTON

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1. Piers R & Z
2. Group 1
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   2. Bldgs 646, 646A & FBM-61
3. Bldg X-10

1. Pier K

a. Introduction:

Pier K is located in grid K-28 of the Charleston Naval Station map and is also identified as structure 325.

(1) Description:

Structure 325 is approximately 960' long by 30' wide, oriented east into the Cooper River. Structure 325 is constructed of wood and concrete pilings supporting a concrete slab surface.

(2) Brief History:

(a) **Use:** This pier was constructed as part of the U.S. naval shore establishment expansion program and was used as a Naval Supply Center fueling pier and berth for the Auxiliary Repair Docking Medium (ARDM).

(b) **Radiological History:** This structure was certified to berth nuclear powered vessels.

(3) Survey Requirements:

Nuclear Ship Berthing Area surveys. Group 2 surveys were performed on the pier and extended 40' beyond the base of the pier.

b. Discussion:

The pier was divided into approximately 10' by 10' grids. Where physically possible, each grid was subdivided into two, 3' by 3' subsections which were located in areas of highest potential for contamination. One of these subsections was surveyed using the IM-247/PD and the other using the IM-253/PD (HV-1 PHA). Solid material samples were taken from a minimum of 50% of the 10' by 10' grids. Additionally, solid material samples were taken from each 3' by 3' subsection that resulted in levels greater than twice background with the IM-253/PD (HV-1 PHA).

Pier K including the 40' extension was divided into 330, 10' by 10' grids.

Individual backgrounds were used for this pier and its land side approach. The IM-247/PD and the IM-253/PD (HV-1 PHA and HV-2 GROSS) backgrounds used for the asphalt pours were 60, 400, and 8,500 counts per minute based upon background radiation levels obtained from the Building 233 east road area. The IM-247/PD and the IM-253/PD (HV-1 PHA and HV-2 GROSS) backgrounds used for the low and high natural activity concrete pours were 40, 200, 5,000 and 50, 300, 8,000 counts per minute. These areas were based

1. Pier K

upon background radiation levels obtained from the Building 1601 parking lot and the concrete area outside Building 1601B, respectively.

A total of 167 solid material samples were taken. Each solid sample was removed from the grid location indicating the area of highest potential. The following naturally occurring radionuclides were typical isotopes identified during analysis of solid material samples: lead 212 and lead 214.

c. Summary:

Surveys performed with the IM-247/PD did not detect areas greater than 450μμCi/20cm^2.

Surveys performed with the IM-253/PD (HV-1 PHA) detected one area greater than or equal to twice background.

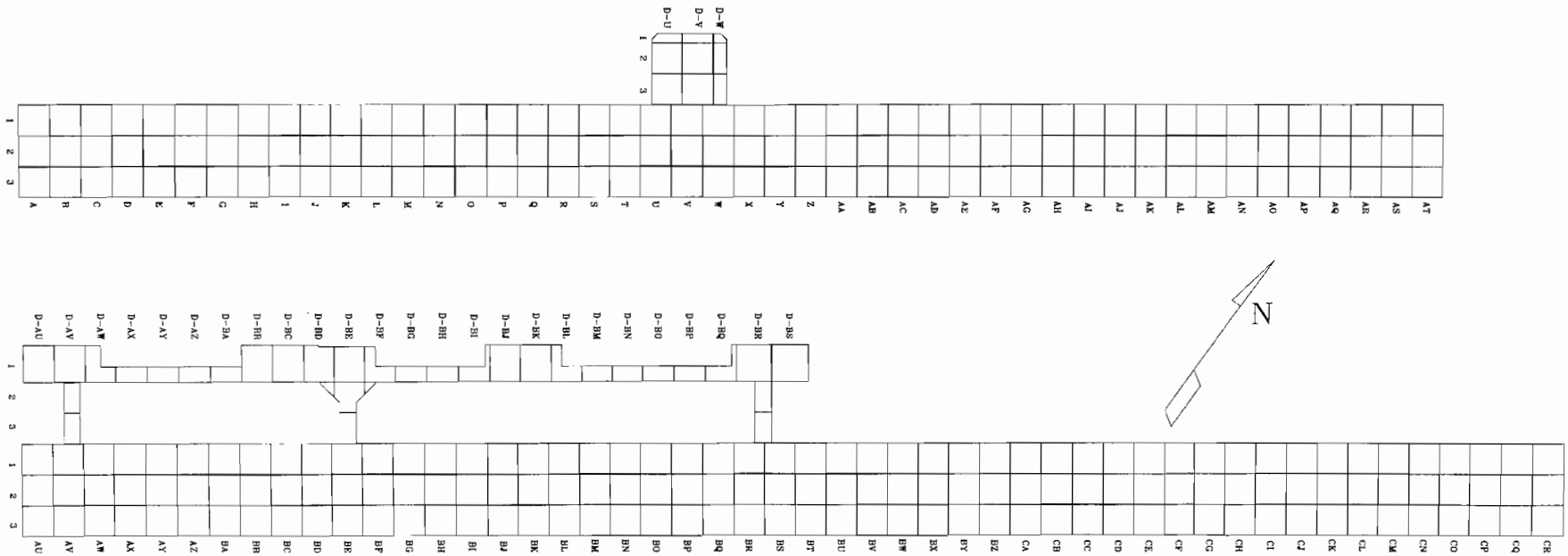
Surveys performed with the IM-253/PD (HV-2 GROSS) detected one area greater than or equal to twice background.

Analysis performed on solid material samples with the multi-channel analyzer (MCA) detected gross gamma equivalent cobalt 60 levels ranging from a low of 0.52 pCi/g to a high of 5.29 pCi/g.

Analysis performed on solid material samples with the MCA for specific cobalt 60, indicated that all solid material samples were less than 1 pCi/g.

1. Pier K

d. Overall Grid Map



1. Pier K

e. Localized Grid Maps

	1	2	3
E	<450 – – – – 1.16 <1 – 200 200 – – –	<450 – – – – – – – 200 250 – – –	<450 – – – – 1.38 <1 200 200 – – – –
D	<450 – – – – – – – 300 300 – – –	<450 – – – – 2.01 – – 300 300 – – –	<450 – – – – – – – 300 400 – – –
C	<450 – – – – 2.88 <1 – 300 300 – – –	<450 – – – – – – – 300 300 – – –	<450 – – – – 1.81 <1 – 300 330 – – –
B	<450 – – – – – – – 300 450 – – –	<450 – – – – 2.88 <1 – 300 350 – – –	<450 – – – – – – – 300 350 – – –
A	<450 – – – – 4.39 <1 – 300 450 – – –	<450 – – – – – – – 300 450 – – –	<450 – – – – 5.29 <1 – 300 150 – – –

	1	2	3
J	<450 – – – – – – – 200 200 – – –	<450 – – – – 1.12 – – 200 250 – – –	<450 – – – – – – – 200 200 – – –
I	<450 – – – – 1.23 <1 – 200 200 – – –	<450 – – – – – – – 200 300 – – –	<450 – – – – 1.41 <1 – 200 200 – – –
H	<450 – – – – – – – 200 200 – – –	<450 – – – – 1.30 <1 – <450 200 500 5000 10000 2.79 <1	<450 – – – – – – – 200 200 – – –
G	<450 – – – – 1.27 <1 – 200 250 – – –	<450 – – – – – – – 200 250 – – –	<450 – – – – 1.22 <1 – 200 200 – – –
F	<450 – – – – – – – 200 250 – – –	<450 – – – – 1.41 <1 – 200 250 – – –	<450 – – – – – – – 200 200 – – –

Sample Data

< 450 – IM-247/PD Results [μμCi/20cm²]
200 – IM-253/PD (HV-1 PHA) [bkg.]
300 – IM-253/PD (HV-1 PHA) [cpm]
7000 – IM-253/PD (HV-2 GROSS) [bkg.]
7300 – IM-253/PD (HV-2 GROSS) [cpm]
1.82 – MCA Gross Gamma Eq. Co-60 [pCi/g]
<1 – MCA Specific Co-60 Results [pCi/g]

1. Pier K

e. Localized Grid Maps

	1	2	3
O	<450 – – – – 1.40 <1 – 200 300 – – –	<450 – – – – – – – 200 300 – – –	<450 – – – – 1.81 – – 200 250 – – –
N	<450 – – – – – – – 200 300 – – –	<450 – – – – 1.49 <1 – 200 300 – – –	<450 – – – – – – – 200 200 – – –
M	<450 – – – – 1.21 – – 200 300 – – –	<450 – – – – – – – 200 300 – – –	<450 – – – – 1.75 <1 – 200 200 – – –
L	<450 – – – – – – – 200 250 – – –	<450 – – – – 1.61 <1 – 200 300 – – –	<450 – – – – – – – 200 200 – – –
K	<450 – – – – 1.29 <1 – 200 250 – – –	<450 – – – – – – – 200 300 – – –	<450 – – – – 1.27 <1 – 200 200 – – –

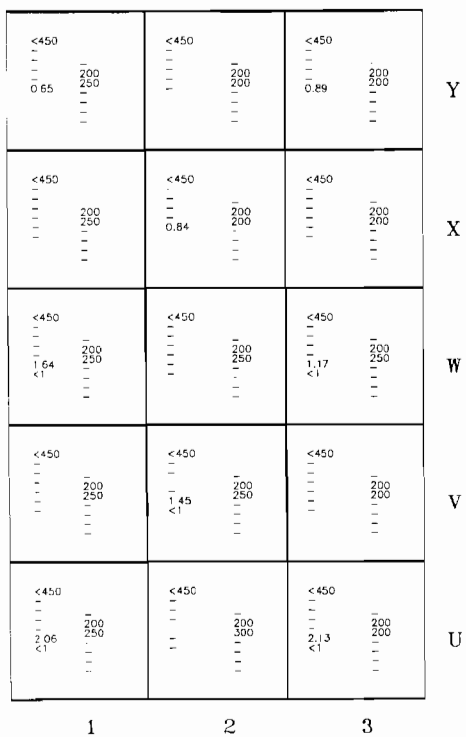
	1	2	3
T	<450 – – – – – – – 200 250 – – –	<450 – – – – 1.62 <1 – 200 250 – – –	<450 – – – – – – – 200 200 – – –
S	<450 – – – – 1.38 – – 200 300 – – –	<450 – – – – – – – 200 250 – – –	<450 – – – – 1.64 <1 – 200 200 – – –
R	<450 – – – – – – – 200 350 – – –	<450 – – – – 1.91 <1 – 200 300 – – –	<450 – – – – – – – 200 200 – – –
Q	<450 – – – – 1.87 <1 – 200 300 – – –	<450 – – – – – – – 200 300 – – –	<450 – – – – 1.65 <1 – 200 250 – – –
P	<450 – – – – – – – 200 300 – – –	<450 – – – – 1.42 <1 – 200 250 – – –	<450 – – – – – – – 200 250 – – –

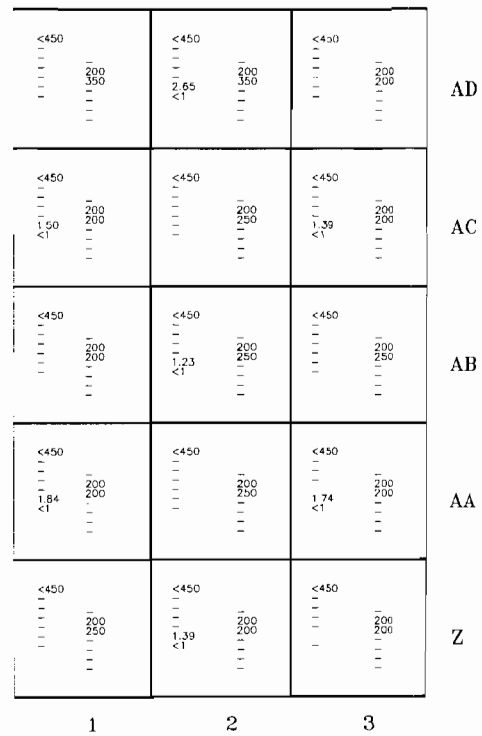
Sample Data

< 450 – IM-247/PD Results [μμCi/26cm²]
200 – IM-253/PD (HV-1 PHA) [bkg.]
300 – IM-253/PD (HV-1 PHA) [cpm]
7000 – IM-253/PD (HV-2 GROSS) [bkg.]
7300 – IM-253/PD (HV-2 GROSS) [cpm]
1.82 – MCA Gross Gamma Eq. Co-60 [pCi/g]
<1 – MCA Specific Co-60 Results [pCi/g]

1. Pier K

e. Localized Grid Maps





Sample Data

<450 – IM-247/PD Results [μμCi/20cm²]
200 – IM-253/PD (HV-1 PHA) [bkg.]
300 – IM-253/PD (HV-1 PHA) [cpm]
7000 – IM-253/PD (HV-2 GROSS) [bkg.]
7300 – IM-253/PD (HV-2 GROSS) [cpm]
1.82 – MCA Gross Gamma Eq. Co-60 [pCi/g]
<1 – MCA Specific Co-60 Results [pCi/g]

1. Pier K

e. Localized Grid Maps

	1	2	3
AI	<450 – – – – 2.20 <1 – 200 350 – – – –	<450 – – – – – – – 200 300 – – – –	<450 – – – – 2.67 <1 – 200 200 – – – –
AH	<450 – – – – – – – 200 250 – – – –	<450 – – – – 1.74 <1 – 200 300 – – – –	<450 – – – – – – – 200 200 – – – –
AG	<450 – – – – 2.10 <1 – 200 350 – – – –	<450 – – – – – – – 200 200 – – – –	<450 – – – – 1.40 <1 – 200 200 – – – –
AF	<450 – – – – – – – 200 350 – – – –	<450 – – – – 2.16 <1 – 200 200 – – – –	<450 – – – – – – – 200 200 – – – –
AE	<450 – – – – 1.38 <1 – 200 250 – – – –	<450 – – – – – – – 200 250 – – – –	<450 – – – – 1.18 <1 – 200 200 – – – –

	1	2	3
AN	<450 – – – – – – – 200 350 – – – –	<450 – – – – 1.60 <1 – 200 300 – – – –	<450 – – – – – – – 200 150 – – – –
AM	<450 – – – – 1.34 <1 – 200 250 – – – –	<450 – – – – – – – 200 250 – – – –	<450 – – – – 1.97 <1 – 200 200 – – – –
AL	<450 – – – – – – – 200 250 – – – –	<450 – – – – 1.49 <1 – 200 300 – – – –	<450 – – – – – – – 200 200 – – – –
AK	<450 – – – – 1.31 <1 – 200 250 – – – –	<450 – – – – – – – 200 250 – – – –	<450 – – – – 1.52 <1 – 200 200 – – – –
AJ	<450 – – – – – – – 200 250 – – – –	<450 – – – – 1.10 <1 – 200 300 – – – –	<450 – – – – – – – 200 200 – – – –

Sample Data

<450 – IM-247/PD Results [μaCi/20cm²]
200 – IM-253/PD (HV-1 PHA) [bkg.]
300 – IM-253/PD (HV-1 PHA) [cpm]
7000 – IM-253/PD (HV-2 GROSS) [bkg.]
7300 – IM-253/PD (HV-2 GROSS) [cpm]
1.82 – MCA Gross Gamma Eq. Co-60 [pCi/g]
<1 – MCA Specific Co-60 Results [pCi/g]

1. Pier K

e. Localized Grid Maps

	1	2	3
AS	<450 – – – – 1.37 <1 – 200 250 – – –	<450 – – – – – – – 200 300 – – –	<450 – – – – 1.47 <1 – 200 200 – – –
AR	<450 – – – – – – – 200 250 – – –	<450 – – – – 1.48 – – 200 250 – – –	<450 – – – – – – – 200 200 – – –
AQ	<450 – – – – 2.52 <1 – 200 250 – – –	<450 – – – – – – – 200 250 – – –	<450 – – – – 1.43 <1 – 200 200 – – –
AP	<450 – – – – – – – 200 300 – – –	<450 – – – – 1.55 <1 – 200 250 – – –	<450 – – – – – – – 200 200 – – –
AO	<450 – – – – 1.56 <1 – 200 350 – – –	<450 – – – – – – – 200 300 – – –	<450 – – – – 1.60 <1 – 200 150 – – –

	1	2	3
AX	<450 – – – – – – – 200 250 – – –	<450 – – – – 1.20 – – 200 300 – – –	<450 – – – – – – – 200 300 – – –
AW	<450 – – – – 1.70 <1 – 200 250 – – –	<450 – – – – – – – 200 250 – – –	<450 – – – – 1.15 <1 – 200 250 – – –
AV	<450 – – – – – – – 200 250 – – –	<450 – – – – 1.71 <1 – 200 300 – – –	<450 – – – – – – – 200 300 – – –
AU	<450 – – – – 1.18 <1 – 200 250 – – –	<450 – – – – – – – 200 250 – – –	<450 – – – – 1.71 <1 – 200 300 – – –
AT	<450 – – – – – – – 200 250 – – –	<450 – – – – 1.77 <1 – 200 300 – – –	<450 – – – – – – – 200 200 – – –

Sample Data

<450 – IM-247/PD Results [μCi/20cm^2]
200 – IM-253/PD (HV-1 PHA) [bkg.]
300 – IM-253/PD (HV-1 PHA) [cpm]
7000 – IM-253/PD (HV-2 GROSS) [bkg.]
7300 – IM-253/PD (HV-2 GROSS) [cpm]
1.82 – MCA Gross Gamma Eq. Co-60 [pCi/g]
<1 – MCA Specific Co-60 Results [pCi/g]

1. Pier K

e. Localized Grid Maps

	1	2	3
BC	<450 – – – – 1.32 <1 – 200 200 – – – –	<450 – – – – – – – 200 200 – – – –	<450 – – – – 0.75 – 200 150 – – – –
BB	<450 – – – – – – – 200 150 – – – –	<450 – – – – 1.53 – 200 150 – – – –	<450 – – – – – – – 200 150 – – – –
BA	<450 – – – – 1.36 <1 – 200 200 – – – –	<450 – – – – – – – 200 150 – – – –	<450 – – – – 1.33 <1 – 200 150 – – – –
AZ	<450 – – – – – – – 200 250 – – – –	<450 – – – – 1.06 – 200 300 – – – –	<450 – – – – – – – 200 150 – – – –
AY	<450 – – – – – 1.15 <1 – 200 250 – – – –	<450 – – – – – – – 200 250 – – – –	<450 – – – – – 1.10 <1 – 200 250 – – – –

	1	2	3
BH	<450 – – – – – – – 200 100 – – – –	<450 – – – – 1.50 – 200 150 – – – –	<450 – – – – – – – 200 150 – – – –
BG	<450 – – – – 1.16 <1 – 200 150 – – – –	<450 – – – – – – – 200 150 – – – –	<450 – – – – 1.23 <1 – 200 150 – – – –
BF	<450 – – – – – – – 200 150 – – – –	<450 – – – – 0.85 – 200 150 – – – –	<450 – – – – – – – 200 150 – – – –
BE	<450 – – – – – 1.46 <1 – 200 200 – – – –	<450 – – – – – – – 200 200 – – – –	<450 – – – – 3.63 – 200 100 – – – –
BD	<450 – – – – – – – 200 200 – – – –	<450 – – – – 1.17 <1 – 200 200 – – – –	<450 – – – – – – – 200 150 – – – –

Sample Data

<450 – IM-247/PD Results [$\mu\mu$Ci/20cm^2]
200 – IM-253/PD (HV-1 PHA) [bkg.]
300 – IM-253/PD (HV-1 PHA) [cpm]
7000 – IM-253/PD (HV-2 GROSS) [bkg.]
7300 – IM-253/PD (HV-2 GROSS) [cpm]
1.82 – MCA Gross Gamma Eq. Co-60 [pCi/g]
<1 – MCA Specific Co-60 Results [pCi/g]

1. Pier K

e. Localized Grid Maps

	1	2	3
BM	<450 – – – – 1.17 <1 – 200 100 – – – –	<450 – – – – – – – 200 150 – – – –	<450 – – – – 1.36 <1 – 200 150 – – – –
BL	<450 – – – – – – – 200 150 – – – –	<450 – – – – 1.44 – – 200 150 – – – –	<450 – – – – – – – 200 150 – – – –
BK	<450 – – – – 1.02 <1 – 200 200 – – – –	<450 – – – – – – – 200 200 – – – –	<450 – – – – 1.47 <1 – 200 125 – – – –
BJ	<450 – – – – – – – 200 100 – – – –	<450 – – – – 0.89 – – 200 200 – – – –	<450 – – – – – – – 200 125 – – – –
BI	<450 – – – – – – – 200 100 – – – –	<450 – – – – – – – 200 150 – – – –	<450 – – – – 1.28 <1 – 200 300 – – – –

	1	2	3
BR	<450 – – – – – – – 200 100 – – – –	<450 – – – – 1.36 – – 200 150 – – – –	<450 – – – – – – – 200 150 – – – –
BQ	<450 – – – – 1.42 <1 – 200 100 – – – –	<450 – – – – – – – 200 200 – – – –	<450 – – – – 1.51 <1 – 200 100 – – – –
BP	<450 – – – – – – – 200 150 – – – –	<450 – – – – 1.61 <1 – 200 150 – – – –	<450 – – – – – – – 200 150 – – – –
BO	<450 – – – – 1.00 <1 – 200 100 – – – –	<450 – – – – – – – 200 150 – – – –	<450 – – – – 1.46 <1 – 200 150 – – – –
BN	<450 – – – – – – – 200 150 – – – –	<450 – – – – 1.24 <1 – 200 200 – – – –	<450 – – – – – – – 200 150 – – – –

Sample Data

<450 – IM-247/PD Results (µrCi/20cm²)
200 – IM-253/PD (HV-1 PHA) (bkg)
300 – IM-253/PD (HV-1 PHA) (cpm)
7000 – IM-253/PD (HV-2 GROSS) (bkg)
7300 – IM-253/PD (HV-2 GROSS) (cpm)
1.82 – MCA Gross Gamma Eq Co-60 (pCi/g)
<1 – MCA Specific Co-60 Results (pCi/g)

1. Pier K

e. Localized Grid Maps

	1	2	3
BW	<450 – – – – 1.19 <1 – 200 100 – – – –	<450 – – – – – – – 200 200 – – – –	<450 – – – – 1.23 <1 – 200 200 – – – –
BV	<450 – – – – – – – 200 100 – – – –	<450 – – – – 1.55 <1 – 200 200 – – – –	<450 – – – – – – – 200 200 – – – –
BU	<450 – – – – 1.28 <1 – 200 100 – – – –	<450 – – – – – – – 200 150 – – – –	<450 – – – – 1.14 <1 – 200 100 – – – –
BT	<450 – – – – – – – 200 100 – – – –	<450 – – – – 0.76 – – 200 200 – – – –	<450 – – – – – – – 200 100 – – – –
BS	<450 – – – – 1.36 <1 – 200 150 – – – –	<450 – – – – – – – 200 150 – – – –	<450 – – – – 1.39 <1 – 200 100 – – – –

	1	2	3
CB	<450 – – – – – – – 200 100 – – – –	<450 – – – – 1.36 <1 – 200 100 – – – –	<450 – – – – – – – 200 100 – – – –
CA	<450 – – – – 1.75 <1 – 200 100 – – – –	<450 – – – – – – – 200 250 – – – –	<450 – – – – 4.36 <1 – 200 225 – – – –
BZ	<450 – – – – – – – 200 100 – – – –	<450 – – – – 1.53 <1 – 200 100 – – – –	<450 – – – – – – – 200 50 – – – –
BY	<450 – – – – 1.39 <1 – 200 100 – – – –	<450 – – – – – – – 200 150 – – – –	<450 – – – – 0.73 – – 200 150 – – – –
BX	<450 – – – – – – – 200 100 – – – –	<450 – – – – 1.40 <1 – 200 200 – – – –	<450 – – – – – – – 200 200 – – – –

Sample Data

<450 – IM-247/PD Results [μμCi/20cm²]
200 – IM-253/PD (HV-1 PHA) [bkg.]
300 – IM-253/PD (HV-1 PHA) [cpm]
7000 – IM-253/PD (HV-2 GROSS) [bkg.]
7300 – IM-253/PD (HV-2 GROSS) [cpm]
1.82 – MCA Gross Gamma Eq. Co-60 [pCi/g]
<1 – MCA Specific Co-60 Results [pCi/g]

1. Pier K

e. Localized Grid Maps

	1	2	3
CG	<450 – – – 2.04 <1 – 200 150 – – – –	<450 – – – – – – – 200 100 – – – –	<450 – – – – 1.48 – – 200 150 – – – –
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CE	<450 – – – – 0.94 – – 200 100 – – – –	<450 – – – – – – – 200 50 – – – –	<450 – – – – 1.10 – – 200 250 – – – –
CD	<450 – – – – – – – 200 100 – – – –	<450 – – – – 1.00 – – 200 100 – – – –	<450 – – – – – – – 200 250 – – – –
CC	<450 – – – – 0.52 – – 200 100 – – – –	<450 – – – – – – – 200 100 – – – –	<450 – – – – 1.79 – – 200 100 – – – –

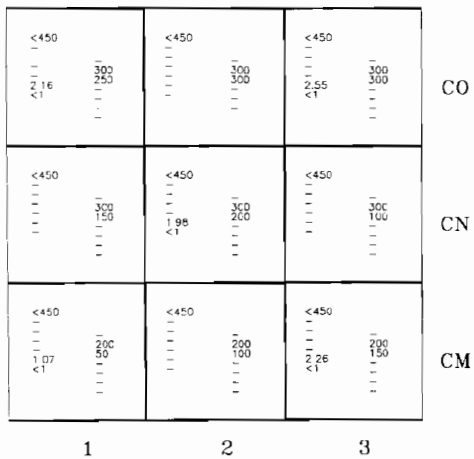
	1	2	3
CL	<450 – – – – – – – 200 100 – – – –	<450 – – – – 1.03 – – 200 100 – – – –	<450 – – – – – – – 200 150 – – – –
CK	<450 – – – – 0.84 – – 200 50 – – – –	<450 – – – – – – – 200 50 – – – –	<450 – – – – 1.54 – – 200 200 – – – –
CJ	<450 – – – – – – – 200 50 – – – –	<450 – – – – 1.01 – – 200 100 – – – –	<450 – – – – – – – 200 200 – – – –
CI	<450 – – – – 1.20 – – 200 100 – – – –	<450 – – – – – – – 200 50 – – – –	<450 – – – – 1.64 – – 200 150 – – – –
CH	<450 – – – – – – – 200 150 – – – –	<450 – – – – 1.22 – – 200 100 – – – –	<450 – – – – – – – 200 100 – – – –

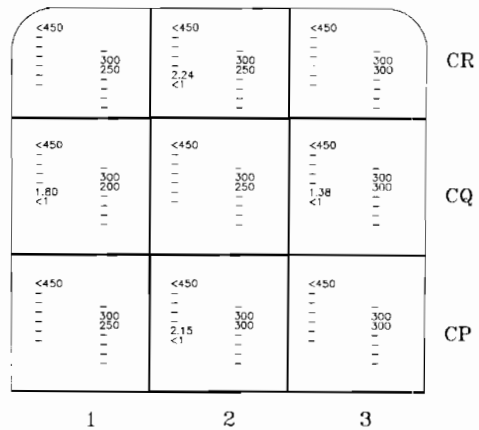
Sample Data

< 450 – IM-247/PD Results [μμCv/20cm²]
200 – IM-253/PD (HV-1 PHA) [bkg.]
300 – IM-253/PD (HV-1 PHA) [cpm]
7000 – IM-253/PD (HV-2 GROSS) [bkg.]
7300 – IM-253/PD (HV-2 GROSS) [cpm]
1.82 – MCA Gross Gamma Eq. Co-60 [pCi/g]
<1 – MCA Specific Co-60 Results [pCi/g]

1. Pier K

e. Localized Grid Maps



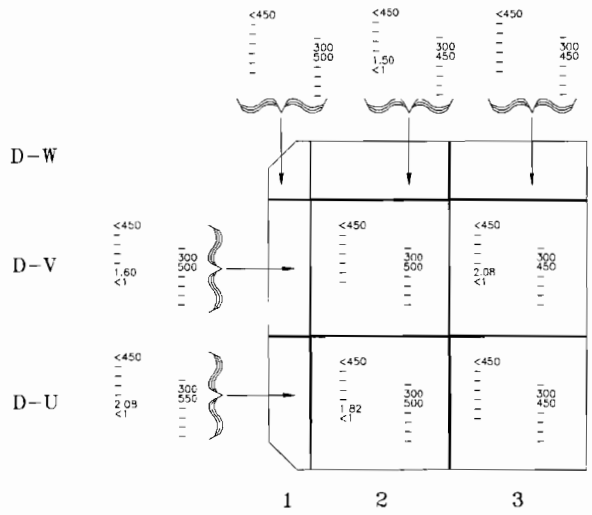


Sample Data

<450 – IM-247/PD Results [μμCi/20cm²]
200 – IM-253/PD (HV-1 PHA) [bkg.]
300 – IM-253/PD (HV-1 PHA) [cpm]
7000 – IM-253/PD (HV-2 GROSS) [bkg.]
7300 – IM-253/PD (HV-2 GROSS) [cpm]
1.82 – MCA Gross Gamma Eq. Co-60 [pCi/g]
<1 – MCA Specric Co-60 Results [pCi/g]

1. Pier K

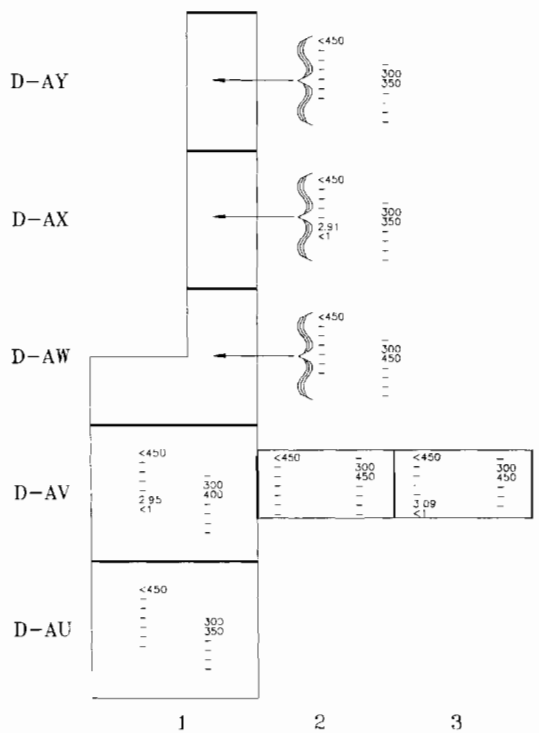
e. Localized Grid Maps

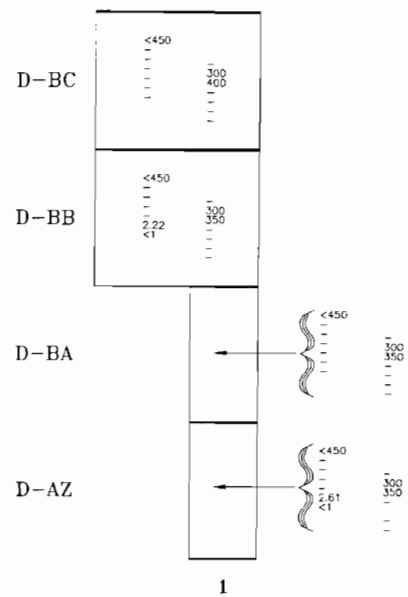


Sample Data
< 450 – IM-247/PD Results [μμCi/20cm²]
200 – IM-253/PD (HV-1 PHA) [bkg.]
300 – IM-253/PD (HV-1 PHA) [cpm]
7000 – IM-253/PD (HV-2 GROSS) [bkg.]
7300 – IM-253/PD (HV-2 GROSS) [cpm]
1.82 – MCA Gross Gamma Eq. Co-60 [pCi/g]
<1 – MCA Specific Co-60 Results [pCi/g]

1. Pier K

e. Localized Grid Maps

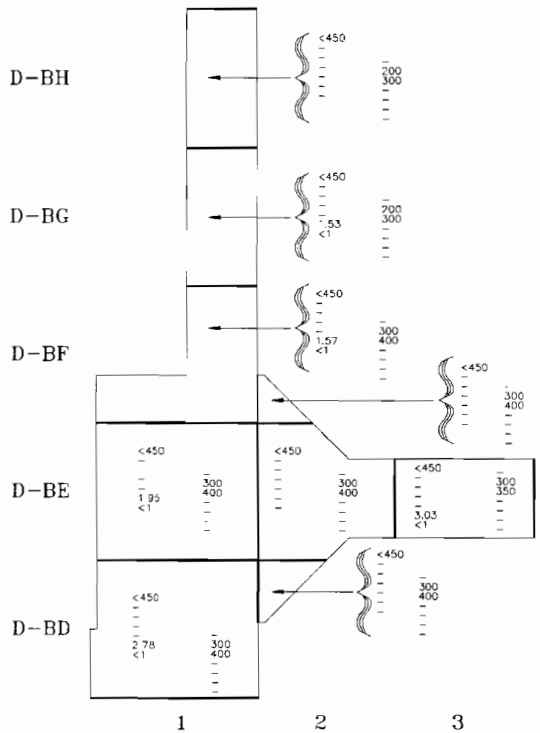


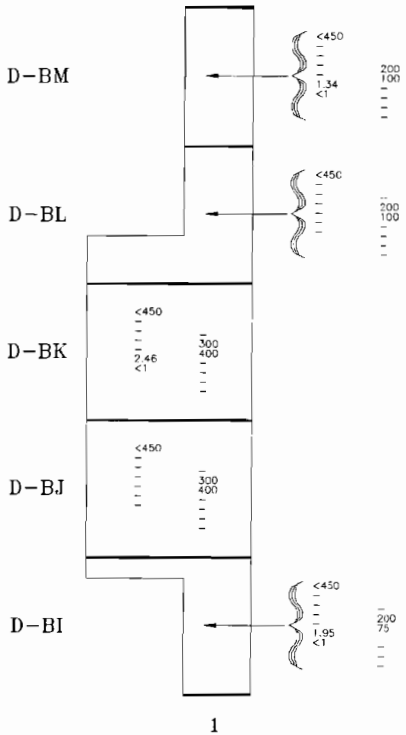


Sample Data
<450 – IM-247/PD Results [µµCi/20cm²]
200 – IM-253/PD (HV-1 PHA) [bkg.]
300 – IM-253/PD (HV-1 PHA) [cpm]
7030 – IM-253/PD (HV-2 GROSS) [bkg.]
7330 – IM-253/PD (HV-2 GROSS) [cpm]
1.32 – MCA Gross Gamma Eq. Co-60 [pCi/g]
<1 – MCA Specific Co-60 Results [pCi/g]

1. Pier K

e. Localized Grid Maps



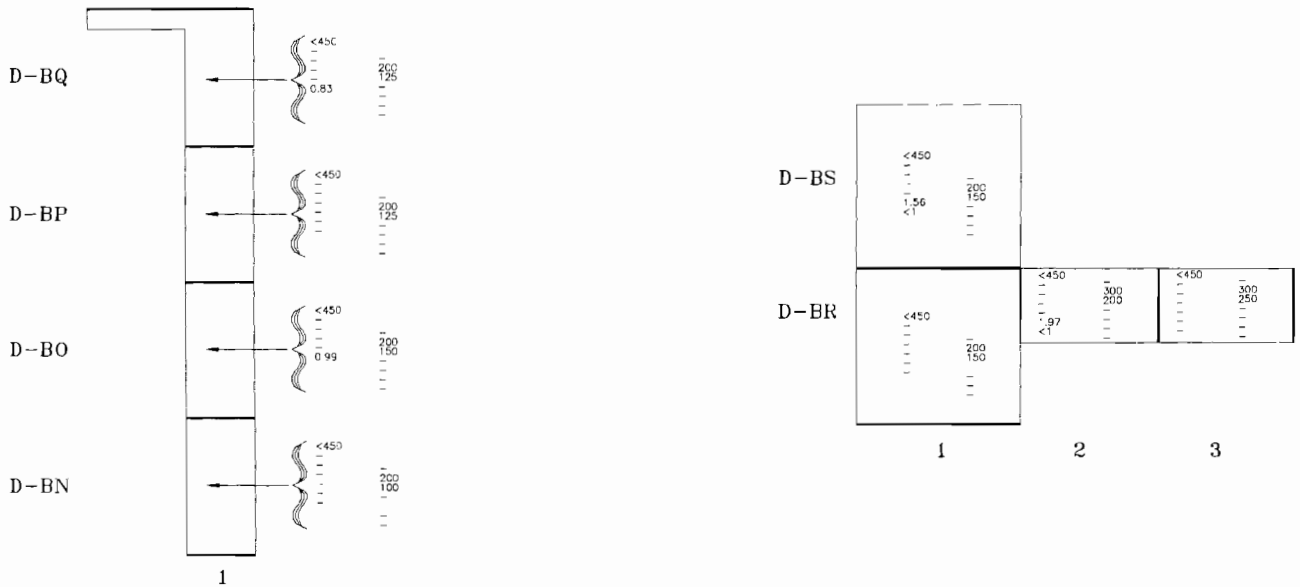


Sample Data

<450 – IM-247/PD Results [µuCi/20cm²]
200 – IM-253/PD (HV-1 PHA) [bkg.]
300 – IM-253/PD (HV-1 PHA) [cpm]
7000 – IM-253/PD (HV-2 GROSS) [bkg.]
7300 – IM-253/PD (HV-2 GROSS) [cpm]
1.82 – MCA Gross Gamma Eq. Co-60 [pCi/g]
<1 – MCA Specific Co-60 Results [pCi/g]

1. Pier K

e. Localized Grid Maps



Sample Data

<450 – IM-247/PD Results [μμCi/20cm²]
200 – IM-253/PD (HV-1 PHA) [bkg.]
300 – IM-253/PD (HV-1 PHA) [cpm]
7000 – IM-253/PD (HV-2 GROSS) [bkg.]
7300 – IM-253/PD (HV-2 GROSS) [cpm]
1.82 – MCA Gross Gamma Eq. Co-60 [pCi/g]
<1 – MCA Specific Co-60 Results [pCi/g]

1. Pier K

f. Prior To Photograph

Head of pier, looking east.

1. Pier K

g. After Photograph

From grid # D-AV-1, facing east.

1. Pier K

g. After Photograph

From grid D-BR-1, looking west.

1. PIER L

a. Introduction:

Pier L is located in grid K-27 of the Charleston Naval Station map and was constructed in 1961. Pier L is also identified as structure 326.

(1) Description:

Structure 326 is 960' long and 30' wide oriented northeast into the Cooper River. Topside structures include one 5' by 8' security building, one 11' by 42' shore power distribution center and one 5' by 17' pierside receptacle center.

(2) Brief History:

(a) **Use:** This pier was constructed as part of the U.S. naval shore establishment expansion program and was used to berth various naval vessels.

(b) **Radiological History:** This structure was certified to berth nuclear vessels. Loose surface contamination levels were less than 450 $\mu\mu Ci/100cm^2$.

(3) Survey Requirements:

Nuclear Ship Berthing Area surveys. Group 2 surveys were performed on the pier and extended 40' beyond the end of the pier.

b. Discussion:

Pier L is categorized under Nuclear Ship Berthing Areas. Because SSBNs were once regularly berthed along this structure, prepackaged shipments of low level radioactive material may have been handled on the pier. Group 2 surveys were performed on the pier and 40' beyond the base of the pier.

Group 2 survey areas were divided into approximately 10' by 10' grids. Where physically possible, each grid contained two 3' by 3' subsections which were located in areas of highest potential for contamination. One of these subsections was surveyed using the IM-247/PD and the other using the IM-253/PD (HV-1 PHA). Solid material samples were taken from a minimum of 50% of the 10' by 10' grids. Additionally, solid material samples were taken from each 3' by 3' subsection that resulted in levels greater than twice background with the IM-253/PD (HV-1 PHA).

Pier L including the 40' extension was divided into 297 10' by 10' grids.

1. PIER L

Individual backgrounds were used for this pier and its land side approach. The main section of Pier L is constructed primarily of concrete and its approach is of asphalt. The IM-247/PD and IM-253/PD (HV-1 PHA and HV-2 GROSS) backgrounds of 40, 450, and 4750 counts per minute used for the concrete pours were based upon background levels obtained from the Pier K Quay Wall. The IM-247/PD and IM-253/PD (HV-1 PHA and HV-2 GROSS) backgrounds of 60, 450, and 9000 counts per minute used for the asphalt pours were based upon background levels obtained from the roadway west of Building 185.

A total of 154 solid material samples were taken. Each solid sample was removed from the grid location indicating the area of highest potential. The following naturally occurring radionuclides were typical isotopes identified during analysis of solid material samples: lead 212 and lead 214.

c. Summary:

Surveys performed with the IM-247/PD did not detect areas greater than 450 $\mu\mu Ci/20cm^2$.

Surveys performed with the IM-253/PD (HV-1 PHA) detected five areas greater than or equal to twice background.

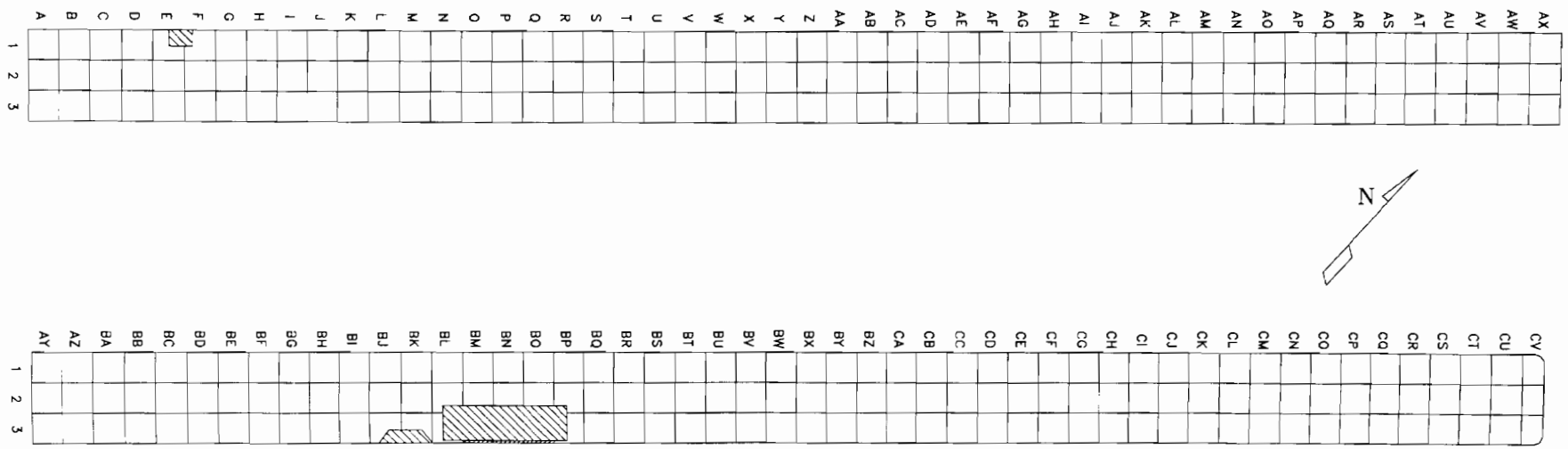
Surveys performed with the IM-253/PD (HV-2 GROSS) detected one area greater than or equal to twice background.

Analysis performed on solid material samples with the multi-channel analyzer (MCA) detected gross gamma equivalent cobalt 60 levels ranging from a low of less than 0.39 pCi/g to a high of 4.99 pCi/g.

Analysis performed on solid material samples with the MCA for specific cobalt 60, indicated that all solid material samples were less than 1 pCi/g.

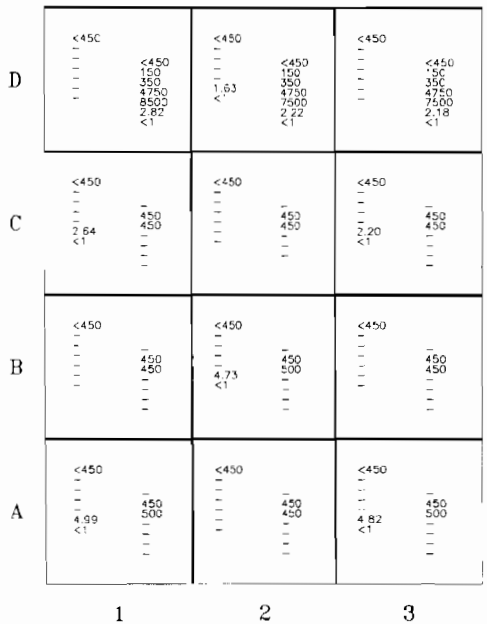
1. PIER L

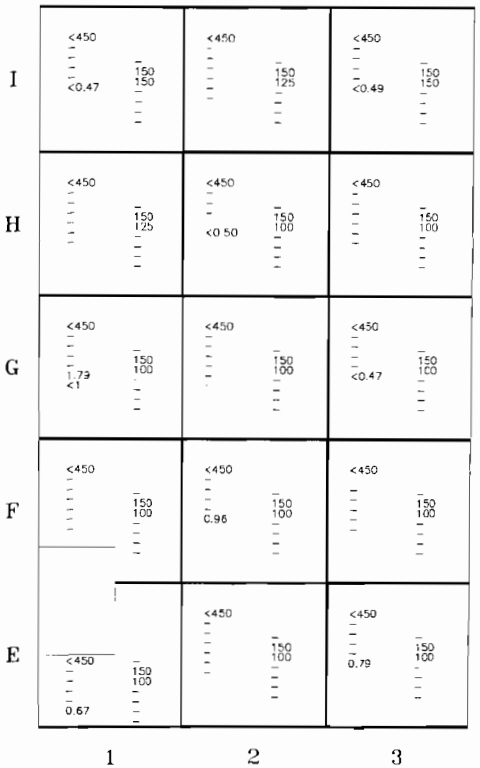
d. Overall Grid Maps



1. PIER L

e. Localized Grid Maps





Sample Data

<450 – IM-247/PD Results [μμCi/20cm²]
200 – IM-253/PD (HV-1 PHA) [bkg.]
300 – IM-253/PD (HV-1 PHA) [cpm]
7000 – IM-253/PD (HV-2 GROSS) [bkg.]
7300 – IM-253/PD (HV-2 GROSS) [cpm]
1.82 – MCA Gross Gamma Eq. Co-60 [pCi/gm]
<1 – MCA Specific Co-60 Results [pCi/gm]

1. PIER L

e. Localized Grid Maps

	1	2	3
N	<450 – – – – – – – – – – 150 250 – – – – –	<450 – – – – – – – – 1.09 <1 – 150 175 – – – –	<450 – – – – – – – – – – 150 250 – – – – –
M	<450 – – – – – – – – 1.51 – 150 175 – – – – –	<450 – – – – – – – – – – 150 150 – – – – –	<450 – – – – – – – – 0.93 – 150 175 – – – – –
L	<450 – – – – – – – – – – 150 150 – – – – –	<450 – – – – – – – – 0.48 – 150 225 – – – – –	<450 – – – – – – – – – – 150 175 – – – – –
K	<450 – – – – – – – – 0.66 – 150 125 – – – – –	<450 – – – – – – – – – – 150 125 – – – – –	<450 – – – – – – – – 0.64 – 150 150 – – – – –
J	<450 – – – – – – – – – – 150 125 – – – – –	<450 – – – – – – – – 0.54 – 150 125 – – – – –	<450 – – – – – – – – – – 150 150 – – – – –

	1	2	3
S	<450 – – – – – – – – 1.49 – 150 125 – – – – –	<450 – – – – – – – – – – 150 100 – – – – –	<450 – – – – – – – – 1.43 – 150 125 – – – – –
R	<450 – – – – – – – – – – 150 100 – – – – –	<450 – – – – – – – – 1.81 – 150 100 – – – – –	<450 – – – – – – – – – – 150 125 – – – – –
Q	<450 – – – – – – – – 2.24 – 150 100 – – – – –	<450 – – – – – – – – – – 150 100 – – – – –	<450 – – – – – – – – 1.09 – 150 150 – – – – –
P	<450 – – – – – – – – – – 150 100 – – – – –	<450 – – – – – – – – 1.62 – 150 125 – – – – –	<450 – – – – – – – – – – 150 100 – – – – –
O	<450 – – – – – – – – 1.30 – 150 150 – – – – –	<450 – – – – – – – – – – 150 100 – – – – –	<450 – – – – – – – – 1.24 – 150 100 – – – – –

Sample Data

<450 – IM-247/PD Results [μμCi/20cm²]
200 – IM-253/PD (HV-1 PHA) [bkg.]
300 – IM-253/PD (HV-1 PHA) [cpm]
7000 – IM-253/PD (HV-2 GROSS) [bkg.]
7300 – IM-253/PD (HV-2 GROSS) [cpm]
1.82 – MCA Gross Gamma Eq. Co-60 [pCi/gm]
<1 – MCA Specific Co-60 Results [pCi/gm]

1. PIER L

e. Localized Grid Maps

	1	2	3
X	<450 – – – – – – – 150 100 – – – –	<450 – – – – – – 1.01 <1 – 150 100 – – – –	<450 – – – – – – – 150 200 – – – –
W	<450 – – – – – – 1.31 – 150 100 – – – –	<450 – – – – – – – 150 100 – – – –	<450 – – – – – – 1.11 <1 150 100 – – – –
V	<450 – – – – – – – 150 100 – – – –	<450 – – – – – – 0.95 150 100 – – – –	<450 – – – – – – – 150 100 – – – –
U	<450 – – – – – – 1.25 <1 150 125 – – – –	<450 – – – – – – – 150 125 – – – –	<450 – – – – – – 1.21 – 150 100 – – – –
T	<450 – – – – – – – 150 100 – – – –	<450 – – – – – – 1.28 <1 150 100 – – – –	<450 – – – – – – – 150 100 – – – –

	1	2	3
AC	<450 – – – – – – 1.26 <1 150 200 – – – –	<450 – – – – – – – 150 175 – – – –	<450 – – – – – – 1.11 <1 150 175 – – – –
AB	<450 – – – – – – – 150 200 – – – –	<450 – – – – – – 1.19 <1 150 100 – – – –	<450 – – – – – – – 150 200 – – – –
AA	<450 – – – – – – 0.79 150 100 – – – –	<450 – – – – – – – 150 100 – – – –	<450 – – – – – – 1.50 <1 150 100 – – – –
Z	<450 – – – – – – – 150 100 – – – –	<450 – – – – – – 1.25 <1 150 100 – – – –	<450 – – – – – – – 150 100 – – – –
Y	<450 – – – – – – 1.03 <1 150 100 – – – –	<450 – – – – – – – 150 100 – – – –	<450 – – – – – – 1.36 <1 150 100 – – – –

Sample Data

<450 – IM-247/PD Results [$\mu\mu$Ci/20cm^2]
200 – IM-253/PD (HV-1 PHA) [bkg.]
300 – IM-253/PD (HV-1 PHA) [cpm]
7000 – IM-253/PD (HV-2 GROSS) [bkg.]
7300 – IM-253/PD (HV-2 GROSS) [cpm]
1.82 – MCA Gross Gamma Eq. Co-60 [pCi/gm]
<1 – MCA Specific Co-60 Results [pCi/gm]

1. PIER L

e. Localized Grid Maps

	1	2	3
AH	<450 – – – – – – 150 100 – – – –	<450 – – – – 0.76 – 150 100 – – – –	<450 – – – – – – 150 100 – – – –
AG	<450 – – – – 1.50 <1 150 100 – – – –	<450 – – – – – – 150 100 – – – –	<450 – – – – 0.57 – 150 100 – – – –
AF	<450 – – – – – – 150 100 – – – –	<450 – – – – 1.20 <1 150 100 – – – –	<450 – – – – – – 150 100 – – – –
AE	<450 – – – – 1.24 <1 150 100 – – – –	<450 – – – – – – 150 100 – – – –	<450 – – – – 1.14 – 150 100 – – – –
AD	<450 – – – – – – 150 150 – – – –	<450 – – – – 1.07 <1 150 100 – – – –	<450 – – – – – – 150 100 – – – –

	1	2	3
AM	<450 – – – – 0.62 – 150 100 – – – –	<450 – – – – – – 150 150 – – – –	<450 – – – – 1.17 <1 150 150 – – – –
AL	<450 – – – – – – 150 200 – – – –	<450 – – – – 0.82 – 150 150 – – – –	<450 – – – – – – 150 200 – – – –
AK	<450 – – – – 1.18 <1 150 150 – – – –	<450 – – – – – – 150 150 – – – –	<450 – – – – 0.72 – 150 200 – – – –
AJ	<450 – – – – – – 150 150 – – – –	<450 – – – – <0.39 – 150 150 – – – –	<450 – – – – – – 150 100 – – – –
AI	<450 – – – – 1.30 <1 150 100 – – – –	<450 – – – – – – 150 100 – – – –	<450 – – – – 0.92 – 150 100 – – – –

Sample Data

<450 – IM-247/PD Results [μμCi/20cm²]
200 – IM-253/PD (HV-1 PHA) [bkg]
300 – IM-253/PD (HV-1 PHA) [cpm]
7000 – IM-253/PD (HV-2 GROSS) [bkg]
7300 – IM-253/PD (HV-2 GROSS) [cpm]
1.82 – MCA Gross Gamma Eq. Co-60 [pCi/gm]
<1 – MCA Specific Co-60 Results [pCi/gm]

1. PIER L

e. **Localized Grid Maps**

	1	2	3
AR	<450 – – – – – – 150 100 – – – –	<450 – – – – 1.51 <1 150 100 – – – –	<450 – – – – – – 150 150 – – – –
AQ	<450 – – – – 1.97 <1 150 150 – – – –	<450 – – – – – – 150 150 – – – –	<450 – – – – 1.51 <1 150 150 – – – –
AP	<450 – – – – – – 150 150 – – – –	<450 – – – – 1.26 <1 150 150 – – – –	<450 – – – – – – 150 150 – – – –
AO	<450 – – – – 1.02 <1 150 150 – – – –	<450 – – – – – – 150 150 – – – –	<450 – – – – 1.23 <1 150 150 – – – –
AN	<450 – – – – – – 150 150 – – – –	<450 – – – – 0.50 150 150 – – – –	<450 – – – – – – 150 150 – – – –

	1	2	3
AW	<450 – – – – 1.02 <1 150 125 – – – –	<450 – – – – – – 150 100 – – – –	<450 – – – – 1.05 <1 150 100 – – – –
AV	<450 – – – – – – 150 100 – – – –	<450 – – – – 1.21 <1 150 100 – – – –	<450 – – – – – – 150 100 – – – –
AU	<450 – – – – 1.89 <1 150 150 – – – –	<450 – – – – – – 150 150 – – – –	<450 – – – – 1.01 <1 150 150 – – – –
AT	<450 – – – – – – 150 150 – – – –	<450 – – – – 1.61 <1 150 150 – – – –	<450 – – – – – – 150 150 – – – –
AS	<450 – – – – 1.12 <1 150 100 – – – –	<450 – – – – – – 150 100 – – – –	<450 – – – – 0.97 – 150 150 – – – –

Sample Data

<450 – IM-247/PD Results [μμCi/20cm²]
200 – IM-253/PD (HV-1 PHA) [bkg.]
300 – IM-253/PD (HV-1 PHA) [cpm]
7000 – IM-253/PD (HV-2 GROSS) [bkg.]
7300 – IM-253/PD (HV-2 GROSS) [cpm]
1.82 – MCA Gross Gamma Eq. Co-60 [pCi/gm]
<1 – MCA Specific Co-60 Results [pCi/gm]

1. PIER L

e. Localized Grid Maps

	1	2	3
BB	<450 – – – – – – – – – – 150 150 – – – –	<450 – – – – – – 0.91 – – – 150 150 – – – –	<450 – – – – – – – – – – 150 250 – – – –
BA	<450 – – – – – – 1.08 <1 – 150 100 – – – –	<450 – – – – – – – – – – 150 150 – – – –	<450 – – – – – – 1.32 <1 – – 150 150 – – – –
AZ	<450 – – – – – – – – – – 150 100 – – – –	<450 – – – – – – 1.20 – – – 150 100 – – – –	<450 – – – – – – – – – – 150 100 – – – –
AY	<450 – – – – – – 1.51 <1 – – 150 100 – – – –	<450 – – – – – – – – – – 150 100 – – – –	<450 – – – – – – 1.16 <1 – – 150 100 – – – –
AX	<450 – – – – – – – – – – 150 100 – – – –	<450 – – – – – – 1.23 <1 – – 150 100 – – – –	<450 – – – – – – – – – – 150 100 – – – –

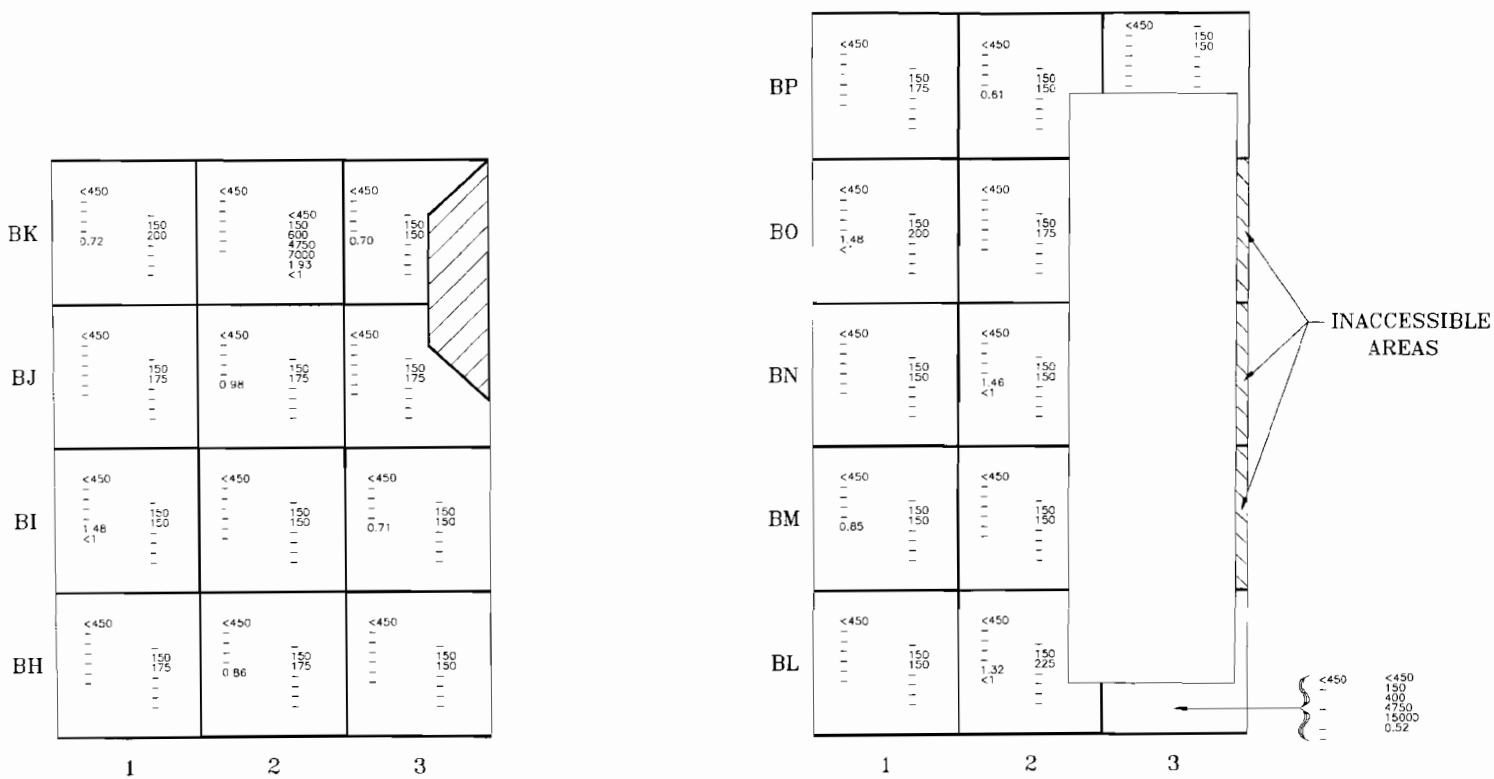
	1	2	3
BG	<450 – – – – – – 1.48 <1 – – 150 200 – – – –	<450 – – – – – – – – – – 150 175 – – – –	<450 – – – – – – 1.08 <1 – – 150 150 – – – –
BF	<450 – – – – – – – – – – 150 175 – – – –	<450 – – – – – – 1.03 <1 – – 150 150 – – – –	<450 – – – – – – – – – – 150 150 – – – –
BE	<450 – – – – – – 1.07 <1 – – 150 125 – – – –	<450 – – – – – – – – – – 150 100 – – – –	<450 – – – – – – 1.04 <1 – – 150 125 – – – –
BD	<450 – – – – – – – – – – 150 100 – – – –	<450 – – – – – – 0.95 – – – 150 100 – – – –	<450 – – – – – – – – – – 150 150 – – – –
BC	<450 – – – – – – 1.10 <1 – – 150 150 – – – –	<450 – – – – – – 0.98 – – – 150 150 – – – –	<450 – – – – – – 1.16 <1 – – 150 150 – – – –

Sample Data

<450 – IM-247/PD Results [μμCi/20cm²]
200 – IM-253/PD (HV-1 PHA) [bkg]
300 – IM-253/PD (HV-1 PHA) [cpm]
7000 – IM-253/PD (HV-2 GROSS) [bkg]
7300 – IM-253/PD (HV-2 GROSS) [cpm]
1.82 – MCA Gross Gamma Eq. Co-60 [pCi/gm]
<' – MCA Specific Co-60 Results [pCi/gm]

1. PIER L

e. Localized Grid Maps



Sample Data
<450 – IM-247/PD Results [μμCi/20cm²]
200 – IM-253/PD (HV-1 PHA) [bkg.]
300 – IM-253/PD (HV-1 PHA) [cpm]
7000 – IM-253/PD (HV-2 GROSS) [bkg.]
7300 – IM-253/PD (HV-2 GROSS) [cpm]
1.82 – MCA Gross Gamma Eq. Co-60 [pCi/gm]
<1 – MCA Specific Co-60 Results [pCi/gm]

1. PIER L

e. Localized Grid Maps

	1	2	3
BU	<450 – – – – – 1.40 <1 – 150 150 – – – –	<450 – – – – – – – – 150 125 – – – –	<450 – – – – – 1.07 <1 – 150 125 – – – –
BT	<450 – – – – – – – – 150 175 – – – –	<450 – – – – – 1.58 – – 150 150 – – – –	<450 – – – – – – – – 150 175 – – – –
BS	<450 – – – – – 0.93 – – 150 200 – – – –	<450 – – – – – – – – 150 175 – – – –	<450 – – – – – 1.45 <1 – 150 200 – – – –
BR	<450 – – – – – – – – 150 150 – – – –	<450 – – – – – 1.06 <1 – 150 150 – – – –	<450 – – – – – – – – 150 175 – – – –
BQ	<450 – – – – – 2.28 <1 – 150 175 – – – –	<450 – – – – – – – – 150 150 – – – –	<450 – – – – – 1.87 – – 150 150 – – – –

	1	2	3
BZ	<450 – – – – – – – – 150 150 – – – –	<450 – – – – – 1.75 <1 – 150 150 – – – –	<450 – – – – – – – – 150 200 – – – –
BY	<450 – – – – – 1.17 – – 150 150 – – – –	<450 – – – – – – – – 150 150 – – – –	<450 – – – – – 0.81 – – 150 200 – – – –
BX	<450 – – – – – – – – 150 150 – – – –	<450 – – – – – 1.26 <1 – 150 150 – – – –	<450 – – – – – – – – 150 175 – – – –
BW	<450 – – – – – 1.34 <1 – 150 175 – – – –	<450 – – – – – – – – 150 175 – – – –	<450 – – – – – 1.21 <1 – 150 175 – – – –
BV	<450 – – – – – – – – 150 150 – – – –	<450 – – – – – 1.75 <1 – 150 150 – – – –	<450 – – – – – – – – 150 200 – – – –

Sample Data

<450 – IM-247/PD Results [μμCi/20cm²]
200 – IM-253/PD (HV-1 PHA) [bkg.]
300 – IM-253/PD (HV-1 PHA) [com]
7000 – IM-253/PD (HV-2 GROSS) [bkg.]
7300 – IM-253/PD (HV-2 GROSS) [com]
1.82 – MCA Gross Gamma Eq. Co-60 [pCi/gm]
<1 – MCA Specific Co-60 Results [pCi/gm]

1. PIER L

e. Localized Grid Maps

	1	2	3
CE	<450 – – – – 0.89 – 150 150 – – – –	<450 – – – – – – 150 150 – – – –	<450 – – – – 1.07 <1 – 150 150 – – – –
CD	<450 – – – – – – – 150 150 – – – –	<450 – – – – 1.08 <1 – 150 125 – – – –	<450 – – – – – – – 150 125 – – – –
CC	<450 – – – – 1.19 <1 – 150 150 – – – –	<450 – – – – – – – 150 150 – – – –	<450 – – – – 0.96 – 150 100 – – – – –
CB	<450 – – – – – – – 150 150 – – – –	<450 – – – – 0.84 – 150 150 – – – –	<450 – – – – – – – 150 200 – – – –
CA	<450 – – – – 1.45 <1 – 150 150 – – – –	<450 – – – – – – – 150 150 – – – –	<450 – – – – 0.86 – 150 200 – – – – –

	1	2	3
CJ	<450 – – – – – – – 150 150 – – – –	<450 – – – – 1.27 <1 – 150 150 – – – –	<450 – – – – – – – 150 100 – – – –
CI	<450 – – – – 1.86 <1 – 150 100 – – – –	<450 – – – – – – – 150 100 – – – –	<450 – – – – 1.05 <1 – 150 100 – – – –
CH	<450 – – – – – – – 150 100 – – – –	<450 – – – – 1.18 <1 – 150 100 – – – –	<450 – – – – – – – 150 100 – – – –
CG	<450 – – – – 1.30 <1 – 150 100 – – – –	<450 – – – – – – – 150 100 – – – –	<450 – – – – 1.14 <1 – 150 100 – – – –
CF	<450 – – – – – – – 150 150 – – – –	<450 – – – – 1.09 <1 – 150 150 – – – –	<450 – – – – – – – 150 125 – – – –

Sample Data

<450 – IM-247/PD Results [$\mu\mu$C/20cm^2]
200 – IM-253/PD (HV-1 PHA) [bkg.]
300 – IM-253/PD (HV-1 PHA) [cpm]
7000 – IM-253/PD (HV-2 GROSS) [bkg.]
7300 – IM-253/PD (HV-2 GROSS) [cpm]
1.82 – MCA Gross Gamma Eq. Co-60 [pCi/gm]
<1 – MCA Specific Co-60 Results [pCi/gm]

1. PIER L

e. Localized Grid Maps

	1	2	3
CO	<450 – – – – 1.89 <1 – 150 100 – – – –	<450 – – – – – – – 150 100 – – – –	<450 – – – – 1.10 <1 – 150 150 – – – –
CN	<450 – – – – – – – 150 175 – – – –	<450 – – – – 1.50 <1 – 150 175 – – – –	<450 – – – – – – – 150 200 – – – –
CM	<450 – – – – 1.52 – – 150 150 – – – –	<450 – – – – – – – 150 175 – – – –	<450 – – – – 1.21 <1 – 150 150 – – – –
CL	<450 – – – – – – – 150 200 – – – –	<450 – – – – 1.56 <1 – 150 150 – – – –	<450 – – – – – – – 150 150 – – – –
CK	<450 – – – – 1.27 <1 – 150 100 – – – –	<450 – – – – – – – 150 150 – – – –	<450 – – – – 1.71 <1 – 150 150 – – – –

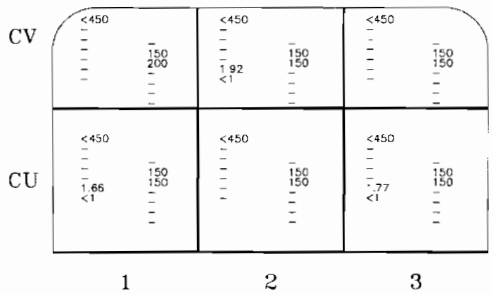
	1	2	3
CT	<450 – – – – – – – 150 100 – – – –	<450 – – – – 1.42 – – 150 150 – – – –	<450 – – – – – – – 150 200 – – – –
CS	<450 – – – – 1.48 <1 – 150 100 – – – –	<450 – – – – – – – 150 150 – – – –	<450 – – – – 1.67 <1 – 150 200 – – – –
CR	<450 – – – – – – – 150 150 – – – –	<450 – – – – 0.80 – – 150 100 – – – –	<450 – – – – – – – 150 150 – – – –
CQ	<450 – – – – 1.71 <1 – 150 150 – – – –	<450 – – – – – – – 150 200 – – – –	<450 – – – – 1.39 <1 – 150 150 – – – –
CP	<450 – – – – – – – 150 150 – – – –	<450 – – – – 1.68 <1 – 150 150 – – – –	<450 – – – – – – – 150 150 – – – –

Sample Data

<450 – IM-247/PD Results [μμCi/20cm²]
200 – IM-253/PD (HV-1 PHA) [bkg.]
300 – IM-253/PD (HV-1 PHA) [cpm]
7000 – IM-253/PD (HV-2 GROSS) [bkg.]
7300 – IM-253/PD (HV-2 GROSS) [cpm]
1.82 – MCA Gross Gamma Eq. Co-60 [pCi/gm]
<1 – MCA Specific Co-60 Results [pCi/gm]

1. PIER L

e. Localized Grid Maps



Sample Data

<450 – IM-247/PD Results [μμCi/20cm²]
200 – IM-253/PD (HV-1 PHA) [bkg.]
300 – IM-253/PD (HV-1 PHA) [cpm]
7000 – IM-253/PD (HV-2 GROSS) [bkg.]
7300 – IM-253/PD (HV-2 GROSS) [cpm]
1.82 – MCA Gross Gamma Eq. Co-60 [pCi/gm]
<1 – MCA Specific Co-60 Results [pCi/gm]

1. PIER L

f. Prior To Photographs

From grid CB-2, facing north.

1. PIER L

f. Prior To Photographs

From grid location M-2, facing north.

1. PIER L

f. Prior To Photographs

From grid BW-2, facing west.

1. PIER L

g. After Photographs

Gate entrance, facing east.

1. PIER L

g. After Photographs

Midway of pier, facing west.

1. Pier M

a. Introduction:

Pier M, also identified as Structure 336, is located on the Naval Station as shown on PW dwg. no. H606-273, "Charleston Naval Shipyard, Naval Station and Contiguous Activities Existing and Planned as of January 1990." Pier M was constructed in 1975 .

(1) Description:

Pier M, including the 40' land side approach and a 172' mooring dolphin, is 1312' long and oriented northeast into the Cooper River. Pier M is 70' wide for the first 600' in length and 25' wide for the next 500' in length. Topside structures include one 14' by 70' and one 30' by 150' shore power distribution center.

(2) Brief History:

(a) **Use:** This pier was constructed as part of the U.S. Naval shore establishment expansion program and was used to berth various classes of naval vessels.

(b) **Radiological History:** Pier M was certified to berth nuclear vessels. Areas on the pier were established as radiation and radioactive material storage areas. The radioactive material storage areas were established for temporary storage of portable radioactive liquid collection tanks and ships' components. Radioactive material was transported regularly over the pier. Loose surface contamination levels were maintained less than $450\mu\mu Ci/100cm^2$.

(3) Survey Requirements:

(a) Nuclear Ship Berthing Area survey. Group two and three surveys were performed on the pier and extended forty feet beyond the base of the pier. The 172' mooring dolphin at the end of the pier was not required to be surveyed since no radiological work was performed in this area. Shore power distibution centers and pierside receptacle centers did not require survey since radiological material was not transported over these structures.

b. Discussion:

Pier M, including the 40' landside approach, was divided into 93 grids approximately 10' by 10' for group 2 surveys and 1864 grids approximately 5' by 5' for group 3 surveys. Each grid had its own unique designator.

1. Pier M

Where physically possible, each group 2 grid was subdivided into two 3' by 3' subsections which were located in areas of highest potential for contamination. One of these subsections was surveyed using the IM-247/PD and the other using the IM-253/PD (HV-1 PHA). Solid material samples were taken from a minimum of 50% of the 10' by 10' grids. Additionally, solid material samples were taken from each 3' by 3' subsection that resulted in levels greater than 450μμCi/20cm^2 with an IM-247/PD or greater than twice background with the IM-253/PD (HV-1 PHA).

Each group 3 grid was surveyed using the IM-247/PD and the IM-253/PD (HV-1 PHA). Then a minimum of 25% of these grids were surveyed using the IM-253/PD (HV-2 GROSS). Additionally, solid material samples were taken from each 5' by 5' grid with the exception of grids BG-14, GG-10, GH-10, GI-10, GJ-10 and GK-10 which were unpainted metal surfaces.

Individual backgrounds were used for this pier and its land side approach. The approach to the pier is asphalt. The IM-247/PD and the IM-253/PD (HV-1 PHA and HV-2 GROSS) backgrounds used for the asphalt were 50, 400, and 10000 counts per minute respectively. These levels were based upon backgrounds obtained from Building M1257 north road. The main section of the pier is constructed primarily of concrete. The IM-247/PD and the IM-253/PD (HV-1 PHA and HV-2 GROSS) backgrounds used for the concrete were 60, 300, and 7000 counts per minute respectively. These areas were based upon background radiation levels obtained from the deck of Building 1884. Sections of the pier also contained metal plate. The IM-247/PD and the IM-253/PD (HV-1 PHA and HV-2 GROSS) backgrounds used for the metal plate were 30, 250, and 5500 counts per minute respectively. These levels were based upon backgrounds obtained from the metal wall of Building 1639.

A total of 2023 solid material samples were taken. The following naturally occurring radionuclides were typical isotopes identified during analysis of solid material samples: potassium 40, bismuth 214, thallium 208, lead 212 and lead 214.

c. Summary:

Surveys performed with the IM-247/PD did not detect areas greater than 450μμCi/20cm^2.

Surveys performed with the IM-253/PD (HV-1 PHA) detected 162 areas greater than or equal to twice background.

Surveys performed with the IM-253/PD (HV-2 GROSS) detected 66 areas greater than or equal to twice background.

Analysis performed on solid material samples with the multi-channel analyzer

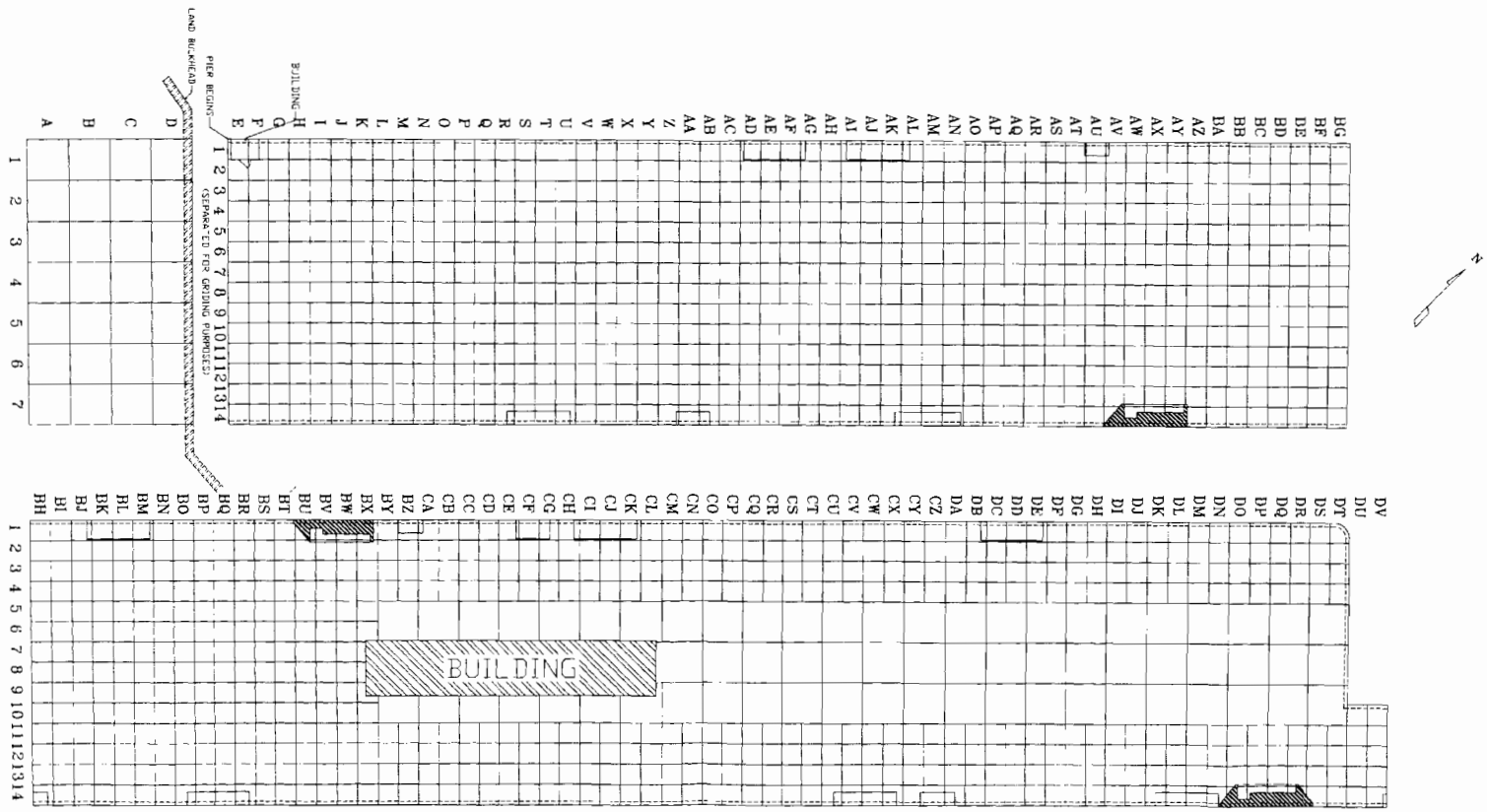
1. Pier M

(MCA) detected gross gamma equivalent cobalt 60 levels ranging from a low of less than a minimum detectable activity of 0.34 pCi/g to a high of 6.83 pCi/g.

Analysis performed on solid material samples with the MCA for specific cobalt 60, indicated that all solid material samples were less than 1 pCi/g.

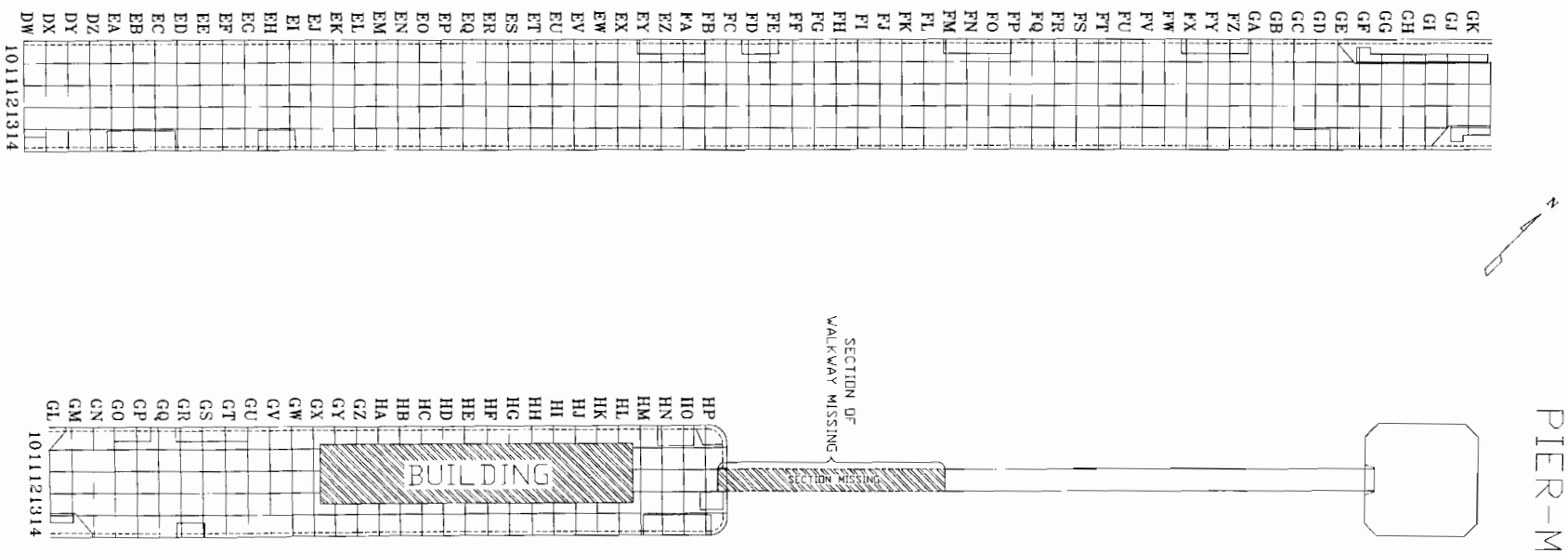
1. Pier M

d. Site Map



1. Pier M

d. Site Map



1. Pier M

e. Localized Grid Maps

	1	2	3	4	5	6	7
D	<450 – – – – – – 400 400 – – – –	<450 – – – – – – 400 400 – – – 4.80 <1	<450 – – – – – – 400 500 – – – –	<450 – – – – – – 400 500 – – – 3.88 <1	<450 – – – – – – 400 350 – – – –	<450 – – – – – – 400 600 – – – 3.63 <1	<450 – – – – – – 400 600 – – – –
C	<450 – – – – – – 400 400 – – – 4.38 <1	<450 – – – – – – 400 400 – – – –	<450 – – – – – – 400 400 – – – 3.54 <1	<450 – – – – – – 400 400 – – – –	<450 – – – – – – 400 500 – – – 4.09 <1	<450 – – – – – – 400 500 – – – –	<450 – – – – – – 400 500 – – – 4.15 <1
B	<450 – – – – – – 400 400 – – – –	<450 – – – – – – 400 400 – – – 4.20 <1	<450 – – – – – – 400 400 – – – –	<450 – – – – – – 400 400 – – – 4.48 <1	<450 – – – – – – 400 400 – – – –	<450 – – – – – – 400 450 – – – 3.63 <1	<450 – – – – – – 400 400 – – – –
A	<450 – – – – – – 400 400 – – – 3.92 <1	<450 – – – – – – 400 400 – – – –	<450 – – – – – – 400 400 – – – 3.38 <1	<450 – – – – – – 400 400 – – – –	<450 – – – – – – 400 400 – – – 2.58 <1	<450 – – – – – – 400 450 – – – –	<450 – – – – – – 400 450 – – – 4.51 <1

Sample Data

<450 – IM-247/PD Results [$\mu\mu$Ci/20cm^2]
200 – IM-253/PD (HV-1 PHA) [bkg.]
300 – IM-253/PD (HV-1 PHA) [cpm]
7000 – IM-253/PD (HV-2 GROSS) [bkg.]
7300 – IM-253/PD (HV-2 GROSS) [cpm]
1.82 – MCA Gross Gamma Eq. Co-60 [pCi/g]
<1 – MCA Specific Co-60 Results [pCi/g]

1. **Pier M**

e. **Localized Grid Maps**

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
O	<450 300 400 7000 12500 2.49 <1	<450 300 450 – – 2.19 <1	<450 300 450 7000 10000 1.85 <1	<450 300 450 – – 1.87 <1	<450 300 400 7000 12500 2.33 <1	<450 300 450 – – 1.60 <1	<450 300 350 7000 12500 1.29 <1	<450 300 400 – – 1.63 <1	<450 300 500 7000 10000 1.71 <1	<450 300 500 – – 1.14 <1	<450 300 450 7000 12500 2.04 <1	<450 300 500 – – 2.17 <1	<450 300 500 7000 12500 1.56 <1	<450 300 450 – – 2.30 <1
N	<450 300 475 – – 2.58 <1	<450 300 450 – – 1.58 <1	<450 300 450 – – 1.73 <1	<450 300 450 – – 2.45 <1	<450 300 450 – – 1.68 <1	<450 300 400 – – 2.59 <1	<450 300 300 – – 1.53 <1	<450 300 425 – – 1.87 <1	<450 300 450 – – 1.87 <1	<450 300 450 – – 1.87 <1	<450 300 450 – – 1.11 <1	<450 300 450 – – 1.15 <1	<450 300 500 – – 1.78 <1	<450 300 550 – – 2.03 <1
M	<450 300 450 7000 10000 2.64 <1	<450 300 450 – – 1.97 <1	<450 300 450 7000 10000 1.62 <1	<450 300 450 – – 2.98 <1	<450 300 450 7000 12500 1.80 <1	<450 300 375 – – 1.19 <1	<450 300 300 7000 12500 1.41 <1	<450 300 450 – – 2.03 <1	<450 300 500 7000 6500 2.49 <1	<450 300 450 – – 1.68 <1	<450 300 450 7000 10000 1.10 <1	<450 300 550 – – 1.16 <1	<450 300 500 7000 11000 1.91 <1	<450 300 550 – – 1.26 <1
L	<450 300 400 – – 1.63 <1	<450 300 450 – – 1.51 <1	<450 300 400 – – 1.65 <1	<450 300 450 – – 1.56 <1	<450 300 475 – – 1.49 <1	<450 300 425 – – 1.18 <1	<450 300 300 – – 1.83 <1	<450 300 400 – – 2.43 <1	<450 300 450 – – 2.31 <1	<450 300 500 – – 1.36 <1	<450 300 400 – – 1.37 <1	<450 300 475 – – 2.17 <1	<450 300 500 – – 1.73 <1	<450 300 550 – – 1.34 <1
K	<450 300 400 7000 10000 2.31 <1	<450 300 450 – – 2.54 <1	<450 300 450 7000 10000 1.38 <1	<450 300 450 – – 1.00 <1	<450 300 450 7000 12500 1.47 <1	<450 300 350 – – 1.26 <1	<450 300 300 7000 12500 1.61 <1	<450 300 450 – – 1.53 <1	<450 300 400 7000 10000 0.97 <1	<450 300 500 – – 2.30 <1	<450 300 400 7000 12500 2.52 <1	<450 300 500 – – 1.92 <1	<450 300 500 7000 8000 2.44 <1	<450 300 500 – – 2.13 <1
J	<450 300 375 – – 1.53 <1	<450 300 400 – – 1.02 <1	<450 300 450 – – 1.49 <1	<450 300 400 – – 1.71 <1	<450 300 450 – – 1.87 <1	<450 300 400 – – 2.31 <1	<450 300 300 – – 1.59 <1	<450 300 425 – – 2.19 <1	<450 300 400 – – 2.01 <1	<450 300 500 – – 2.06 <1	<450 300 450 – – 2.35 <1	<450 300 450 – – 1.40 <1	<450 300 500 – – 2.71 <1	<450 300 550 – – 2.56 <1
I	<450 300 450 7000 15000 1.53 <1	<450 300 400 – – 1.38 <1	<450 300 400 7000 8000 2.20 <1	<450 300 450 – – 1.16 <1	<450 300 450 7000 12500 1.67 <1	<450 300 375 – – 1.73 <1	<450 300 400 7000 12500 1.34 <1	<450 300 400 – – 1.55 <1	<450 300 450 7000 10000 1.86 <1	<450 300 500 – – 3.17 <1	<450 300 450 7000 12500 1.95 <1	<450 300 500 – – 2.08 <1	<450 300 475 7000 9500 2.20 <1	<450 300 550 – – 2.63 <1
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G	<450 300 450 7000 15000 1.71 <1	<450 300 400 – – 1.22 <1	<450 300 400 7000 10000 1.26 <1	<450 300 400 – – 1.35 <1	<450 300 525 7000 12500 1.44 <1	<450 300 375 – – 1.46 <1	<450 300 300 7000 12500 1.33 <1	<450 300 375 – – 1.93 <1	<450 300 450 7000 10000 1.99 <1	<450 300 450 – – 1.77 <1	<450 300 450 7000 12500 1.43 <1	<450 300 550 – – 1.92 <1	<450 300 500 7000 9300 1.79 <1	<450 300 450 – – 1.79 <1
F	<450 300 500 – – 2.98 <1	<450 300 400 – – 1.79 <1	<450 300 400 – – 1.07 <1	<450 300 400 – – 2.33 <1	<450 300 450 – – 2.6[illegible] <1	<450 300 350 – – 2.61 <1	<450 300 300 – – 2.56 <1	<450 300 400 – – 2.31 <1	<450 300 450 – – 3.18 <1	<450 300 450 – – 3.24 <1	<450 300 400 – – 2.45 <1	<450 300 550 – – 1.79 <1	<450 300 475 – – 1.70 <1	<450 300 400 – – 2.58 <1
E	<450 300 425 7000 12500 1.26 <1	<450 300 400 – – 2.32 <1	<450 300 450 7000 10000 1.97 <1	<450 300 400 – – 2.57 <1	<450 300 400 7000 10000 3.04 <1	<450 300 375 – – 2.61 <1	<450 300 350 7000 12500 2.14 <1	<450 300 400 – – 3.18 <1	<450 300 450 7000 10000 2.69 <1	<450 300 400 – – 2.61 <1	<450 300 400 7000 10000 2.68 <1	<450 300 450 – – 3.07 <1	<450 300 350 7000 8000 2.76 <1	<450 300 400 – – 2.75 <1

Sample Data

<450 – IM-247/PD Results [μCi/20cm^2]
200 – IM-253/PD (HV-1 PHA) [bkg.]
300 – IM-253/PD (HV-1 PHA) [cpm]
7000 – IM-253/PD (HV-2 GROSS) [bkg.]
7300 – IM-253/PD (HV-2 GROSS) [cpm]
1.32 – MCA Gross Gamma Eq. Co-60 [pCi/g]
<1 – MCA Specific Co-60 Results [pCi/g]

1. Pier M

e. Localized Grid Maps

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Z	<450 300 500 – – 1.47 <1	<450 300 400 – – 2.19 <1	<450 300 400 – – 2.26 <1	<450 300 450 – – 2.53 <1	<450 300 450 – – 2.03 <1	<450 300 500 – – 1.16 <1	<450 300 375 – – 1.44 <1	<450 300 550 – – 1.56 <1	<450 300 400 – – 1.52 <1	<450 300 400 – – 1.72 <1	<450 300 550 – – 1.97 <1	<450 300 450 – – 1.47 <1	<450 300 450 – – 2.62 <1	<450 300 650 – – 2.03 <1
Y	<450 300 500 7000 12500 1.71 <1	<450 300 400 – – 1.36 <1	<450 300 350 7000 8500 1.81 <1	<450 300 450 – – 1.99 <1	<450 300 450 7000 12500 2.35 <1	<450 300 450 – – 1.42 <1	<450 300 375 7000 9500 3.18 <1	<450 300 500 – – 3.53 <1	<450 300 400 7000 12500 2.33 <1	<450 300 400 – – 3.25 <1	<450 300 400 7000 9000 2.77 <1	<450 300 475 – – 2.27 <1	<450 300 425 7000 12500 1.45 <1	<450 300 650 – – 1.93 <1
X	<450 300 500 – – 2.49 <1	<450 300 450 – – 2.05 <1	<450 300 400 – – 1.77 <1	<450 300 450 – – 1.87 <1	<450 300 400 – – 1.81 <1	<450 300 450 – – 1.42 <1	<450 300 375 – – 1.24 <1	<450 300 550 – – 1.54 <1	<450 300 450 – – 1.60 <1	<450 300 425 – – 1.69 <1	<450 300 425 – – 1.66 <1	<450 300 450 – – 1.13 <1	<450 300 475 – – 1.60 <1	<450 300 650 – – 1.90 <1
W	<450 300 425 7000 12500 1.09 <1	<450 300 450 – – 1.50 <1	<450 300 400 7000 8500 1.83 <1	<450 300 400 – – 2.3· <1	<450 300 400 7000 12500 2.50 <1	<450 300 450 – – 1.32 <1	<450 300 400 7000 9500 1.86 <1	<450 300 550 – – 1.41 <1	<450 300 400 7000 12500 2.10 <1	<450 300 450 – – 1.94 <1	<450 300 450 7000 9000 2.77 <1	<450 300 400 – – 2.00 <1	<450 300 425 7000 12500 1.79 <1	<450 300 650 – – 2.09 <1
V	<450 300 500 – – 3.18 <1	<450 300 400 – – 3.05 <1	<450 300 400 – – 2.32 <1	<450 300 400 – – 2.19 <1	<450 300 450 – – 3.16 <1	<450 300 500 – – 1.41 <1	<450 300 425 – – 1.79 <1	<450 300 550 – – 2.51 <1	<450 300 350 – – 2.43 <1	<450 300 425 – – 2.00 <1	<450 300 425 – – 1.23 <1	<450 300 450 – – 1.25 <1	<450 300 450 – – 1.64 <1	<450 300 650 – – 1.50 <1
U	<450 300 500 7000 12500 1.83 <1	<450 300 400 – – 3.62 <1	<450 300 400 7000 8500 1.94 <1	<450 300 450 – – 2.33 <1	<450 300 450 7000 12500 1.30 <1	<450 300 450 – – 3.59 <1	<450 300 400 7000 9500 2.00 <1	<450 300 550 – – 2.37 <1	<450 300 400 7000 12500 2.41 <1	<450 300 425 – – 1.21 <1	<450 300 400 7000 12500 1.79 <1	<450 300 400 – – 2.73 <1	<450 300 400 7000 10000 1.84 <1	<450 300 650 – – 2.27 <1
T	<450 300 450 – – 0.97	<450 300 450 – – 1.45	<450 300 400 – – 1.38 <1	<450 300 400 – – 1.91 <1	<450 300 400 – – 1.66 <1	<450 300 400 – – 1.85 <1	<450 300 375 – – 1.63 <1	<450 300 550 – – 1.64 <1	<450 300 500 – – 3.06 <1	<450 300 450 – – 2.87 <1	<450 300 400 – – 1.80 <1	<450 300 400 – – 2.17 <1	<450 300 500 – – 1.92 <1	<450 300 650 – – 1.89 <1
S	<450 300 400 7000 12500 2.53 <1	<450 300 400 – – 1.46 <1	<450 300 400 7000 12500 1.51 <1	<450 300 400 – – 1.95 <1	<450 300 400 7000 12500 1.58 <1	<450 300 400 – – 2.02 <1	<450 300 400 7000 9500 1.61 <1	<450 300 500 – – 1.84 <1	<450 300 500 7000 12500 1.39 <1	<450 300 425 – – 1.62 <1	<450 300 350 7000 12500 2.79 <1	<450 300 400 – – 2.10 <1	<450 300 450 7000 12500 2.39 <1	<450 300 750 – – 1.80 <1
R	<450 300 400 – – 1.50 <1	<450 300 400 – – 1.50 <1	<450 300 400 – – 2.79 <1	<450 300 400 – – 1.56 <1	<450 300 400 – – 2.07 <1	<450 300 450 – – 2.49 <1	<450 300 400 – – 2.22 <1	<450 300 600 – – 2.46 <1	<450 300 450 – – 1.80 <1	<450 300 450 – – 1.96 <1	<450 300 350 – – 1.94 <1	<450 300 400 – – 1.95 <1	<450 300 400 – – 2.58 <1	<450 300 650 – – 1.74 <1
Q	<450 300 425 7000 10000 2.35 <1	<450 300 450 – – 2.49 <1	<450 300 400 7000 12500 2.16 <1	<450 300 400 – – 1.89 <1	<450 300 450 7000 12500 1.93 <1	<450 300 500 – – 1.69 <1	<450 300 400 7000 9000 1.67 <1	<450 300 550 – – 1.16 <1	<450 300 450 7000 12500 2.70 <1	<450 300 450 – – 3.94 <1	<450 300 400 7000 12500 1.33 <1	<450 300 525 – – 1.56 <1	<450 300 500 7000 12500 1.62 <1	<450 300 450 – – 1.88 <1
P	<450 300 425 – – 2.18 <1	<450 300 450 – – 1.77 <1	<450 300 400 – – 1.46 <1	<450 300 450 – – 3.04 <1	<450 300 450 – – 2.87 <1	<450 300 450 – – 3.06 <1	<450 300 425 – – 2.82 <1	<450 300 425 – – 3.26 <1	<450 300 450 – – 2.22 <1	<450 300 500 – – 2.50 <1	<450 300 400 – – 2.68 <1	<450 300 500 – – 2.62 <1	<450 300 500 – – 2.77 <1	<450 300 450 – – 1.59 <1

Sample Data

<450 – IM-247/PD Results [µµCi/20cm²]
200 – IM-253/PD (HV-1 PHA) [bkg.]
300 – IM-253/PD (HV-1 PHA) [cpm]
7000 – IM-253/PD (HV-2 GROSS) [bkg.]
7300 – IM-253/PD (HV-2 GROSS) [cpm]
1.82 – MCA Gross Gamma Eq. Co-60 [pCi/g]
<1 – MCA Specific Co-60 Results [pCi/g]

1. Pier M

e. Localized Grid Maps

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
AK	<450 300 550 7000 17500 1.15 <1	<450 300 550 – – 2.10 <1	<450 300 400 7000 9750 1.88 <1	<450 300 450 – – 2.93 <1	<450 300 500 7000 9500 2.44 <1	<450 300 450 – – 1.92 <1	<450 300 500 7000 9000 0.98	<450 300 500 – – 2.30 <1	<450 300 450 7000 10000 2.47 <1	<450 300 450 – – 3.00 <1	<450 300 400 7000 10000 2.87 <1	<450 300 350 – – 2.36 <1	<450 300 425 7000 9500 2.90 <1	<450 300 500 – – 2.55 <1
AJ	<450 300 600 – – 1.45 <1	<450 300 550 – – 2.51 <1	<450 300 450 – – 2.23 <1	<450 300 450 – – 3.05 <1	<450 300 400 – – 2.87 <1	<450 300 450 – – 2.39 <1	<450 300 450 – – 2.57 <1	<450 300 500 – – 2.18 <1	<450 300 400 – – 2.37 <1	<450 300 450 – – 1.76 <1	<450 300 400 – – 2.62 <1	<450 300 350 – – 1.41 <1	<450 300 400 – – 2.68 <1	<450 300 450 – – 2.73 <1
AI	<450 300 650 7000 17500 1.32 <1	<450 300 500 – – 2.89 <1	<450 300 475 7000 9500 1.73 <1	<450 300 450 – – 2.74 <1	<450 300 450 7000 10000 2.34 <1	<450 300 450 – – 2.40 <1	<450 300 450 7000 9000 2.29 <1	<450 300 450 – – 3.33 <1	<450 300 450 7000 10000 2.29 <1	<450 300 450 – – 2.31 <1	<450 300 450 7000 10000 2.56 <1	<450 300 300 – – 2.29 <1	<450 300 450 7000 9000 3.24 <1	<450 300 400 – – 2.24 <1
AH	<450 300 500 – – 2.54 <1	<450 300 550 – – 3.05 <1	<450 300 450 – – 3.74 <1	<450 300 450 – – 1.75 <1	<450 300 425 – – 1.47 <1	<450 300 450 – – 3.93 <1	<450 300 425 – – 1.77 <1	<450 300 425 – – 1.71 <1	<450 300 400 – – 1.65 <1	<450 300 450 – – 1.80 <1	<450 300 450 – – 1.76 <1	<450 300 475 – – 1.39 <1	<450 300 400 – – 2.42 <1	<450 300 500 – – 1.51 <1
AG	<450 300 600 7000 22500 2.21 <1	<450 300 550 – – 3.01 <1	<450 300 450 7000 9500 1.96 <1	<450 300 450 – – 2.94 <1	<450 300 400 7000 9500 2.26 <1	<450 300 400 – – 1.55 <1	<450 300 450 7000 9500 2.58 <1	<450 300 500 – – 2.04 <1	<450 300 400 7000 10000 4.07 <1	<450 300 450 – – 3.40 <1	<450 300 450 7000 8000 2.12 <1	<450 300 350 – – 2.54 <1	<450 300 300 7000 9000 2.66 <1	<450 300 600 – – 2.25 <1
AF	<450 300 650 – – 1.04 <1	<450 300 425 – – 1.24 <1	<450 300 450 – – 1.96 <1	<450 300 450 – – 1.98 <1	<450 300 375 – – 1.45 <1	<450 300 450 – – 2.30 <1	<450 300 400 – – 1.88 <1	<450 300 500 – – 1.30 <1	<450 300 400 – – 0.94	<450 300 450 – – 1.72 <1	<450 300 450 – – 6.83 <1	<450 300 300 – – 3.06 <1	<450 300 450 – – 2.48 <1	<450 300 550 – – 2.31 <1
AE	<450 300 550 7000 20000 1.63 <1	<450 300 550 – – 1.81 <1	<450 300 450 7000 9500 2.16 <1	<450 300 450 – – 2.33 <1	<450 300 400 7000 10000 2.07 <1	<450 300 400 – – 2.09 <1	<450 300 420 7000 8500 1.45 <1	<450 300 400 – – 1.96 <1	<450 300 400 7000 10000 1.38 <1	<450 300 400 – – 0.72	<450 300 400 7000 8500 0.59	<450 300 350 – – 0.71	<450 300 400 7000 9500 1.57 <1	<450 300 500 – – 1.87 <1
AD	<450 300 650 – – 1.62 <1	<450 300 500 – – 2.13 <1	<450 300 400 – – 1.60 <1	<450 300 375 – – 2.74 <1	<450 300 375 – – 1.80 <1	<450 300 450 – – 1.73 <1	<450 300 450 – – 1.76 <1	<450 300 450 – – 1.65 <1	<450 300 450 – – 2.13 <1	<450 300 400 – – 2.28 <1	<450 300 500 – – 1.94 <1	<450 300 450 – – 2.99 <1	<450 300 450 – – 2.71 <1	<450 300 550 – – 2.28 <1
AC	<450 300 450 7000 15000 2.35 <1	<450 300 400 – – 1.75 <1	<450 300 400 7000 9000 3.21 <1	<450 300 400 – – 3.01 <1	<450 300 400 7000 9500 3.04 <1	<450 300 425 – – 3.84 <1	<450 300 450 7000 8000 2.39 <1	<450 300 400 – – 3.68 <1	<450 300 400 7000 10000 1.52 <1	<450 300 450 – – 2.20 <1	<450 300 500 7000 8500 2.83 <1	<450 300 400 – – 2.21 <1	<450 300 450 7000 9500 3.63 <1	<450 300 600 – – 2.10 <1
AB	<450 300 425 – – 2.22 <1	<450 300 450 – – 1.85 <1	<450 300 400 – – 1.84 <1	<450 300 450 – – 2.39 <1	<450 300 425 – – 2.49 <1	<450 300 450 – – 2.12 <1	<450 300 450 – – 1.57 <1	<450 300 425 – – 1.98 <1	<450 300 350 – – 2.22 <1	<450 300 450 – – 2.86 <1	<450 300 500 – – 1.58 <1	<450 300 400 – – 1.89 <1	<450 300 450 – – 1.91 <1	<450 300 700 – – 1.70 <1
AA	<450 300 450 7000 9000 2.30 <1	<450 300 450 – – 2.63 <1	<450 300 400 7000 9500 2.57 <1	<450 300 400 – – 3.32 <1	<450 300 450 7000 9500 2.41 <1	<450 300 450 – – 1.68 <1	<450 300 450 7000 8000 3.46 <1	<450 300 450 – – 2.15 <1	<450 300 350 7000 10000 2.07 <1	<450 300 450 – – 1.98 <1	<450 300 475 7000 9000 2.15 <1	<450 300 450 – – 1.77 <1	<450 300 450 7000 12500 2.42 <1	<450 300 850 – – 2.21 <1

Sample Data

<450 – IM-247/PD Results [μμCi/20cm²]
200 – IM-253/PD (HV-1 PHA) [bkg.]
300 – IM-253/PD (HV-1 PHA) [cpm]
7000 – IM-253/PD (HV-2 GROSS) [bkg.]
7300 – IM-253/PD (HV-2 GROSS) [cpm]
1.82 – MCA Gross Gamma Eq Co-60 [pCi/g]
<1 – MCA Specific Co-60 Results [pCi/g]

1. Pier M

e. Localized Grid Maps

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
AV	<450 300 450 – – 0.68	<450 300 450 – – 0.66	<450 300 500 – – 0.66	<450 300 450 – – 0.62	<450 300 425 – – <0.36	<450 300 400 – – <0.36	<450 300 450 – – 1.10 <1	<450 300 450 – – 1.50 <1	<450 300 450 – – 1.55 <1	<450 300 400 – – 1.00 <1	<450 300 400 – – 1.6[illegible] <1	<450 300 400 – – 1.58 <1	<450 300 400 – – 1.87 <1	<450 300 550 – – 2.20 <1
AU	<450 300 500 7000 12500 0.84	<450 300 550 – – <0.38	<450 300 500 7000 9000 <0.42	<450 300 450 – – 0.57	<450 300 450 7000 8750 <0.41	<450 300 450 – – <0.43	<450 300 450 7000 8750 0.57	<450 300 450 – – 1.29 <1	<450 300 450 7000 8500 1.97 <1	<450 300 450 – – 0.78	<450 300 400 7000 8500 0.40	<450 300 450 – – <0.35	<450 300 400 7000 8750 0.50	<450 300 600 – – 1.11 <1
AT	<450 300 600 – – 2.88 <1	<450 300 500 – – 1.12 <1	<450 300 600 – – 0.98	<450 300 600 – – 1.04 <1	<450 300 450 – – 2.13 <1	<450 300 450 – – 1.42 <1	<450 300 450 – – 1.43 <1	<450 300 400 – – 1.56 <1	<450 300 450 – – 1.45 <1	<450 300 450 – – <0.34	<450 300 400 – – 1.84 <1	<450 300 350 – – 2.23 <1	<450 300 350 – – 2.87 <1	<450 300 700 – – 2.47 <1
AS	<450 300 550 7000 15000 3.03 <1	<450 300 500 – – 2.21 <1	<450 300 500 7000 12500 2.47 <1	<450 300 500 – – 4.86 <1	<450 300 450 7000 10000 2.32 <1	<450 300 450 – – 1.65 <1	<450 300 450 7000 10000 2.72 <1	<450 300 450 – – 4.23 <1	<450 300 450 7000 10000 2.82 <1	<450 300 425 – – 2.87 <1	<450 300 450 7000 9000 2.63 <1	<450 300 450 – – 2.04 <1	<450 300 400 7000 8500 2.16 <1	<450 300 450 – – 4.44 <1
AR	<450 300 500 – – 1.72 <1	<450 300 550 – – 2.04 <1	<450 300 550 – – 1.73 <1	<450 300 450 – – 1.53 <1	<450 300 450 – – 3.09 <1	<450 300 475 – – 1.87 <1	<450 300 450 – – 2.32 <1	<450 300 450 – – 3.20 <1	<450 300 500 – – 2.08 <1	<450 300 450 – – 1.48 <1	<450 300 450 – – 2.69 <1	<450 300 400 – – 3.24 <1	<450 300 375 – – 3.19 <1	<450 300 450 – – 3.35 <1
AQ	<450 300 450 7000 12500 1.00 <1	<450 300 500 – – 2.77 <1	<450 300 500 7000 10000 0.92	<450 300 400 – – 1.53 <1	<450 300 400 7000 12500 3.31 <1	<450 300 400 – – 2.63 <1	<450 300 400 7000 6000 3.31 <1	<450 300 450 – – 3.01 <1	<450 300 450 7000 9250 2.10 <1	<450 300 450 – – 1.90 <1	<450 300 450 7000 10000 2.48 <1	<450 300 375 – – 1.94 <1	<450 300 550 7000 9000 2.10 <1	<450 300 450 – – 2.41 <1
AP	<450 300 450 – – 2.17 <1	<450 300 550 – – 1.79 <1	<450 300 500 – – 2.03 <1	<450 300 500 – – 1.92 <1	<450 300 550 – – 1.26 <1	<450 300 400 – – 1.97 <1	<450 300 400 – – 2.04 <1	<450 300 450 – – 1.84 <1	<450 300 500 – – 1.79 <1	<450 300 450 – – 2.12 <1	<450 300 450 – – 1.97 <1	<450 300 400 – – 2.77 <1	<450 300 550 – – 1.62 <1	<450 300 400 – – 1.99 <1
AO	<450 300 500 7000 12500 2.52 <1	<450 300 550 – – 1.76 <1	<450 300 550 7000 12500 2.59 <1	<450 300 500 – – 2.69 <1	<450 300 550 7000 10000 2.72 <1	<450 300 450 – – 1.18 <1	<450 300 400 7000 8500 2.04 <1	<450 300 450 – – 1.32 <1	<450 300 500 7000 9250 1.56 <1	<450 300 450 – – 2.43 <1	<450 300 450 7000 9000 2.85 <1	<450 300 375 – – 2.73 <1	<450 300 550 7000 9000 2.40 <1	<450 300 500 – – 2.21 <1
AN	<450 300 500 – – 1.10 <1	<450 300 550 – – 1.76 <1	<450 300 500 – – 1.15 <1	<450 300 500 – – 2.32 <1	<450 300 500 – – 1.48 <1	<450 300 450 – – 1.32 <1	<450 300 375 – – 1.67 <1	<450 300 450 – – 1.73 <1	<450 300 400 – – 2.05 <1	<450 300 450 – – 2.64 <1	<450 300 450 – – 2.07 <1	<450 300 375 – – 2.46 <1	<450 300 450 – – 1.86 <1	<450 300 650 – – 2.23 <1
AM	<450 300 500 7000 12500 2.07 <1	<450 300 450 – – 1.55 <1	<450 300 500 7000 10000 2.30 <1	<450 300 450 – – 1.05 <1	<450 300 500 7000 8500 1.63 <1	<450 300 400 – – 1.48 <1	<450 300 400 7000 9000 1.45 <1	<450 300 475 – – 1.66 <1	<450 300 450 7000 9000 3.08 <1	<450 300 350 – – 2.38 <1	<450 300 450 7000 9000 1.52 <1	<450 300 425 – – 2.44 <1	<450 300 450 7000 10000 3.50 <1	<450 300 600 – – 2.52 <1
AL	<450 300 650 – – 1.10 <1	<450 300 450 – – 1.55 <1	<450 300 550 – – 2.28 <1	<450 300 400 – – 2.20 <1	<450 300 450 – – 1.55 <1	<450 300 450 – – 1.67 <1	<450 300 450 – – 1.52 <1	<450 300 450 – – 2.54 <1	<450 300 450 – – 2.42 <1	<450 300 400 – – 1.57 <1	<450 300 400 – – 1.64 <1	<450 300 350 – – 1.94 <1	<450 300 450 – – 1.84 <1	<450 300 600 – – 2.73 <1

Sample Data

<450 – IM-247/PD Results [μμCi/20cm²]
200 – IM-253/PD (HV-1 PHA) [bkg.]
300 – IM-253/PD (HV-1 PHA) [cpm]
7000 – IM-253/PD (HV-2 GROSS) [bkg.]
7300 – IM-253/PD (HV-2 GROSS) [cpm]
1.82 – MCA Gross Gamma Eq. Co-60 [pCi/g]
<1 – MCA Specific Co-60 Results [pCi/g]

1. Pier M

e. Localized Grid Maps

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
BG	<450 300 500 - 7000 15000 2.05 <1	<450 300 500 - - 1.95 <1	<450 300 450 7000 8500 1.71 <1	<450 300 450 - - 2.12 <1	<450 300 450 7000 9000 1.99 <1	<450 300 325 - - 1.81 <1	<450 300 350 7000 12500 2.65 <1	<450 300 325 - - 2.94 <1	<450 300 450 7000 9000 2.38 <1	<450 300 450 - - 2.82 <1	<450 300 400 7000 8500 2.77 <1	<450 300 350 - - 1.85 <1	<450 300 450 7000 9000 2.81 <1	<450 250 300 - - - -
BF	<450 300 550 - - 1.19 <1	<450 300 400 - - 0.87 <1	<450 300 450 - - 1.07 <1	<450 300 450 - - 2.37 <1	<450 300 450 - - 1.85 <1	<450 300 375 - - 1.23 <1	<450 300 350 - - 1.16 <1	<450 300 450 - - 1.86 <1	<450 300 450 - - 3.52 <1	<450 300 450 - - 2.06 <1	<450 300 375 - - 1.35 <1	<450 300 425 - - 2.67 <1	<450 300 400 - - 2.27 <1	<450 300 500 - - 2.39 <1
BE	<450 300 450 7000 12500 2.44 <1	<450 300 500 - - 1.99 <1	<450 300 500 7000 9000 0.78 <1	<450 300 450 - - 1.32 <1	<450 300 450 7000 9000 1.83 <1	<450 300 500 - - 2.60 <1	<450 300 450 7000 9000 1.80 <1	<450 300 450 - - 2.37 <1	<450 300 500 7000 9500 2.04 <1	<450 300 450 - - 1.62 <1	<450 300 400 7000 8750 1.55 <1	<450 300 350 - - 1.18 <1	<450 300 400 7000 8500 2.14 <1	<450 300 400 - - 1.99 <1
BD	<450 300 450 - - 2.17 <1	<450 300 400 - - 1.79 <1	<450 300 450 - - 2.34 <1	<450 300 400 - - 1.76 <1	<450 300 450 - - 1.91 <1	<450 300 450 - - 1.77 <1	<450 300 450 - - 2.84 <1	<450 300 450 - - 3.74 <1	<450 300 450 - - 2.07 <1	<450 300 450 - - 2.62 <1	<450 300 350 - - 2.65 <1	<450 300 450 - - 1.11 <1	<450 300 450 - - 1.47 <1	<450 300 400 - - 2.06 <1
BC	<450 300 450 7000 15000 1.91 <1	<450 300 500 - - 1.03 <1	<450 300 500 7000 12500 1.10 <1	<450 300 450 - - 2.48 <1	<450 300 450 7000 9500 2.19 <1	<450 300 450 - - 1.08 <1	<450 300 350 7000 8500 1.17 <1	<450 300 450 - - 2.21 <1	<450 300 450 7000 10000 2.00 <1	<450 300 450 - - 2.34 <1	<450 300 450 7000 9000 3.05 <1	<450 300 450 - - 1.65 <1	<450 300 400 7000 9000 2.75 <1	<450 300 450 - - 2.72 <1
BB	<450 300 500 - - 1.45 <1	<450 300 500 - - 1.14 <1	<450 300 450 - - 1.83 <1	<450 300 400 - - 1.14 <1	<450 300 450 - - 1.56 <1	<450 300 450 - - 2.12 <1	<450 300 350 - - 2.23 <1	<450 300 450 - - 2.69 <1	<450 300 450 - - 3.13 <1	<450 300 450 - - 2.25 <1	<450 300 450 - - 2.24 <1	<450 300 450 - - 2.07 <1	<450 300 450 - - 2.43 <1	<450 300 550 - - 3.19 <1
BA	<450 300 975 7000 12500 1.69 <1	<450 300 400 - - 1.07 <1	<450 300 450 7000 12500 2.52 <1	<450 300 425 - - 2.58 <1	<450 300 450 7000 9000 1.80 <1	<450 300 450 - - 1.91 <1	<450 300 450 7000 8500 2.05 <1	<450 300 450 - - 3.73 <1	<450 300 450 7000 9500 2.47 <1	<450 300 450 - - 2.96 <1	<450 300 450 7000 9000 2.44 <1	<450 300 400 - - 2.57 <1	<450 300 450 7000 9500 2.07 <1	<450 300 450 - - 2.16 <1
AZ	<450 300 500 - - 1.89 <1	<450 300 500 - - 2.42 <1	<450 300 450 - - 2.17 <1	<450 300 400 - - 1.49 <1	<450 300 400 - - 2.75 <1	<450 300 425 - - 2.75 <1	<450 300 450 - - 3.09 <1	<450 300 450 - - 2.67 <1	<450 300 450 - - 3.72 <1	<450 300 450 - - 3.02 <1	<450 300 450 - - 2.55 <1	<450 300 450 - - 2.83 <1	<450 300 500 - - 2.26 <1	<450 300 550 - - 2.96 <1
AY	<450 300 500 7000 9750 1.91 <1	<450 300 550 - - 3.32 <1	<450 300 500 7000 9000 1.88 <1	<450 300 500 - - 2.43 <1	<450 300 450 7000 9000 2.36 <1	<450 300 475 - - 2.65 <1	<450 300 550 7000 8750 2.51 <1	<450 300 500 - - 3.13 <1	<450 300 450 7000 9000 3.15 <1	<450 300 450 - - 3.39 <1	<450 300 450 7000 8500 3.21 <1	<450 300 450 - - 3.02 <1	<450 300 400 7000 8500 2.69 <1	<450 300 550 - - 2.75 <1
AX	<450 300 500 - - 1.13 <1	<450 300 450 - - 1.47 <1	<450 300 400 - - 1.57 <1	<450 300 450 - - 1.63 <1	<450 300 450 - - 1.49 <1	<450 300 450 - - 1.48 <1	<450 300 450 - - 1.50 <1	<450 300 450 - - 1.75 <1	<450 300 450 - - 3.01 <1	<450 300 450 - - 1.81 <1	<450 300 400 - - 1.61 <1	<450 300 400 - - 2.07 <1	<450 300 400 - - 1.70 <1	<450 300 550 - - 3.27 <1
AW	<450 300 500 7000 15000 2.69 <1	<450 300 475 - - 1.91 <1	<450 300 450 7000 9500 1.81 <1	<450 300 450 - - 1.79 <1	<450 300 450 7000 9000 2.29 <1	<450 300 450 - - 2.59 <1	<450 300 450 7000 9500 1.91 <1	<450 300 450 - - 1.90 <1	<450 300 450 7000 10000 3.39 <1	<450 300 450 - - 2.78 <1	<450 300 400 7000 10000 2.88 <1	<450 300 450 - - 1.80 <1	<450 300 450 7000 10000 2.25 <1	<450 300 550 - - 2.46 <1

Sample Data

<450 – IM-247/PD Results [μμC/20cm²]
200 – IM-253/PD (HV-1 PHA) [bkg.]
300 – IM-253/PD (HV-1 PHA) [cpm]
7000 – IM-253/PD (HV-2 GROSS) [bkg.]
7300 – IM-253/PD (HV-2 GROSS) [cpm]
1.82 – MCA Gross Gamma Eq. Co-60 [pCi/g]
<1 – MCA Specific Co-60 Results [pCi/g]

1. Pier M

e. Localized Grid Maps

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
BR	<450 300 400 – – 1.84	<450 300 500 – – 1.84	<450 300 450 – – 2.06	<450 300 450 – – 2.29	<450 300 425 – – 1.58	<450 300 450 – – 1.85	<450 300 500 – – 2.09	<450 300 450 – – 2.50	<450 300 450 – – 1.36	<450 300 400 – – 1.88	<450 300 350 – – 1.54	<450 300 475 – – 2.41	<450 300 450 – – 2.11	<450 300 550 – – 4.14
BQ	<450 300 400 7000 15000 1.42	<450 300 500 – – 1.57	<450 300 450 7000 9000 1.12	<450 300 450 – – 1.70	<450 300 425 7000 9000 1.22	<450 300 475 – – 2.69	<450 300 550 7000 10000 2.46	<450 300 550 – – 3.44	<450 300 450 7000 12500 1.81	<450 300 450 – – 1.81	<450 300 375 7000 9000 3.01	<450 300 500 – – 2.37	<450 300 425 7000 12500 2.27	<450 300 600 – – 2.85
BP	<450 300 425 – – 2.04	<450 300 500 – – 1.79	<450 300 450 – – 1.75	<450 300 500 – – 1.66	<450 300 500 – – 2.13	<450 300 450 – – 1.88	<450 300 450 – – 2.04	<450 300 500 – – 2.08	<450 300 450 – – 1.87	<450 300 450 – – 2.34	<450 300 375 – – 1.58	<450 300 500 – – 1.68	<450 300 500 – – 1.56	<450 300 600 – – 1.42
BO	<450 300 425 7000 15000 2.13	<450 300 500 – – 1.87	<450 300 550 7000 9500 1.90	<450 300 500 – – 1.77	<450 300 400 7000 9000 1.60	<450 300 400 – – 1.26	<450 300 350 7000 9750 1.33	<450 300 475 – – 1.99	<450 300 400 7000 7500 4.57	<450 300 500 – – 2.55	<450 300 400 7000 9000 1.42	<450 300 450 – – 1.84	<450 300 525 7000 10000 1.18	<450 300 600 – – 2.21
BN	<450 300 400 – – 2.96	<450 300 450 – – 2.62	<450 300 450 – – 2.81	<450 300 450 – – 2.64	<450 300 400 – – 2.81	<450 300 450 – – 1.59	<450 300 400 – – 2.29	<450 300 400 – – 2.38	<450 300 450 – – 3.31	<450 300 400 – – 1.99	<450 300 350 – – 2.33	<450 300 550 – – 1.93	<450 300 450 – – 1.48	<450 300 500 – – 1.80
BM	<450 300 425 7000 15000 3.85	<450 300 450 – – 2.83	<450 300 500 7000 9000 2.86	<450 300 450 – – 3.39	<450 300 525 7000 9000 2.61	<450 300 450 – – 2.44	<450 300 500 7000 9000 3.67	<450 300 500 – – 3.68	<450 300 450 7000 12500 2.78	<450 300 450 – – 3.02	<450 300 350 7000 9500 3.43	<450 300 550 – – 3.15	<450 300 400 7000 9500 3.54	<450 300 550 – – 2.82
BL	<450 300 600 – – 3.50	<450 300 425 – – 2.17	<450 300 500 – – 1.89	<450 300 500 – – 2.31	<450 300 575 – – 1.62	<450 300 500 – – 2.95	<450 300 500 – – 3.03	<450 300 400 – – 2.64	<450 300 400 – – 2.24	<450 300 400 – – 2.40	<450 300 375 – – 3.13	<450 300 600 – – 2.03	<450 300 450 – – 3.38	<450 300 550 – – 1.79
BK	<450 300 650 7000 17500 3.22	<450 300 425 – – 1.85	<450 300 550 7000 9500 3.11	<450 300 500 – – 1.35	<450 300 425 7000 10000 1.78	<450 300 450 – – 1.34	<450 300 450 7000 9000 3.12	<450 300 400 – – 2.95	<450 300 450 7000 12500 2.29	<450 300 500 – – 2.34	<450 300 400 7000 9500 3.18	<450 300 550 – – 1.78	<450 300 400 7000 8500 2.43	<450 300 500 – – 1.60
BJ	<450 300 500 – – 3.77	<450 300 400 – – 2.32	<450 300 475 – – 2.07	<450 300 500 – – 1.62	<450 300 400 – – 1.91	<450 300 450 – – 2.06	<450 300 400 – – 3.48	<450 300 400 – – 3.93	<450 300 450 – – 3.07	<450 300 450 – – 2.74	<450 300 450 – – 2.28	<450 300 500 – – 1.62	<450 300 425 – – 2.11	<450 300 500 – – 2.16
BI	<450 300 550 7000 15000 2.65	<450 300 425 – – 2.38	<450 300 475 7000 10000 2.75	<450 300 500 – – 2.79	<450 300 450 7000 9000 2.10	<450 300 375 – – 2.04	<450 300 450 7000 10000 2.70	<450 300 450 – – 3.38	<450 300 450 7000 12500 2.70	<450 300 400 – – 1.97	<450 300 400 7000 9000 2.09	<450 300 500 – – 1.72	<450 300 375 7000 8500 2.78	<450 300 125 – – 2.17
BH	<450 300 475 – – 2.41	<450 300 400 – – 1.75	<450 300 500 – – 2.03	<450 300 450 – – 1.99	<450 300 450 – – 1.81	<450 300 375 – – 1.70	<450 300 375 – – 1.65	<450 300 450 – – 2.11	<450 300 450 – – 1.77	<450 300 350 – – 2.42	<450 300 400 – – 2.19	<450 300 500 – – 2.36	<450 300 450 – – 2.26	<450 300 500 – – 2.33

Sample Data

<450 – IM-247/PD Results [μμCi/20cm²]
200 – IM-253/PD (HV-1 PHA) [bkg.]
300 – IM-253/PD (HV-1 PHA) [cpm]
7000 – IM-253/PD (HV-2 GROSS) [bkg.]
7300 – IM-253/PD (HV-2 GROSS) [cpm]
1.82 – MCA Gross Gamma Eq. Co-60 [pCi/g]
<1 – MCA Specific Co-60 Results [pCi/g]

1. **Pier M**

e. **Localized Grid Maps**

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
CB	<450 300 450 – – 2.55 <1	<450 300 450 – – 1.87 <1	<450 400 450 – – 1.56 <1	<450 300 400 – – 1.70 <1	<450 – – – – – –	– 300 400 – – 1.72 <1				<450 – – – – – –	<450 300 400 – – 1.52 <1	<450 300 500 – – 1.37 <1	<450 300 400 – – 2.33 <1	<450 300 450 – – 1.93 <1
CA	<450 300 600 7000 15000 1.60 <1	<450 300 450 – – 1.29 <1	<450 300 500 7000 12500 1.38 <1	<450 300 450 – – 1.15 <1						– 300 500 – – 1.80 <1	<450 300 400 7000 12500 1.87 <1	<450 300 500 – – 1.72 <1	<450 300 500 7000 9000 2.46 <1	<450 300 450 – – 3.47 <1
BZ	<450 300 550 – – 1.47 <1	<450 300 450 – – 2.20 <1	<450 300 450 – – 1.42 <1	<450 300 450 – – 1.55 <1	<450 – – – – – –	– 300 450 – – 1.79 <1				<450 – – – – – –	<450 300 400 – – 2.14 <1	<450 300 500 – – 2.32 <1	<450 300 400 – – 1.93 <1	<450 300 450 – – 2.41 <1
BY	<450 300 550 7000 17500 1.78 <1	<450 300 450 – – 1.63 <1	<450 300 450 7000 9000 2.18 <1	<450 300 450 – – 1.92 <1			<450 300 450 – – 1.82 <1	<450 300 525 – – 2.65 <1	<450 300 600 – – 3.03 <1		<450 300 500 7000 12500 2.97 <1	<450 300 500 – – 1.66 <1	<450 300 550 7000 10000 1.28 <1	<450 300 450 – – 1.77 <1
BX	<450 300 575 – – 2.56 <1	<450 300 500 – – 3.30 <1	<450 300 450 – – 2.17 <1	<450 300 450 – – 3.22 <1	<450 300 625 – – 2.22 <1	<450 300 650 – – 2.42 <1				<450 300 550 7000 10000 3.51 <1	<450 300 450 – – 2.49 <1	<450 300 450 – – 1.13 <1	<450 300 550 – – 0.98	<450 300 450 – – 2.10 <1
BW	<450 300 550 7000 9500 2.23 <1	<450 300 475 – – 1.33 <1	<450 300 500 7000 10000 1.96 <1	<450 300 600 – – 2.22 <1	<450 300 575 7000 9750 1.43 <1	<450 300 575 – – 1.94 <1	<450 300 400 – – 1.51 <1	<450 300 525 – – 2.24 <1	<450 300 525 – – 1.37 <1	<450 300 575 – – 1.26 <1	<450 300 550 7000 9750 1.29 <1	<450 300 450 – – 2.62 <1	<450 300 500 7000 9500 2.87 <1	<450 300 500 – – 2.61 <1
BV	<450 300 575 – – 2.00 <1	<450 300 525 – – 1.72 <1	<450 300 500 – – 1.50 <1	<450 300 500 – – 1.50 <1	<450 300 450 – – 2.14 <1	<450 300 600 – – 2.09 <1	<450 300 400 – – 1.96 <1	<450 300 525 7000 12500 2.20 <1	<450 300 500 – – 3.04 <1	<450 300 550 7000 10000 1.94 <1	<450 300 450 – – 2.85 <1	<450 300 400 – – 2.68 <1	<450 300 450 – – 2.62 <1	<450 300 450 – – 2.41 <1
BU	<450 300 550 7000 17500 2.52 <1	<450 300 450 – – 2.39 <1	<450 300 450 7000 10000 0.87 <1	<450 300 500 – – 1.37 <1	<450 300 550 7000 9500 0.98 <1	<450 300 500 – – 1.08 <1	<450 300 550 7000 10000 1.71 <1	<450 300 500 – – 0.59 <1	<450 300 500 – – 0.92 <1	<450 300 500 – – 0.91 <1	<450 300 500 7000 9250 0.88 <1	<450 300 400 – – 0.92 <1	<450 300 450 7000 9500 1.49 <1	<450 300 450 – – 3.62 <1
BT	<450 300 450 – – 1.48 <1	<450 300 450 – – 2.17 <1	<450 300 450 – – 1.37 <1	<450 300 400 – – 1.25 <1	<450 300 475 – – 1.14 <1	<450 300 450 – – 2.43 <1	<450 300 450 – – 1.85 <1	<450 300 450 7000 15000 1.65 <1	<450 300 450 – – 3.23 <1	<450 300 500 7000 10000 1.73 <1	<450 300 450 – – 2.65 <1	<450 300 450 – – 2.91 <1	<450 300 400 – – 2.02 <1	<450 300 500 – – 2.76 <1
BS	<450 300 450 7000 15000 1.05 <1	<450 300 500 – – 1.05 <1	<450 300 500 7000 10000 1.15 <1	<450 300 500 – – 1.80 <1	<450 300 500 7000 10000 1.73 <1	<450 300 550 – – 0.98	<450 300 500 7000 10000 0.83	<450 300 450 – – 1.40 <1	<450 300 450 – – 1.47 <1	<450 300 500 – – 1.13 <1	<450 300 450 7000 9250 2.61 <1	<450 300 400 – – 1.55 <1	<450 300 425 7000 9000 1.44 <1	<450 300 450 – – 1.15 <1

Sample Data

< 450 – IM-247/PD Results [$\mu\mu$Ci/20cm^2]
200 – IM-253/PD (HV-1 PHA) [bkg.]
300 – IM-253/PD (HV-1 PHA) [cpm]
7000 – IM-253/PD (HV-2 GROSS) [bkg.]
7300 – IM-253/PD (HV-2 GROSS) [cpm]
1.82 – MCA Gross Gamma Eq. Co-60 [pCi/g]
<1 – MCA Specific Co-60 Results [pCi/g]

1. Pier M

e. Localized Grid Maps

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
CL	<450 300 500 – – 2.93 <1	<450 300 450 – – 1.84 <1	<450 300 500 – – 2.41 <1	<450 300 450 – – 3.22 <1	<450 – – – – – –	– 300 450 – – 1.38 <1				<450 – – – – – –	<450 300 450 – – 2.96 <1	<450 300 500 – – 2.27 <1	<450 300 500 – – 3.15 <1	<450 300 550 – – 3.48 <1
CK	<450 300 700 7000 17500 1.47 <1	<450 300 650 – – 2.74 <1	<450 300 500 7000 12500 2.09 <1	<450 300 550 – – 2.10 <1						– 300 500 – – 1.25 <1	<450 300 450 7000 10000 2.00 <1	<450 300 475 – – 3.26 <1	<450 300 550 7000 10000 2.85 <1	<450 300 500 – – 2.62 <1
CJ	<450 300 700 – – 2.47 <1	<450 300 700 – – 3.42 <1	<450 300 600 – – 2.93 <1	<450 300 500 – – 1.93 <1	<450 – – – – – –	– 300 400 – – 1.93 <1				<450 – – – – – –	<450 300 450 – – 2.22 <1	<450 300 450 – – 1.53 <1	<450 300 450 – – 2.04 <1	<450 300 500 – – 3.93 <1
CI	<450 300 600 7000 15000 1.83 <1	<450 300 475 – – 1.58 <1	<450 300 500 7000 12500 2.61 <1	<450 300 550 – – 1.78 <1						– 300 450 – – 1.97 <1	<450 300 400 7000 10000 2.47 <1	<450 300 400 – – 2.04 <1	<450 300 500 7000 10000 1.85 <1	<450 300 550 – – 3.09 <1
CH	<450 300 650 – – 1.47 <1	<450 300 425 – – 2.74 <1	<450 300 425 – – 2.85 <1	<450 300 425 – – 4.11 <1	<450 – – – – – –	– 300 400 – – 3.41 <1				<450 – – – – – –	<450 300 450 – – 2.00 <1	<450 300 450 – – 1.87 <1	<450 300 550 – – 2.96 <1	<450 300 550 – – 3.45 <1
CG	<450 300 650 7000 20000 2.96 <1	<450 300 450 – – 2.58 <1	<450 300 450 7000 10000 2.03 <1	<450 300 450 – – 1.82 <1						– 300 450 – – 2.77 <1	<450 300 450 7000 12500 1.56 <1	<450 300 475 – – 1.71 <1	<450 300 450 7000 10000 2.00 <1	<450 300 525 – – 2.53 <1
CF	<450 300 700 – – 2.43 <1	<450 300 450 – – 1.64 <1	<450 300 400 – – 1.67 <1	<450 300 400 – – 2.05 <1	<450 – – – – – –	– 300 400 – – 1.70 <1				<450 – – – – – –	<450 300 450 – – 1.55 <1	<450 300 475 – – 2.80 <1	<450 300 550 – – 1.41 <1	<450 300 375 – – 3.77 <1
CE	<450 300 600 7000 15000 2.05 <1	<450 300 400 – – 3.15 <1	<450 300 350 7000 10000 1.96 <1	<450 300 450 – – 1.65 <1						– 300 450 – – 1.78 <1	<450 300 450 7000 10000 1.96 <1	<450 300 475 – – 2.45 <1	<450 300 500 7000 12500 1.59 <1	<450 300 425 – – 2.40 <1
CD	<450 300 550 – – 4.30 <1	<450 300 400 – – 3.60 <1	<450 300 350 – – 3.03 <1	<450 300 500 – – 2.49 <1	<450 – – – – – –	– 300 350 – – 1.32 <1				<450 – – – – – –	<450 300 400 – – 2.43 <1	<450 300 500 – – 2.78 <1	<450 300 500 – – 1.42 <1	<450 300 500 – – 1.64 <1
CC	<450 300 500 7000 15000 2.28 <1	<450 300 375 – – 2.07 <1	<450 300 500 7000 12500 3.16 <1	<450 300 400 – – 1.44 <1						– 300 500 – – 1.72 <1	<450 300 400 7000 15000 1.66 <1	<450 300 550 – – 2.10 <1	<450 300 450 7000 9000 1.53 <1	<450 300 550 – – 2.27 <1

Sample Data

- <450 – IM-247/PD Results [μμC/20cm²]
- 200 – IM-253/PD (HV-1 PHA) [bkg.]
- 300 – IM-253/PD (HV-1 PHA) [cpm]
- 7000 – IM-253/PD (HV-2 GROSS) [bkg.]
- 7300 – IM-253/PD (HV-2 GROSS) [cpm]
- 1.62 – MCA Gross Gamma Eq. Co-60 [pCi/g]
- <1 – MCA Specific Co-60 Results [pCi/g]

1. Pier M

e. Localized Grid Maps

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
CV	<450 300 450 – – 2.35 <1	<450 300 450 – – 1.50 <1	<450 300 550 – – 1.23 <1	<450 300 550 – – 1.54 <1	<450 – – – –	– 300 450 – – 2.14 <1	<450 – – – –	– 300 400 – – 2.33 <1	<450 – – – –	– 300 450 – – 2.09 <1	<450 300 400 – – 1.81 <1	<450 300 450 – – 2.78 <1	<450 300 550 – – 1.78 <1	<450 300 450 – – 1.80 <1
CU	<450 300 450 7000 15000 1.59 <1	<450 300 450 – – 1.93 <1	<450 300 450 7000 8500 1.47 <1	<450 300 550 – – 1.82 <1							<450 300 450 7000 12500 1.82 <1	<450 300 400 – – 2.30 <1	<450 300 500 7000 15000 2.33 <1	<450 300 500 – – 2.46 <1
CT	<450 300 550 – – 1.67 <1	<450 300 450 – – 1.90 <1	<450 300 550 – – 2.83 <1	<450 300 550 – – 1.88 <1	<450 – – – –	– 300 400 – – 1.89 <1	<450 – – – –	– 300 450 – – 1.92 <1	<450 – – – –	– 300 400 – – 2.50 <1	<450 300 450 – – 1.47 <1	<450 300 450 – – 2.14 <1	<450 300 500 – – 1.87 <1	<450 300 400 – – 2.04 <1
CS	<450 300 500 7000 15000 1.74 <1	<450 300 500 – – 2.69 <1	<450 300 550 7000 8500 1.94 <1	<450 300 550 – – 2.17 <1							<450 300 500 7000 12500 3.67 <1	<450 300 400 – – 1.99 <1	<450 300 450 7000 8500 1.88 <1	<450 300 400 – – 3.28 <1
CR	<450 300 500 – – 1.54 <1	<450 300 400 – – 1.72 <1	<450 300 400 – – 2.16 <1	<450 300 550 – – 1.85 <1	<450 – – – –	– 300 400 – – 1.78 <1	<450 – – – –	– 300 400 – – 1.82 <1	<450 – – – –	– 300 400 – – 2.12 <1	<450 300 450 – – 1.10 <1	<450 300 400 – – 1.61 <1	<450 300 500 – – 1.75 <1	<450 300 400 – – 2.22 <1
CQ	<450 300 550 7000 15000 1.77 <1	<450 300 550 – – 1.43 <1	<450 300 500 7000 8500 2.15 <1	<450 300 500 – – 1.46 <1							<450 300 400 7000 12500 1.65 <1	<450 300 450 – – 2.87 <1	<450 300 450 7000 8500 2.34 <1	<450 300 450 – – 2.33 <1
CP	<450 300 600 – – 2.05 <1	<450 300 450 – – 2.23 <1	<450 300 550 – – 1.67 <1	<450 300 550 – – 2.28 <1	<450 – – – –	– 300 400 – – 1.01 <1	<450 – – – –	– 300 400 – – 1.06 <1	<450 – – – –	– 300 400 – – 1.42 <1	<450 300 450 – – 2.24 <1	<450 300 450 – – 1.81 <1	<450 300 450 – – 1.78 <1	<450 300 450 – – 2.00 <1
CO	<450 300 550 7000 15000 2.20 <1	<450 300 450 – – 1.38 <1	<450 300 500 7000 8000 1.86 <1	<450 300 550 – – 1.33 <1							<450 300 500 7000 9000 2.04 <1	<450 300 500 – – 2.37 <1	<450 300 450 7000 9000 1.89 <1	<450 300 550 – – 2.42 <1
CN	<450 300 500 – – 1.50 <1	<450 300 500 – – 1.75 <1	<450 300 500 – – 1.76 <1	<450 300 500 – – 2.85 <1	<450 – – – –	– 300 450 – – 2.14 <1	<450 – – – –	– 300 450 – – 4.19 <1	<450 – – – –	– 300 450 – – 2.08 <1	<450 300 500 – – 2.07 <1	<450 300 425 – – 1.82 <1	<450 300 500 – – 1.94 <1	<450 300 650 – – 3.80 <1
CM	<450 300 400 7000 10000 2.51 <1	<450 300 450 – – 2.29 <1	<450 300 500 7000 8750 1.67 <1	<450 300 800 – – 2.42 <1							<450 300 400 7000 10000 1.68 <1	<450 300 450 – – 1.69 <1	<450 300 450 7000 10000 1.75 <1	<450 300 525 – – 3.43 <1

Sample Data

<450 – IM-247/PD Results [μμCi/20cm²]
200 – IM-253/PD (HV-1 PHA) [bkg.]
300 – IM-253/PD (HV-1 PHA) [cpm]
7000 – IM-253/PD (HV-2 GROSS) [bkg.]
7300 – IM-253/PD (HV-2 GROSS) [cpm]
1.82 – MCA Gross Gamma Eq. Co-60 [pCi/g]
<1 – MCA Specific Co-60 Results [pCi/g]

1. **Pier M**

e. **Localized Grid Maps**

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
DF	<450 300 600 – – 2.26 <1	<450 300 500 – – 3.01 <1	<450 300 475 – – 1.27 <1	<450 300 450 – – 1.64 <1	<450 – – – – – – –	– 300 450 – – 2.86 <1	<450 – – – – – – –	– 300 500 – – 1.44 <1	<450 – – – – – – –	– 300 450 – – 2.54 <1	<450 300 475 – – 1.62 <1	<450 300 475 – – 2.10 <1	<450 300 450 – – 2.31 <1	<450 300 425 – – 2.57 <1
DE	<450 300 500 7000 12000 1.76 <1	<450 300 450 – – 1.54 <1	<450 300 525 7000 10000 1.71 <1	<450 300 500 – – 1.81 <1							<450 300 400 7000 12500 1.41 <1	<450 300 400 – – 2.41 <1	<450 300 400 7000 12500 1.84 <1	<450 300 450 – – 2.42 <1
DD	<450 300 550 – – 1.81 <1	<450 300 375 – – 1.57 <1	<450 300 500 – – 1.53 <1	<450 300 475 – – 1.28 <1	<450 – – – – – – –	– 300 400 – – 1.75 <1	<450 – – – – – – –	– 300 400 – – 2.24 <1	<450 – – – – – – –	– 300 450 – – 4.48 <1	<450 300 400 – – 1.59 <1	<450 300 425 – – 2.3[illegible] <[illegible]	<450 300 450 – – 3.63 <1	<450 300 425 – – 2.84 <[illegible]
DC	<450 300 500 7000 15000 2.23 <1	<450 300 400 – – 1.27 <1	<450 300 525 7000 12500 1.61 <1	<450 300 500 – – 1.63 <1							<450 300 425 7000 12500 3.10 <1	<450 300 450 – 1.88 <1	<450 300 400 7000 13000 2.33 <1	<450 300 400 – – 3.69 <1
DB	<450 300 500 – 1.92 <1	<450 300 375 – – 1.41 <1	<450 300 475 – – 1.56 <1	<450 300 500 – – 1.75 <1	<450 – – – – – – –	– 300 400 – – 2.88 <1	<450 – – – – – – –	– 300 400 – – 4.11 <1	<450 – – – – – – –	– 300 450 – – 2.37 <1	<450 300 400 – – 2.29 <1	<450 300 450 – – 2.27 <1	<450 300 500 – – 2.42 <1	<450 300 400 – – 2.32 <1
DA	<450 300 450 7000 15000 2.22 <1	<450 300 450 – – 1.83 <1	<450 300 525 7000 9500 2.26 <1	<450 300 550 – – 1.72 <1							<450 300 450 7000 12500 1.92 <1	<450 300 450 – – 1.85 <1	<450 300 450 7000 12500 2.51 <1	<450 300 400 – – 2.97 <1
CZ	<450 300 650 – – 1.94 <1	<450 300 600 – – 2.86 <1	<450 300 500 – – 1.49 <1	<450 300 550 – – 1.50 <1	<450 – – – – – –	– 300 450 – – 2.64 <1	<450 – – – – – –	– 300 450 – – 2.53 <1	<450 – – – – – –	– 300 400 – – 1.25 <1	<450 300 400 – – 2.33 <1	<450 300 450 – – 3.78 <1	<450 300 450 – – 2.71 <1	<450 300 300 – – 2.34 <1
CY	<450 300 600 7000 15000 2.53 <1	<450 300 550 – – 1.78 <1	<450 300 550 7000 9250 1.61 <1	<450 300 525 – – 1.65 <1							<450 300 550 7000 12500 1.46 <1	<450 300 550 – – 2.70 <1	<450 300 550 7000 12500 1.43 <1	<450 300 400 – – 2.13 <1
CX	<450 300 550 – – 1.57 <1	<450 300 450 – – 1.57 <1	<450 300 525 – – 1.96 <1	<450 300 550 – – 1.97 <1	<450 – – – – – – –	– 300 400 – – 1.89 <1	<450 – – – – – – –	– 300 400 – – 1.88 <1	<450 – – – – – – –	– 300 400 – – 1.97 <1	<450 300 550 – – 2.85 <1	<450 300 550 – – 1.98 <1	<450 300 600 – – 2.20 <1	<450 300 450 – – 1.79 <1
CW	<450 300 550 7000 15000 1.86 <1	<450 300 450 – – 1.59 <1	<450 300 500 7000 8500 1.26 <1	<450 300 525 – – 1.57 <1							<450 300 550 7000 12500 1.57 <1	<450 300 550 – – 2.50 <1	<450 300 600 7000 15000 2.14 <1	<450 300 450 – – 2.89 <1

Sample Data

<450 – IM-247/PD Results [μμCi/20cm²]
200 – IM-253/PD (HV-1 PHA) [bkg.]
300 – IM-253/PD (HV-1 PHA) [cpm]
7000 – IM-253/PD (HV-2 GROSS) [bkg.]
7300 – IM-253/PD (HV-2 GROSS) [cpm]
1.82 – MCA Gross Gamma Eq. Co-60 [pCi/g]
<1 – MCA Specific Co-60 Results [pCi/g]

1. **Pier M**

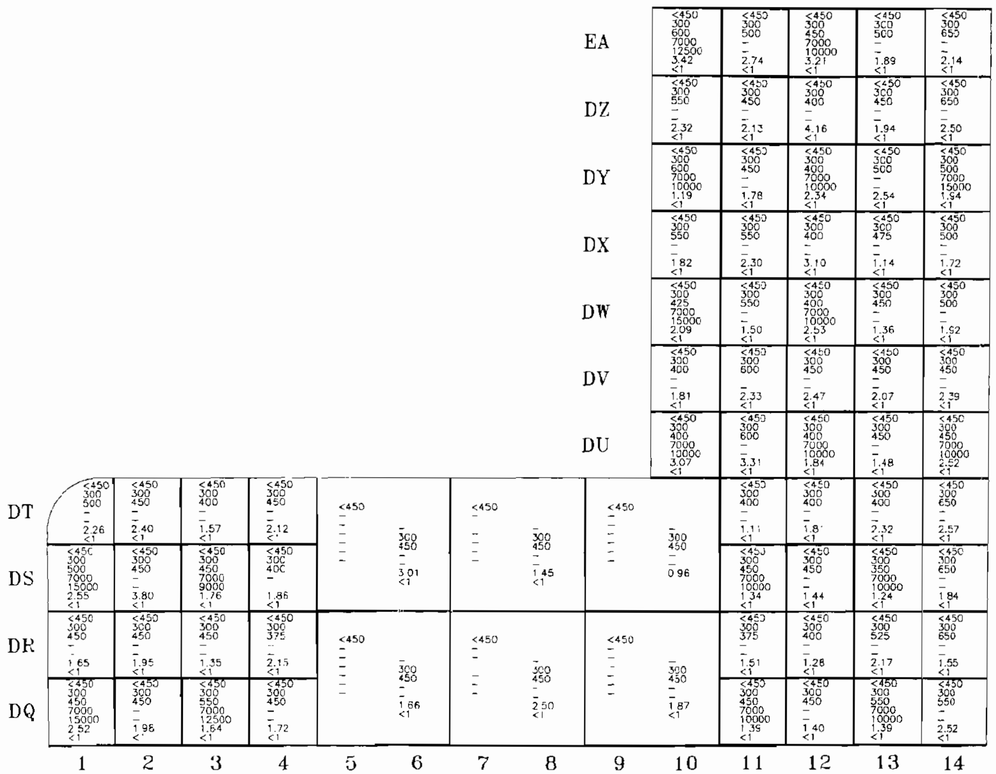
e. Localized Grid Maps

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
DP	<450 300 500 – – 2.43 <1	<450 300 450 – – 2.77 <1	<450 300 550 – – 2.05 <1	<450 300 450 – – 1.69 <1	<450 – – – – – –	– 300 450 – – 1.96 <1	<450 – – – – – –	– 300 450 – – 1.74 <1	<450 – – – – – –	– 300 450 – – 1.90 <1	<450 300 400 – – 2.23 <1	<450 300 450 – – 2.33 <1	<450 300 550 – – 1.91 <1	<450 300 500 – – 3.39 <1
DO	<450 300 550 7000 12500 1.47 <1	<450 300 450 – – 1.46 <1	<450 300 500 7000 9000 2.04 <1	<450 300 325 – – 1.34 <1							<450 300 450 7000 12500 1.50 <1	<450 300 350 – – 2.82 <1	<450 300 500 7000 12500 2.57 <1	<450 300 550 – – 3.22 <1
DN	<450 300 550 – – 1.30 <1	<450 300 400 – – 1.47 <1	<450 300 550 – – 1.59 <1	<450 300 500 – – 2.35 <1	<450 – – – – – –	– 300 450 – – 2.49 <1	<450 – – – – – –	– 300 500 – – 3.19 <1	<450 – – – – – –	– 300 450 – – 2.22 <1	<450 300 450 – – 1.28 <1	<450 300 450 – – 1.90 <1	<450 300 400 – – 3.77 <1	<450 300 600 – – 3.48 <1
DM	<450 300 550 7000 12500 3.00 <1	<450 300 450 – – 1.77 <1	<450 300 450 7000 9000 1.85 <1	<450 300 450 – – 1.04 <1							<450 300 350 7000 8000 2.34 <1	<450 300 450 – – 1.97 <1	<450 300 425 7000 10000 2.38 <1	<450 300 550 – – 1.91 <1
DL	<450 300 450 – – 1.52 <1	<450 300 450 – – 2.58 <1	<450 300 375 – – 3.47 <1	<450 300 450 – – 2.15 <1	<450 – – – – – –	– 300 450 – – 2.16 <1	<450 – – – – – –	– 300 450 – – 1.33 <1	<450 – – – – – –	– 300 450 – – 2.68 <1	<450 300 350 – – 1.58 <1	<450 300 450 – – 2.38 <1	<450 300 425 – – 2.41 <1	<450 300 525 – – 2.93 <1
DK	<450 300 500 7000 15000 2.61 <1	<450 300 400 – – 3.99 <1	<450 300 400 7000 9000 2.70 <1	<450 300 350 – – 2.39 <1							<450 300 300 7000 10000 1.30 <1	<450 300 450 – – 2.19 <1	<450 300 450 7000 12500 2.31 <1	<450 300 600 – – 1.93 <1
DJ	<450 300 550 – 3.91 <1	<450 300 400 – – 2.65 <1	<450 300 350 – – 2.68 <1	<450 300 350 – – 1.97 <1	<450 – – – – – –	– 300 450 – – 0.49	<450 – – – – – –	– 300 450 – 2.07 <1	<450 – – – – – –	– 300 450 – – 1.40 <1	<450 300 450 – – 2.74 <1	<450 300 300 – 3.66 <1	<450 300 400 – – 2.49 <1	<450 300 550 – – 2.19 <1
DI	<450 300 550 7000 15000 1.91 <1	<450 300 450 – – 1.45 <1	<450 300 350 7000 10000 0.96	<450 300 350 – – 1.61 <1							<450 300 450 7000 12500 1.79 <1	<450 300 450 – – 3.24 <1	<450 300 500 7000 13000 2.53 <1	<450 300 600 – – 2.93 <1
DH	<450 300 550 – – 3.41 <1	<450 300 450 – – 1.56 <1	<450 300 375 – – 1.73 <1	<450 300 400 – – 2.40 <1	<450 – – – – – –	– 300 450 – – 1.80 <1	<450 – – – – – –	– 300 450 – – 2.69 <1	<450 – – – – –	– 300 450 – – 4.26 <1	<450 300 400 – – 2.71 <1	<450 300 475 – – 2.45 <1	<450 300 450 – – 2.13 <1	<450 300 500 – – 2.54 <1
DG	<450 300 450 7000 12500 1.90 <1	<450 300 400 – – 1.46 <1	<450 300 400 7000 8500 2.05 <1	<450 300 400 – – 1.39 <1							<450 300 450 7000 9000 3.11 <1	<450 300 450 – – 3.57 <1	<450 300 500 7000 12500 1.92 <1	<450 300 450 – 2.50 <1

Sample Data
<450 – IM-247/PD Results [μμCi/20cm^2]
200 – IM-253/PD (HV-1 PHA) [bkg.]
300 – IM-253/PD (HV-1 PHA) [cpm]
7000 – IM-253/PD (HV-2 GROSS) [bkg.]
7300 – IM-253/PD (HV-2 GROSS) [cpm]
1.82 – MCA Gross Gamma Ec. Co-60 [pCi/g]
<1 – MCA Specific Co-60 Results [pCi/g]

1. Pier M

e. Localized Grid Maps



Sample Data
<450 – IM-247/PD Results [μμCi/20cm²]
200 – IM-253/PD (HV-1 PHA) [bkg.]
300 – IM-253/PD (HV-1 PHA) [cpm]
7000 – IM-253/PD (HV-2 GROSS) [bkg.]
7300 – IM-253/PD (HV-2 GROSS) [cpm]
1.82 – MCA Gross Gamma Eq Co-60 [pCi/g]
<1 – MCA Specific Co-60 Results [pCi/g]

1. Pier M

e. Localized Grid Maps

	10	11	12	13	14
EL	<450 300 500 – – 1.89 <1	<450 300 500 – – 3.05 <1	<450 300 500 – – 2.89 <1	<450 300 450 – – 2.18 <1	<450 300 550 – – 1.87 <1
EK	<450 300 500 7000 15000 2.47 <1	<450 300 400 – – 2.92 <1	<450 300 400 7000 12500 2.21 <1	<450 300 450 – – 1.50 <1	<450 300 500 7000 15000 2.06 <1
EJ	<450 300 550 – – 2.61 <1	<450 300 525 – – 2.75 <1	<450 300 575 – – 2.96 <1	<450 300 600 – – 2.61 <1	<450 300 550 – – 3.29 <1
EI	<450 300 500 7000 15000 3.21 <1	<450 300 550 – – 3.51 <1	<450 300 525 7000 10000 2.54 <1	<450 300 600 – – 3.43 <1	<450 300 550 – – 2.51 <1
EH	<450 300 500 – – 3.49 <1	<450 300 575 – – 3.85 <1	<450 300 550 – – 2.20 <1	<450 300 625 – – 2.43 <1	<450 300 700 – – 3.26 <1
EG	<450 300 500 7000 12500 2.86 <1	<450 300 550 – – 3.99 <1	<450 300 575 7000 12500 3.29 <1	<450 300 600 – – 2.90 <1	<450 300 600 7000 20000 2.90 <1
EF	<450 300 550 – – 2.47 <1	<450 300 500 – – 2.57 <1	<450 300 500 – – 2.36 <1	<450 300 400 – – 3.35 <1	<450 300 450 – – 2.39 <1
EE	<450 300 600 7000 17500 2.83 <1	<450 300 500 – – 2.46 <1	<450 300 400 7000 10000 1.30 <1	<450 300 500 – – 2.37 <1	<450 300 550 – – 2.18 <1
ED	<450 300 600 – – 2.31 <1	<450 300 500 – – 3.74 <1	<450 300 400 – – 1.71 <1	<450 300 500 – – 2.93 <1	<450 300 550 – – 2.05 <1
EC	<450 300 400 7000 15000 2.07 <1	<450 300 500 – – 2.59 <1	<450 300 400 7000 10000 1.38 <1	<450 300 450 – – 1.58 <1	<450 300 550 7000 15000 1.58 <1
EB	<450 300 400 – – 3.31 <1	<450 300 450 – – 2.49 <1	<450 300 400 – – 1.81 <1	<450 300 500 – – 2.03 <1	<450 300 700 – – 3.12 <1

Sample Data

<450 – IM-247/PD Results [µµCi/20cm²]
200 – IM-253/PD (HV-1 PHA) [bkg.]
300 – IM-253/PD (HV-1 PHA) [cpm]
7000 – IM-253/PD (HV-2 GROSS) [bkg.]
7300 – IM-253/PD (HV-2 GROSS) [cpm]
1.82 – MCA Gross Gamma Eq. Co-60 [pCi/g]
<1 – MCA Specific Co-60 Results [pCi/g]

1. Pier M

e. Localized Grid Maps

	10	11	12	13	14
EW	<450 300 550 7000 12500 2.19 <1	<450 300 500 – – 1.68 <1	<450 300 450 7000 10000 1.71 <1	<450 300 500 – – 3.31 <1	<450 300 550 7000 15000 1.87 <1
EV	<450 300 500 – – 2.21 <1	<450 300 400 – – 2.60 <1	<450 300 450 – – 3.37 <1	<450 300 550 – – 2.46 <1	<450 300 550 – – 1.38 <1
EU	<450 300 450 7000 15000 1.05 <1	<450 300 400 – – 1.66 <1	<450 300 450 7000 10000 2.10 <1	<450 300 450 – – 3.68 <1	<450 300 450 – – 2.72 <1
ET	<450 300 450 – – 2.98 <1	<450 300 400 – – 2.58 <1	<450 300 450 – – 3.54 <1	<450 300 500 – – 2.32 <1	<450 300 600 – – 1.88 <1
ES	<450 300 450 7000 15000 3.68 <1	<450 300 400 – – 2.70 <1	<450 300 450 7000 10000 3.72 <1	<450 300 450 – – 3.10 <1	<450 300 450 7000 9000 2.01 <1
ER	<450 300 450 – – 3.90 <1	<450 300 450 – – 3.80 <1	<450 300 450 – – 2.74 <1	<450 300 450 – – 2.41 <1	<450 300 450 – – 3.49 <1
EQ	<450 300 600 7000 7500 2.59 <1	<450 300 450 – – 3.88 <1	<450 300 500 7000 9250 3.70 <1	<450 300 525 – – 2.45 <1	<450 300 600 – – 2.32 <1
EP	<450 300 600 – – 2.70 <1	<450 300 525 – – 2.50 <1	<450 300 475 – – 2.84 <1	<450 300 475 – – 2.82 <1	<450 300 550 – – 2.46 <1
EO	<450 300 300 7000 10000 3.31 <1	<450 300 475 – – 2.22 <1	<450 300 500 7000 9250 2.79 <1	<450 300 500 – – 2.51 <1	<450 300 450 7000 9000 3.03 <1
EN	<450 300 550 – – 2.64 <1	<450 300 500 – – 2.97 <1	<450 300 500 – – 2.46 <1	<450 300 500 – – 3.01 <1	<450 300 550 – – 2.07 <1
EM	<450 300 550 7000 15000 2.46 <1	<450 300 550 – – 2.47 <1	<450 300 350 7000 12500 2.63 <1	<450 300 350 – – 2.03 <1	<450 300 550 – – 1.54 <1

Sample Data

<450 – IM-247/PD Results [μμCi/20cm²]
200 – IM-253/PD (HV-1 PHA) [bkg.]
300 – IM-253/PD (HV-1 PHA) [cpm]
7000 – IM-253/PD (HV-2 GROSS) [bkg.]
7300 – IM-253/PD (HV-2 GROSS) [cpm]
1.82 – MCA Gross Gamma Eq. Co-60 [pCi/g]
<1 – MCA Specific Co-60 Results [pCi/g]

1. Pier M

e. Localized Grid Maps

	10	11	12	13	14
FH	<450 300 500 – – 2.43 <1	<450 300 450 – – 3.15 <1	<450 300 350 – – 2.17 <1	<450 300 425 – – 2.33 <1	<450 300 550 – – 2.34 <1
FG	<450 300 500 7000 12500 3.83 <1	<450 300 400 – – 3.63 <1	<450 300 350 7000 10000 2.00 <1	<450 300 400 – – 2.95 <1	<450 300 475 – – 2.32 <1
FF	<450 300 550 – – 1.44 <1	<450 300 400 – – 2.71 <1	<450 300 400 – – 1.02 <1	<450 300 450 – – 2.38 <1	<450 300 450 – – 1.86 <1
FE	<450 300 600 7000 8000 1.89 <1	<450 300 400 – – 1.99 <1	<450 300 400 7000 10000 1.16 <1	<450 300 450 – – 1.13 <1	<450 300 600 7000 8000 2.27 <1
FD	<450 300 700 – – 2.59 <1	<450 300 400 – – 3.35 <1	<450 300 400 – – 1.28 <1	<450 300 450 – – 1.75 <1	<450 300 650 – – 4.64 <1
FC	<450 300 700 7000 17500 2.09 <1	<450 300 500 – – 2.54 <1	<450 300 550 7000 9500 2.81 <1	<450 300 500 – – 2.93 <1	<450 300 650 – – 2.68 <1
FB	<450 300 600 – – 2.65 <1	<450 300 550 – – 2.13 <1	<450 300 400 – – 1.63 <1	<450 300 325 – – 2.63 <1	<450 300 450 – – 2.78 <1
FA	<450 300 750 7000 20000 1.40 <1	<450 300 500 – – 1.85 <1	<450 300 350 7000 10000 2.15 <1	<450 300 350 – – 3.55 <1	<450 300 500 7000 15000 2.93 <1
EZ	<450 300 550 – – 1.60 <1	<450 300 500 – – 2.22 <1	<450 300 500 – – 2.79 <1	<450 300 500 – – 2.51 <1	<450 300 500 – – 2.62 <1
EY	<450 300 700 7000 22500 2.02 <1	<450 300 500 – – 2.39 <1	<450 300 350 7000 10000 2.22 <1	<450 300 350 – – 1.14 <1	<450 300 500 – – 2.74 <1
EX	<450 300 550 – – 1.95 <1	<450 300 450 – – 2.46 <1	<450 300 500 – – 1.20 <1	<450 300 500 – – 2.42 <1	<450 300 550 – – 2.02 <1

Sample Data

<450 – IM-247/PD Results [μμCi/20cm²]
200 – IM-253/PD (HV-1 PHA) [bkg.]
300 – IM-253/PD (HV-1 PHA) [cpm]
7000 – IM-253/PD (HV-2 GROSS) [bkg.]
7300 – IM-253/PD (HV-2 GROSS) [cpm]
1.82 – MCA Gross Gamma Eq. Co-60 [pCi/g]
<1 – MCA Specific Co-60 Results [pCi/g]

1. Pier M

e. Localized Grid Maps

	10	11	12	13	14
FS	<450 300 450 7000 15000 3.88 <1	<450 300 400 – – 2.60 <1	<450 300 450 7000 12500 3.01 <1	<450 300 450 – – 2.92 <1	<450 300 450 – – 3.54 <1
FR	<450 300 600 – – 2.15 <1	<450 300 450 – – 2.58 <1	<450 300 500 – – 3.00 <1	<450 300 450 – – 2.38 <1	<450 300 500 – – 3.94 <1
FQ	<450 300 600 7000 9500 3.29 <1	<450 300 400 – – 2.05 <1	<450 300 425 7000 9000 2.13 <1	<450 300 450 – – 1.80 <1	<450 300 400 7000 10000 2.77 <1
FP	<450 300 650 – – 1.80 <1	<450 300 550 – – 2.82 <1	<450 300 500 – – 3.23 <1	<450 300 500 – – 3.06 <1	<450 300 600 – – 3.13 <1
FO	<450 300 650 7000 17500 1.73 <1	<450 300 400 – – 2.29 <1	<450 300 425 7000 10000 2.43 <1	<450 300 400 – – 3.35 <1	<450 300 750 – – 1.25 <1
FN	<450 300 550 – – 2.61 <1	<450 300 425 – – 2.31 <1	<450 300 375 – – 1.53 <1	<450 300 375 – – 2.66 <1	<450 300 450 – – 2.55 <1
FM	<450 300 600 7000 15000 4.72 <1	<450 300 450 – – 3.49 <1	<450 300 400 7000 10000 1.81 <1	<450 300 425 – – 1.74 <1	<450 300 450 7000 12500 2.09 <1
FL	<450 300 600 – – 2.30 <1	<450 300 400 – – 1.48 <1	<450 300 450 – – 2.95 <1	<450 300 475 – – 4.37 <1	<450 300 550 – – 2.46 <1
FK	<450 300 500 7000 10000 2.84 <1	<450 300 400 – – 2.48 <1	<450 300 450 7000 8000 2.25 <1	<450 300 450 – – 3.30 <1	<450 300 500 – – 2.60 <1
FJ	<450 300 500 – – 2.05 <1	<450 300 450 – – 2.56 <1	<450 300 450 – – 2.00 <1	<450 300 450 – – 2.66 <1	<450 300 450 – – 1.85 <1
FI	<450 300 500 7000 15000 3.05 <1	<450 300 450 – – 1.77 <1	<450 300 400 7000 10000 2.21 <1	<450 300 425 – – 1.95 <1	<450 300 550 7000 15000 2.93 <1

Sample Data

<450 – IM-247/PD Results [μμCi/20cm²]
200 – IM-253/PD (HV-1 PHA) [bkg.]
300 – IM-253/PD (HV-1 PHA) [cpm]
7000 – IM-253/PD (HV-2 GROSS) [bkg.]
7300 – IM-253/PD (HV-2 GROSS) [cpm]
1.82 – MCA Gross Gamma Eq. Co-60 [pCi/g]
<1 – MCA Specific Co-60 Results [pCi/g]

1. Pier M

e. Localized Grid Maps

	10	11	12	13	14
GD	<450 300 625 – – 2.42 <1	<450 300 475 – – 2.27 <1	<450 300 425 – – 3.76 <1	<450 300 525 – – 1.39 <1	<450 300 675 – – 0.89
GC	<450 300 550 7000 15000 2.62 <1	<450 300 500 – – 1.57 <1	<450 300 600 7000 9000 3.53 <1	<450 300 425 – – 1.68 <1	<450 300 650 7000 17500 1.76 <1
GB	<450 300 400 – – 3.26 <1	<450 300 400 – – 1.56 <1	<450 300 400 – – 1.67 <1	<450 300 450 – – 3.37 <1	<450 300 700 – – 2.35 <1
GA	<450 300 500 7000 12500 2.56 <1	<450 300 450 – – 1.37 <1	<450 300 450 7000 8750 2.29 <1	<450 300 450 – – 2.47 <1	<450 300 450 – – 2.47 <1
FZ	<450 300 800 – – 2.13 <1	<450 300 400 – – 2.87 <1	<450 300 450 – – 1.91 <1	<450 300 450 – – 3.05 <1	<450 300 450 – – 2.33 <1
FY	<450 300 550 7000 12500 2.78 <1	<450 300 450 – – 2.97 <1	<450 300 400 7000 9250 3.37 <1	<450 300 450 – – 1.91 <1	<450 300 450 7000 12500 3.19 <1
FX	<450 300 650 – – 2.31 <1	<450 300 550 – – 2.46 <1	<450 300 425 – – 3.61 <1	<450 300 450 – – 2.22 <1	<450 300 450 – – 3.71 <1
FW	<450 300 550 7000 12500 3.80 <1	<450 300 375 – – 3.09 <1	<450 300 450 7000 9000 3.86 <1	<450 300 425 – – 2.86 <1	<450 300 500 – – 2.57 <1
FV	<450 300 575 – – 3.47 <1	<450 300 550 – – 2.71 <1	<450 300 425 – – 1.87 <1	<450 300 550 – – 2.50 <1	<450 300 550 – – 2.38 <1
FU	<450 300 525 7000 9000 2.56 <1	<450 300 500 – – 1.93 <1	<450 300 500 7000 8750 2.73 <1	<450 300 525 – – 1.96 <1	<450 300 625 7000 12500 2.14 <1
FT	<450 300 650 – – 3.03 <1	<450 300 450 – – 3.34 <1	<450 300 425 – – 3.87 <1	<450 300 450 – – 2.30 <1	<450 300 500 – – 3.64 <1

Sample Data

<450 – IM-247/PD Results [μμCi/20cm²]
200 – IM-253/PD (HV-1 PHA) [bkg.]
300 – IM-253/PD (HV-1 PHA) [cpm]
7000 – IM-253/PD (HV-2 GROSS) [bkg.]
7300 – IM-253/PD (HV-2 GROSS) [cpm]
1.82 – MCA Gross Gamma Eq. Co-60 [pCi/g]
<1 – MCA Specific Co-60 Results [pCi/g]

1. Pier M

e. Localized Grid Maps

	10	11	12	13	14
GO	<450 300 500 7000 12500 1.13 <1	<450 300 650 – – 2.71 <1	<450 300 600 7000 10000 1.73 <1	<450 300 600 – – 2.42 <1	<450 300 500 7000 12500 3.46 <1
GN	<450 300 450 – – 2.25 <1	<450 300 500 – – 2.47 <1	<450 300 450 – – 2.02 <1	<450 300 400 – – 1.98 <1	<450 300 500 – – 2.49 <1
GM	<450 300 450 7000 9000 3.42 <1	<450 300 450 – – 1.76 <1	<450 300 550 7000 10000 2.17 <1	<450 300 550 – – 2.61 <1	<450 300 800 – – 1.92 <1
GL	<450 300 450 – – 2.33 <1	<450 300 550 – – 1.54 <1	<450 300 525 – – 1.61 <1	<450 300 450 – – 2.23 <1	<450 300 550 – – 1.46 <1
GK	<450 300 400 5500 5500 – –	<450 300 575 – – 1.26 <1	<450 300 450 7000 12500 2.57 <1	<450 300 425 – – 1.46 <1	<450 300 650 7000 12500 2.18 <1
GJ	<450 250 175 – – – –	<450 300 400 – – 2.45 <1	<450 300 400 – – 1.09 <1	<450 300 500 – – 1.49 <1	<450 300 550 – – 2.00 <1
GI	<450 250 225 5500 4000 – –	<450 300 400 – – 2.78 <1	<450 300 400 5500 4500 2.00 <1	<450 300 600 – – 1.40 <1	<450 300 600 – – 2.22 <1
GH	<450 250 200 – – – –	<450 300 400 – – 1.49 <1	<450 300 400 – – 1.29 <1	<450 300 600 – – 2.43 <1	<450 300 550 – – 1.42 <1
GG	<450 250 150 5500 3750 – –	<450 300 400 – – 1.14 <1	<450 300 500 7000 12500 2.27 <1	<450 300 600 – – 2.41 <1	<450 300 550 7000 15000 1.52 <1
GF	<450 300 450 – – 2.35 <1	<450 300 450 – – 0.99	<450 300 550 – – 1.77 <1	<450 300 525 – – 2.37 <1	<450 300 550 – – 1.28 <1
GE	<450 300 550 7000 8500 3.18 <1	<450 300 450 – – 1.70 <1	<450 300 450 7000 10000 2.89 <1	<450 300 550 – – 1.49 <1	<450 300 550 – – 1.54 <1

Sample Data

<450 – IM-247/PD Results [μμCi/20cm²]
200 – IM-253/PD (HV-1 PHA) [bkg.]
300 – IM-253/PD (HV-1 PHA) [cpm]
7000 – IM-253/PD (HV-2 GROSS) [bkg.]
7300 – IM-253/PD (HV-2 GROSS) [cpm]
1.82 – MCA Gross Gamma Eq. Co-60 [pCi/g]
<1 – MCA Specific Co-60 Results [pCi/g]

1. Pier M

e. Localized Grid Maps

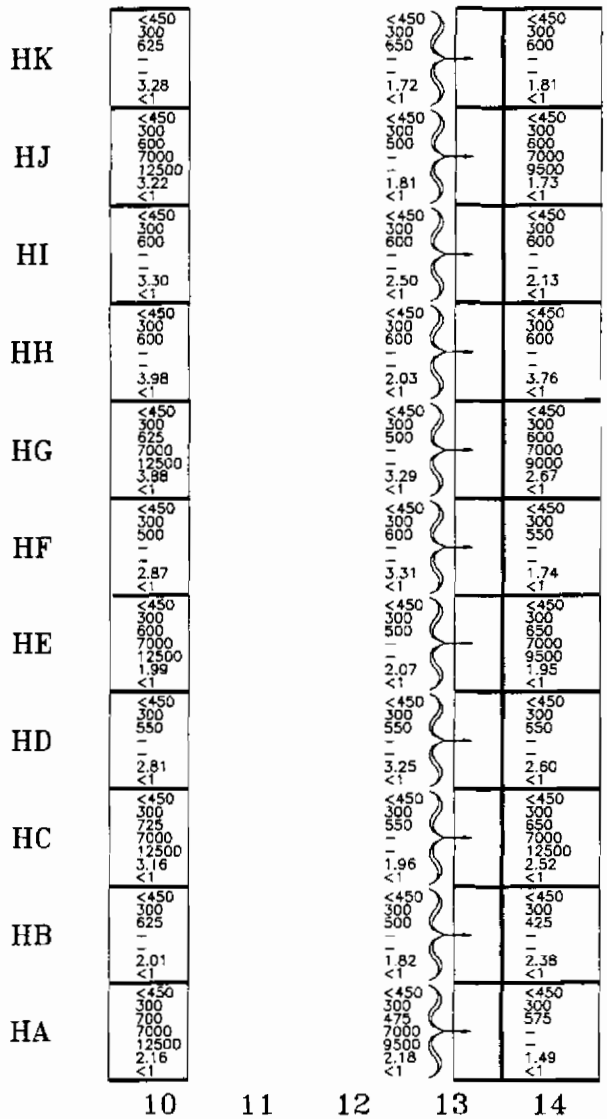
	10	11	12	13	14
GZ	<450 300 625 – – 2.87 <1		<450 300 500 – – 2.53 <1		<450 300 600 – – 1.44 <1
GY	<450 300 725 7000 12500 2.50 <1		<450 300 525 – – 1.51 <1	<450 300 475 7000 12500 1.97 <1	<450 300 600 – – 2.07 <1
GX	<450 300 725 – – 2.41 <1				<450 300 550 – – 1.76 <1
GW	<450 300 650 7000 12500 1.47 <1	<450 300 650 – – 2.46 <1	<450 300 500 – – 3.43 <1	<450 300 550 7000 12500 2.04 <1	<450 300 675 – – 1.94 <1
GV	<450 300 500 – – 1.43 <1	<450 300 550 – – 2.25 <1	<450 300 500 – – 3.48 <1	<450 300 500 – – 2.67 <1	<450 300 600 – – 2.26 <1
GU	<450 300 500 7000 12500 1.33 <1	<450 300 450 – – 2.20 <1	<450 300 500 7000 12500 1.94 <1	<450 300 500 – – 2.54 <1	<450 300 425 – – 2.94 <1
GT	<450 300 650 – – 2.97 <1	<450 300 450 – – 3.67 <1	<450 300 450 – – 2.41 <1	<450 300 425 – – 3.83 <1	<450 300 425 – – 3.92 <1
GS	<450 300 500 7000 8500 1.26 <1	<450 300 475 – – 3.09 <1	<450 300 475 7000 12500 1.93 <1	<450 300 500 – – 1.80 <1	<450 300 500 7000 12500 1.89 <1
GR	<450 300 550 – – 2.87 <1	<450 300 450 – – 2.11 <1	<450 300 450 – – 1.97 <1	<450 300 525 – – 1.73 <1	<450 300 500 – – 2.15 <1
GQ	<450 300 600 7000 12500 2.28 <1	<450 300 450 – – 1.57 <1	<450 300 450 7000 10000 2.54 <1	<450 300 450 – – 2.60 <1	<450 300 500 – – 2.45 <1
GP	<450 300 550 – – 2.46 <1	<450 300 500 – – 2.05 <1	<450 300 525 – – 1.90 <1	<450 300 550 – – 2.95 <1	<450 300 500 – – 2.19 <1

Sample Data

<450 – IM-247/PD Results [μμCi/20cm²]
200 – IM-253/PD (HV-1 PHA) [bkg.]
300 – IM-253/PD (HV-1 PHA) [cpm]
7000 – IM-253/PD (HV-2 GROSS) [bkg.]
7300 – IM-253/PD (HV-2 GROSS) [cpm]
1.82 – MCA Gross Gamma Eq. Co-60 [pCi/g]
<1 – MCA Specific Co-60 Results [pCi/g]

1. Pier M

e. Localized Grid Maps

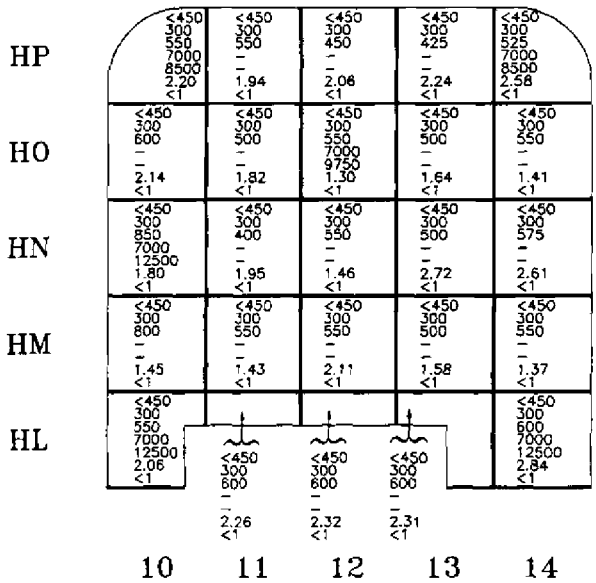


Sample Data

<450 – IM-247/PD Results [μμCi/20cm²]
200 – IM-253/PD (HV-1 PHA) [bkg.]
300 – IM-253/PD (HV-1 PHA) [cpm]
7000 – IM-253/PD (HV-2 GROSS) [bkg.]
7300 – IM-253/PD (HV-2 GROSS) [cpm]
1.82 – MCA Gross Gamma Eq. Co-60 [pCi/g]
<1 – MCA Specific Co-60 Results [pCi/g]

1. Pier M

e. Localized Grid Maps



Sample Data

<450 – IM-247/PD Results [μμCi/20cm²]
200 – IM-253/PD (HV-1 PHA) [bkg.]
300 – IM-253/PD (HV-1 PHA) [cpm]
7000 – IM-253/PD (HV-2 GROSS) [bkg.]
7300 – IM-253/PD (HV-2 GROSS) [cpm]
1.82 – MCA Gross Gamma Eq. Co-60 [pCi/g]
<1 – MCA Specific Co-60 Results [pCi/g]

1. Pier M

f. Prior To Photograph

Looking northeast.

1. Pier M

f. Prior To Photograph

Looking northeast 25' wide section.

1. Pier M

f. Prior To Photograph

Looking northeast, 70' wide section.

1. Pier M

f. Prior To Photograph

Base of pier, looking northeast.

1. Pier M

g. After Photograph

End of pier, looking northeast.

1. Pier M

g. After Photograph

Looking northeast 25' wide section.

1. Pier M

g. After Photograph

Looking northeast 70' wide section.

1. Pier M

g. After Photograph

Base of pier, looking northeast.

1. Pier M

g. After Photograph

Base of pier, looking southwest.

1. Pier N

a. Introduction:

Pier N, also identified as Structure 327, is located on the Naval Station as shown on PW dwg. no. H606-273, "Charleston Naval Shipyard, Naval Station and Contiguous Activities Existing and Planned as of January 1990." Pier N was constructed in 1962 .

(1) Description:

Pier N, including the 40' land side approach, is 1264' long by 60' wide, oriented northeast into the Cooper River. Included in the overall length is a 165' dolphin mooring, which extends from the end of the 60' wide section of the pier. Topside structures include two 11' by 70', one 11' by 55', one 11' by 40' and one 11' by 35' shore power distribution center.

(2) Brief History:

(a) **Use:** This pier was constructed as part of the U.S. Naval shore establishment expansion program and was used to berth various classes of naval vessels.

(b) **Radiological History:** Pier N was certified to berth nuclear vessels. Areas on the pier were established as radiation and radioactive material storage areas. The radioactive material storage areas were established for temporary storage of portable radioactive liquid collection tanks and ships' components. Radioactive material was transported regularly over the pier. Loose surface contamination levels were maintained less than 450$\mu\mu$Ci/100cm^2.

(3) Survey Requirements:

(a) Nuclear Ship Berthing Area survey. Group two and three surveys were performed on the pier and extended forty feet beyond the base of the pier. The 165' mooring dolphin at the end of the pier was not required to be surveyed since no radiological work was performed in this area. Shore power distribution centers and pierside receptacle centers did not require survey since radiological material was not transported over these structures.

b. Discussion:

Pier N, including the 40' landside approach, was divided into 264 grids approximately 10' by 10' for group 2 surveys and 2076 grids approximately 5' by 5' for group 3 surveys. Each grid had its own unique designator.

1. Pier N

Where physically possible, each group 2 grid was subdivided into two, 3' by 3' subsections which were located in areas of highest potential for contamination. One of these subsections was surveyed using the IM-247/PD and the other using the IM-253/PD (HV-1 PHA). Solid material samples were taken from a minimum of 50% of the 10' by 10' grids. Additionally, solid material samples were taken from each 3' by 3' subsection that resulted in levels greater than 450μμCi/20cm^2 with an IM-247/PD or greater than twice background with the IM-253/PD (HV-1 PHA).

Each group 3 grid was surveyed using the IM-247/PD and the IM-253/PD (HV-1 PHA). Then a minimum of 25% of these grids were surveyed using the IM-253/PD (HV-2 GROSS). Additionally, solid material samples were taken from each 5' by 5' grid with the exception of grids FN-14, FO-14, FP-14, FR-14 and FS-14 which were unpainted metal surfaces.

Individual backgrounds were used for this pier and its land side approach. The approach to the pier is asphalt. The IM-247/PD and the IM-253/PD (HV-1 PHA and HV-2 GROSS) backgrounds used for the asphalt were 60, 300, and 8000 counts per minute respectively. These levels were based upon backgrounds obtained from Building 1601 parking lot. The main section of the pier is constructed primarily of concrete. The IM-247/PD and the IM-253/PD (HV-1 PHA and HV-2 GROSS) backgrounds used for the low and high natural radioactivity concrete pours were 40, 150, and 3500; and 40, 450, and 15000 counts per minute respectively. These areas were based upon background radiation levels obtained from Pier U and Building 1897. Sections of the pier also contained metal plate. The IM-247/PD and the IM-253/PD (HV-1 PHA and HV-2 GROSS) backgrounds used for the metal plate were 60, 150, and 3500 counts per minute respectively. These levels were based upon backgrounds obtained from Building 1891.

A total of 2531 solid material samples were taken. The following naturally occurring radionuclides were typical isotopes identified during analysis of solid material samples: potassium 40, bismuth 214, thallium 208, lead 212, and lead 214.

c. Summary:

Surveys performed with the IM-247/PD did not detect areas greater than 450μμCi/20cm^2.

Surveys performed with the IM-253/PD (HV-1 PHA) detected 81 areas greater than or equal to twice background.

Surveys performed with the IM-253/PD (HV-2 GROSS) detected 40 areas greater than or equal to twice background.

Analysis performed on solid material samples with the multi-channel analyzer

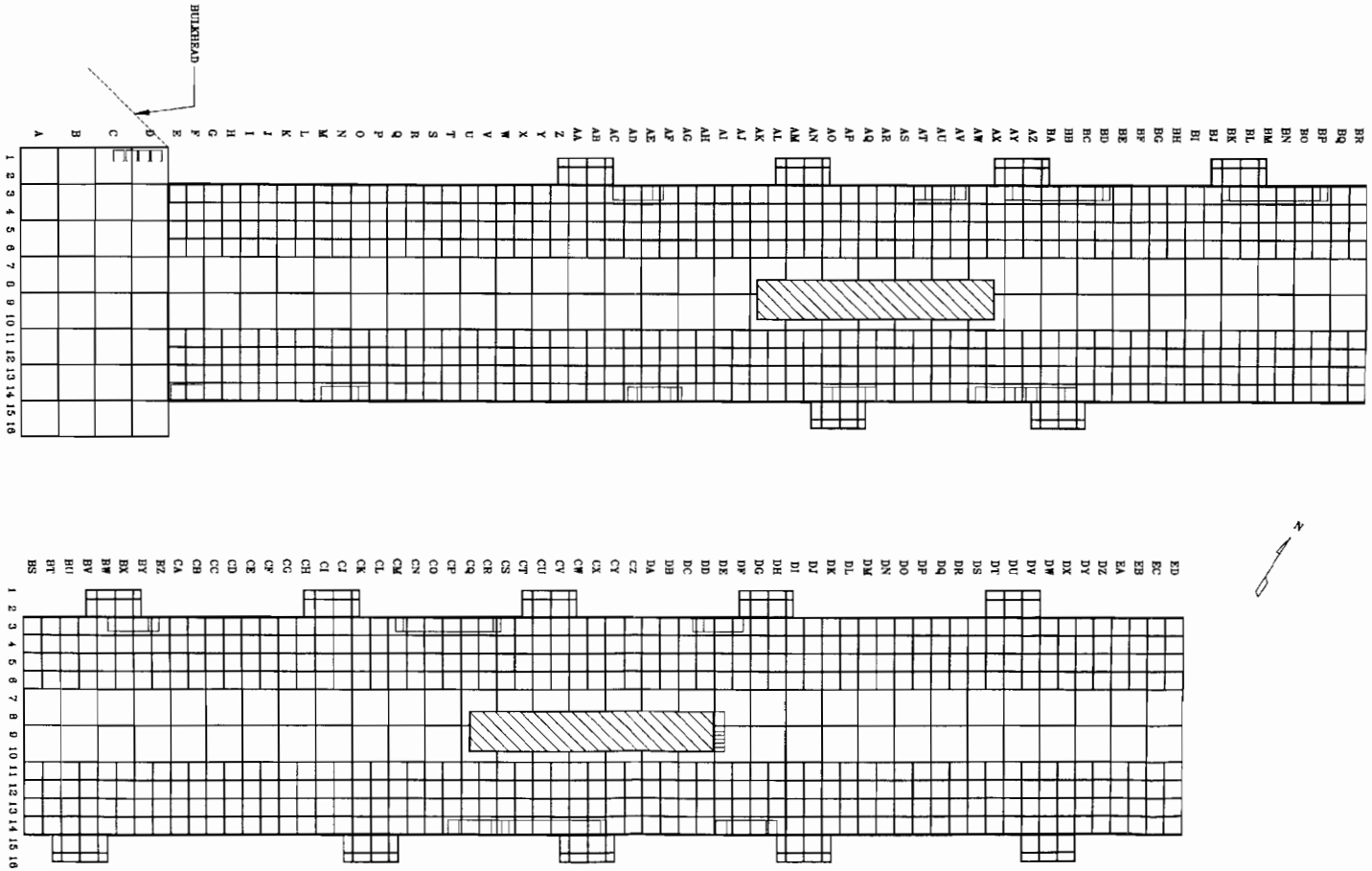
1. **Pier N**

(MCA) detected gross gamma equivalent cobalt 60 levels ranging from a low of less than a minimum detectable activity of 0.24 pCi/g to a high of 8.09 pCi/g.

Analysis performed on solid material samples with the MCA for specific cobalt 60, indicated that all solid material samples were less than 1 pCi/g.

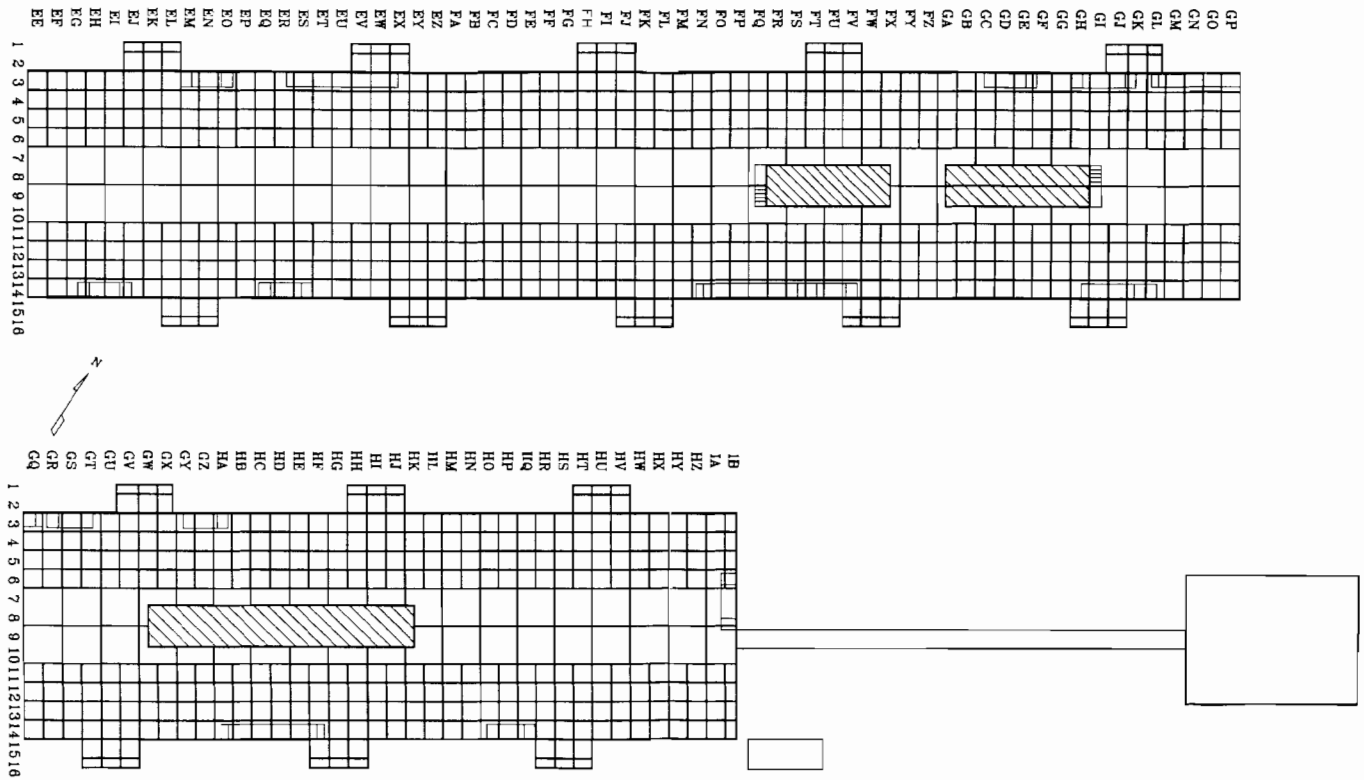
1. Pier N

d. Site Map



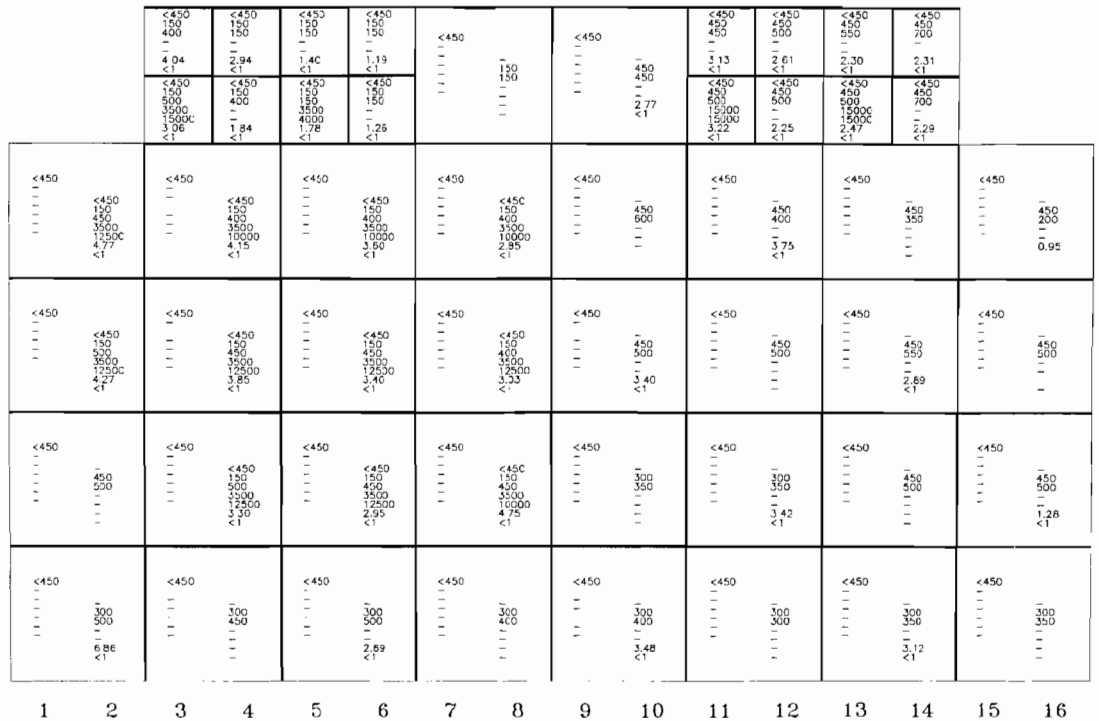
1. Pier N

d. Site Map



1. Pier N

e. Localized Grid Maps



Sample Data

< 450 – IM-247/PD Results [μμCi/20cm²]
200 – IM-253/PD (HV-1 PHA) [bkg.]
300 – IM-253/PD (HV-1 PHA) [cpm]
7000 – IM-253/PD (HV-2 GROSS) [bkg.]
7300 – IM-253/PD (HV-2 GROSS) [cpm]
1.82 – MCA Gross Gamma Eq. Co-60 [pCi/g]
<1 – MCA Specific Co-60 Results [pCi/g]

1. Pier N

e. Localized Grid Maps

	3	4	5	6	7	8	9	10	11	12	13	14
P	<450 150 100 – – 1.83 <1	<450 150 150 – – 1.40 <1	<450 150 175 – – 1.60 <1	<450 150 125 – – 1.47 <1	<450 – – – – – – – –	– 150 100 – – 1.57 <1	<450 – – – – – – – –	– 450 550 – – – – – –	<450 450 500 – – 3.31 <1	<450 450 500 – – 2.36 <1	<450 450 500 – – 3.42 <1	<450 450 500 – – 4.77 <1
O	<450 150 125 3500 5000 1.09 <1	<450 150 100 – – 1.58 <1	<450 150 125 3500 3750 1.99 <1	<450 150 125 – – 1.09 <1					<450 450 500 15000 12500 2.81 <1	<450 450 500 – – 3.44 <1	<450 450 500 15000 15000 3.74 <1	<450 450 500 – – 3.02 <1
N	<450 150 75 – – 1.83 <1	<450 150 100 – – 1.56 <1	<450 150 100 – – 1.45 <1	<450 150 100 – – 1.62 <1	<450 – – – – – – – –	– 150 100 – – – – – –	<450 – – – – – – – –	– 450 600 – – 4.07 <1	<450 450 500 – – 4.20 <1	<450 450 500 – – 2.77 <1	<450 450 550 – – 3.15 <1	<450 450 550 – – 3.73 <1
M	<450 150 100 3500 4500 1.52 <1	<450 150 100 – – 1.02 <1	<450 150 100 3500 3500 1.38 <1	<450 150 100 – – 1.85 <1					<450 450 550 15000 15000 3.83 <1	<450 450 500 – – 4.15 <1	<450 450 600 15000 15000 4.32 <1	<450 450 500 – – 3.78 <1
L	<450 150 200 – – 1.45 <1	<450 150 75 – – 1.25 <1	<450 150 100 – – 1.37 <1	<450 150 150 – – <0.37	<450 – – – – – – – –	– 150 100 – – – – – –	<450 – – – – – – – –	– 450 550 – – – – – –	<450 450 400 – – 3.51 <1	<450 450 500 – – 3.64 <1	<450 450 500 – – 3.51 <1	<450 450 400 – – 3.06 <1
K	<450 150 125 3500 4000 1.55 <1	<450 150 125 – – 2.46 <1	<450 150 125 3500 4000 2.15 <1	<450 150 150 – – 1.67 <1					<450 450 475 15000 12500 2.42 <1	<450 450 500 – – 3.64 <1	<450 450 500 15000 12500 3.58 <1	<450 450 575 – – 2.85 <1
J	<450 150 200 – – 1.81 <1	<450 150 175 – – 1.68 <1	<450 150 150 – – 1.41 <1	<450 150 150 – – 1.50 <1	<450 – – – – – – – –	– 150 100 – – – – – –	<450 – – – – – – – –	– 450 550 – – – – – –	<450 450 450 – – 2.36 <1	<450 450 475 – – 2.57 <1	<450 450 425 – – 2.65 <1	<450 450 575 – – 2.93 <1
I	<450 150 550 3500 15000 1.82 <1	<450 150 450 – – 2.91 <1	<450 150 175 3500 4000 2.59 <1	<450 150 175 – – 1.68 <1					<450 450 475 15000 10000 3.65 <1	<450 450 475 – – 2.87 <1	<450 450 475 15000 10000 2.12 <1	<450 450 625 – – 3.29 <1
H	<450 150 150 – – 1.55 <1	<450 150 200 – – 1.58 <1	<450 150 150 – – 1.68 <1	<450 150 150 – – 1.44 <1	<450 – – – – – – – –	– 150 150 – – – – – –	<450 – – – – – – – –	– 450 550 – – – – – –	<450 450 550 – – 2.97 <1	<450 450 500 – – 3.49 <1	<450 450 500 – – 1.88 <1	<450 450 650 – – 3.39 <1
G	<450 150 150 3500 4500 1.50 <1	<450 150 150 – – 1.28 <1	<450 150 150 3500 4000 1.93 <1	<450 150 150 – – 1.98 <1					<450 450 450 15000 15000 2.77 <1	<450 450 500 – – 4.77 <1	<450 450 500 15000 15000 2.25 <1	<450 450 550 – – 3.32 <1

Sample Data

<450 – IM-247/PD Results [μμCi/20cm²]
200 – IM-253/PD (HV-1 PHA) [bkg.]
300 – IM-253/PD (HV-1 PHA) [cpm]
7000 – IM-253/PD (HV-2 GROSS) [bkg.]
7300 – IM-253/PD (HV-2 GROSS) [cpm]
1.82 – MCA Gross Gamma Eq. Co-60 [pCi/g]
<1 – MCA Specific Co-60 Results [pCi/g]

1. **Pier N**

e. **Localized Grid Maps**

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Z	<450 450 450 – 2.55 <1	<450 450 475 15000 10000 2.11 <1	<450 150 125 – – 1.68 <1	<450 150 150 – – 1.26 <1	<450 150 100 – – 1.18 <1	<450 150 150 – – 1.27 <1	<450 – – – – – –	– 150 100 – – – –	<450 – – – – – –	– 450 550 – – – –	<450 450 450 – – 3.14 <1	<450 450 550 – – 1.98 <1	<450 450 500 – – 3.77 <1	<450 450 600 – – 3.46 <1
Y			<450 150 125 3500 3500 1.07 <1	<450 150 100 – – 1.34 <1	<450 150 125 3500 4000 1.43 <1	<450 150 100 – – 1.41 <1					<450 450 600 15000 12500 3.18 <1	<450 450 550 – – 3.29 <1	<450 450 500 15000 15000 2.97 <1	<450 450 500 – – 3.17 <1
X			<450 150 100 – – 1.74 <1	<450 150 100 – – 1.07 <1	<450 150 100 – – 1.64 <1	<450 150 100 – – 1.70 <1	<450 – – – – – –	– 150 150 – – – –	<450 – – – – – –	– 450 600 – – – –	<450 450 500 – – 3.14 <1	<450 450 550 – – 3.65 <1	<450 450 500 – – 2.29 <1	<450 450 550 – – 2.18 <1
W			<450 150 150 3500 5000 1.86 <1	<450 150 100 – – 1.45 <1	<450 150 150 3500 3500 1.57 <1	<450 150 150 – – 1.33 <1					<450 450 475 15000 15000 2.24 <1	<450 450 450 – – 4.15 <1	<450 450 450 15000 15000 2.94 <1	<450 450 550 – – 2.34 <1
V			<450 150 200 – – 1.56 <1	<450 150 350 – – 2.18 <1	<450 150 125 – – 1.45 <1	<450 150 125 – – 1.78 <1	<450 – – – – – –	– 150 200 – – – –	<450 – – – – – –	– 450 600 – – – –	<450 450 475 – – 2.57 <1	<450 450 475 – – 2.98 <1	<450 450 500 – – 2.65 <1	<450 450 500 – – 3.22 <1
U			<450 150 550 3500 20000 2.79 <1	<450 150 125 – – 1.79 <1	<450 150 100 3500 4000 1.53 <1	<450 150 125 – – 1.89 <1					<450 450 450 15000 15000 3.02 <1	<450 450 400 – – 2.30 <1	<450 450 400 15000 12500 2.53 <1	<450 450 400 – – 2.40 <1
T			<450 150 150 – – 2.31 <1	<450 150 100 – – 1.68 <1	<450 150 150 – – 1.87 <1	<450 150 150 – – 1.50 <1	<450 – – – – – –	– 150 150 – – – –	<450 – – – – – –	– 450 600 – – – –	<450 450 450 – – 2.82 <1	<450 450 450 – – 4.15 <1	<450 450 450 – – 3.19 <1	<450 450 500 – – <0.34
S			<450 150 150 3500 3500 1.40 <1	<450 150 100 – – 1.56 <1	<450 150 100 3500 3500 1.75 <1	<450 150 100 – – 1.81 <1					<450 450 450 15000 12500 3.92 <1	<450 450 450 – – 3.60 <1	<450 450 450 15000 10000 2.76 <1	<450 450 650 – – 3.27 <1
R			<450 150 100 – – 1.84 <1	<450 150 100 – – 1.66 <1	<450 150 100 – – 1.92 <1	<450 150 100 – – 1.29 <1	<450 – – – – – –	– 150 150 – – – –	<450 – – – – – –	– 450 550 – – – –	<450 450 450 – – 3.98 <1	<450 450 450 – – 3.23 <1	<450 450 500 – – 3.71 <1	<450 450 600 – – 3.5[illegible] <1
Q			<450 150 100 3500 3000 1.86 <1	<450 150 100 – – 1.12 <1	<450 150 100 3500 3500 1.18 <1	<450 150 150 – – 1.14 <1					<450 450 500 15000 12500 2.99 <1	<450 450 500 – – 4.06 <1	<450 450 500 15000 12500 3.15 <1	<450 450 500 – – 3.37 <1

Sample Data

- <450 – IM-247/PD Results [μμC/20cm²]
- 200 – IM-253/PD (HV-1 PHA) [bkg.]
- 300 – IM-253/PD (HV-1 PHA) [cpm]
- 7000 – IM-253/PD (HV-2 GROSS) [bkg.]
- 7300 – IM-253/PD (HV-2 GROSS) [cpm]
- 1.82 – MCA Gross Gamma Eq. Co-60 [pCi/g]
- <1 – MCA Specific Co-60 Results [pCi/g]

1. Pier N

e. Localized Grid Maps

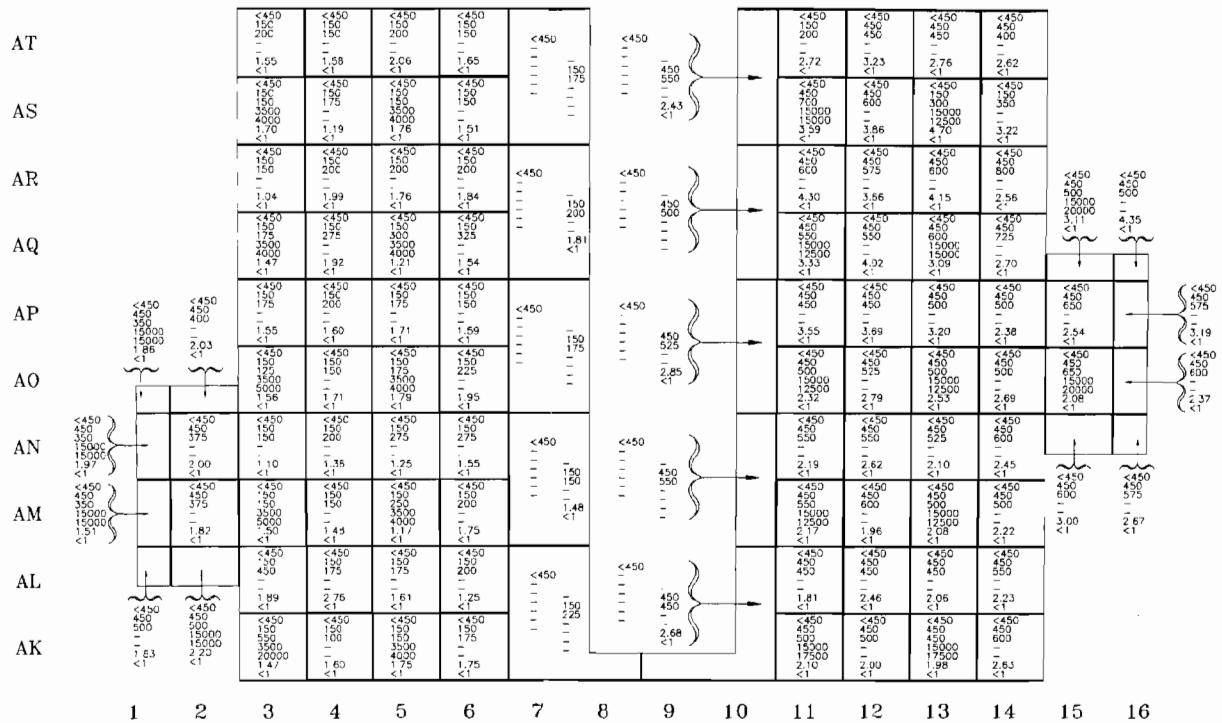
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
AJ	<450 450 450 15000 10000 2.83 <1	<450 450 425 – 2.17 <1	<450 150 200 – – 1.92 <1	<450 150 125 – – 0.99	<450 150 150 – – 1.62 <1	<450 150 175 – – 1.18 <1	<450 – – – – – –	– 150 200 – – 1.54 <1	<450 – – – – – –	– 450 450 – – – –	<450 450 550 – – 2.61 <1	<450 450 550 – – 2.58 <1	<450 450 525 – – 3.80 <1	<450 450 600 – – 2.29 <1
AI	<450 450 525 – – 3.29 <1	<450 450 500 – – 3.14 <1	<450 150 175 3500 3500 1.91 <1	<450 150 100 – – 1.36 <1	<450 150 175 3500 3500 1.16 <1	<450 150 150 – – 1.76 <1					<450 450 500 15000 12500 2.20 <1	<450 450 500 – – 2.43 <1	<450 450 450 15000 12500 2.05 <1	<450 450 600 – – 3.75 <1
AH	<450 450 450 15000 10000 7.14 <1	<450 450 450 – – 3.85 <1	<450 150 175 – – 2.09 <1	<450 150 100 – – 1.60 <1	<450 150 100 – – 1.67 <1	<450 150 100 – – 1.79 <1	<450 – – – – – –	– 150 150 – – – –	<450 – – – – – –	– 450 550 – – 2.67 <1	<450 450 450 – – 3.28 <1	<450 450 400 – – 2.68 <1	<450 450 400 – – 1.95 <1	<450 450 400 – – 2.31 <1
AG	<450 450 450 1500 1500 1.82 <1	<450 450 450 – – 1.83 <1	<450 150 150 3500 4250 1.73 <1	<450 150 125 – – 1.60 <1	<450 150 150 3500 4500 1.63 <1	<450 150 125 – – 1.54 <1					<450 450 400 3500 4000 2.97 <1	<450 450 400 – – 2.42 <1	<450 450 450 3500 4200 0.81	<450 450 450 – – 2.10 <1
AF	<450 450 450 15000 10000 2.83 <1	<450 450 425 – – 2.17 <1	<450 150 150 – – 1.62 <1	<450 150 150 – – 1.94 <1	<450 150 175 – – 1.86 <1	<450 150 150 – – 2.11 <1	<450 – – – – – –	– 150 125 – – – –	<450 – – – – – –	– 450 550 – – – –	<450 450 500 – – 3.63 <1	<450 450 550 – – 2.82 <1	<450 450 550 – – 2.92 <1	<450 450 500 – – 2.56 <1
AE	<450 450 450 15000 10000 2.83 <1	<450 450 425 – – 2.17 <1	<450 150 150 3500 4000 2.19 <1	<450 150 175 – – 1.66 <1	<450 150 150 3500 4500 1.60 <1	<450 150 175 – – 2.28 <1	<450 – – – – – –	– 150 125 – – 1.93 <1	<450 – – – – – –	– 450 550 – – – –	<450 450 600 15000 12500 3.13 <1	<450 450 650 – – 2.50 <1	<450 450 600 15000 15000 3.14 <1	<450 450 500 – – 3.84 <1
AD	<450 450 450 15000 10000 2.83 <1	<450 450 425 – – 2.17 <1	<450 450 100 – – 1.66 <1	<450 150 125 – – 1.58 <1	<450 150 150 – – 1.75 <1	<450 150 150 – – 1.61 <1	<450 – – – – – –	– 150 100 – – – –	<450 – – – – – –	– 450 600 – – – –	<450 450 450 – – 3.19 <1	<450 450 450 – – 2.37 <1	<450 450 450 – – 2.26 <1	<450 450 450 – – 2.59 <1
AC	<450 450 450 15000 10000 2.83 <1	<450 450 425 – – 2.17 <1	<450 150 100 3500 4000 1.23 <1	<450 150 125 – – 1.62 <1	<450 150 100 3500 3500 1.53 <1	<450 150 150 – – 1.35 <1	<450 – – – – – –	– 150 100 – – – –	<450 – – – – – –	– 450 600 – – 3.40 <1	<450 450 400 3500 3500 4.08 <1	<450 450 400 – – 3.98 <1	<450 450 400 3500 4000 2.16 <1	<450 450 400 – – 3.07 <1
AB	<450 450 525 – – 3.29 <1	<450 450 500 – – 3.14 <1	<450 150 175 – – 2.44 <1	<450 150 150 – – 1.57 <1	<450 150 100 – – 1.91 <1	<450 150 150 – – 1.84 <1	<450 – – – – – –	– 150 125 – – – –	<450 – – – – – –	– 450 450 – – – –	<450 450 500 – – 3.54 <1	<450 450 600 – – 3.81 <1	<450 450 550 – – 3.50 <1	<450 450 600 – – 3.04 <1
AA	<450 450 500 15000 10000 7.14 <1	<450 450 450 – – 3.85 <1	<450 150 175 3500 4500 1.90 <1	<450 150 100 – – 1.72 <1	<450 150 100 3500 4000 2.06 <1	<450 150 150 – – 1.84 <1	<450 – – – – – –	– 150 125 – – 2.11 <1	<450 – – – – – –	– 450 450 – – – –	<450 450 450 15000 10000 2.45 <1	<450 450 500 – – 3.58 <1	<450 450 500 15000 15000 3.89 <1	<450 450 550 – – 8.09 <1

Sample Data

<450 – IM-247/PD Results [µCi/20cm²]
200 – IM-253/PD (HV-1 PHA) [bkg.]
300 – IM-253/PD (HV-1 PHA) [cpm]
7000 – IM-253/PD (HV-2 GROSS) [bkg.]
7300 – IM-253/PD (HV-2 GROSS) [cpm]
1.82 – MCA Gross Gamma Eq. Co-60 [pCi/g]
<1 – MCA Specific Co-60 Results [pCi/g]

1. Pier N

e. Localized Grid Maps

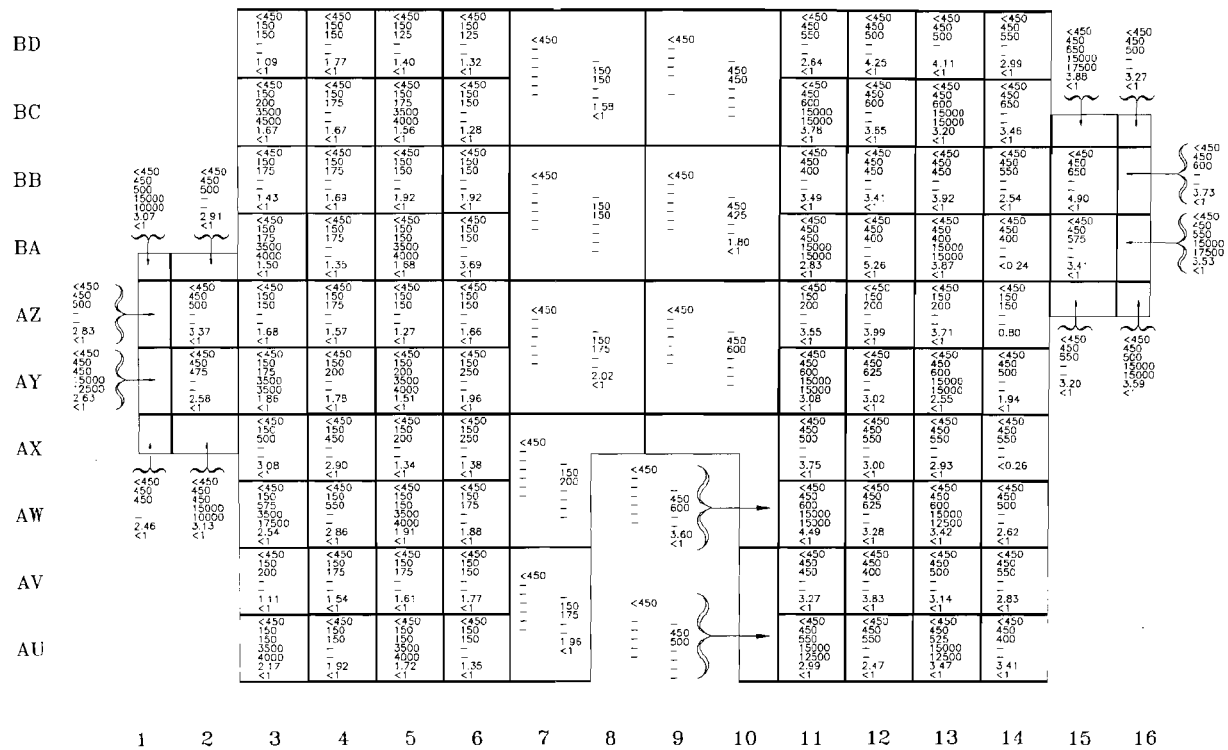


Sample Data

< 450 – IM-247/PD Results [μμCi/20cm²]
200 – IM-253/PD (HV-1 PHA) [bkg.]
300 – IM-253/PD (HV-1 PHA) [cpm]
7000 – IM-253/PD (HV-2 GROSS) [bkg.]
7300 – IM-253/PD (HV-2 GROSS) [cpm]
1.82 – MCA Gross Gamma Eq. Co-60 [pCi/g]
<1 – MCA Specific Co-60 Results [pCi/g]

1. Pier N

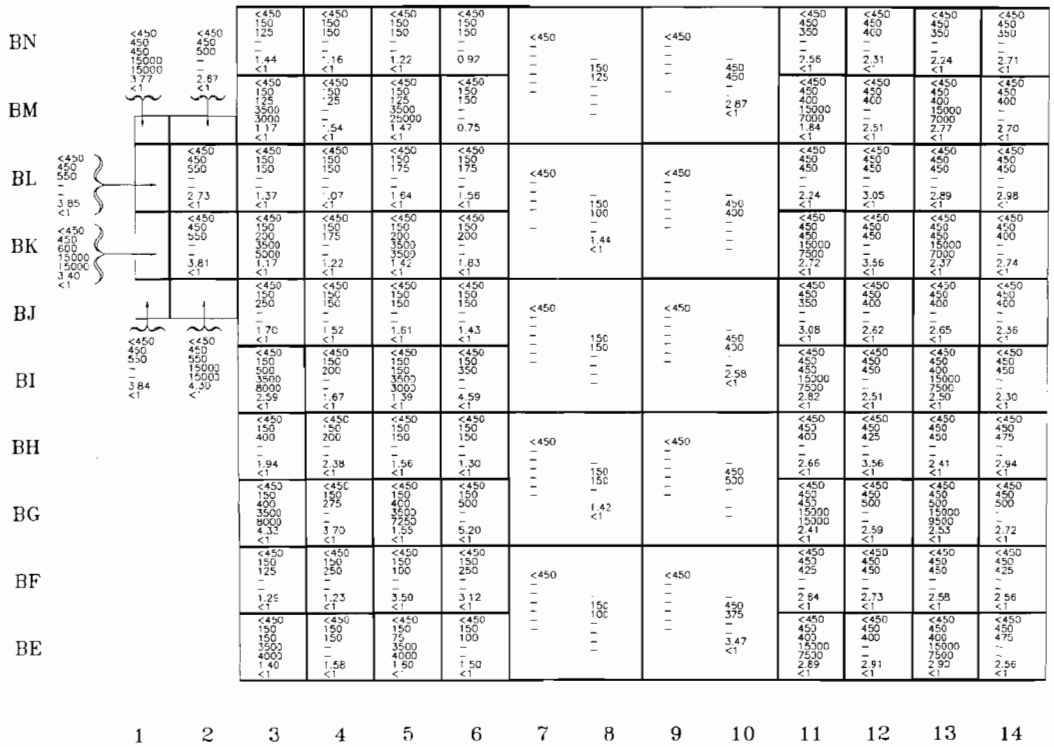
e. Localized Grid Maps



Sample Data
<450 – IM-247/PD Results [μCi/20cm²]
200 – IM-253/PD (HV-1 PHA) [bkg.]
300 – IM-253/PD (HV-1 PHA) [cpm]
7000 – IM-253/PD (HV-2 GROSS) [bkg.]
7300 – IM-253/PD (HV-2 GROSS) [cpm]
1.82 – MCA Gross Gamma Eq. Co-60 [pCi/g]
<1 – MCA Specific Co-60 Results [pCi/g]

1. Pier N

e. Localized Grid Maps

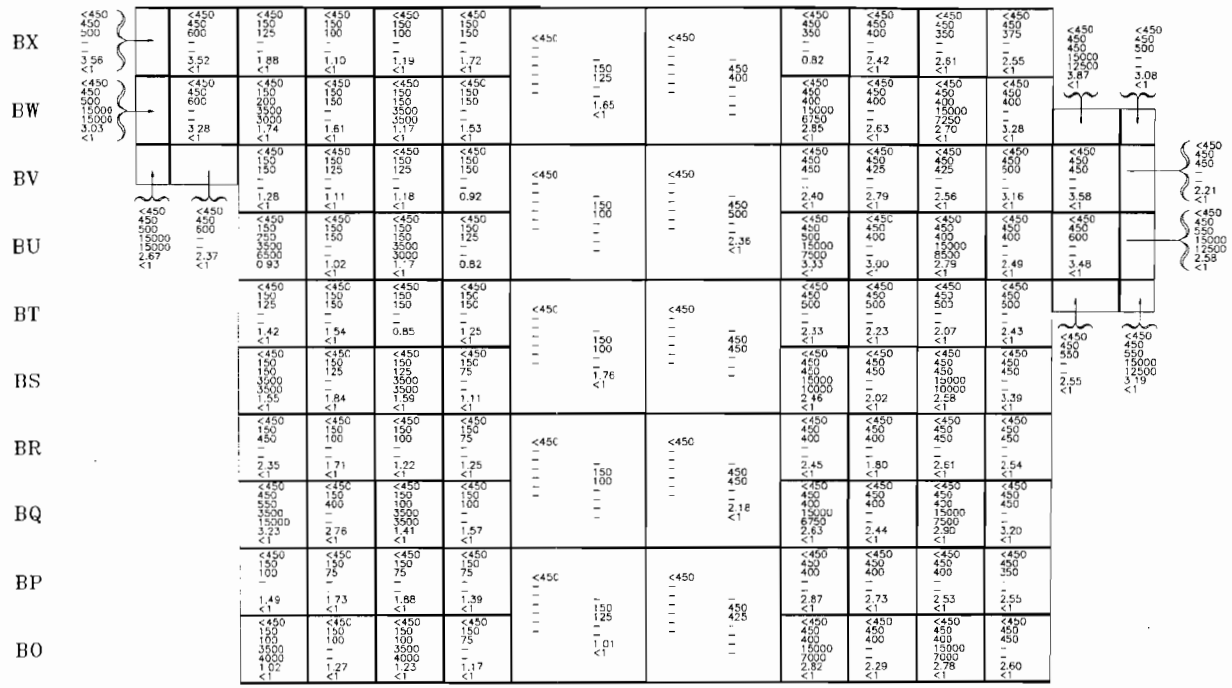


Sample Data

<450 – IM-247/PD Results [μμCi/20cm²]
200 – IM-253/PD (HV-1 PHA) [bkg.]
500 – IM-253/PD (HV-1 PHA) [cpm]
7000 – IM-253/PD (HV-2 GROSS) [bkg.]
7300 – IM-253/PD (HV-2 GROSS) [cpm]
1.82 – MCA Gross Gamma Eq. Co-60 [pCi/g]
<1 – MCA Specific Co-60 Results [pCi/g]

1. Pier N

e. Localized Grid Maps



Sample Data

< 450 – IM-247/PD Results [μμCi/20cm²]
200 – IM-253/PD (HV-1 PHA) [pkg]
300 – IM-253/PD (HV-1 PHA) [cpm]
7000 – IM-253/PD (HV-2 GROSS) [pkg]
7300 – IM-253/PD (HV-2 GROSS) [cpm]
1.82 – MCA Gross Gamma Eq. Co-60 [pCi/g]
<1 – MCA Specific Co-60 Results [pCi/g]

1. Pier N

e. Localized Grid Maps

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
CH	<450 450 550 – – 4.16 <1	<450 450 550 15000 12500 4.68 <1	<450 150 125 – – 1.15 <1	<450 150 125 – – 1.06 <1	<450 150 150 – – 0.74	<450 150 150 – – 1.39 <1	<450 – – – – – – –	– 150 100 – – – –	<450 – – – – – – –	– 450 450 – – 1.14 <1	<450 450 375 – – 2.66 <1	<450 450 400 – – 3.27 <1	<450 450 400 – – 2.51 <1	<450 450 400 – – 2.75 <1
CG			<450 150 450 3500 15000 3.21 <1	<450 150 475 – – 3.10 <1	<450 150 150 3500 2500 1.50 <1	<450 150 150 – – 1.77 <1					<450 450 400 15000 6000 2.82 <1	<450 450 400 – – 2.33 <1	<450 450 400 15000 6000 2.70 <1	<450 450 375 – – 2.67 <1
CF			<450 150 150 – – 1.68 <1	<450 150 150 – – 0.97	<450 150 150 – – 1.41 <1	<450 150 150 – – 1.51 <1	<450 – – – – – – –	– 150 100 – – – –	<450 – – – – – – –	– 450 350 – – – –	<450 450 400 – – 3.02 <1	<450 450 400 – – 2.80 <1	<450 450 400 – – 2.43 <1	<450 450 400 – – 2.23 <1
CE			<450 150 150 3500 3500 1.79 <1	<450 150 150 – – 1.25 <1	<450 150 150 3500 3500 0.90	<450 150 150 – – 1.46 <1					<450 450 350 15000 6000 3.45 <1	<450 450 300 – – 3.30 <1	<450 450 300 15000 6000 2.78 <1	<450 450 500 – – 2.83 <1
CD			<450 150 100 – – 1.98 <1	<450 150 100 – – 1.05 <1	<450 150 100 – – 1.51 <1	<450 150 100 – – 1.61 <1	<450 – – – – – – –	– 150 100 – – – –	<450 – – – – – – –	– 450 350 – – – –	<450 450 400 – – 4.04 <1	<450 450 425 – – 3.06 <1	<450 450 450 – – 2.86 <1	<450 450 400 – – 3.34 <1
CC			<450 150 100 3500 3750 1.76 <1	<450 150 100 – – 0.91	<450 150 100 3500 3000 2.13 <1	<450 150 100 – – 1.49 <1					<450 450 400 15000 7000 3.10 <1	<450 450 350 – – 2.71 <1	<450 450 400 15000 7000 2.80 <1	<450 450 350 – – 2.72 <1
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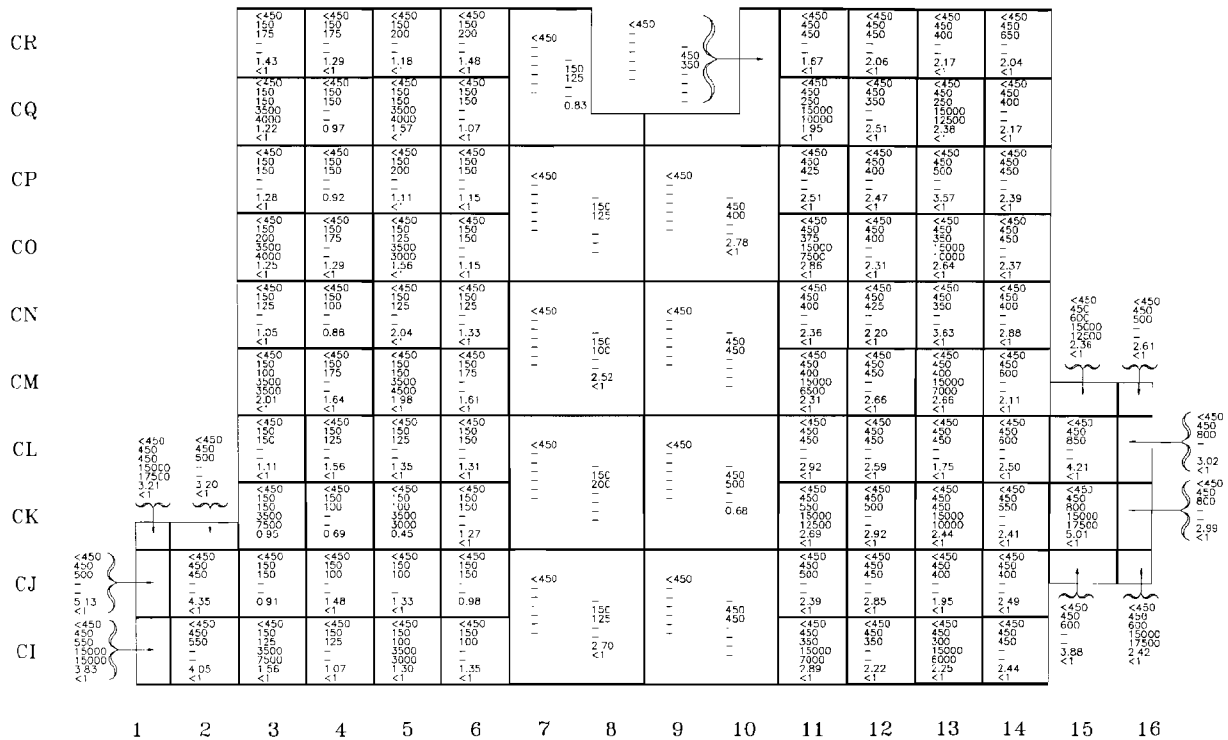
CA			<450 150 125 3500 3500 1.40 <1	<450 150 100 – – 1.31 <1	<450 150 125 3500 4000 1.43 <1	<450 150 100 – – 0.79		– 0.97			<450 450 400 15000 7000 2.89 <1	<450 450 450 – – 2.43 <1	<450 450 450 15000 7000 2.50 <1	<450 450 450 – – 2.75 <1
BZ	<450 450 600 15000 15000 2.24 <1	<450 450 600 – – 2.34 <1	<450 150 100 – – 1.23 <1	<450 150 100 – – 1.76 <1	<450 150 100 – – 1.20 <1	<450 150 125 – – 1.26 <1	<450 – – – – – – –	– 150 150 – – – –	<450 – – – – – – –	– 450 350 – – – –	<450 450 400 – – 2.95 <1	<450 450 400 – – 2.61 <1	<450 450 400 – – 2.36 <1	<450 450 450 – – 2.82 <1
BY			<450 150 125 3500 4000 1.41 <1	<450 150 150 – – 1.30 <1	<450 150 75 3500 3000 1.38 <1	<450 150 100 – – 1.13 <1				– 2.73 <1	<450 450 435 15000 7000 2.36 <1	<450 450 375 – – 3.02 <1	<450 450 350 15000 6250 2.38 <1	<450 450 400 – – 2.61 <1

Sample Data

<450 – IM-247/PD Results [μμCi/20cm²]
200 – IM-253/PD (HV-1 PHA) [bkg.]
300 – IM-253/PD (HV-1 PHA) [cpm]
7000 – IM-253/PD (HV-2 GROSS) [bkg.]
7300 – IM-253/PD (HV-2 GROSS) [cpm]
1.82 – MCA Gross Gamma Eq. Co-60 [pCi/g]
<1 – MCA Specific Co-60 Results [pCi/g]

1. Pier N

e. Localized Grid Maps

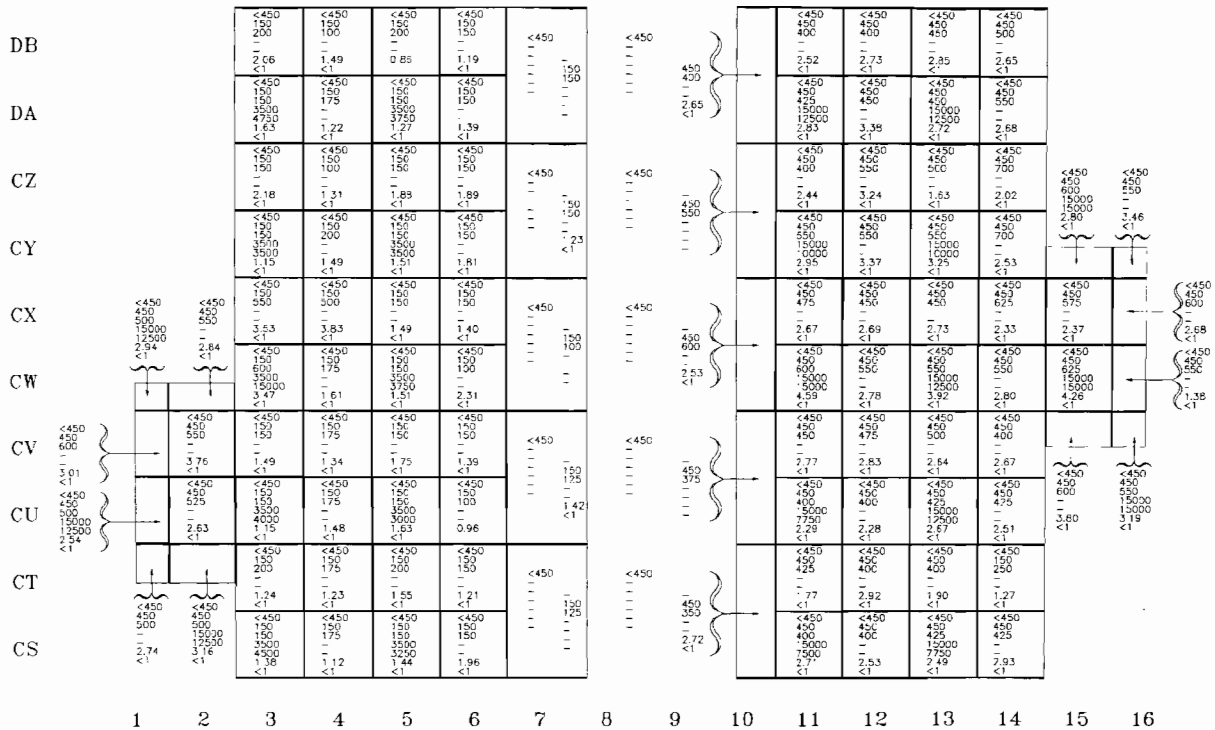


Sample Data

< 450 – IM-247/PD Results [μμC/20cm²]
200 – IM-253/PD (HV-1 PHA) [bkg.]
300 – IM-253/PD (HV-1 PHA) [cpm]
7000 – IM-253/PD (HV-2 GROSS) [bkg.]
7300 – IM-253/PD (HV-2 GHOSS) [cpm]
1.82 – MCA Gross Gamma Eq Co-60 [pCi/g]
<1 – MCA Specific Co-60 Results [pCi/g]

1. Pier N

e. Localized Grid Maps

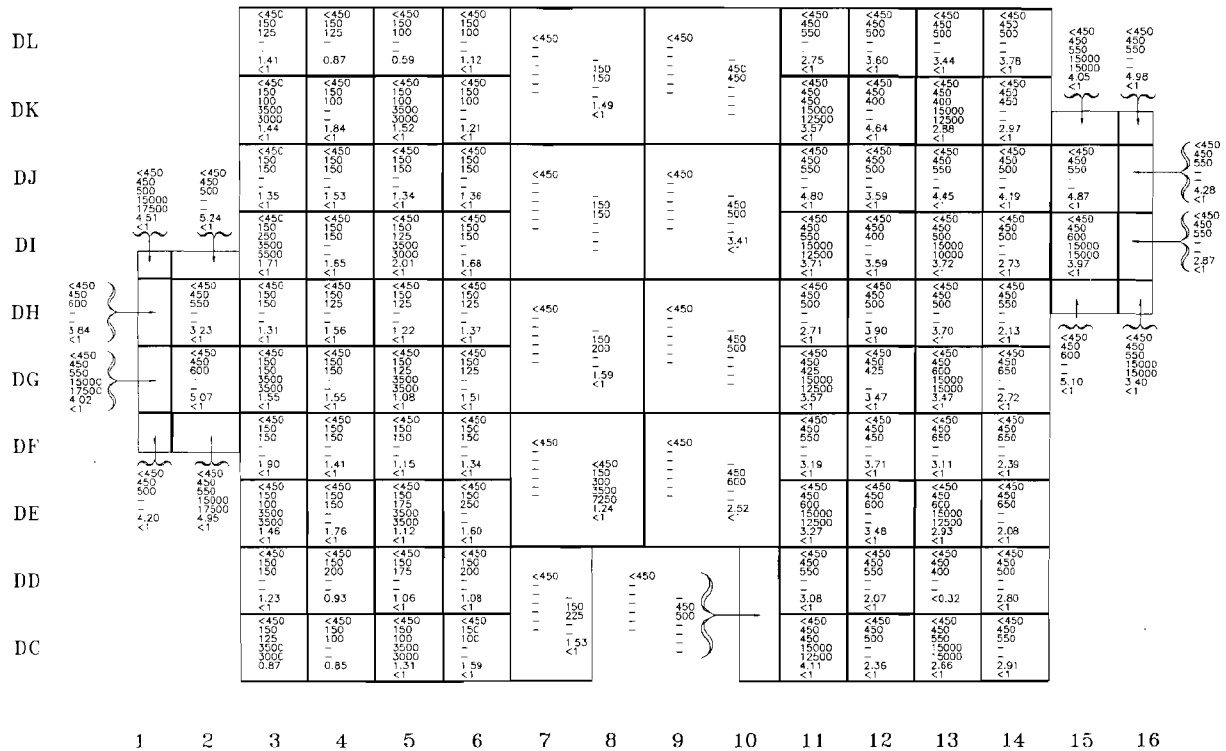


Sample Data

<450 – IM-247/PD Results [μμCi/20cm²]
200 – IM-253/PD (HV-1 PHA) [bkg.]
300 – IM-253/PD (HV-1 PHA) [cpm]
7000 – IM-253/PD (HV-2 GRCSS) [bkg.]
7300 – IM-253/PD (HV-2 GRCSS) [cpm]
1.82 – MCA Gross Gamma Eq. Co-60 [pCi/g]
<1 – MCA Specific Co-60 Results [pCi/g]

1. Pier N

e. Localized Grid Maps



Sample Data

<450 – IM-247/PD Results [μμCi/20cm²]
200 – IM-253/PD (HV-1 PHA) [bkg.]
300 – IM-253/PD (HV-1 PHA) [cpm]
7000 – IM-253/PD (HV-2 GROSS) [bkg.]
7300 – IM-253/PD (HV-2 GROSS) [cpm]
1.82 – MCA Gross Gamma Eq. Co-60 [pCi/g]
<1 – MCA Specific Co-60 Results [pCi/g]

1. Pier N

e. Localized Grid Maps

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
DV	<450 450 600 – – 5.01 <1	<450 450 600 15000 15000 3.25 <1	<450 150 250 – – 0.79	<450 150 75 – – 1.68 <1	<450 150 100 – – 1.35 <1	<450 150 100 – – 1.87 <1	<450 – – – – – – –	– 150 100 – – – – –	<450 – – – – – – –	– 450 450 – – 4.06 <1	<450 450 420 – – 5.16 <1	<450 450 400 – – 3.16 <1	<450 450 450 – – 4.20 <1	<450 450 500 – – 2.88 <1	<450 450 600 – – 4.19 <1	<450 450 600 15000 15000 3.41 <1
DU	<450 450 600 15000 15000 3.82 <1	<450 450 600 – – 4.62 <1	<450 150 250 15000 15000 1.33 <1	<450 150 125 – – 0.97	<450 150 125 3500 3500 1.85 <1	<450 150 100 – – 1.22 <1					<450 450 500 15000 12500 3.35 <1	<450 450 500 – – 6.84 <1	<450 150 350 – – 3.35 <1	<450 450 650 – – 2.53 <1		
DT	<450 450 600 – – 3.84 <1	<450 450 600 15000 15000 2.59 <1	<450 150 250 – – 1.61 <1	<450 150 175 – – 1.06 <1	<450 150 150 – – 1.34 <1	<450 150 175 – – 1.05 <1	<450 – – – – – – –	– 150 100 – – – – –	<450 – – – – – – –	– 450 450 – – – – –	<450 450 450 – – 3.26 <1	<450 450 450 – – 3.93 <1	<450 150 500 – – 3.17 <1	<450 450 600 – – 2.80 <1		
DS			<450 150 450 3500 20000 1.07 <1	<450 150 175 – – 3.34 <1	<450 150 150 3500 2750 1.04 <1	<450 150 150 – – 1.25 <1		1.14 <1			<450 450 600 15000 15000 2.94 <1	<450 450 550 – – 2.44 <1	<450 450 625 15000 17500 3.46 <1	<450 450 500 – – 2.20 <1		
DR			<450 150 350 – – 3.11 <1	<450 150 150 – – 1.44 <1	<450 150 150 – – 1.59 <1	<450 150 150 – – 1.13 <1	<450 – – – – – – –	– 150 150 – – – – –	<450 – – – – – – –	– 450 450 – – – – –	<450 450 450 – – 2.94 <1	<450 450 500 – – 3.13 <1	<450 450 500 – – 3.56 <1	<450 450 600 – – 2.77 <1		
DQ			<450 150 150 3500 3500 1.60 <1	<450 150 125 – – 1.34 <1	<450 150 150 3500 3000 1.54 <1	<450 150 125 – – 1.56 <1					<450 450 450 15000 10000 3.19 <1	<450 450 450 – – 3.41 <1	<450 450 450 15000 10000 3.54 <1	<450 450 500 – – 2.79 <1		
DP			<450 150 175 – – 2.10 <1	<450 150 150 – – 1.87 <1	<450 150 150 – – 1.77 <1	<450 150 125 – – 1.50 <1	<450 – – – – – – –	– 150 150 – – – – –	<450 – – – – – – –	– 450 475 – – – – –	<450 450 550 – – 4.84 <1	<450 450 525 – – 2.95 <1	<450 450 450 – – 3.18 <1	<450 450 600 – – 2.63 <1		
DO			<450 150 175 3500 3500 1.72 <1	<450 150 150 – – 1.68 <1	<450 150 125 3500 3500 1.71 <1	<450 150 150 – – 1.24 <1		1.66 <1			<450 450 500 15000 9000 3.45 <1	<450 450 550 – – 3.63 <1	<450 450 450 15000 9000 2.54 <1	<450 450 600 – – 3.97 <1		
DN			<450 450 550 – – 4.37 <1	<450 450 450 – – 4.40 <1	<450 150 100 – – 1.57 <1	<450 150 100 – – 1.40 <1	<450 – – – – – – –	– 150 125 – – – – –	<450 – – – – – – –	– 450 550 – – – – –	<450 450 450 – – 2.97 <1	<450 450 450 – – 2.50 <1	<450 450 450 – – 2.44 <1	<450 450 450 – – 2.57 <1		
DM			<450 150 700 15000 17500 2.35 <1	<450 150 500 – – 4.45 <1	<450 150 100 3500 2750 1.38 <1	<450 150 100 – – 1.61 <1					<450 450 500 15000 15000 2.68 <1	<450 450 550 – – 2.71 <1	<450 450 450 15000 9000 3.01 <1	<450 450 600 – – 2.83 <1		

Sample Data

<450 – IM-247/PD Results [μμC/20cm²]
200 – IM-253/PD (HV-1 PHA) [bkg.]
300 – IM-253/PD (HV-1 PHA) [cpm]
7000 – IM-253/PD (HV-2 GROSS) [bkg.]
7300 – IM-253/PD (HV-2 GROSS) [cpm]
1.82 – MCA Gross Gamma Eq. Co-60 [pCi/g]
<1 – MCA Specific Co-60 Results [pCi/g]

1. Pier N

e. Localized Grid Maps

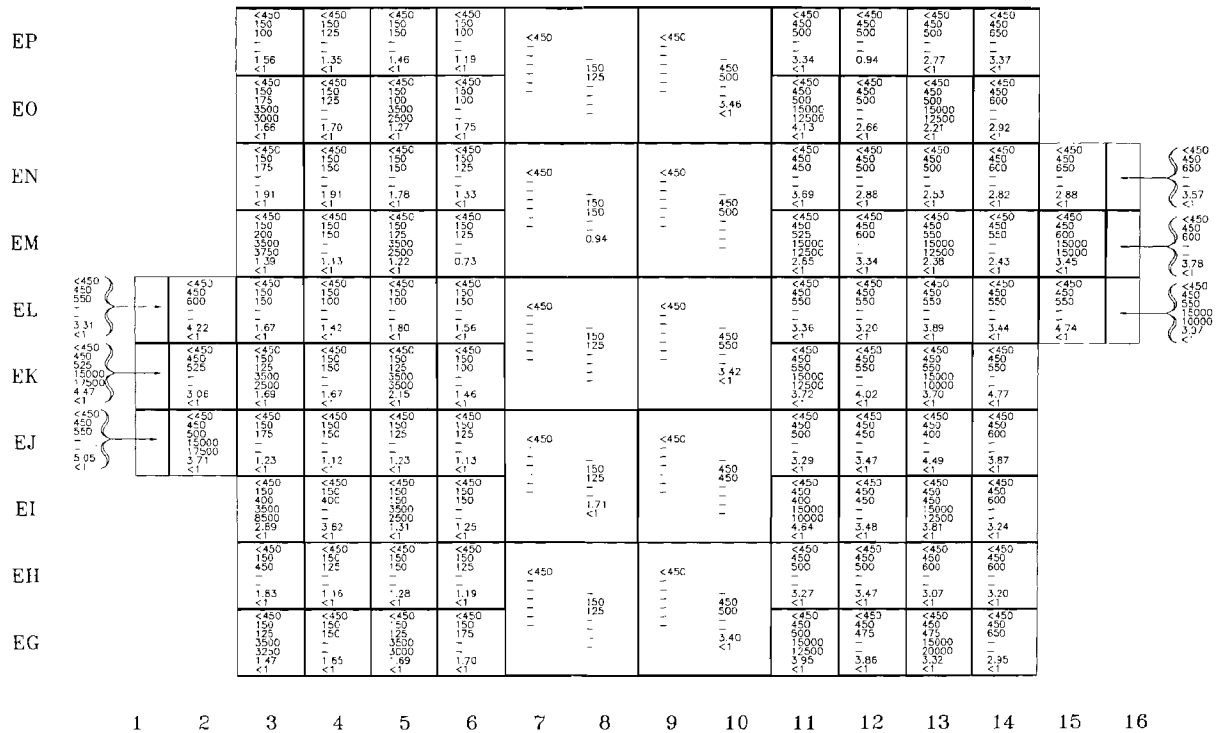
	3	4	5	6	7	8	9	10	11	12	13	14	15	16
EF	<450 150 200 – – 1.61 <1	<450 150 100 – – 1.60 <1	<450 150 100 – – 1.47 <1	<450 150 100 – – 1.55 <1	<450 – – – – – –	– 150 1.25 – – 0.73 –	<450 – – – – – –	– 450 500 – – – –	<450 450 475 – – 3.04 <1	<450 450 500 – – 3.04 <1	<450 450 500 – – 3.41 <1	<450 450 600 – – 2.90 <1		
EE	<450 150 400 3500 15000 2.00 <1	<450 150 350 – – 2.62 <1	<450 150 100 3500 2500 1.22 <1	<450 150 100 – – 1.21 <1					<450 450 500 15000 12500 3.22 <1	<450 450 500 – – 3.32 <1	<450 450 475 15000 12500 3.37 <1	<450 450 550 – – 2.49 <1		
ED	<450 150 300 – – 2.17 <1	<450 150 150 – – 1.34 <1	<450 150 125 – – 1.04 <1	<450 150 125 – – 1.17 <1	<450 – – – – – –	– 150 125 – – – –	<450 – – – – – –	– 450 400 – – 3.24 <1	<450 450 550 – – 2.77 <1	<450 450 500 – – 3.68 <1	<450 450 500 – – 3.29 <1	<450 450 650 – – 2.31 <1		
EC	<450 150 125 3500 3000 0.77 –	<450 150 125 – – 1.25 <1	<450 150 100 3500 3000 0.57 –	<450 150 100 – – 0.64 –					<450 450 450 15000 12500 3.42 <1	<450 450 450 – – 3.15 <1	<450 450 450 15000 15000 3.12 <1	<450 450 500 – – 2.30 <1		
EB	<450 150 250 – – 2.31 <1	<450 150 150 – – 0.70 –	<450 150 150 – – 1.14 <1	<450 150 150 – – 1.39 <1	<450 – – – – – –	– 150 150 – – – –	<450 – – – – – –	– 450 400 – – – –	<450 450 500 – – 3.33 <1	<450 450 450 – – 3.82 <1	<450 450 500 – – 2.82 <1	<450 450 600 – – 2.76 <1		
EA	<450 150 500 3500 10000 2.12 <1	<450 150 450 – – 2.31 <1	<450 150 150 3500 3500 0.97 –	<450 150 150 – – 0.76 –					<450 450 400 15000 10000 3.53 <1	<450 450 450 – – 2.61 <1	<450 450 400 15000 10000 3.61 <1	<450 450 550 – – 2.56 <1		
DZ	<450 150 150 – – 1.59 <1	<450 150 150 – – 1.86 <1	<450 150 150 – – 2.18 <1	<450 150 100 – – 1.91 <1	<450 – – – – – –	– 150 200 – – – –	<450 – – – – – –	– 450 450 – – – –	<450 450 400 – – 3.07 <1	<450 450 500 – – 3.75 <1	<450 450 400 – – 2.60 <1	<450 450 600 – – 2.10 <1		
DY	<450 150 350 3500 8000 2.71 <1	<450 150 125 – – 1.29 <1	<450 150 100 3500 2500 1.74 <1	<450 150 100 – – 1.10 <1					<450 450 600 15000 8500 3.02 <1	<450 450 500 – – 2.89 <1	<450 450 600 15000 8500 2.32 <1	<450 450 550 – – 3.09 <1		
DX	<450 150 300 – – 3.54 <1	<450 150 150 – – 1.44 <1	<450 150 125 – – 1.88 <1	<450 150 125 – – 1.41 <1	<450 – – – – – –	– 150 125 – – – –	<450 – – – – – –	– 450 450 – – – –	<450 450 600 – – 3.33 <1	<450 450 600 – – 3.36 <1	<450 450 600 – – 3.22 <1	<450 450 600 – – 2.83 <1	<450 450 550 – – 3.24 <1	<450 450 550 – – 3.03 <1
DW	<450 150 150 3500 2750 2.30 <1	<450 150 100 – – 1.34 <1	<450 150 100 3500 2500 1.36 <1	<450 150 125 – – 1.36 <1					<450 450 600 15000 8500 3.28 <1	<450 450 350 – – 3.08 <1	<450 450 400 15000 12500 3.92 <1	<450 450 400 – – 3.85 <1	<450 450 500 15000 15000 4.29 <1	<450 450 500 – – 3.53 <1

Sample Data

<450 – IM-247/PD Results [μμCi/20cm²]
200 – IM-253/PD (HV-1 PHA) [bkg.]
300 – IM-253/PD (HV-1 PHA) [cpm]
7000 – IM-253/PD (HV-2 GROSS) [bkg.]
7300 – IM-253/PD (HV-2 GROSS) [cpm]
1.82 – MCA Gross Gamma Eq. Co-60 [pCi/g]
<1 – MCA Specific Co-60 Results [pCi/g]

1. Pier N

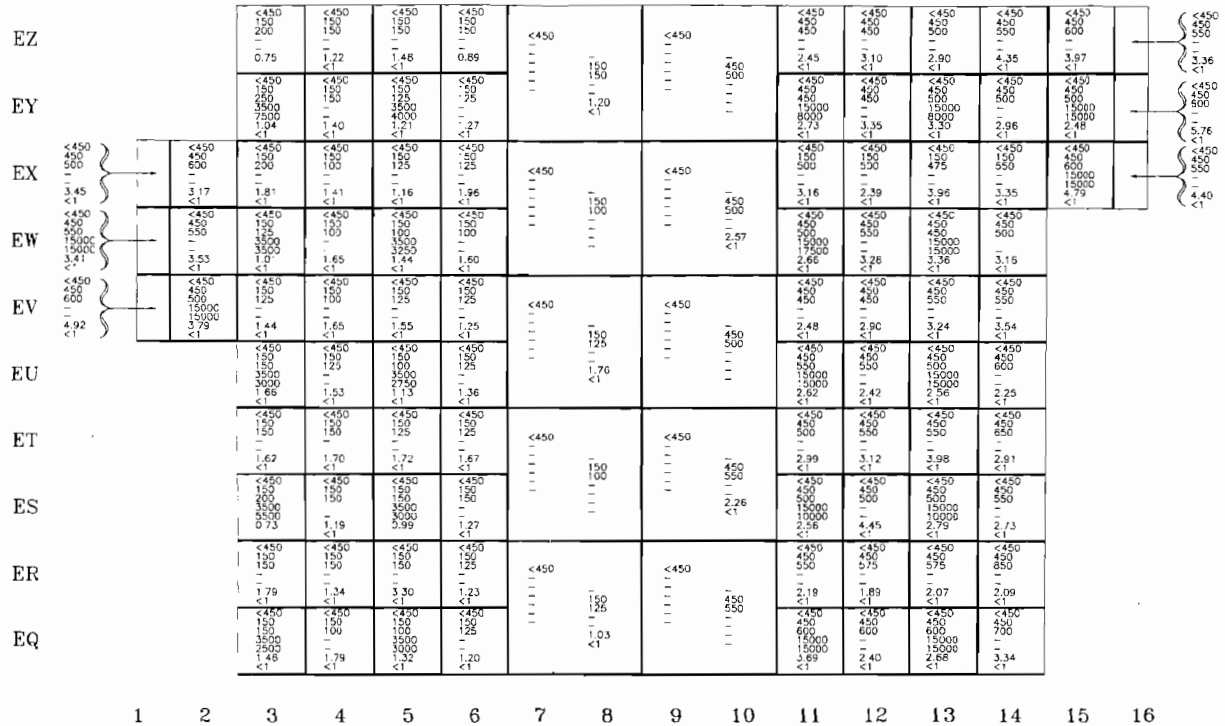
e. Localized Grid Maps



Sample Data
<450 – IM-247/PD Results [µµCi/20cm²]
200 – IM-253/PD (HV-1 PHA) [bkg.]
300 – IM-253/PD (HV-1 PHA) [cpm]
7000 – IM-253/PD (HV-2 GROSS) [bkg.]
7300 – IM-253/PD (HV-2 GROSS) [cpm]
1.82 – MCA Gross Gamma Eq. Co-60 [pCi/g]
<1 – MCA Specific Co-60 Results [pCi/g]

1. **Pier N**

e. **Localized Grid Maps**



Sample Data

<450 – IM-247/PD Results [μμCi/20cm²]
200 – IM-253/PD (HV-1 PHA) [bkg.]
300 – IM-253/PD (HV-1 PHA) [cpm]
7000 – IM-253/PD (HV-2 GROSS) [bkg.]
7300 – IM-253/PD (HV-2 GROSS) [cpm]
1.82 – MCA Gross Gamma Eq. Co-60 [pCi/g]
<1 – MCA Specific Co-60 Results [pCi/g]

1. Pier N

e. Localized Grid Maps

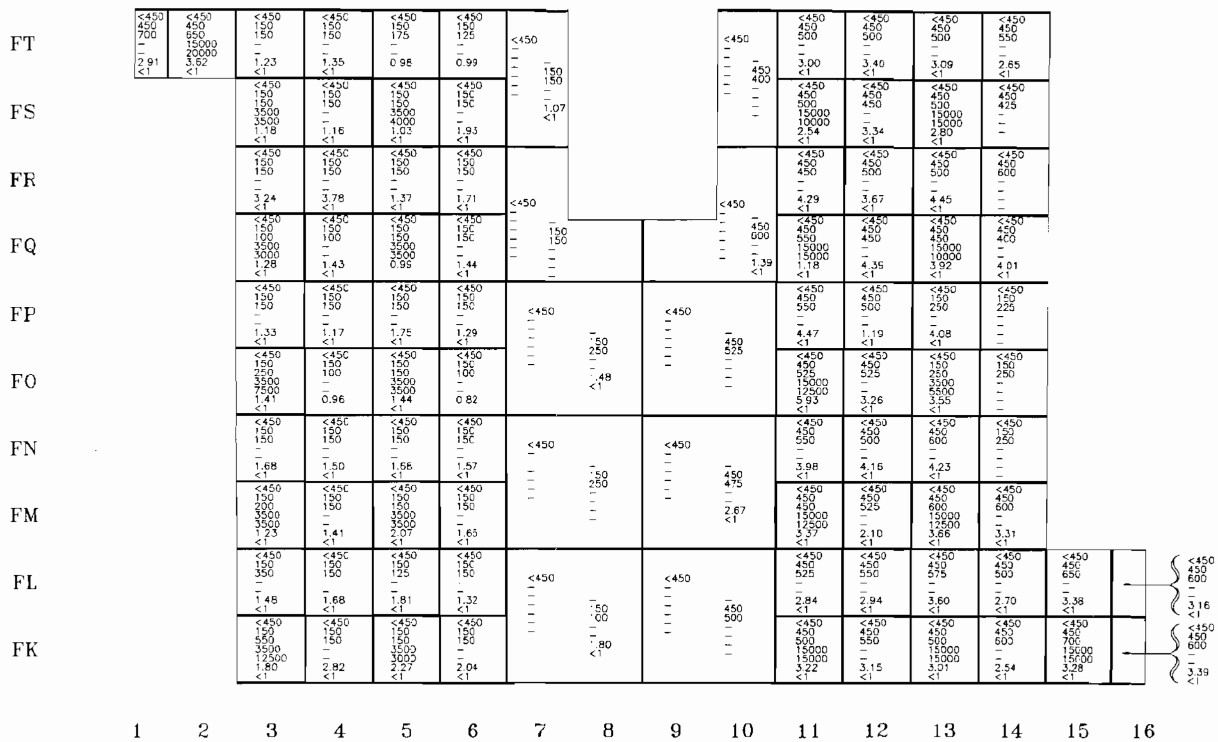
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
FJ	<450 450 600 – – 2.66 <1	<450 450 630 – – 3.54 <1	<450 150 200 – – 1.79 <1	<450 150 200 – – 1.80 <1	<450 150 200 – – 1.44 <1	<450 150 100 – – 2.14 <1	<450 – – – – – – –	– 150 100 – – – – –	<450 – – – – – – –	– 450 400 – – – 1.55 <1	<450 450 450 – – 3.91 <1	<450 450 500 – – 3.74 <1	<450 450 550 – – 4.09 <1	<450 450 500 – – 3.19 <1	<450 450 650 – – 3.20 <1	<450 450 575 15000 17500 4.64 <1
FI	<450 450 600 15000 15000 3.36 <1	<450 450 600 – – 2.14 <1	<450 150 150 3500 3500 0.83	<450 150 150 – – 1.15 <1	<450 150 150 3500 3500 1.72 <1	<450 150 100 – – 1.71 <1					<450 450 450 15000 8500 2.96 <1	<450 450 525 – – 2.88 <1	<450 450 475 15000 15000 3.44 <1	<450 450 475 – – 3.74 <1		
FH	<450 450 600 – – 3.80 <1	<450 450 600 15000 15000 2.95 <1	<450 150 150 – – 1.76 <1	<450 150 125 – – 1.29 <1	<450 150 150 – – 1.79 <1	<450 150 150 – – 1.25 <1	<450 – – – – – – –	– 150 150 – – – – –	<450 – – – – – – –	– 450 500 – – – – –	<450 450 500 – – 3.19 <1	<450 450 500 – – 2.60 <1	<450 450 500 – – 3.15 <1	<450 450 500 – – 3.00 <1		
FG			<450 150 200 3500 5000 1.32 <1	<450 150 150 – – 1.73 <1	<450 150 125 3500 2500 1.33 <1	<450 150 150 – – 1.83 <1	1.55 <1				<450 450 500 15000 9500 3.55 <1	<450 450 450 – – 3.73 <1	<450 450 450 15000 9000 3.11 <1	<450 450 550 – – 3.43 <1		
FF			<450 150 150 – – 1.61 <1	<450 150 125 – – 1.05 <1	<450 150 150 – – 1.29 <1	<450 150 125 – – 1.24 <1	<450 – – – – – – –	– 150 125 – – – – –	<450 – – – – – – –	– 450 500 – – – – –	<450 450 450 – – 3.47 <1	<450 450 375 – – 5.13 <1	<450 450 450 – – 3.14 <1	<450 450 550 – – 4.04 <1		
FE			<450 150 100 3500 3500 1.48 <1	<450 150 150 – – 1.09 <1	<450 150 125 3500 3500 1.20 <1	<450 150 125 – – 1.55 <1					<450 450 500 15000 9000 3.65 <1	<450 450 500 – – 3.78 <1	<450 450 450 15000 8500 2.66 <1	<450 450 550 – – 4.78 <1		
FD			<450 150 150 – – 1.26 <1	<450 150 150 – – 1.40 <1	<450 150 150 – – 1.64 <1	<450 150 150 – – 1.26 <1	<450 – – – – – – –	– 150 125 – – – – –	<450 – – – – – – –	– 450 400 – – – – –	<450 450 500 – – 2.55 <1	<450 450 475 – – 3.54 <1	<450 450 500 – – 3.90 <1	<450 450 525 – – 2.94 <1		
FC			<450 150 150 3500 3500 1.74 <1	<450 150 150 – – 1.33 <1	<450 150 150 3500 3500 1.32 <1	<450 150 125 – – 1.61 <1		– 150 125 – – 1.50 <1			<450 450 300 15000 10000 3.34 <1	<450 450 400 – – 2.73 <1	<450 450 400 15000 10000 3.00 <1	<450 450 500 – – 3.03 <1		
FB			<450 150 125 – – 1.71 <1	<450 150 150 – – 1.58 <1	<450 150 150 – – 1.41 <1	<450 150 125 – – 1.54 <1	<450 – – – – – – –	– 150 100 – – – – –	<450 – – – – – – –	– 450 550 – – – – –	<450 450 450 – – 3.10 <1	<450 450 350 – – 3.24 <1	<450 450 350 – – 3.71 <1	<450 450 450 – – 5.13 <1		
FA			<450 150 150 3500 3250 1.14 <1	<450 150 175 – – 0.68	<450 150 150 3500 3000 1.30 <1	<450 150 125 – – 1.25 <1					<450 450 550 15000 8500 3.33 <1	<450 450 550 – – 2.20 <1	<450 450 550 15000 9000 3.30 <1	<450 450 550 – – 4.91 <1		

Sample Data

<450 – IM-247/PD Results [μCi/20cm²]
200 – IM-253/PD (HV-1 PHA) [bkg]
300 – IM-253/PD (HV-1 PHA) [cpm]
7000 – IM-253/PD (HV-2 GROSS) [bkg]
7300 – IM-253/PD (HV-2 GROSS) [cpm]
1.82 – MCA Gross Gamma Eq Co-60 [pCi/g]
<1 – MCA Specific Co-60 Results [pCi/g]

1. Pier N

e. Localized Grid Maps

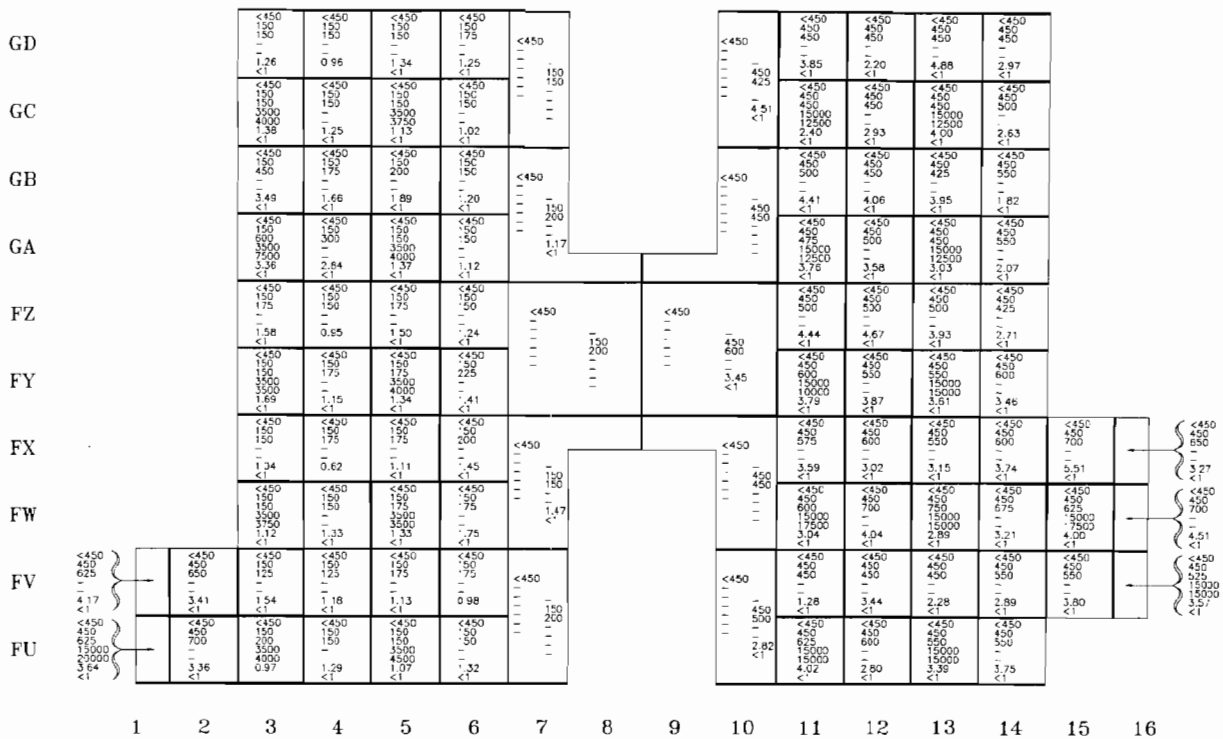


Sample Data

<450 – IM-247/PD Results (μμCi/20cm²)
200 – IM-253/PD (HV-1 PHA) (bkg)
300 – IM-253/PD (HV-1 PHA) (cpm)
7000 – IM-253/PD (HV-2 GROSS) (bkg)
7300 – IM-253/PD (HV-2 GROSS) (cpm)
1.82 – MCA Gross Gamma Eq. Co-60 (pCi/g)
<1 – MCA Specific Co-60 Results (pCi/g)

1. Pier N

e. Localized Grid Maps

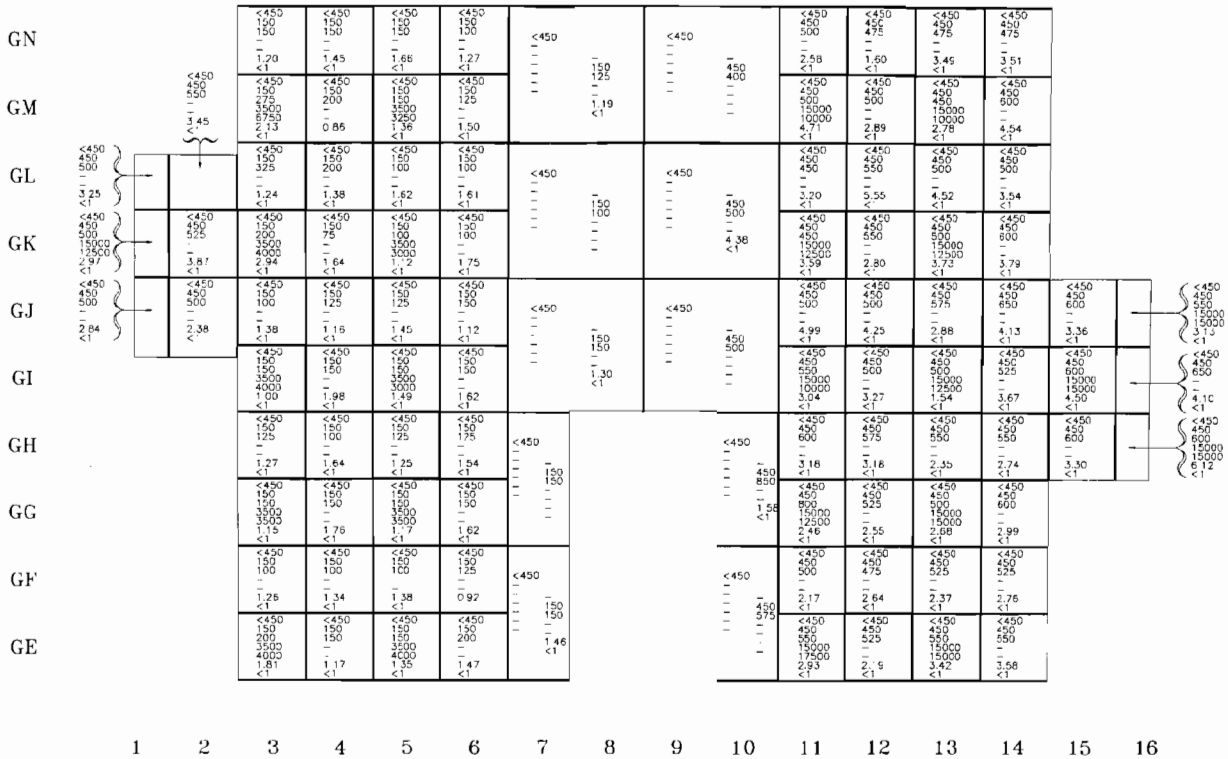


Sample Data

<450 – IM-247/PD Results [µµCi/20cm²]
200 – IM-253/PD (HV-1 PHA) [bkg.]
300 – IM-253/PD (HV-1 PHA) [cpm]
7000 – IM-253/PD (HV-2 GROSS) [bkg.]
7300 – IM-253/PD (HV-2 GROSS) [cpm]
1.82 – MCA Gross Gamma Eq. Co-60 [pCi/g]
<1 – MCA Specific Co-60 Results [pCi/g]

1. Pier N

e. Localized Grid Maps

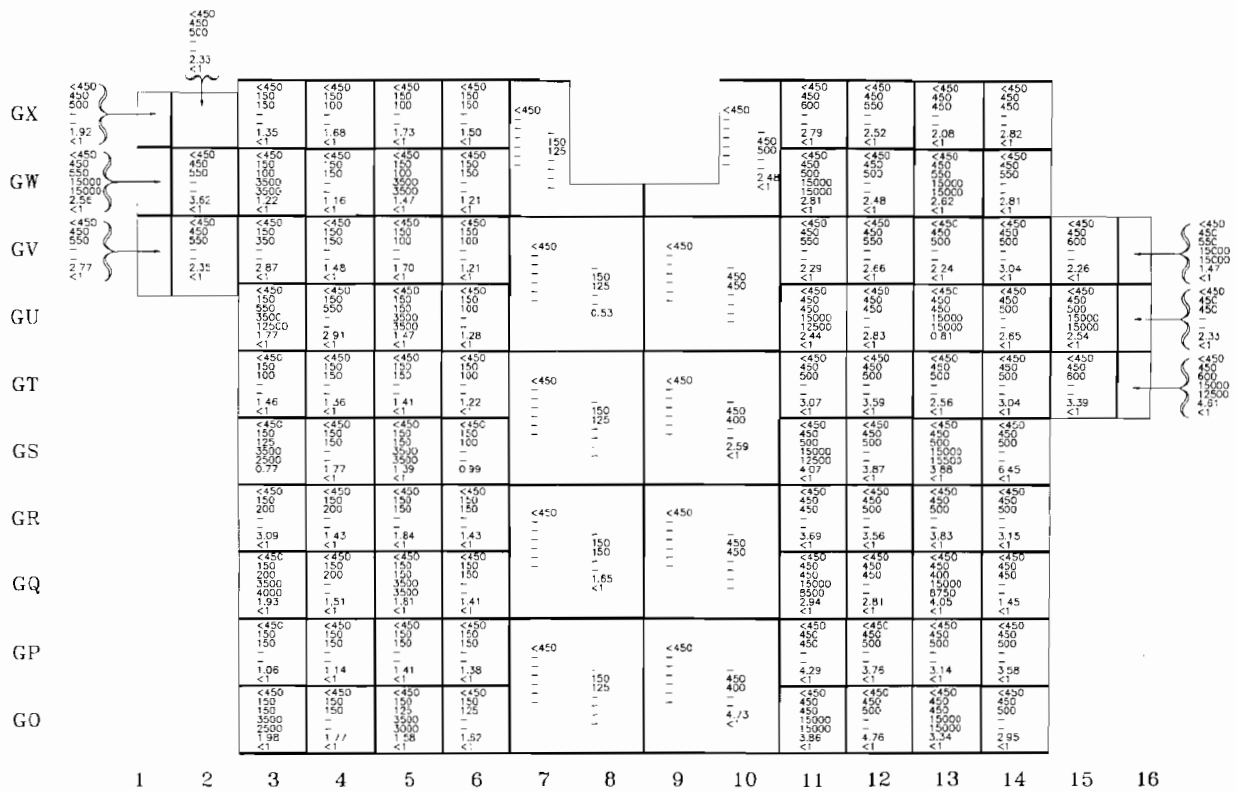


Sample Data

<450 – IM-247/PD Results (μμCi/20cm²)
200 – IM-253/PD (HV-1 PHA) (bkg)
300 – IM-253/PD (HV-1 PHA) (cpm)
7000 – IM-253/PD (HV-2 GROSS) (bkg)
7300 – IM-253/PD (HV-2 GROSS) (cpm)
1.82 – MCA Gross Gamma Eq. Co-60 (pCi/g)
<1 – MCA Specific Co-60 Results (pCi/g)

1. Pier N

e. Localized Grid Maps

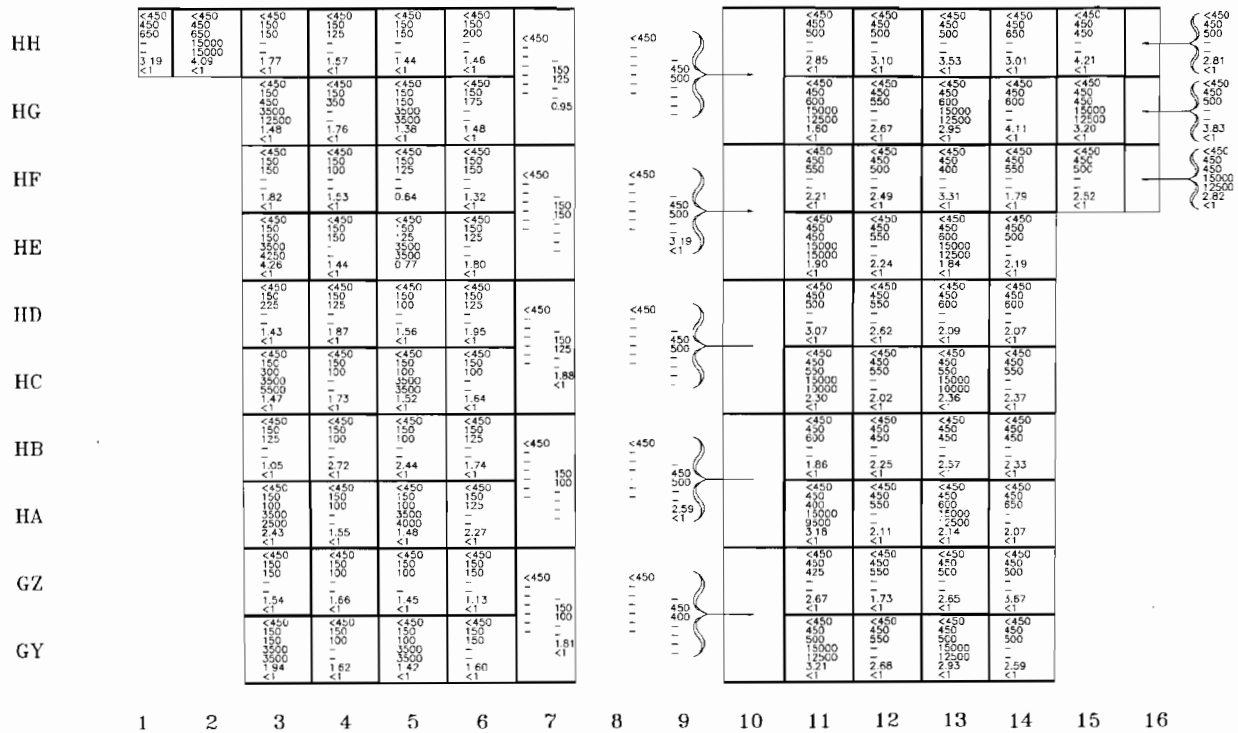


Sample Data

<450 – IM-247/PD Results [μμCi/20cm²]
200 – IM-253/PD (HV-1 PHA) [bkg]
300 – IM-253/PD (HV-1 PHA) [cpm]
7000 – IM-253/PD (HV-2 GROSS) [bkg]
7300 – IM-253/PD (HV-2 GROSS) [cpm]
1.82 – MCA Gross Gamma Eq. Co-60 [pCi/g]
<1 – MCA Specific Co-60 Results [pCi/g]

1. Pier N

e. Localized Grid Maps



Sample Data
<450 – IM-247/PD Results [μμCi/20cm²]
200 – IM-253/PD (HV-1 PHA) [bkg.]
300 – IM-253/PD (HV-1 PHA) [cpm]
7000 – IM-253/PD (HV-2 GROSS) [bkg.]
7300 – IM-253/PD (HV-2 GROSS) [cpm]
1.62 – MCA Gross Gamma Eq. Co-60 [pCi/g]
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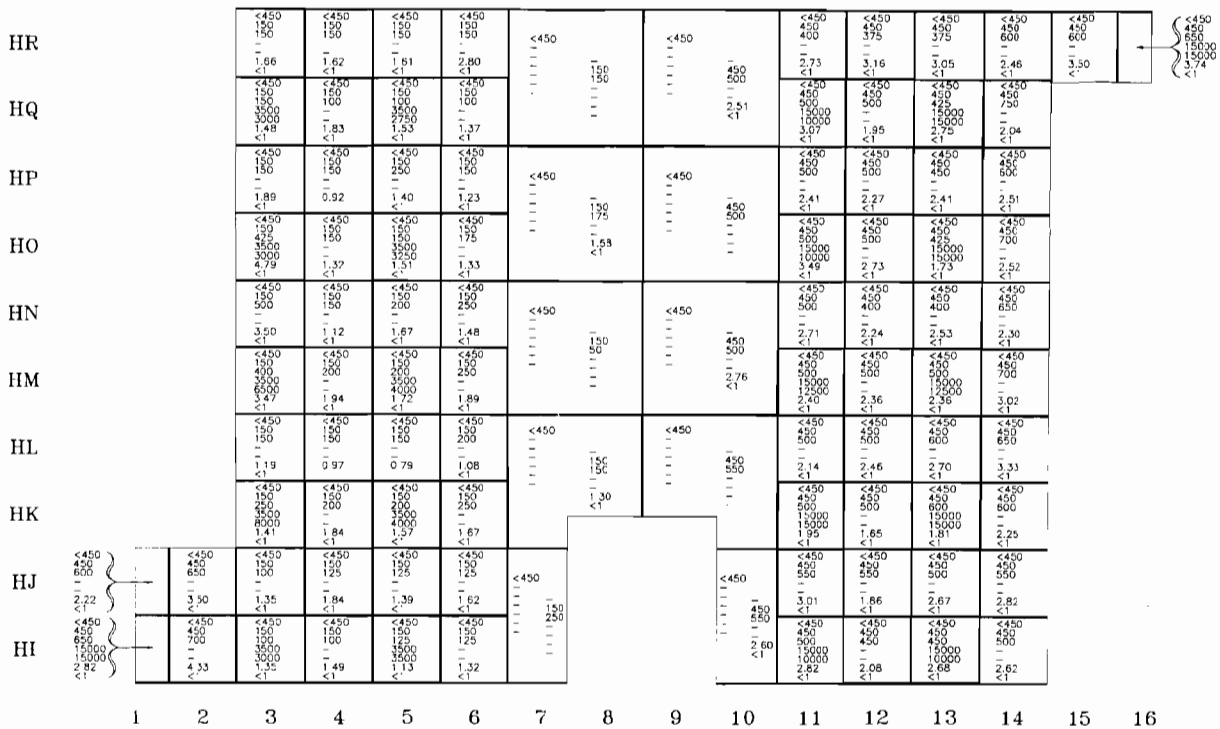
1. Pier N

e. Localized Grid Maps

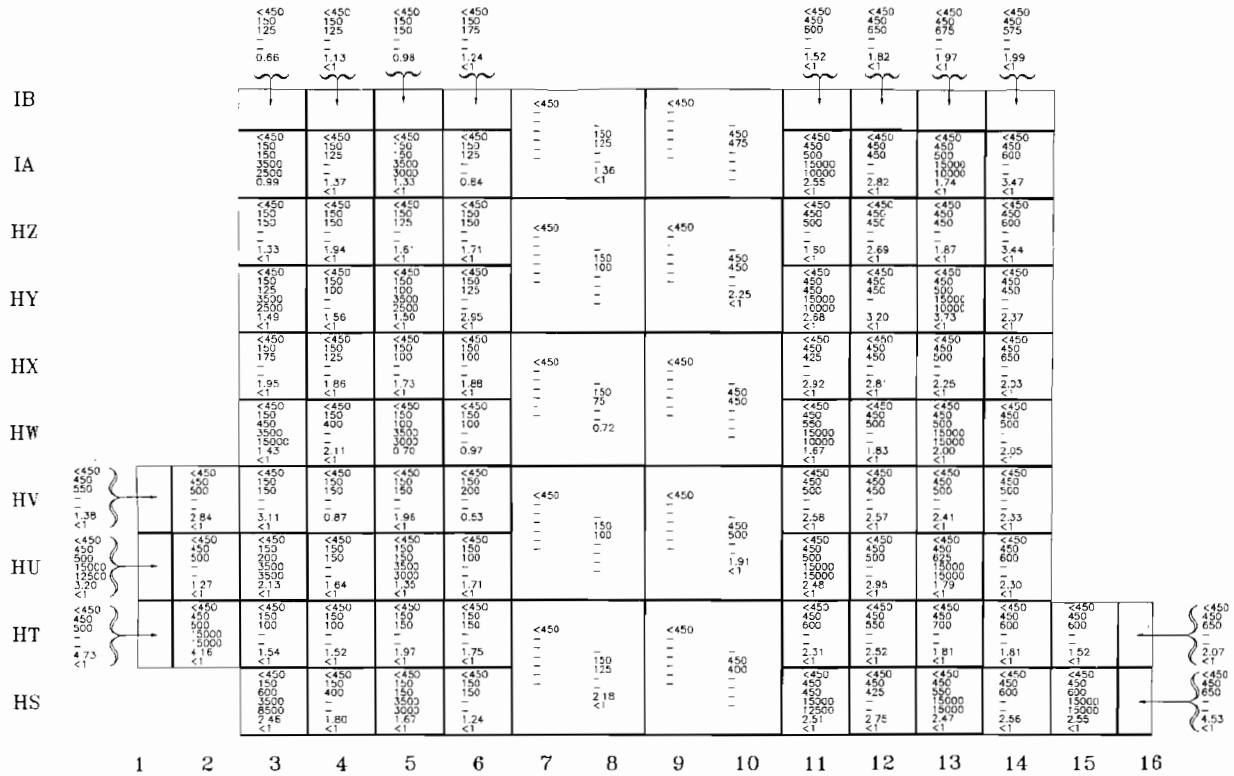


Sample Data

< 450 – IM-247/PD Results [μμCi/20cm²]
200 – IM-253/PD (HV-1 PHA) [bkg.]
300 – IM-253/PD (HV-1 PHA) [cpm]
7000 – IM-253/PD (HV-2 GROSS) [bkg.]
7300 – IM-253/PD (HV-2 GROSS) [cpm]
1.82 – MCA Gross Gamma Eq. Co-60 [pCi/g
<1 – MCA Specific Co-60 Results [pCi/g]

1. **Pier N**

e. **Localized Grid Maps**



Sample Data
<450 – IM-247/PD Results [μμCi/20cm²]
200 – IM-253/PD (HV-1 PHA) [bkg.]
300 – IM-253/PD (HV-1 PHA) [cpm]
7000 – IM-253/PD (HV-2 GROSS) [bkg.]
7300 – IM-253/PD (HV-2 GROSS) [cpm]
1.82 – MCA Gross Gamma Eq. Co-60 [pCi/g]
<1 – MCA Specific Co-60 Results [pCi/g]

1. Pier N

f. Prior To Photograph

South side of pier, looking southwest.

1. Pier N

f. Prior To Photograph

North side of pier, looking southwest

1. Pier N

g. After Photograph

Head of pier, looking northeast.

1. Pier N

g. After Photograph

North side of pier, looking northeast.

1. Pier N

g. After Photograph

South side of pier, looking northeast.

1. Pier N

g. After Photograph

Base of pier, looking northeast.

1. Pier N

g. After Photograph

Base of pier, looking southwest.

1. Pier P

a. Introduction:

Pier P, also identified as Structure 328, is located in grid J-22 of Charleston Naval Shipyard map (Figure 10). Pier P was constructed in 1959.

(1) **Description:**

Pier P, including the 40' land side approach, is 1397' long by 60' wide, oriented northeast into the Cooper River. Topside structures include three, 11' by 40' and two 11' by 35' shore power distribution centers and six 4' by 32' pierside receptacle centers.

(2) **Brief History:**

(a) **Use:** This pier was constructed as part of the U.S. Naval shore establishment expansion program and was used to berth various classes of naval vessels.

(b) **Radiological History:** Pier P was certified to berth nuclear vessels. Loose surface contamination levels were less than 450μμCi/100cm^2.

(3) **Survey Requirements:**

(a) Nuclear Ship Berthing Area survey. Group two surveys were performed on the pier and extended forty feet beyond the base of the pier.

b. Discussion:

Pier P, including a 40' land side approach, was divided into 925 grids approximately 10' by 10'. Each of these grids was subdivided into two 3' by 3' subsections. These subsections were located in the area of highest potential. Each grid had its own unique designator.

One subsection per grid received a survey with the IM-247/PD and the other subsection of each grid received a survey with the IM-253/PD (HV-1 PHA). Shore power distibution centers and pierside receptacle centers did not require survey since radiological material was not transported over these structures. Additionally, solid material samples were taken from a minimum of 50% of the 10' by 10' grids and each 3' by 3' subsection that indicated greater than 450μμCi/20cm^2 using the IM-247/PD or greater than twice background using the IM-253/PD.

Solid material samples were taken from 514 grids on Pier P. The solid material samples were removed from the location indicating the area of highest potential. The following typical naturally occurring radionuclides were identified

1. Pier P

during isotopic analysis of the solid material samples: lead 212, lead 214, thallium 208.

Individual backgrounds were used for Pier P and it's land side approach. These backgrounds were for high natural radioactivity concrete, low natural radioactivity concrete, and asphalt. Due to variations in natural radioactivity among the construction materials, different background levels exist. The IM-247/PD, IM-253/PD (HV-1 PHA and HV-2 GROSS) background of 60, 300, and 7000 counts per minute used for the high natural radioactivity concrete were based on the radiation levels obtained from Building 1884. The IM-247/PD, IM-253/PD (HV-1 PHA and HV-2 GROSS) backgrounds of 40, 100, and 3000 counts per minute used for the low natural radioactivity concrete were based on the radiation levels obtained from Pier U. The IM-247/PD, IM-253/PD (HV-1 PHA and HV-2 GROSS) backgrounds of 50, 400, and 10000 counts per minute used for the asphalt, were based on the radiation levels obtained from Building M1257 North Road.

c. Summary:

Surveys performed with the IM-247/PD did not detect areas greater than 450μμCi/20cm^2.

Surveys performed with the IM-253/PD (HV-1 PHA) detected 51 areas greater than or equal to twice background.

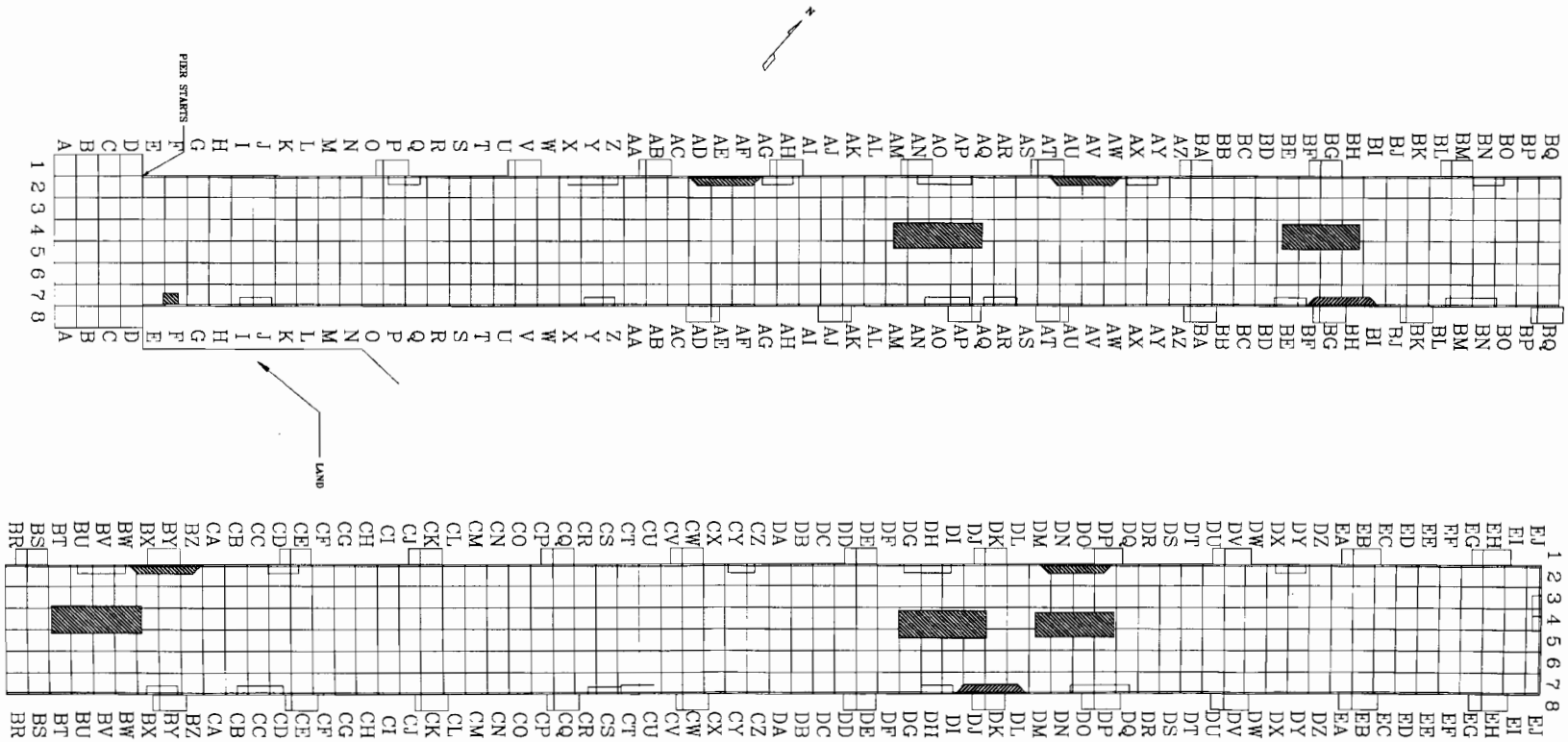
Surveys performed with the IM-253/PD (HV-2 GROSS) detected 46 areas greater than or equal to twice background.

Analysis performed on solid material samples with the multi-channel analyzer (MCA) detected gross gamma equivalent cobalt 60 levels ranging from a low of less than a minimum detectable activity of 0.47 pCi/g to a high of 11.52 pCi/g.

Analysis performed on solid material samples with the MCA for specific cobalt 60, indicated that all solid material samples were less than 1 pCi/g.

1. Pier P

d. Site Map



1. Pier P

e. Localized Grid Maps

	1	2	3	4	5	6	7	8
E		<450 – – – – – – 100 175 – – –	<450 – – – – – 1.73 <1 – 100 150 – – –	<450 – – – – – – 100 150 – – –	<450 – – – – – 1.79 <1 – 100 100 – – –	<450 – – – – – – 100 100 – – –	<450 – – – – – 2.36 <1 – 100 150 – – –	
D	<450 – – – – – – <450 100 300 3000 6000 1.71 <1	<450 – – – – – 2.90 <1 – 400 400 – – –	<450 – – – – – – 400 400 – – –	<450 – – – – – 2.91 <1 – 400 450 – – –	<450 – – – – – – 400 400 – – –	<450 – – – – – 2.59 <1 – 400 450 – – –	<450 – – – – – – 400 450 – – –	<450 – – – – – 2.35 <1 – 200 300 – – –
C	<450 – – – – – 2.37 <1 – <450 100 400 3000 5500 2.36 <1	<450 – – – – – – 400 450 – – –	<450 – – – – – 2.53 <1 – 400 400 – – –	<450 – – – – – – 400 450 – – –	<450 – – – – – 2.89 <1 – 400 450 – – –	<450 – – – – – – 400 450 – – –	<450 – – – – – 2.85 <1 – 400 400 – – –	<450 – – – – – – 400 450 – – –
B	<450 – – – – – – 400 450 – – –	<450 – – – – – 2.32 <1 – 400 450 – – –	<450 – – – – – – 400 450 – – –	<450 – – – – – 2.58 <1 – 400 450 – – –	<450 – – – – – – 400 400 – – –	<450 – – – – – 2.46 <1 – 400 400 – – –	<450 – – – – – – 400 400 – – –	<450 – – – – – 2.21 <1 – 400 400 – – –
A	<450 – – – – – 2.14 <1 – 400 450 – – –	<450 – – – – – – 400 450 – – –	<450 – – – – – 2.41 <1 – 400 400 – – –	<450 – – – – – – 400 400 – – –	<450 – – – – – 2.59 <1 – 400 400 – – –	<450 – – – – – – 400 400 – – –	<450 – – – – – 2.39 <1 – 400 400 – – –	<450 – – – – – – 400 400 – – –

Sample Data

<450 – IM-247/PD Results [μμCi/20cm²]
200 – IM-253/PD (HV-1 PHA) [bkg.]
300 – IM-253/PD (HV-1 PHA) [cpm]
7000 – IM-253/PD (HV-2 GROSS) [bkg.]
7300 – IM-253/PD (HV-2 GROSS) [cpm]
1.82 – MCA Gross Gamma Eq. Co-60 [pCi/g]
<1 – MCA Specific Co-60 Results [pCi/g]

1. Pier P

e. Localized Grid Maps

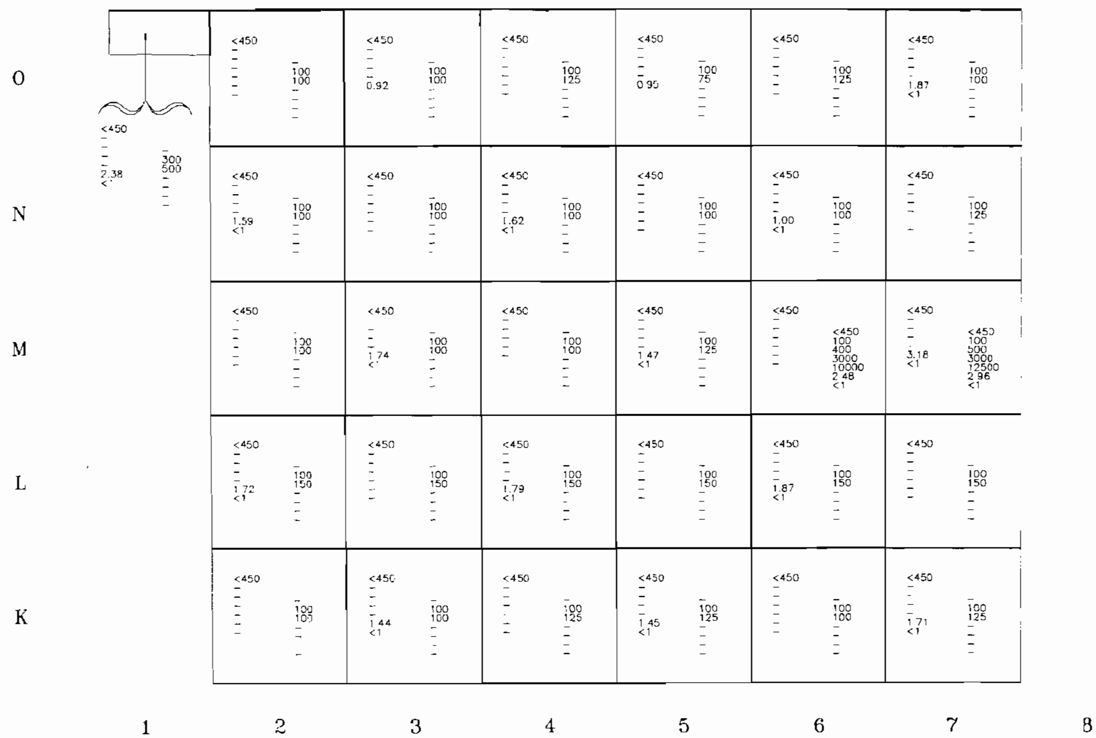
	1	2	3	4	5	6	7	8
J		<450 – – – – 2.09 <1 – 100 100 – – – –	<450 – – – – – – – 100 100 – – – –	<450 – – – – 2.18 <1 – 100 100 – – – –	<450 – – – – – – – 100 150 – – – –	<450 – – – – 1.72 <1 – 100 100 – – – –	<450 – – – – – – – 100 150 – – – –	
I		<450 – – – – – – – 100 100 – – – –	<450 – – – – 1.64 – – 100 100 – – – –	<450 – – – – – – – 100 100 – – – –	<450 – – – – 1.15 <1 – 100 100 – – – –	<450 – – – – – – – 100 100 – – – –	<450 – – – – 1.67 <1 – 100 150 – – – –	
H		<450 – – – – 1.79 <1 – 100 100 – – – –	<450 – – – – – – – 100 125 – – – –	<450 – – – – 1.18 <1 – 100 125 – – – –	<450 – – – – – – – 100 125 – – – –	<450 – – – – 1.85 <1 – 100 125 – – – –	<450 – – – – – – – 100 100 – – – –	
G		<450 – – – – – – – 100 125 – – – –	<450 – – – – 1.84 <1 – 100 100 – – – –	<450 – – – – – – – 100 100 – – – –	<450 – – – – 1.55 <1 – 100 75 – – – –	<450 – – – – – – – 100 100 – – – –	<450 – – – – 1.75 <1 – 100 100 – – – –	
F		<450 – – – – 1.79 <1 – 100 100 – – – –	<450 – – – – – – – 100 150 – – – –	<450 – – – – 1.93 <1 – 100 150 – – – –	<450 – – – – – – – 100 150 – – – –	<450 – – – – 1.40 <1 – 100 150 – – – –	<450 – – – – – – – 100 125 – – – –	

Sample Data

<450 – IM-247/PD Results [μμCi/20cm²]
200 – IM-253/PD (HV-1 PHA) [bkg.]
300 – IM-253/PD (HV-1 PHA) [cpm]
7000 – IM-253/PD (HV-2 GROSS) [bkg.]
7300 – IM-253/PD (HV-2 GROSS) [cpm]
1.82 – MCA Gross Gamma Eq. Co-60 [pCi/g]
<1 – MCA Specific Co-60 Results [pCi/g]

1. Pier P

e. Localized Grid Maps



Sample Data
<450 – IM-247/PD Results [μμCi/20cm²]
200 – IM-253/PD (HV-1 PHA) [bkg.]
300 – IM-253/PD (HV-1 PHA) [cpm]
7000 – IM-253/PD (HV-2 GROSS) [bkg.]
7300 – IM-253/PD (HV-2 GROSS) [cpm]
1 82 – MCA Gross Gamma Eq Co-60 [pCi/g]
<1 – MCA Specific Co-60 Results [pCi/g]

1. Pier P

e. Localized Grid Maps

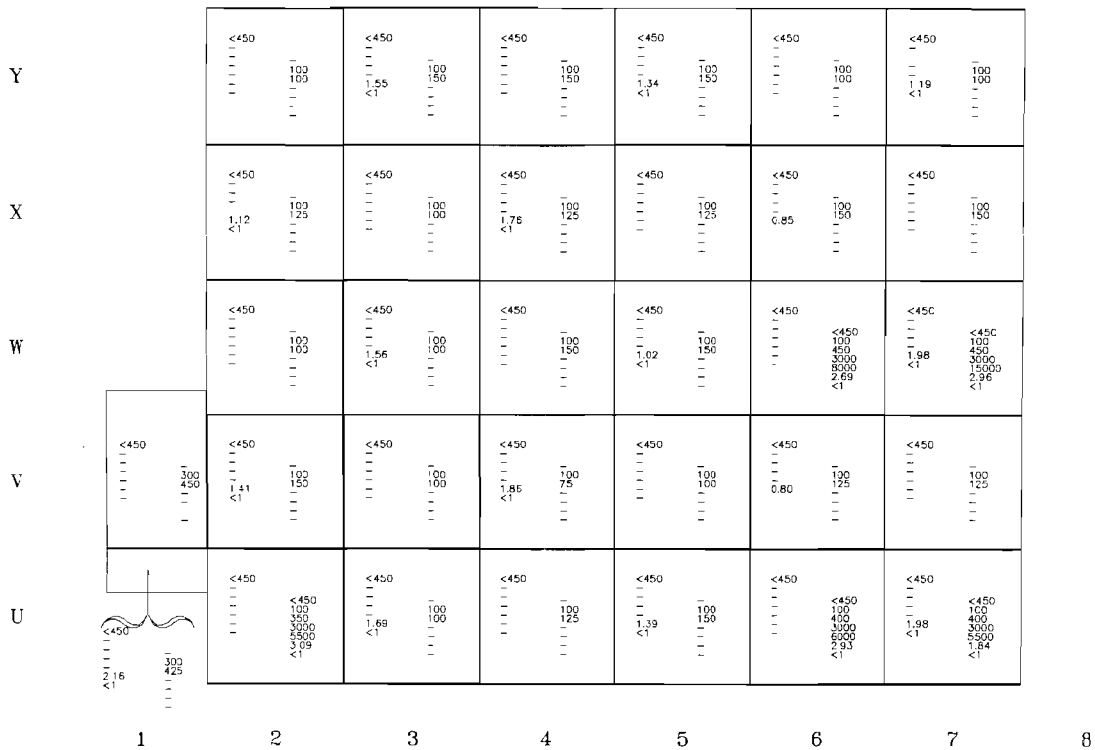
	1	2	3	4	5	6	7	8
T		<450 – – – – 1.00 <1 – 100 100 – – – –	<450 – – – – – – – 100 100 – – – –	<450 – – – – 1.27 <1 – 100 100 – – – –	<450 – – – – – – – 100 100 – – – –	<450 – – – – 1.64 – – 100 125 – – – –	<450 – – – – – – – 100 125 – – – –	
S		<450 – – – – – – – 100 150 – – – –	<450 – – – – – 2.22 <1 – 100 150 – – –	<450 – – – – – – – 100 150 – – – –	<450 – – – – – 1.83 <1 – 100 150 – – –	<450 – – – – – – – <450 100 400 3000 5500 2.19 <1	<450 – – – – – 2.09 <1 – <450 130 500 3000 15000 1.96 <1	
R		<450 – – – – – 1.78 <1 – 100 125 – – –	<450 – – – – – – – 100 100 – – – –	<450 – – – – – 1.65 <1 – 100 100 – – –	<450 – – – – – – – 100 125 – – – –	<450 – – – – – 1.63 <1 – 100 125 – – –	<450 – – – – – – – 100 100 – – – –	
Q		<450 – – – – – – – 100 125 – – – –	<450 – – – – – 1.31 <1 – 100 125 – – –	<450 – – – – – – – 100 125 – – – –	<450 – – – – – 1.15 <1 – 100 125 – – –	<450 – – – – – – – 100 125 – – – –	<450 – – – – – 1.87 <1 – 100 125 – – –	
P	<450 – – – – – – – 300 450 – – – –	<450 – – – – – 1.87 – 100 100 – – – –	<450 – – – – – – – 100 125 – – – –	<450 – – – – – 1.78 <1 – 100 125 – – –	<450 – – – – – – – 100 100 – – – –	<450 – – – – – 1.39 <1 – 100 125 – – –	<450 – – – – – – – 100 150 – – – –	

Sample Data

<450 – IM-247/PD Results [$\mu\mu$Ci/20cm^2]
200 – IM-253/PD (HV-1 PHA) [bkg.]
300 – IM-253/PD (HV-1 PHA) [cpm]
7000 – IM-253/PD (HV-2 GROSS) [bkg.]
7300 – IM-253/PD (HV-2 GROSS) [cpm]
1.82 – MCA Gross Gamma Eq. Co-60 [pCi/g]
<1 – MCA Specific Co-60 Results [pCi/g]

1. Pier P

e. Localized Grid Maps

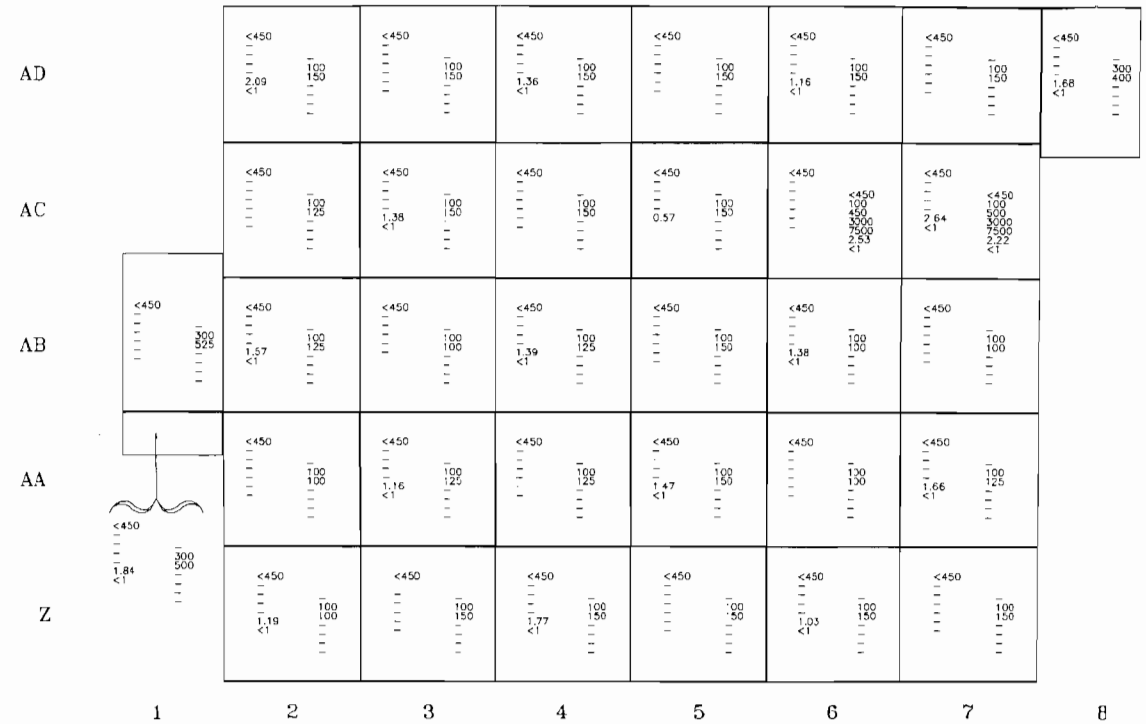


Sample Data

< 450 – IM-247/PD Results [μμCi/20cm²]
200 – IM-253/PD (HV-1 PHA) [bkg.]
300 – IM-253/PD (HV-1 PHA) [cpm]
7000 – IM-253/PD (HV-2 GROSS) [bkg.]
7300 – IM-253/PD (HV-2 GROSS) [cpm]
1.82 – MCA Gross Gamma Eq. Co-60 [pCi/g]
<1 – MCA Specific Co-60 Results [pCi/g]

1. Pier P

e. Localized Grid Maps

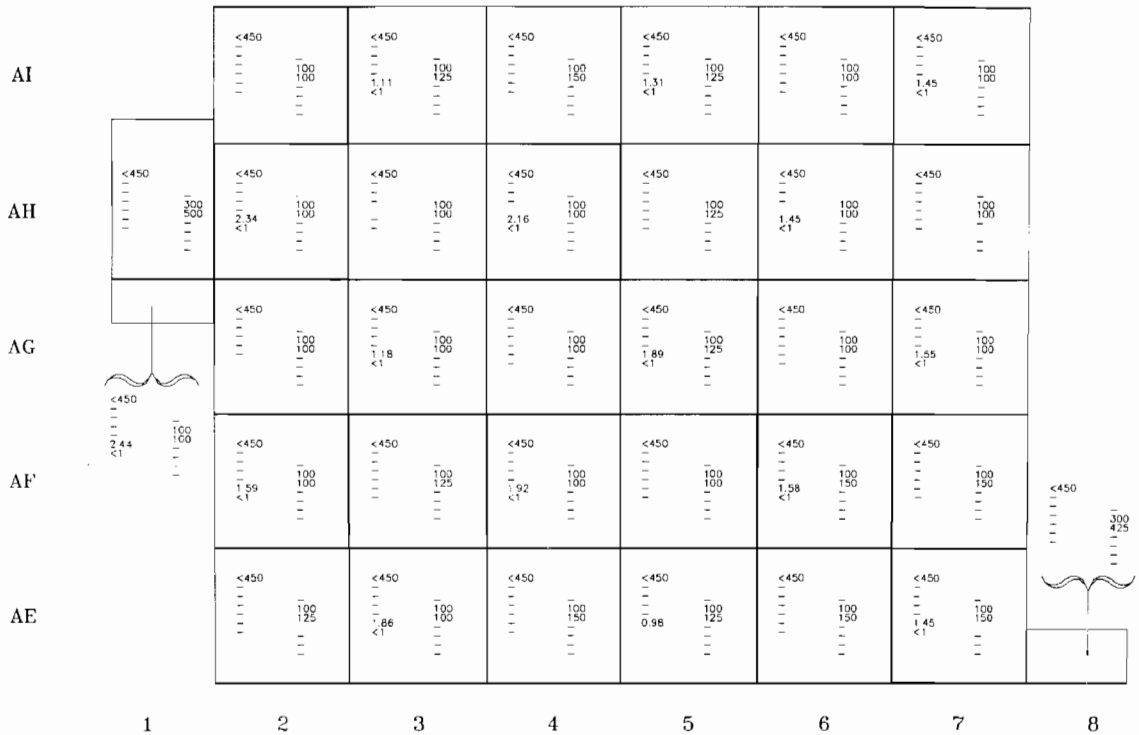


Sample Data

<450 – IM-247/PD Results [μμCi/20cm²]
200 – IM-253/PD (HV-1 PHA) [bkg.]
300 – IM-253/PD (HV-1 PHA) [cpm]
7000 – IM-253/PD (HV-2 GROSS) [bkg.]
7300 – IM-253/PD (HV-2 GROSS) [cpm]
1.82 – MCA Gross Gamma Eq. Co-60 [pCi/g]
<1 – MCA Specific Co-60 Results [pCi/g]

1. Pier P

e. Localized Grid Maps

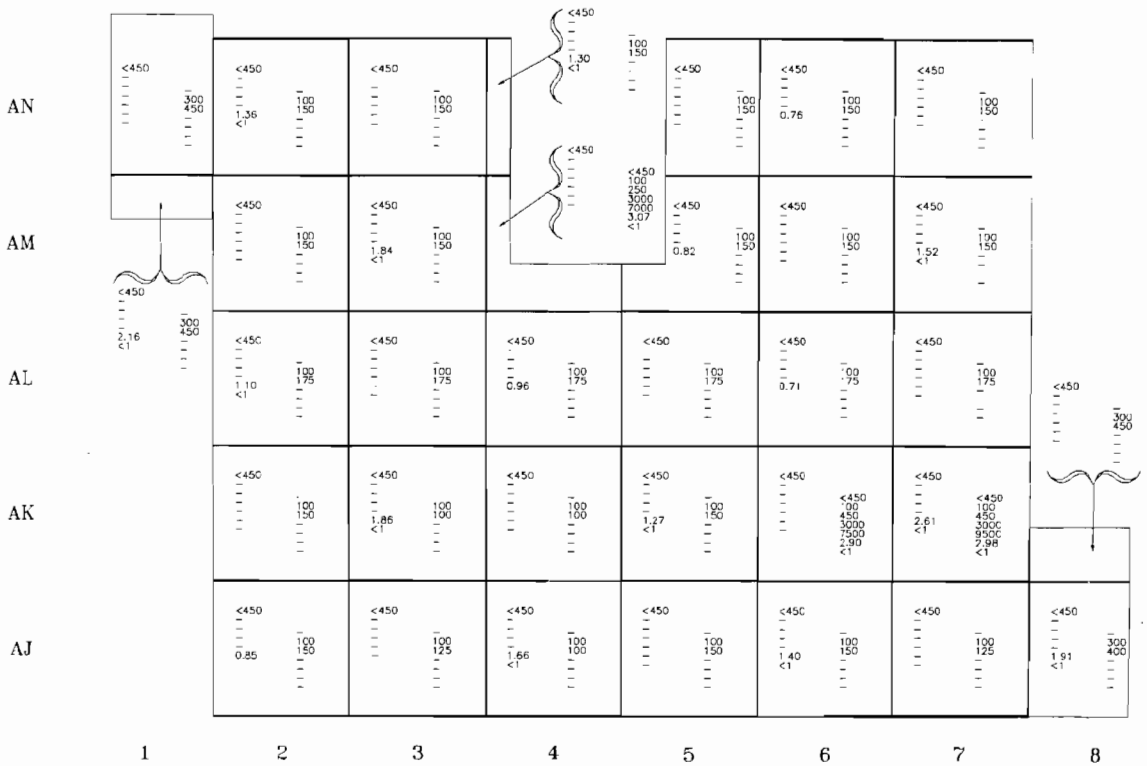


Sample Data

<450 – IM-247/PD Results [μCi/20cm²]
200 – IM-253/PD (HV-1 PHA) [bkg.]
300 – IM-253/PD (HV-1 PHA) [cpm]
7000 – IM-253/PD (HV-2 GROSS) [bkg.]
7300 – IM-253/PD (HV-2 GROSS) [cpm]
1.82 – MCA Gross Gamma Eq. Co-60 [pCi/g]
<1 – MCA Specific Co-60 Results [pCi/g]

1. Pier P

e. Localized Grid Maps

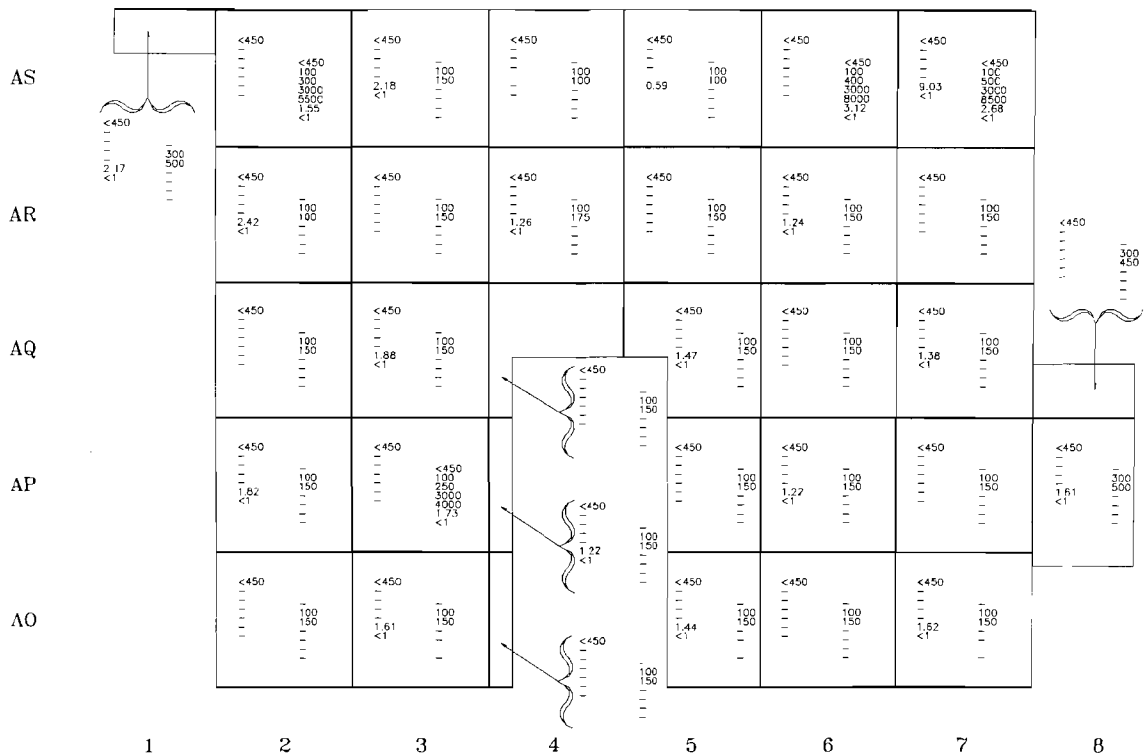


Sample Data

<450 – IM-247/PD Results [μμCi/20cm²]
200 – IM-253/PD (HV-1 PHA) [bkg.]
300 – IM-253/PD (HV-1 PHA) [cpm]
7000 – IM-253/PD (HV-2 GROSS) [bkg.]
7300 – IM-253/PD (HV-2 GROSS) [cpm]
1.82 – MCA Gross Gamma Eq. Co-60 [pC/g]
<1 – MCA Specific Co-60 Results [pC/g]

1. Pier P

e. Localized Grid Maps

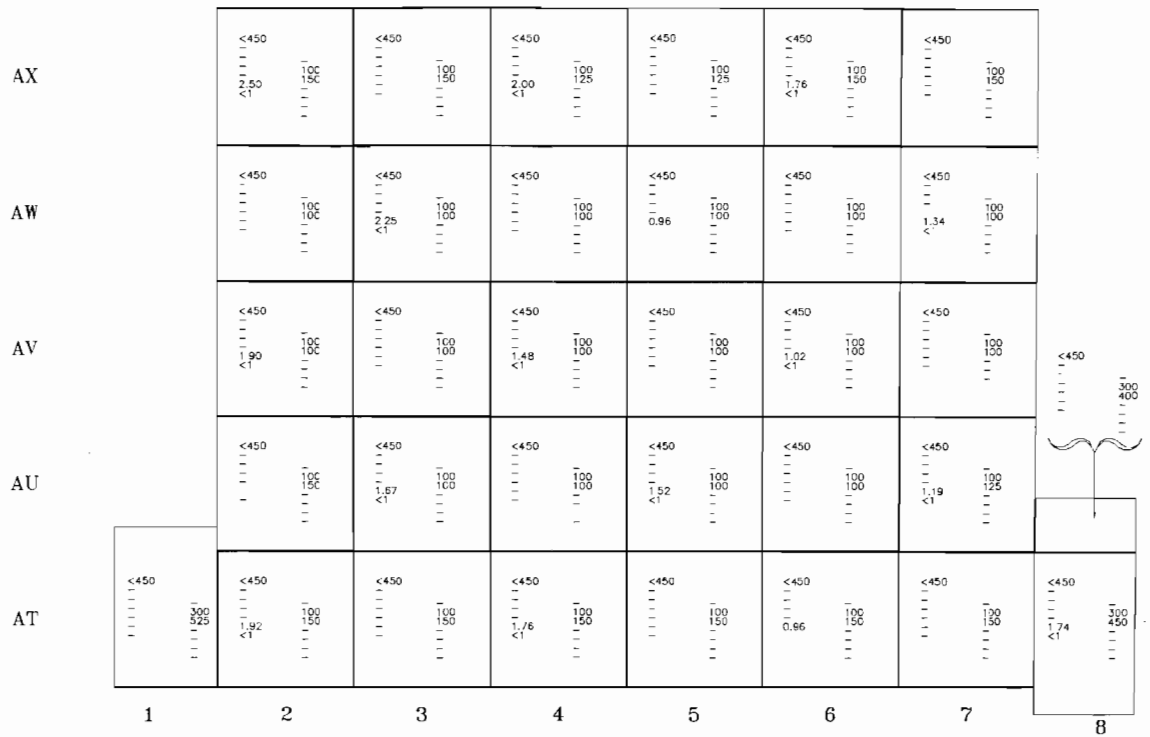


Sample Data

<450 – IM-247/PD Results [μμCi/20cm²]
200 – IM-253/PD (HV-1 PHA) [bkg.]
300 – IM-253/PD (HV-1 PHA) [cpm]
7000 – IM-253/PD (HV-2 GROSS) [bkg.]
7300 – IM-253/PD (HV-2 GROSS) [cpm]
1.82 – MCA Gross Gamma Eq. Co-60 [pCi/g]
<1 – MCA Specific Co-60 Results [pCi/g]

1. Pier P

e. Localized Grid Maps

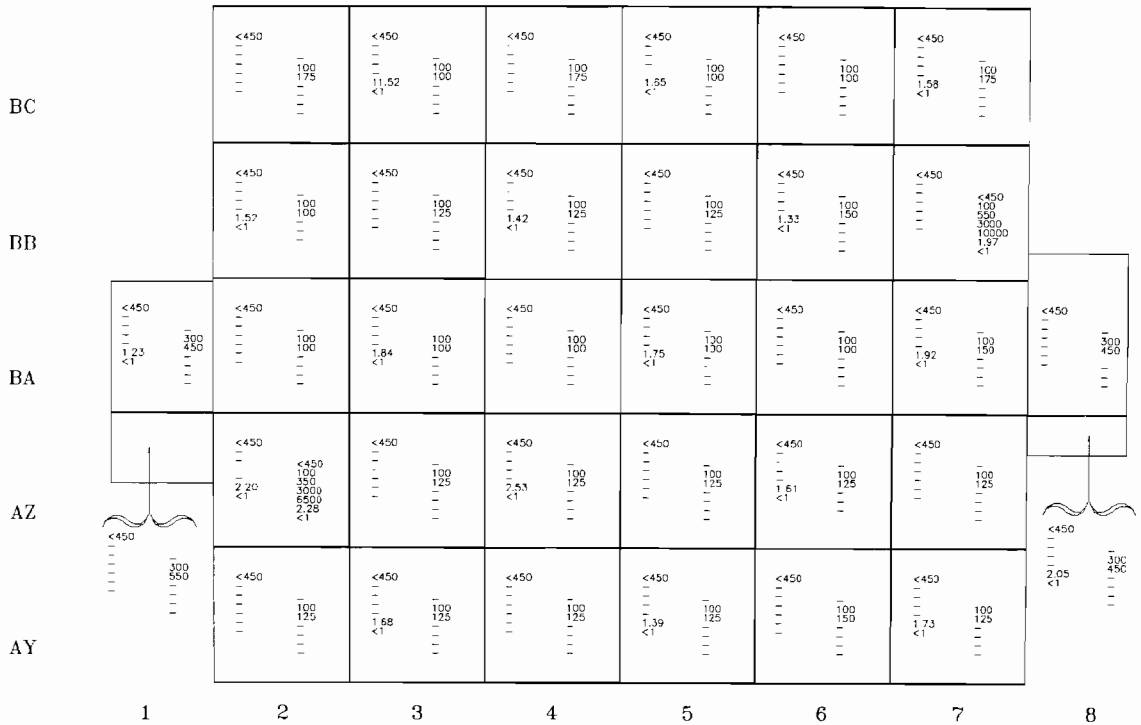


Sample Data

<450 – IM-247/PD Results [µµCi/20cm²]
20C – IM-253/PD (HV-1 PHA) [bkg.]
300 – IM-253/PD (HV-1 PHA) [cpm]
7000 – IM-253/PC (HV-2 GROSS) [bkg.]
7300 – IM-253/PC (HV-2 GROSS) [cpm]
1.82 – MCA Gross Gamma Eq. Co-60 [pCi/g]
<1 – MCA Specific Co-60 Results [pCi/g]

1. Pier P

e. Localized Grid Maps

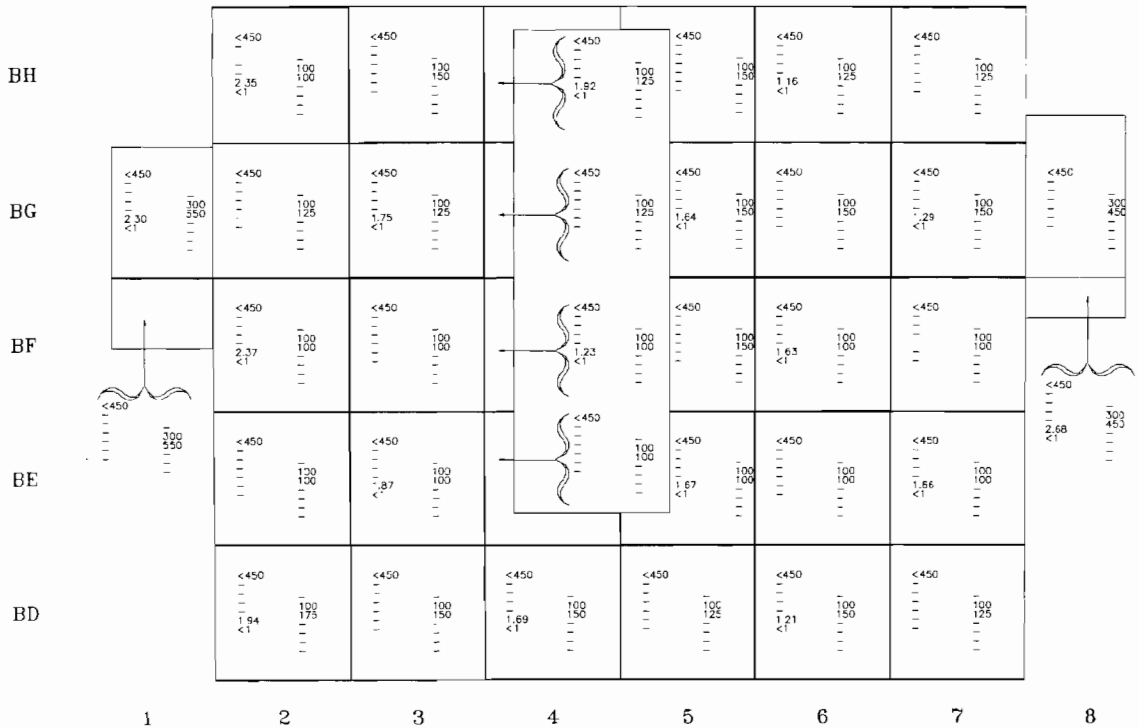


Sample Data

<450 – IM-247/PD Results [µµCi/20cm²]
200 – IM-253/PD (HV-1 PHA) [bkg.]
300 – IM-253/PD (HV-1 PHA) [cpm]
7000 – IM-253/PD (HV-2 GROSS) [bkg.]
7300 – IM-253/PD (HV-2 GROSS) [cpm]
1.82 – MCA Gross Gamma Eq Co-60 [pCi/g]
<1 – MCA Specific Co-60 Results [pCi/g]

1. Pier P

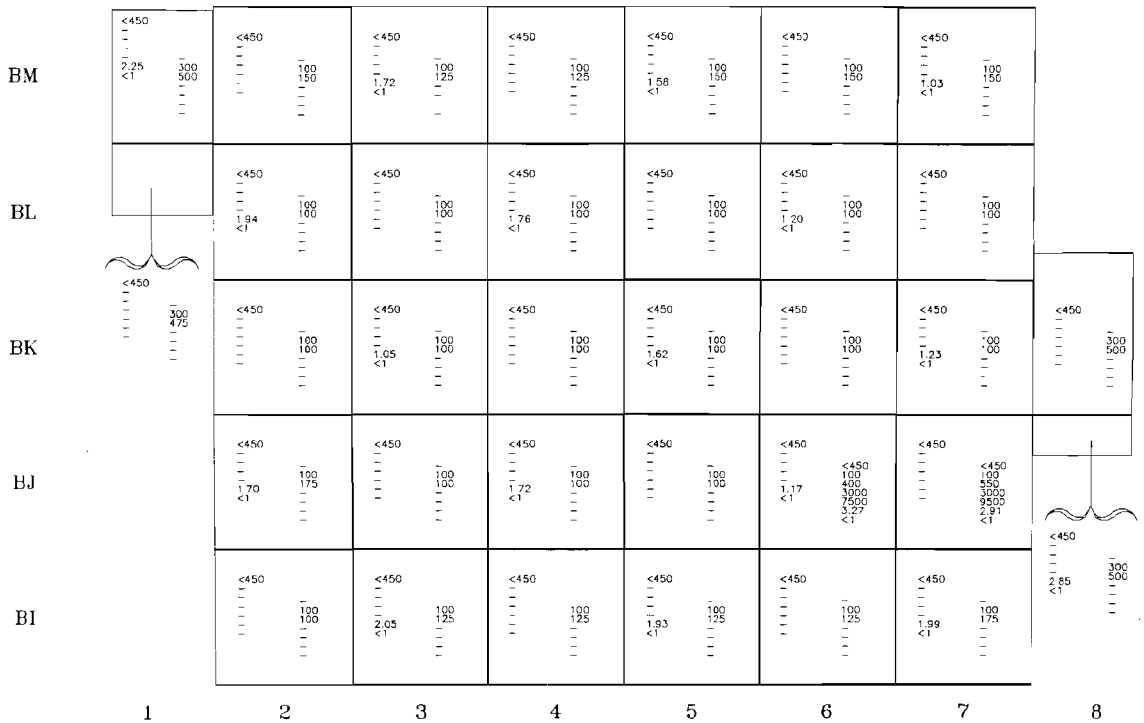
e. Localized Grid Maps



Sample Data
<450 – IM-247/PD Results [μμCi/20cm²]
200 – IM-253/PD (HV-1 PHA) [bkg]
300 – IM-253/PD (HV-1 PHA) [cpm]
7000 – IM-253/PD (HV-2 GROSS) [bkg]
7300 – IM-253/PD (HV-2 GROSS) [cpm]
1.82 – MCA Gross Gamma Eq Co-60 [pCi/g]
<1 – MCA Specific Co-60 Results [pCi/g]

1. Pier P

e. Localized Grid Maps

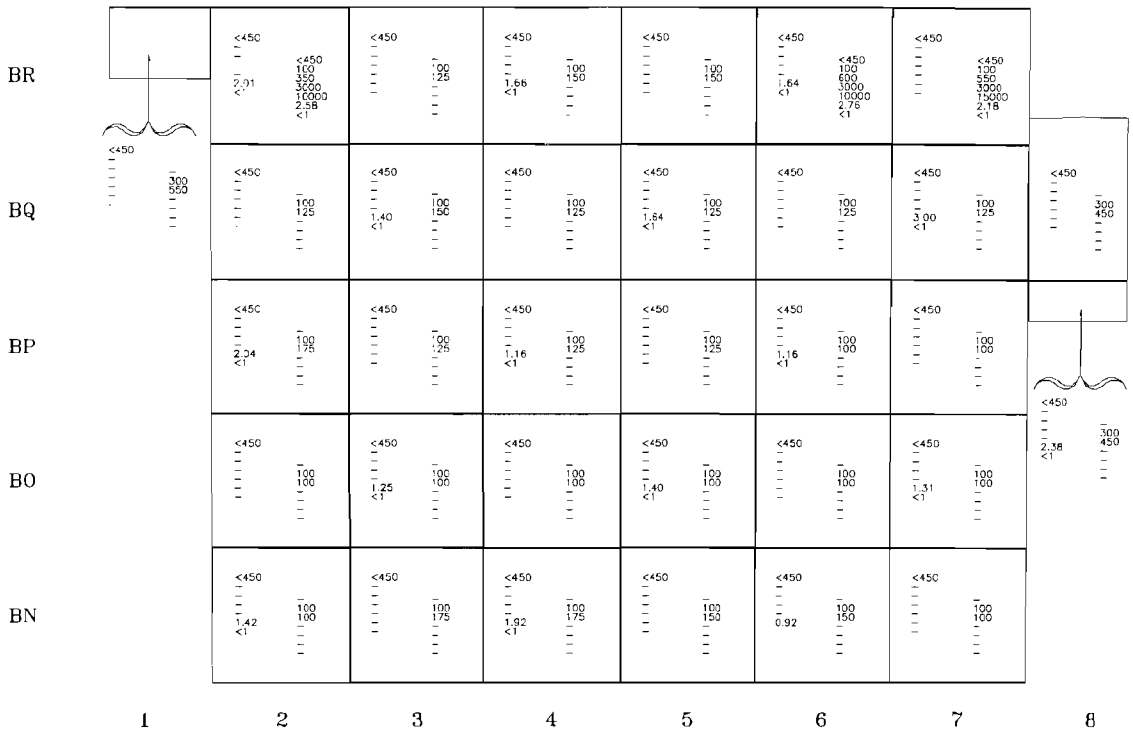


Sample Data

<450 – IM-247/PD Results [μμCi/20cm²]
200 – IM-253/PD (HV-1 PHA) [bkg.]
300 – IM-253/PD (HV-1 PHA) [cpm]
7000 – IM-253/PD (HV-2 GROSS) [bkg.]
7300 – IM-253/PD (HV-2 GROSS) [cpm]
1.82 – MCA Gross Gamma Eq. Co-60 [pCi/g]
<1 – MCA Specific Co-60 Results [pCi/g]

1. Pier P

e. Localized Grid Maps

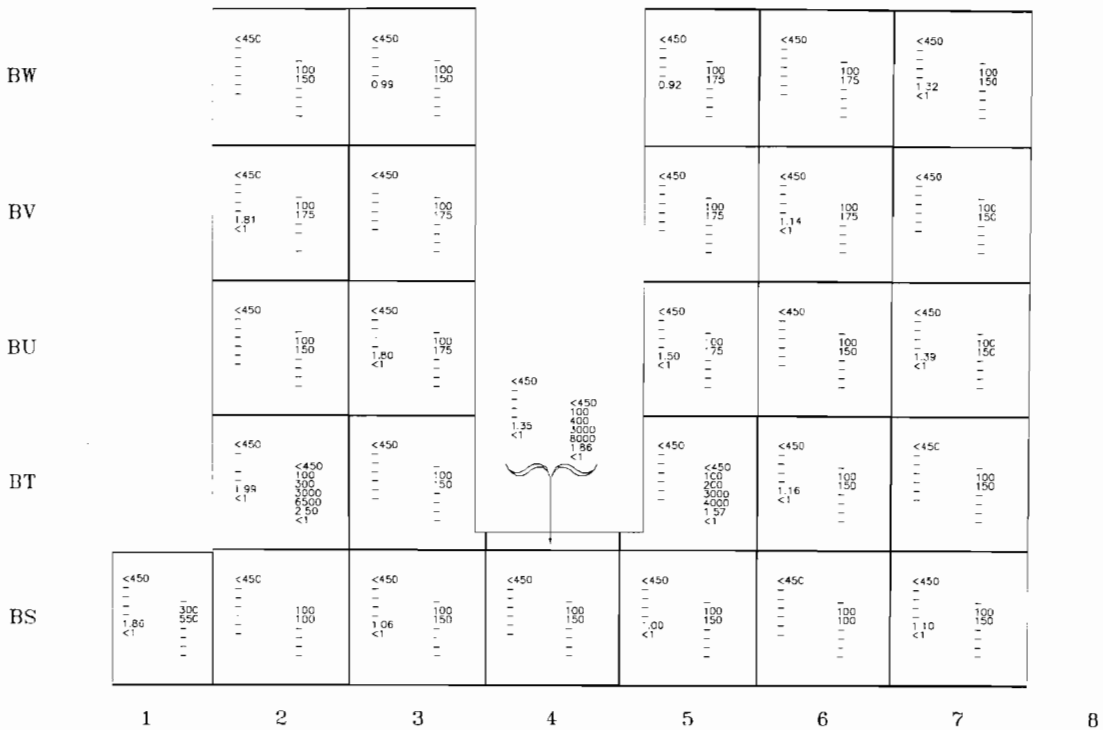


Sample Data

< 450 – IM-247/PD Results [μCi/20cm²]
200 – IM-253/PD (HV-1 PHA) [bkg.]
300 – IM-253/PD (HV-1 PHA) [cpm]
7000 – IM-253/PD (HV-2 GROSS) [bkg.]
7300 – IM-253/PD (HV-2 GROSS) [cpm]
1.82 – MCA Gross Gamma Eq. Co-60 [pCi/g]
<1 – MCA Specific Co-60 Results [pCi/g]

1. Pier P

e. Localized Grid Maps

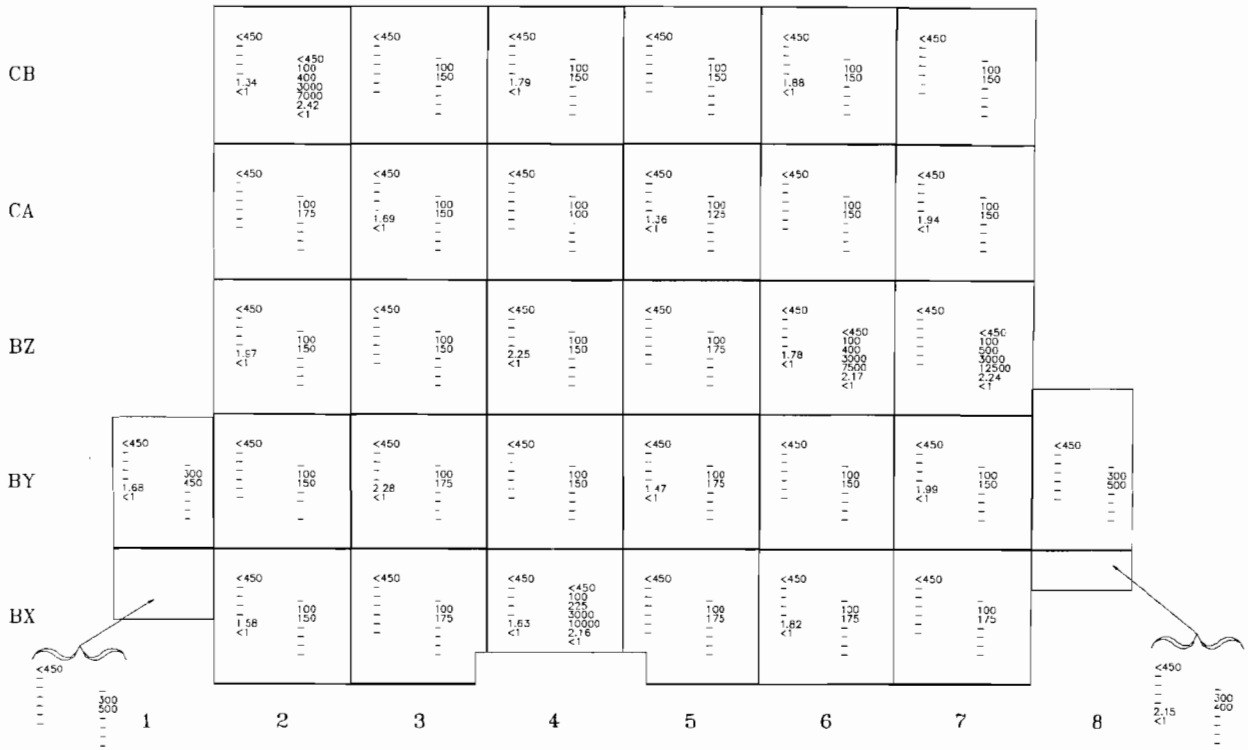


Sample Data

<450 – IM-247/PD Results [μμC/20cm²]
200 – IM-253/PD (HV-1 PHA) [bkg.]
300 – IM-253/PD (HV-1 PHA) [cpm]
7000 – IM-253/PD (HV-2 GROSS) [bkg.]
7300 – IM-253/PD (HV-2 GROSS) [cpm]
1.82 – MCA Gross Gamma Eq. Co-60 [pCi/g]
<1 – MCA Specific Co-60 Results [pCi/g]

1. Pier P

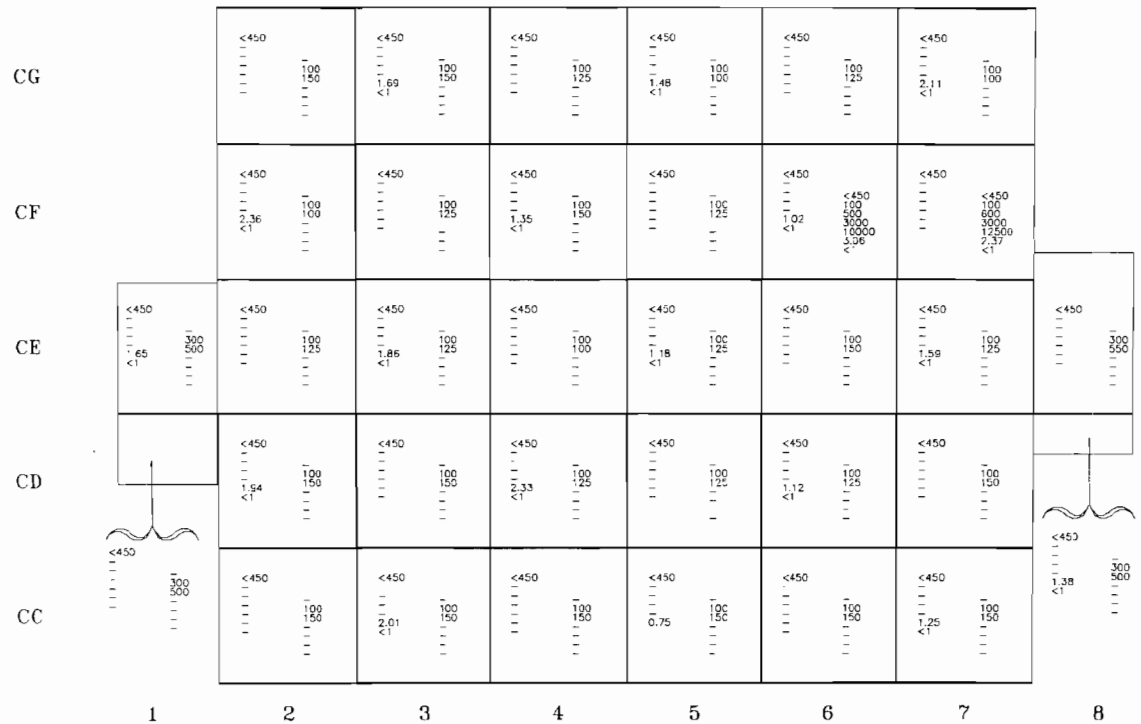
e. Localized Grid Maps



Sample Data
<450 – IM-247/PD Results [μμCi/20cm²]
200 – IM-253/PD (HV-1 PHA) [bkg.]
300 – IM-253/PD (HV-1 PHA) [cpm]
7000 – IM-253/PD (HV-2 GROSS) [bkg.]
7300 – IM-253/PD (HV-2 GROSS) [cpm]
1.82 – MCA Gross Gamma Eq. Co-60 [pCi/g]
<1 – MCA Specific Co-60 Results [pCi/g]

1. Pier P

e. Localized Grid Maps

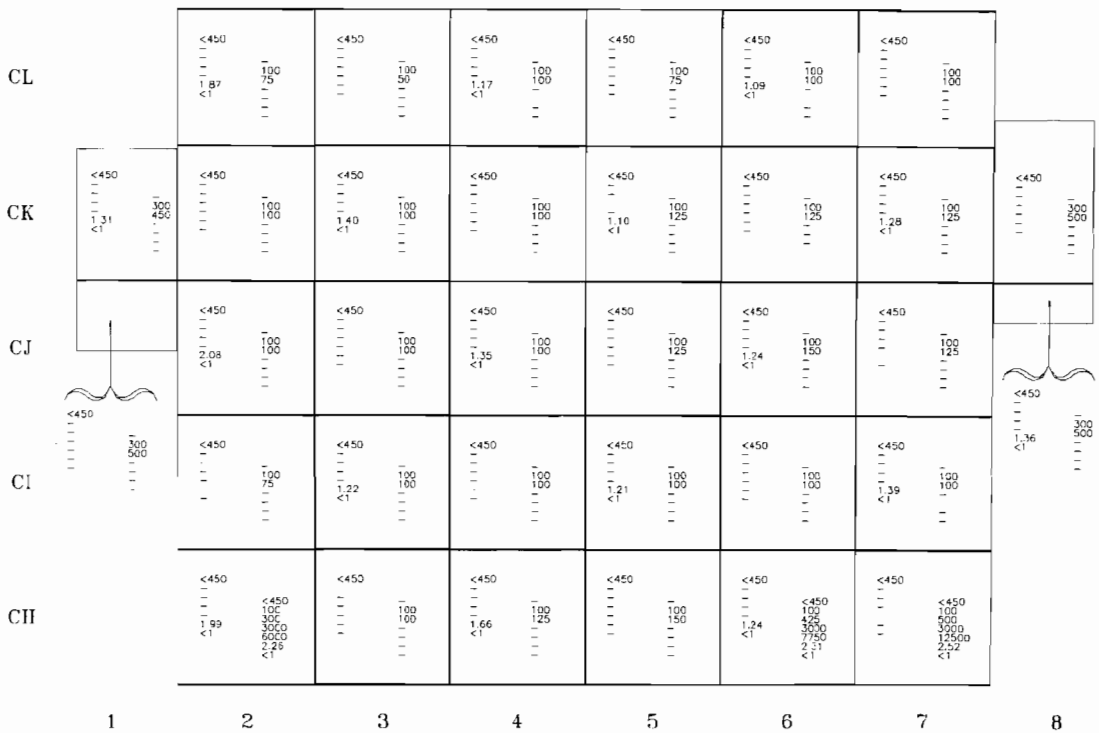


Sample Data

<450 – IM-247/PD Results [μμCi/20cm²]
200 – IM-253/PD (HV-1 PHA) [bkg.]
300 – IM-253/PD (HV-1 PHA) [cpm]
7000 – IM-253/PD (HV-2 GROSS) [bkg.]
7300 – IM-253/PD (HV-2 GROSS) [cpm]
1.82 – MCA Gross Gamma Eq. Co-60 [pCi/g]
<1 – MCA Specific Co-60 Results [pCi/g]

1. Pier P

e. Localized Grid Maps

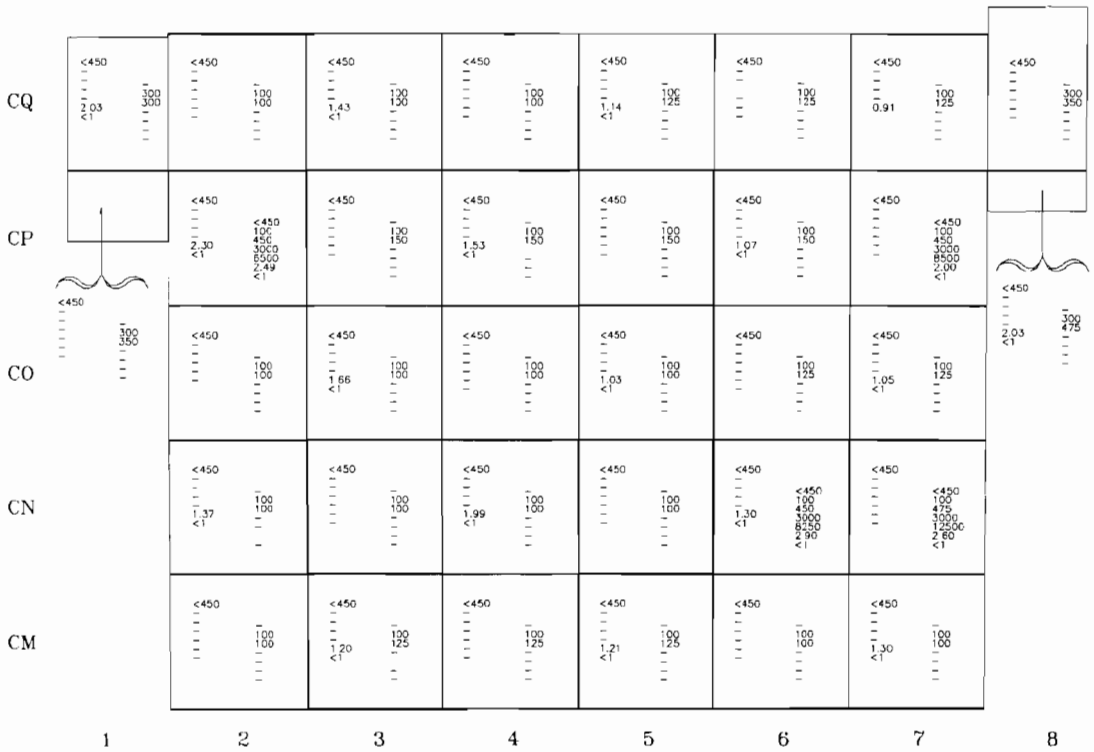


Sample Data

<450 – IM-247/PD Results [μμCi/20cm²]
200 – IM-253/PD (HV-1 PHA) [bkg.]
300 – IM-253/PD (HV-1 PHA) [cpm]
7000 – IM-253/PD (HV-2 GROSS) [bkg.]
7300 – IM-253/PD (HV-2 GROSS) [cpm]
1.82 – MCA Gross Gamma Eq. Co-60 [pCi/g]
<1 – MCA Specific Co-60 Results [pCi/g]

1. **Pier P**

e. **Localized Grid Maps**

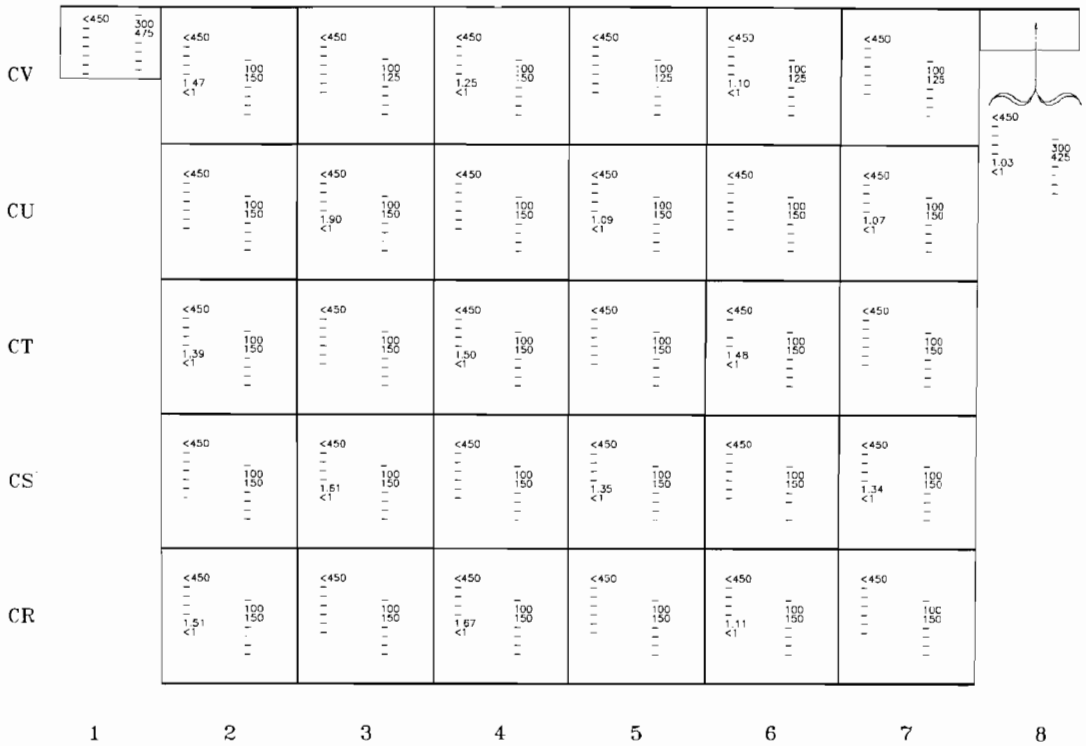


Sample Data

<450 – IM-247/PD Results [μμCv20cm²]
200 – IM-253/PD (HV-1 PMA) [bkg]
300 – IM-253/PD (HV-1 PMA) [cpm]
700C – IM-253/PD (HV-2 GROSS) [bkg]
730C – IM-253/PD (HV-2 GROSS) [cpm]
1.82 – MCA Gross Gamma Eq Co-60 [pCi/g]
<1 – MCA Specific Co-60 Results [pCi/g]

1. Pier P

e. Localized Grid Maps



Sample Data
<450 – IM-247/PD Results [μμC/20cm²]
200 – IM-253/PD (HV-1 PHA) [bkg.]
300 – IM-253/PD (HV-1 PHA) [cpm]
7000 – IM-253/PD (HV-2 GROSS) [bkg.]
7300 – IM-253/PD (HV-2 GROSS) [cpm]
1.82 – MCA Gross Gamma Eq. Co-60 [pCi/g]
<1 – MCA Specific Co-60 Results [pCi/g]

1. Pier P

e. Localized Grid Maps

	1	2	3	4	5	6	7	8
DA		<450 – – – – – – – 100 125 – – – –	<450 – – – – <0.47 – – 100 100 – – – –	<450 – – – – – – – 100 100 – – – –	<450 – – – – 1.21 <1 – 100 100 – – – –	<450 – – – – – – – 100 75 – – – –	<450 – – – – 1.24 <1 – 100 125 – – – –	
CZ		<450 – – – – – – 1.52 <1 – 100 100 – – – –	<450 – – – – – – – 100 100 – – – –	<450 – – – – – – 1.25 <1 – 100 125 – – – –	<450 – – – – – – – 100 100 – – – –	<450 – – – – – – 1.36 <1 – 100 125 – – – –	<450 – – – – – – – 100 100 – – – –	
CY		<450 – – – – – – – 100 100 – – – –	<450 – – – – – – 1.12 <1 – 100 125 – – – –	<450 – – – – – – – 100 125 – – – –	<450 – – – – – – 1.56 <1 – 100 150 – – – –	<450 – – – – – – – 100 150 – – – –	<450 – – – – – – 1.30 <1 – 100 125 – – – –	
CX		<450 – – – – – – – 1.13 <1 – 100 150 – – – –	<450 – – – – – – – 100 150 – – – –	<450 – – – – – – 0.85 – 100 150 – – – –	<450 – – – – – – – 100 150 – – – –	<450 – – – – – – 0.83 <450 100 500 3000 8500 2.52 <1	<450 – – – – – – – <450 100 500 3000 8500 2.16 <1	
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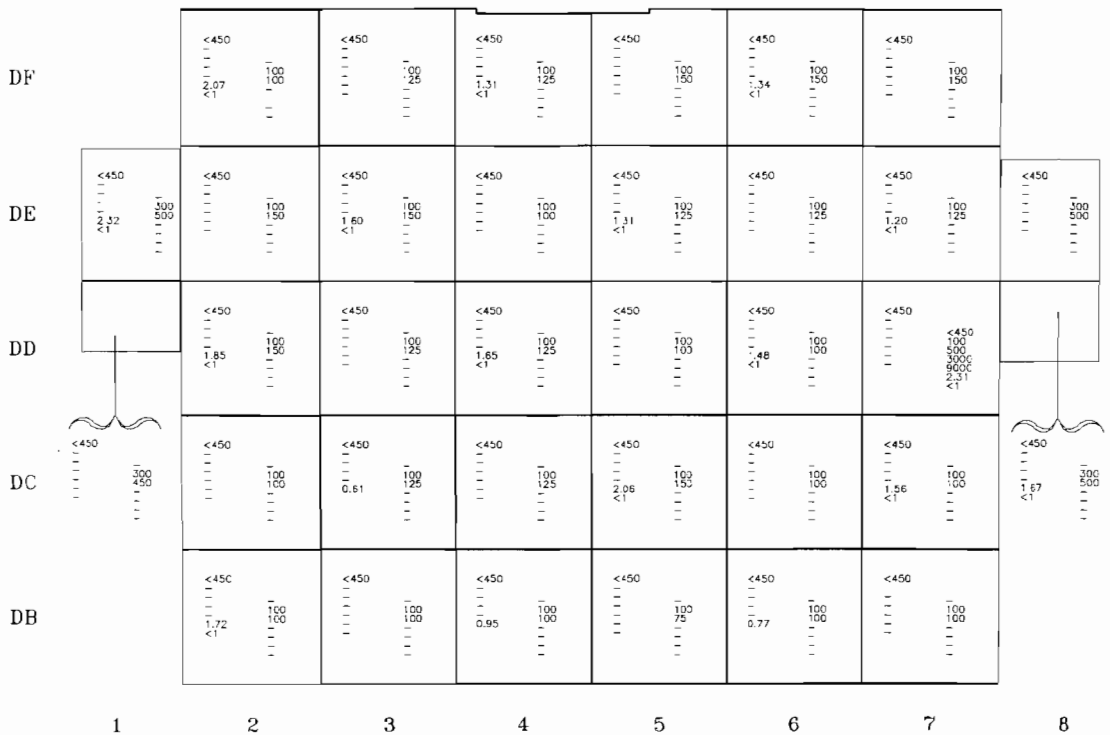
Sample Data
<450 – IM-247/PD Results [μμCi/20cm²]
200 – IM-253/PD (HV-1 PHA) [bkg.]
300 – IM-253/PD (HV-1 PHA) [cpm]
7000 – IM-253/PD (HV-2 GROSS) [bkg.]
7300 – IM-253/PD (HV-2 GROSS) [cpm]
1.82 – MCA Gross Gamma Eq. Co-60 [pCi/g]
<1 – MCA Specific Co-60 Results [pCi/g]

1. Pier P

e. Localized Grid Maps

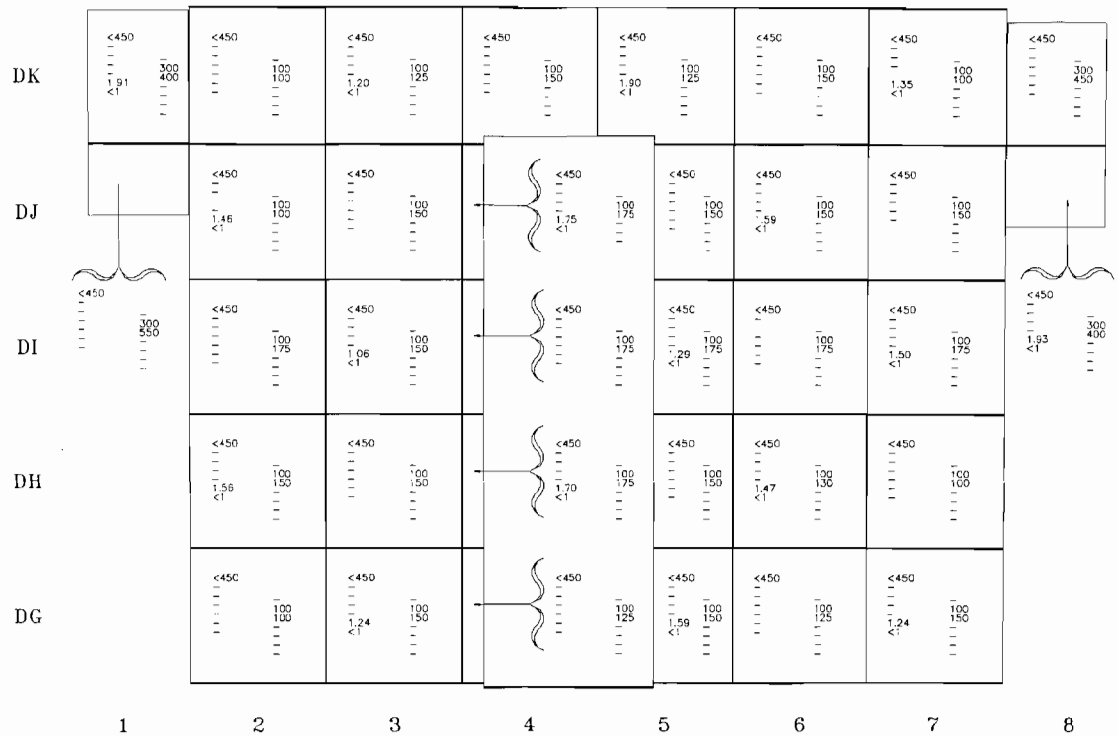


Sample Data

< 450 – IM-247/PD Results [μμCv20km²]
200 – IM-253/PD (HV-1 PHA) [bkg.]
300 – IM-253/PD (HV-1 PHA) [cpm]
7000 – IM-253/PD (HV-2 GROSS) [bkg.]
7300 – IM-253/PD (HV-2 GROSS) [cpm]
1.82 – MCA Gross Gamma Eq. Co-60 [pCi/g]
<1 – MCA Specific Co-60 Results [pCi/g]

1. Pier P

e. Localized Grid Maps

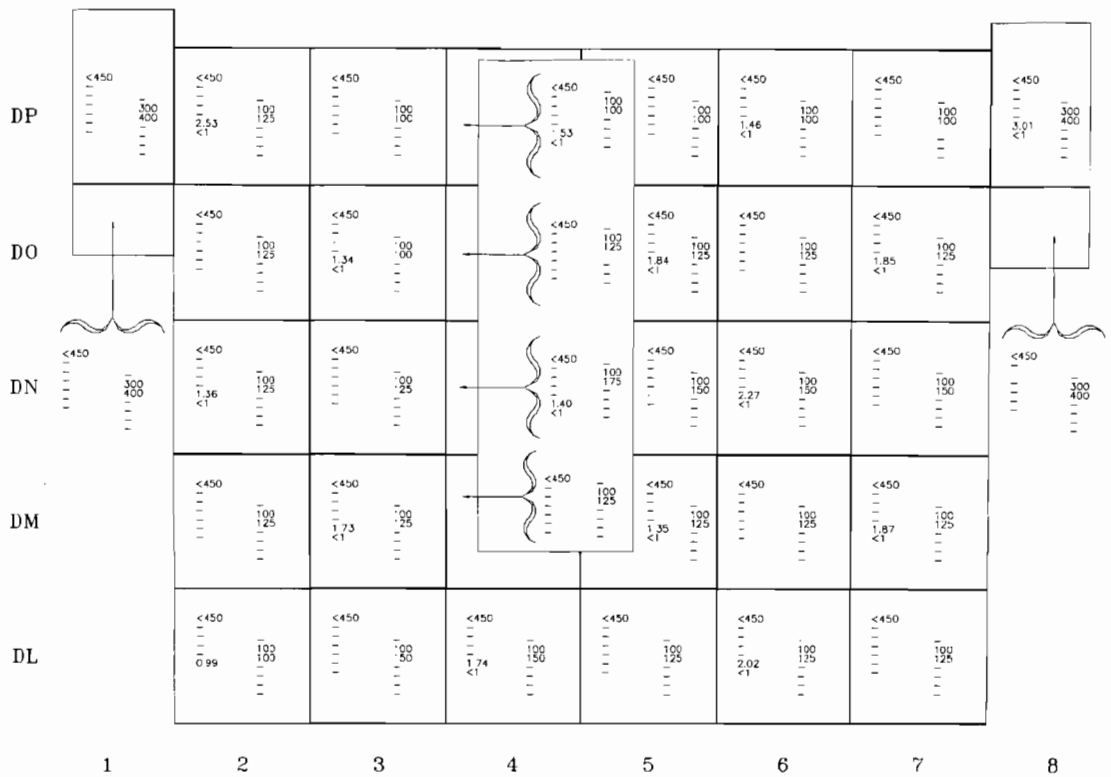


Sample Data

<450 – IM-247/PD Results [μμCi/20cm²]
200 – IM-253/PD (HV-1 PHA) [bkg.]
300 – IM-253/PD (HV-1 PHA) [cpm]
7000 – IM-253/PD (HV-2 GROSS) [bkg.]
7300 – IM-253/PD (HV-2 GROSS) [cpm]
1.82 – MCA Gross Gamma Eq. Co-60 [pCi/g]
<1 – MCA Specific Co-60 Results [pCi/g]

1. Pier P

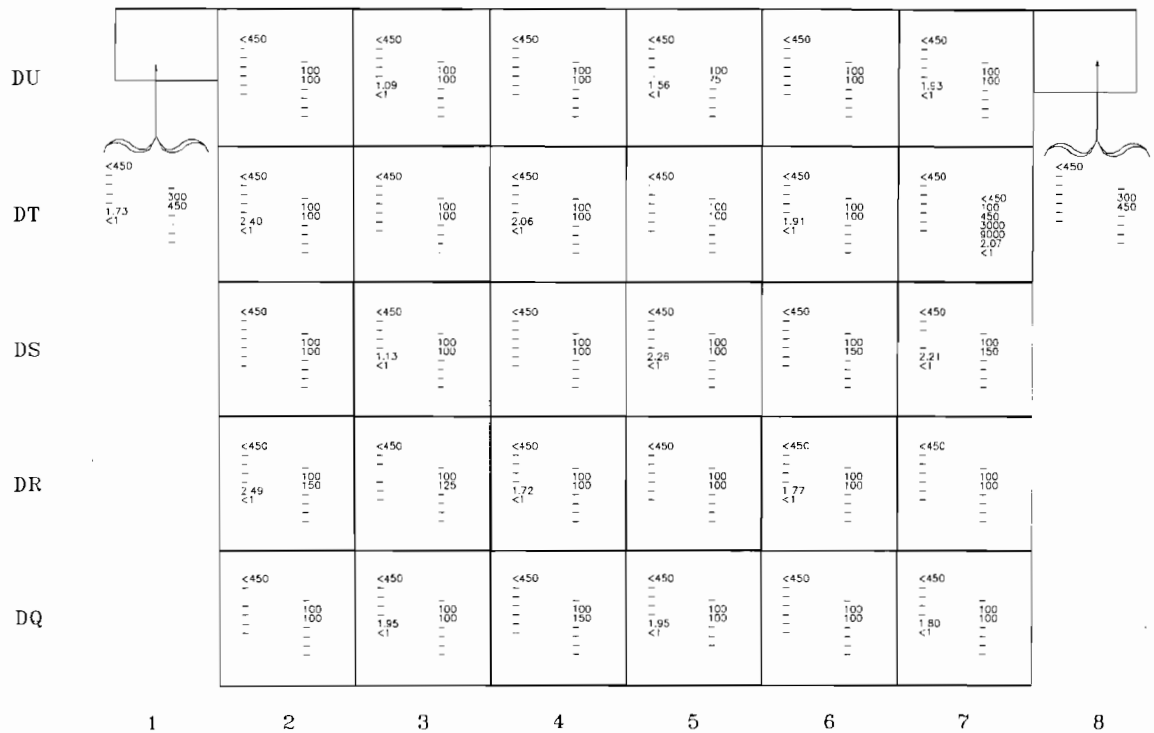
e. Localized Grid Maps



Sample Data
<450 – IM-247/PD Results [μμCi/20cm²]
200 – IM-253/PD (HV-1 PHA) [bkg.]
300 – IM-253/PD (HV-1 PHA) [cpm]
7000 – IM-253/PD (HV-2 GROSS) [bkg.]
7300 – IM-253/PD (HV-2 GROSS) [cpm]
1.82 – MCA Gross Gamma Eq. Co-60 [pCi/g]
<1 – MCA Specific Co-60 Results [pCi/g]

1. Pier P

e. Localized Grid Maps

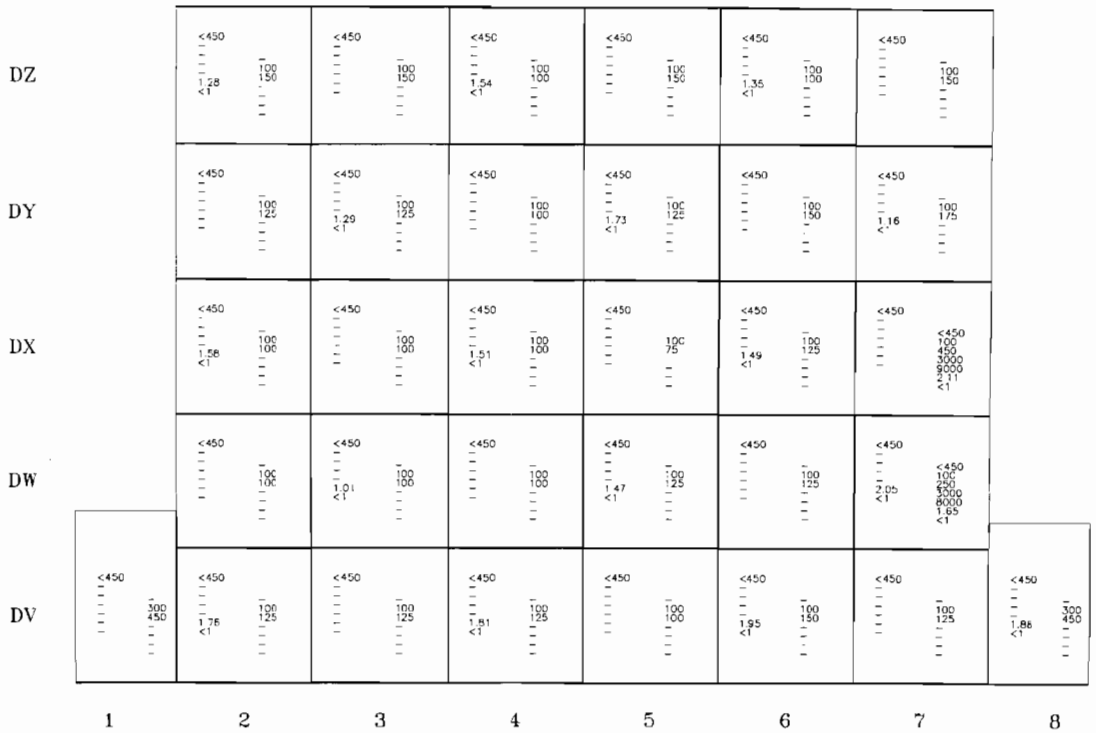


Sample Data

<450 – IM-247/PD Results [μμC/20cm²]
200 – IM-253/PD (HV-1 PHA) [bkg.]
300 – IM-253/PD (HV-1 PHA) [cpm]
7000 – IM-253/PD (HV-2 GROSS) [bkg.]
7300 – IM-253/PD (HV-2 GROSS) [cpm]
1.82 – MCA Gross Gamma Eq. Co-60 [pCi/g]
<1 – MCA Specific Co-60 Results [pCi/g]

1. Pier P

e. Localized Grid Maps



Sample Data

<450 – IM-247/PD Results [µµCi/20cm²]
200 – IM-253/PD (HV-1 PHA) [bkg.]
300 – IM-253/PD (HV-1 PHA) [cpm]
7000 – IM-253/PD (HV-2 GROSS) [bkg.]
7300 – IM-253/PD (HV-2 GROSS) [cpm]
1.62 – MCA Gross Gamma Eq. Co-60 [pCi/g]
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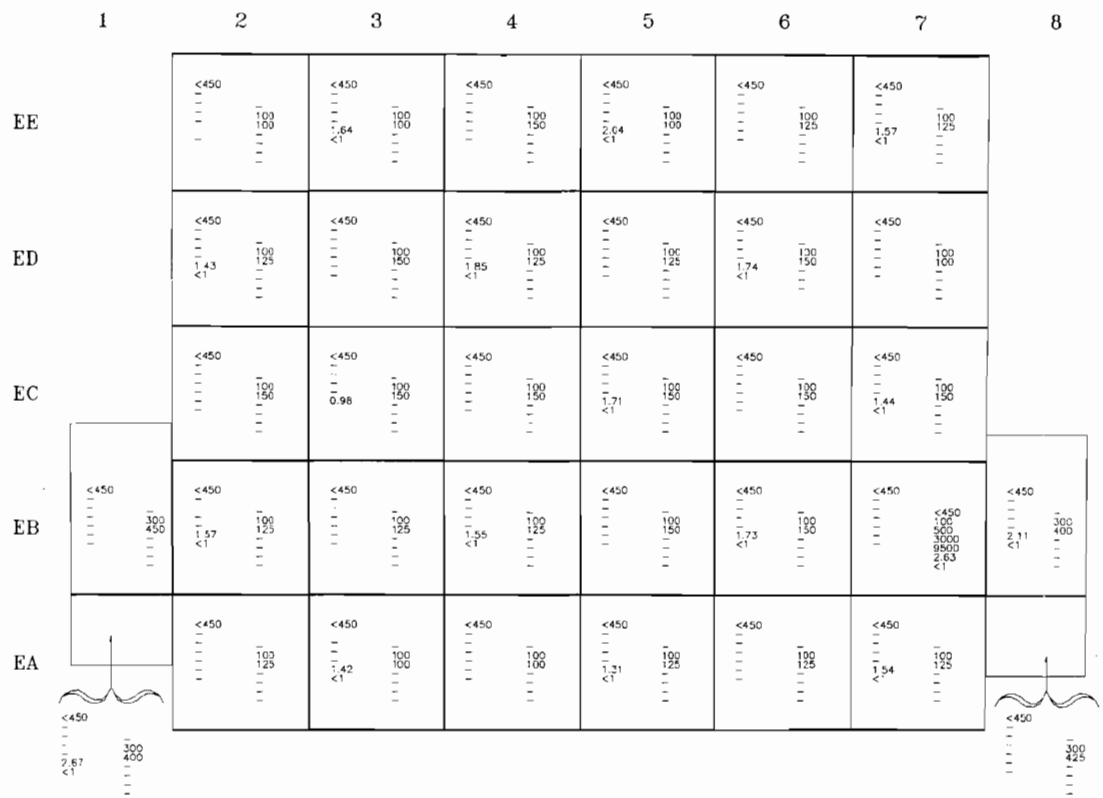
1. Pier P

e. Localized Grid Maps

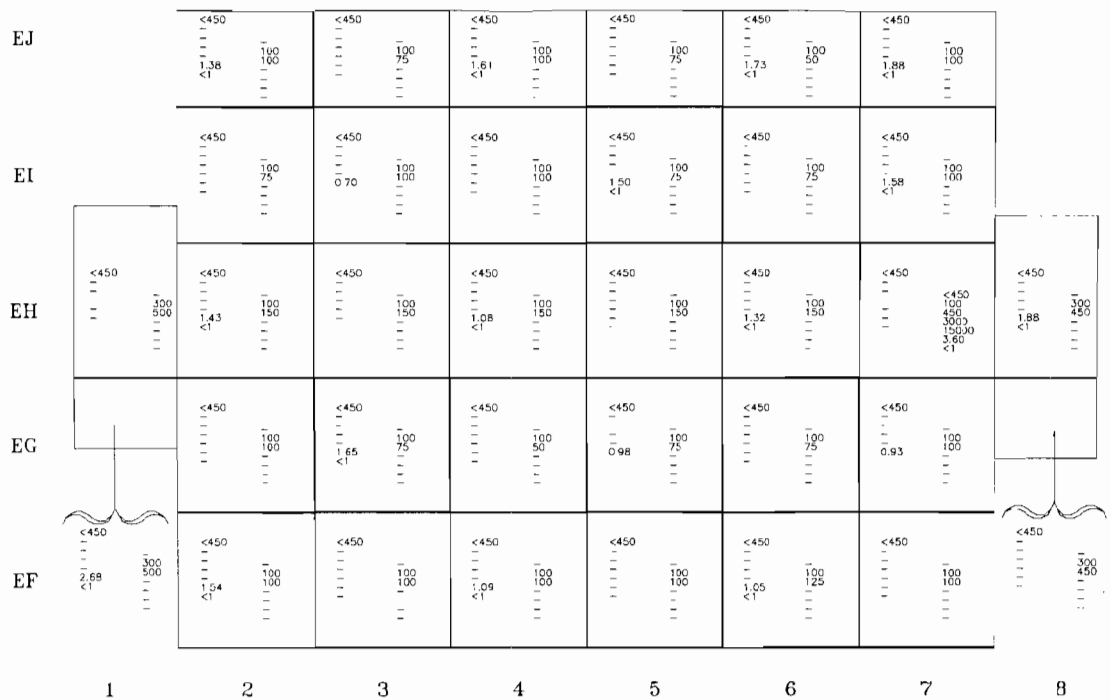


Sample Data

- <450 – IM-247/PD Results [μμCi/20cm²]
- 200 – IM-253/PD (HV-1 PHA) [bkg.]
- 300 – IM-253/PD (HV-1 PHA) [cpm]
- 7000 – IM-253/PD (HV-2 GROSS) [bkg.]
- 7300 – IM-253/PD (HV-2 GROSS) [cpm]
- 1.82 – MCA Gross Gamma Eq. Co-60 [pCi/g]
- <1 – MCA Specific Co-60 Results [pCi/g]

1. Pier P

e. Localized Grid Maps



Sample Data

< 450 – IM-247/PD Results [μμC/20cm²]
230 – IM-253/PD (HV-1 PHA) [bkg.]
300 – IM-253/PD (HV-1 PHA) [cpm]
7000 – IM-253/PD (HV-2 GROSS) [bkg.]
7330 – IM-253/PD (HV-2 GROSS) [cpm]
1.82 – MCA Gross Gamma Eq. Co-60 [pCi/g]
<1 – MCA Specific Co-60 Results [pCi/g]

1. Pier P

f. Prior To Photographs

Head of pier looking Northeast.

1. Pier P

f. Prior To Photographs

Pier end looking North.

1. Pier P

f. Prior To Photographs

Pier middle looking Northeast.

1. Pier P

g. After Photographs

Head of pier looking Northeast.

1. Pier P

g. After Photographs

Pier middle looking Northeast.

1. Pier P

g. After Photographs

Pier end looking Northeast.

1. Pier Q

a. Introduction:

Pier Q is located in grid M-20 of the Charleston Naval Station map and was constructed in 1959. Pier Q is also identified as structure 329.

(1) **Description:**

Structure 329 is 1037' long by 60' wide, oriented northeast into the Cooper River. Topside structures include four 11' by 55' shore power distribution centers and four 5' by 31' pierside receptacle centers.

(2) **Brief History:**

(a) **Use:** This pier was constructed as part of the U.S. naval shore establishment expansion program and was used to berth various naval vessels.

(b) **Radiological History:** This structure was certified to berth nuclear vessels. Loose surface contamination levels were less than 450 $\mu\mu Ci/100cm^2$.

(3) **Survey Requirements:**

Nuclear Ship Berthing Area surveys. Group 2 surveys were performed on the pier and extended 40' beyond the base of the pier.

b. Discussion:

Group 2 survey areas were divided into approximately 10' by 10' grids. Where physically possible, each grid was subdivided into two 3' by 3' subsections which were located in areas of highest potential for contamination. One of these subsections was surveyed using the IM-247/PD and the other using the IM-253/PD (HV-1 PHA). Solid material samples were taken from a minimum of 50% of the 10' by 10' grids. Additionally, solid material samples were taken from each 3' by 3' subsection that resulted in levels greater than twice background with the IM-253/PD (HV-1 PHA).

Pier Q including the 40' extension was divided into 780 10' by 10' grids.

Individual backgrounds were used for this pier and its land side approach. The approach to the pier is asphalt bordered with grassy areas. The IM-247/PD and IM-253/PD (HV-1 PHA and HV-2 GROSS) backgrounds of 60, 300, and 5750 counts per minute used for the asphalt pours were based upon background radiation levels obtained from NS-53 west parking area of the Charleston Naval Base. The IM-247/PD and IM-253/PD (HV-1 PHA and HV-2 GROSS) backgrounds of 60, 150, and 4500 counts per minute used for the

1. Pier Q

grassy areas were based upon background radiation levels obtained from the Building 1628 train tracks. The main section of the pier is constructed primarily of concrete. The IM-247/PD and IM-253/PD (HV-1 PHA and HV-2 GROSS) backgrounds of 60, 150, 4750; 60, 250, 6750; and 60, 400, and 15000 counts per minute used for the low, medium, and high natural activity concrete pours were based upon background radiation levels obtained from the Building 220 west area, the Pier K Quay Wall and the Pier X parking area located on the Charleston Naval Base.

A total of 401 solid material samples were taken. Each solid sample was removed from the grid location indicating the area of highest potential. The following naturally occurring radionuclides were typical isotopes identified during analysis of solid material samples: lead 212 and lead 214.

c. Summary:

Surveys performed with the IM-247/PD did not detect areas greater than 450 $\mu\mu Ci/20cm^2$.

Surveys performed with the IM-253/PD (HV-1 PHA) detected eight areas greater than or equal to twice background.

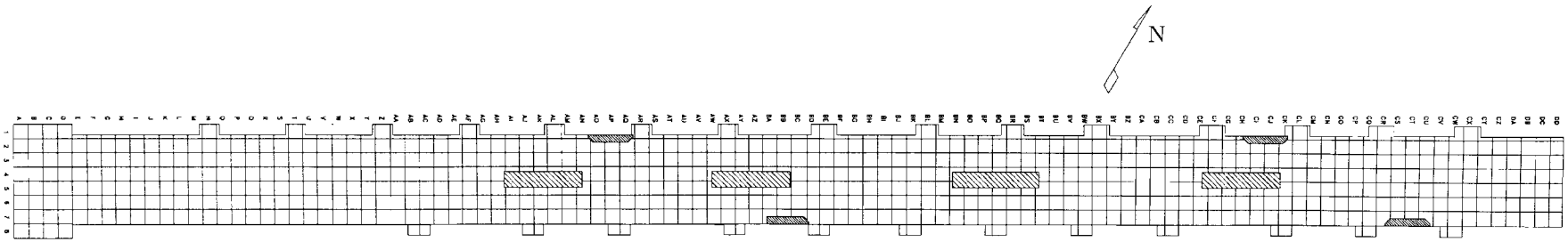
Surveys performed with the IM-253/PD (HV-2 GROSS) detected seven areas greater than or equal to twice background.

Analysis performed on solid material samples with the multi-channel analyzer (MCA) detected gross gamma equivalent cobalt 60 levels ranging from a low of 0.42 pCi/g to a high of 8.54 pCi/g.

Analysis performed on solid material samples with the MCA for specific cobalt 60 indicated that all solid material samples were less than 1 pCi/g.

1. Pier Q

d. Overall Grid Maps



1. Pier Q

e. Localized Grid Maps

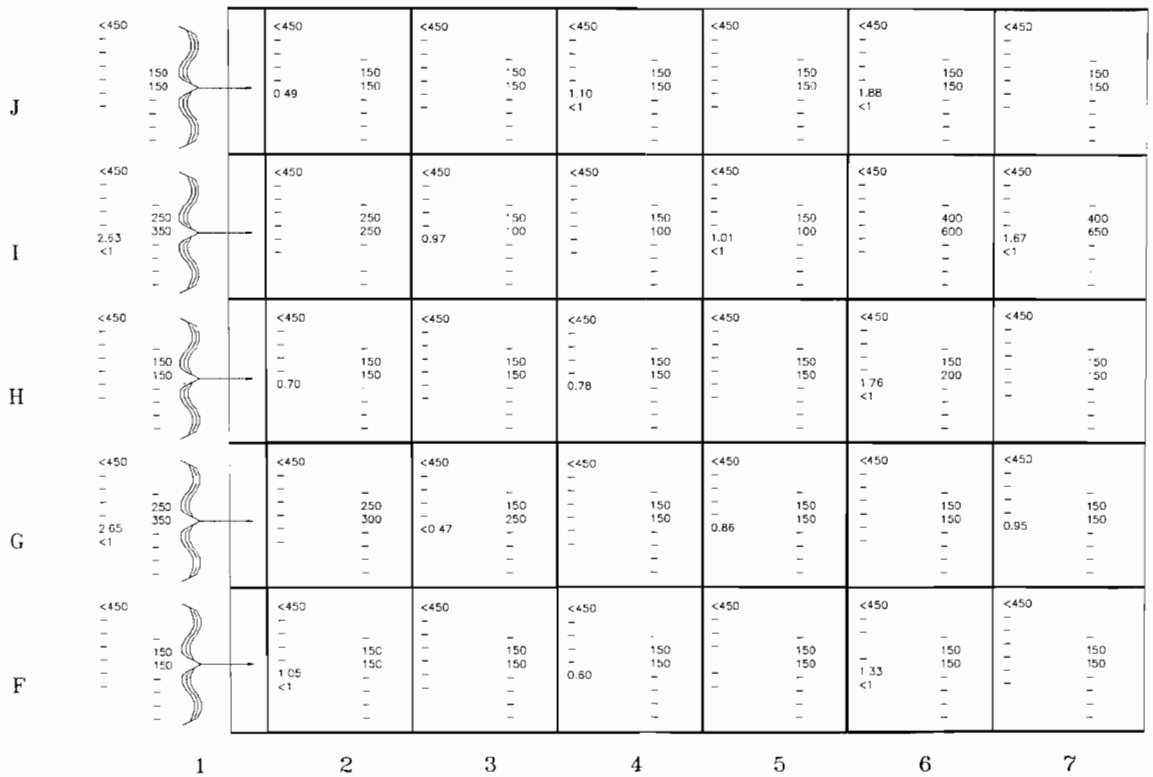
	1	2	3	4	5	6	7	8
E	<450 – – – – 0.87 – 150 150 – – – –	<450 – – – – – – 150 200 – – – –	<450 – – – – 0.77 – 150 150 – – – –	<450 – – – – – – 150 150 – – – –	<450 – – – – 1.07 <1 – 150 150 – – – –	<450 – – – – – – 150 150 – – – –	<450 – – – – 0.85 – 150 150 – – – –	
D	<450 – – – – – – 150 200 – – – –	<450 – – – – 1.90 <1 – 300 350 – – – –	<450 – – – – – – 300 350 – – – –	<450 – – – – 3.30 <1 – 300 250 – – – –	<450 – – – – – – 300 350 – – – –	<450 – – – – 2.35 <1 – 300 350 – – – –	<450 – – – – – – 300 300 – – – –	<450 – – – – 1.42 <1 – 250 200 – – – –
C	<450 – – – – 1.75 <1 – 150 200 – – – –	<450 – – – – – – 300 350 – – – –	<450 – – – – 2.88 <1 – 300 300 – – – –	<450 – – – – – – 300 300 – – – –	<450 – – – – 3.48 <1 – 300 300 – – – –	<450 – – – – – – 300 350 – – – –	<450 – – – – 2.68 <1 – 300 350 – – – –	<450 – – – – – – 150 200 – – – –
B	<450 – – – – – – 150 200 – – – –	<450 – – – – 1.61 <1 – 300 300 – – – –	<450 – – – – – – 300 300 – – – –	<450 – – – – 3.72 <1 – 300 300 – – – –	<450 – – – – – – 300 350 – – – –	<450 – – – – 3.07 <1 – 300 400 – – – –	<450 – – – – – – 300 350 – – – –	<450 – – – – 1.38 <1 – 150 200 – – – –
A	<450 – – – – 0.94 – 150 200 – – – –	<450 – – – – – – 300 300 – – – –	<450 – – – – 2.88 <1 – 300 350 – – – –	<450 – – – – – – 300 400 – – – –	<450 – – – – 2.51 <1 – 300 300 – – – –	<450 – – – – – – 300 300 – – – –	<450 – – – – 2.47 <1 – 300 300 – – – –	<450 – – – – – – 150 200 – – – –

Sample Data

<450 – IM-247/PD Results [μCi/20cm²]
200 – IM-253/PD (HV-1 PHA) [bkg.]
300 – IM-253/PD (HV-1 PHA) [cpm]
7000 – IM-253/PD (HV-2 GROSS) [bkg.]
7300 – IM-253/PD (HV-2 GROSS) [cpm]
1.82 – MCA Gross Gamma Eq. Co-60 [pCi/g]
<1 – MCA Specific Co-60 Results [pCi/g]

1. Pier Q

e. Localized Grid Maps

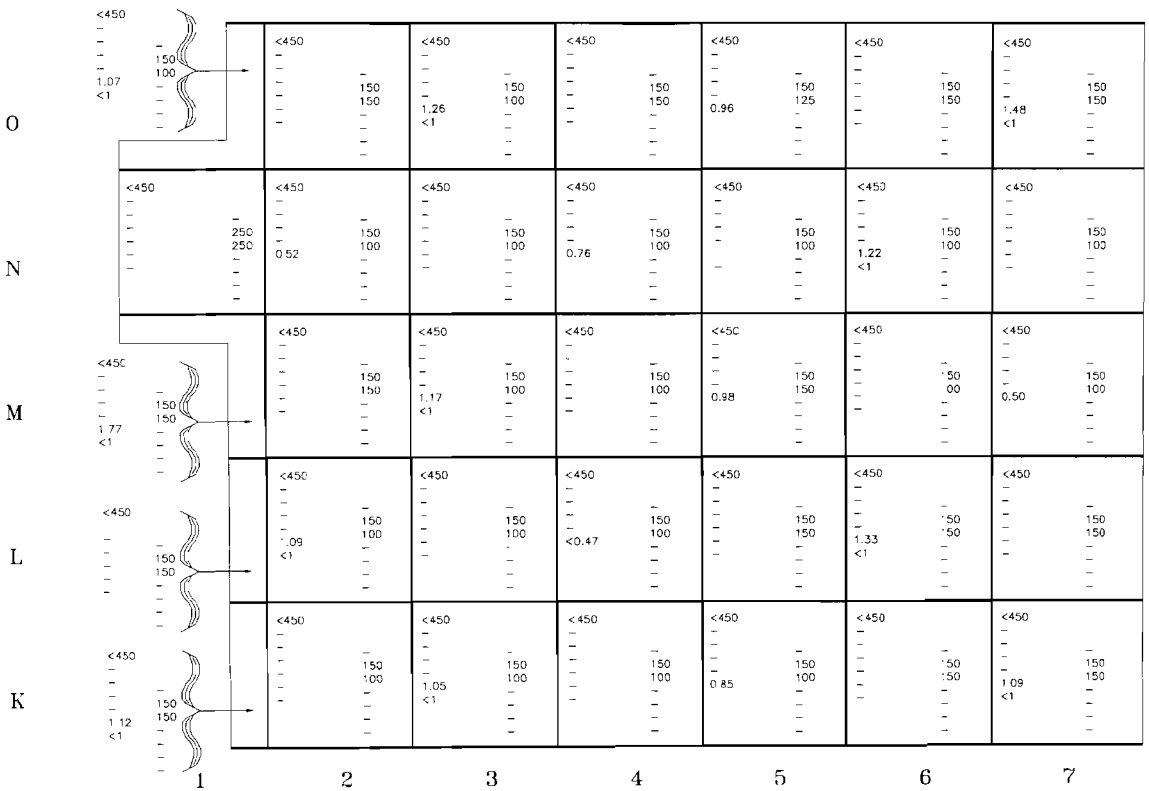


Sample Data

<450 – IM-247/PD Results [μμCi/20cm²]
200 – IM-253/PD (HV-1 PHA) [bkg.]
300 – IM-253/PD (HV-1 PHA) [cpm]
7000 – IM-253/PD (HV-2 GROSS) [bkg.]
7300 – IM-253/PD (HV-2 GROSS) [cpm]
1.82 – MCA Gross Gamma Eq. Co-60 [pCi/g]
<1 – MCA Specific Co-60 Results [pCi/g]

1. Pier Q

e. Localized Grid Maps

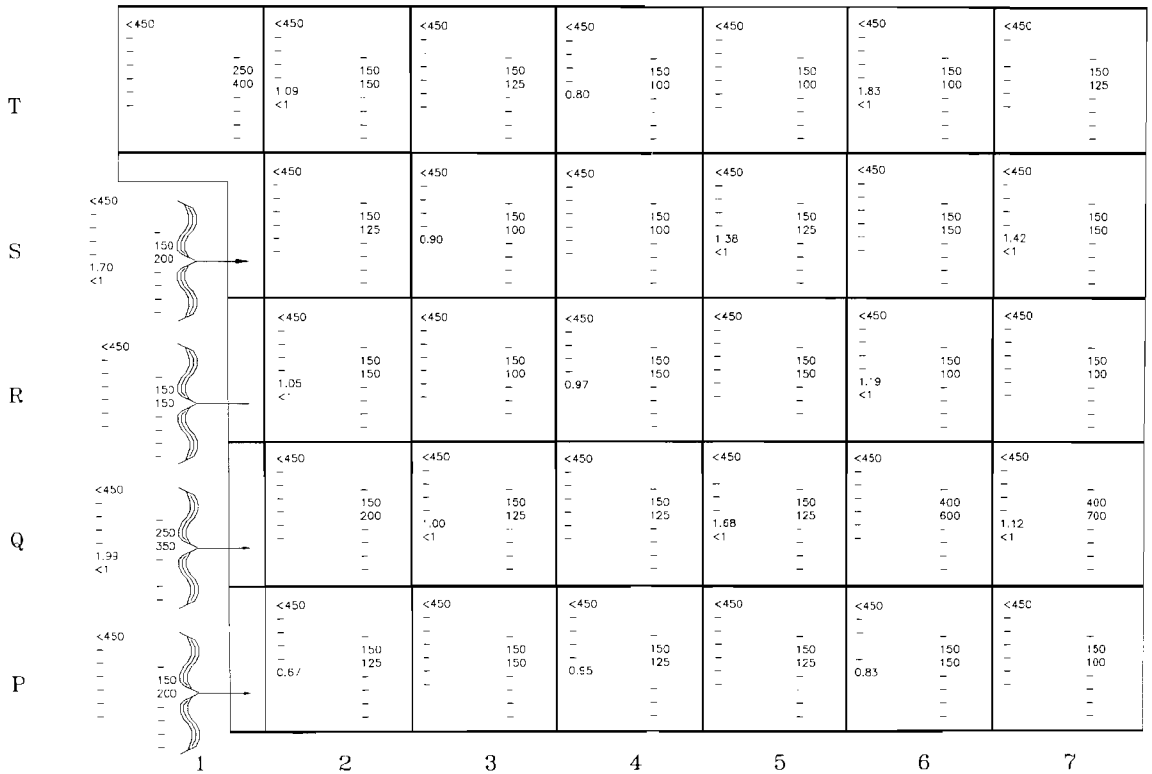


Sample Data

<450 – IM-247/PD Results [μμCi/20cm²]
200 – IM-253/PD (HV-1 PHA) [bkg.]
300 – IM-253/PD (HV-1 PHA) [cpm]
7000 – IM-253/PD (HV-2 GROSS) [bkg.]
7300 – IM-253/PD (HV-2 GROSS) [cpm]
1.82 – MCA Gross Gamma Eq. Co-60 [pCi/g]
<1 – MCA Specific Co-60 Results [pCi/g]

1. Pier Q

e. Localized Grid Maps

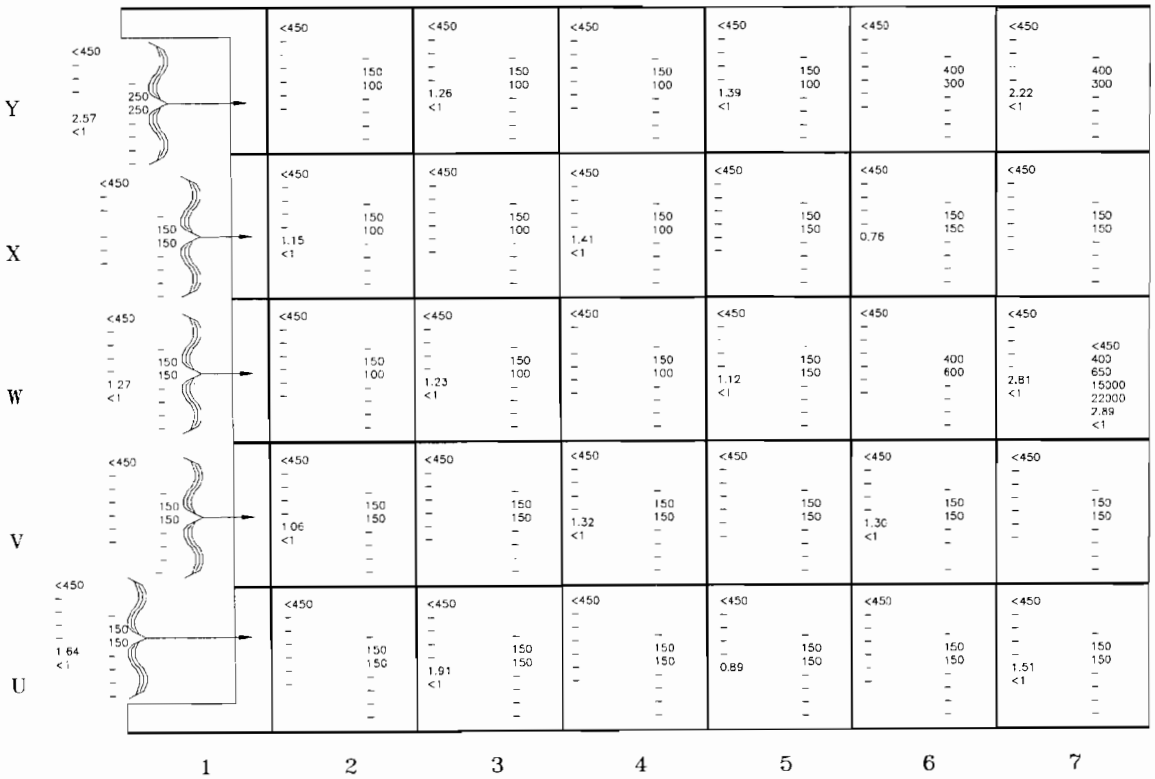


Sample Data

<450 – IM-247/PD Results [μμCi/20cm²]
200 – IM-253/PD (HV-1 PHA) [bkg.]
300 – IM-253/PD (HV-1 PHA) [cpm]
7000 – IM-253/PD (HV-2 GROSS) [bkg.]
7300 – IM-253/PD (HV-2 GROSS) [cpm]
1.82 – MCA Gross Gamma Eq. Co-60 [pCi/g]
<1 – MCA Specific Co-60 Results [pCi/g]

1. Pier Q

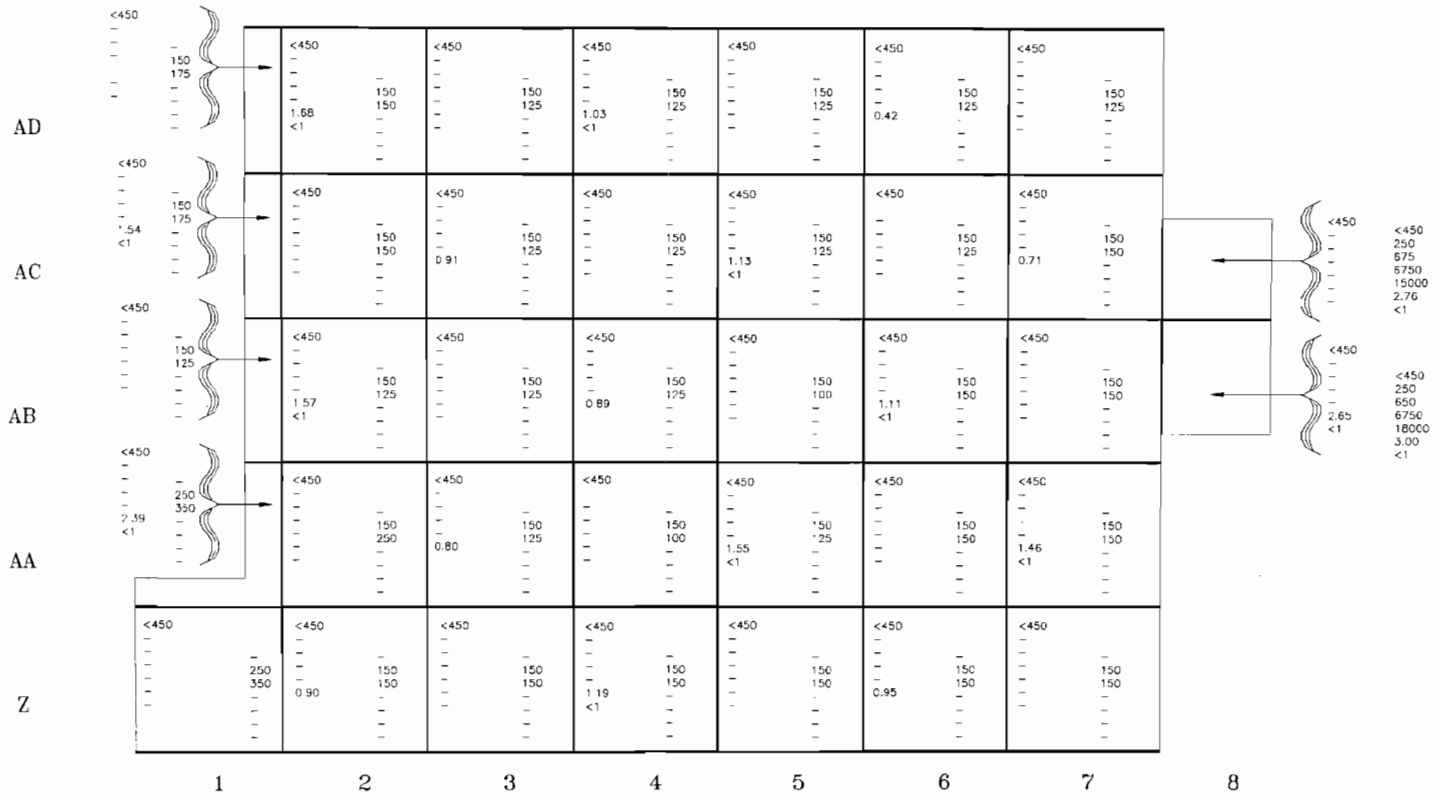
e. Localized Grid Maps



Sample Data
<450 – IM-247/PD Results [µµCi/20cm²]
200 – IM-253/PD (HV-1 PHA) [bkg.]
300 – IM-253/PD (HV-1 PHA) [cpm]
7000 – IM-253/PD (HV-2 GROSS) [bkg.]
7300 – IM-253/PD (HV-2 GROSS) [cpm]
1.82 – MCA Gross Gamma Eq. Co-60 [pCi/g]
<1 – MCA Specific Co-60 Results [pCi/g]

1. Pier Q

e. Localized Grid Maps

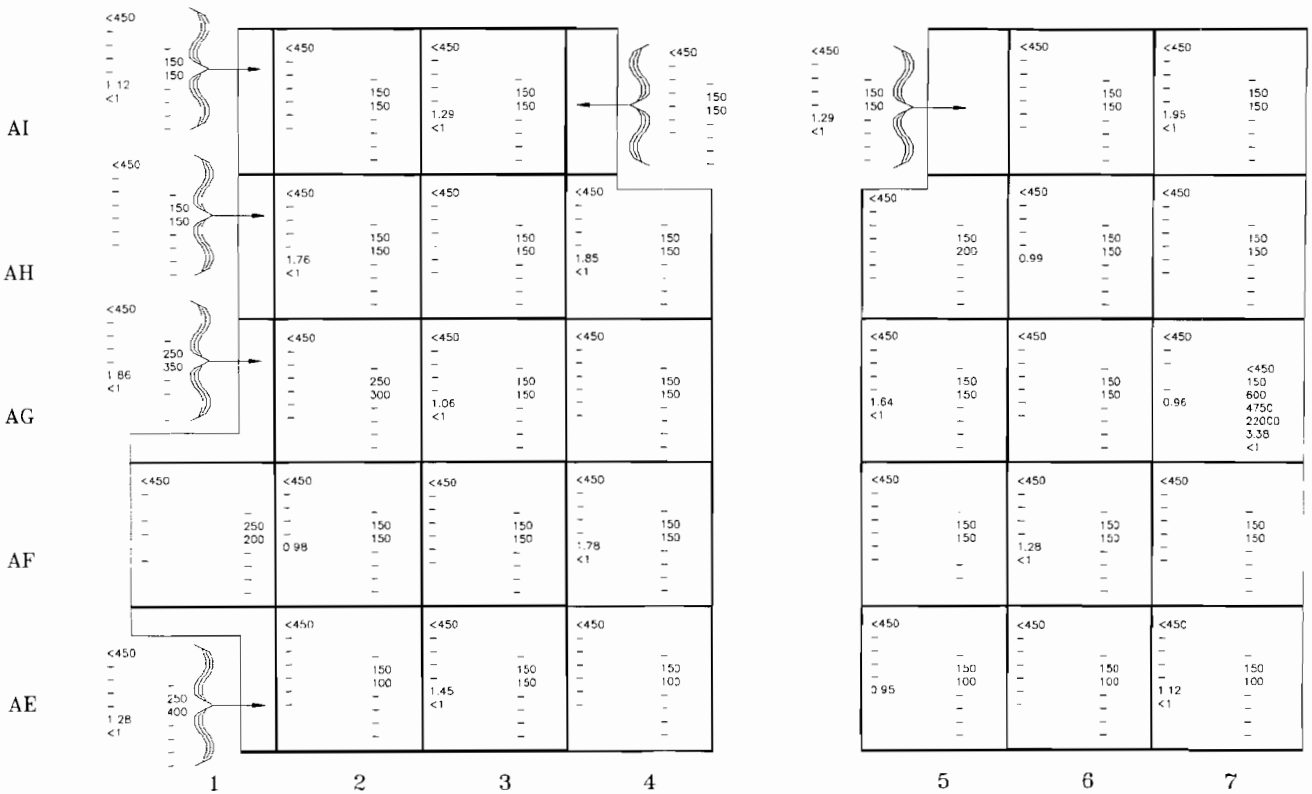


Sample Data

<450 – IM-247/PD Results [μμCi/20cm²]
200 – IM-253/PD (HV-1 PHA) [bkg.]
300 – IM-253/PD (HV-1 PHA) [cpm]
7000 – IM-253/PD (HV-2 GROSS) [bkg.]
7300 – IM-253/PD (HV-2 GROSS) [cpm]
*.82 – MCA Gross Gamma Eq. Co-60 [pCi/g]
<1 – MCA Specific Co-60 Results [pCi/g]

1. Pier Q

e. Localized Grid Maps

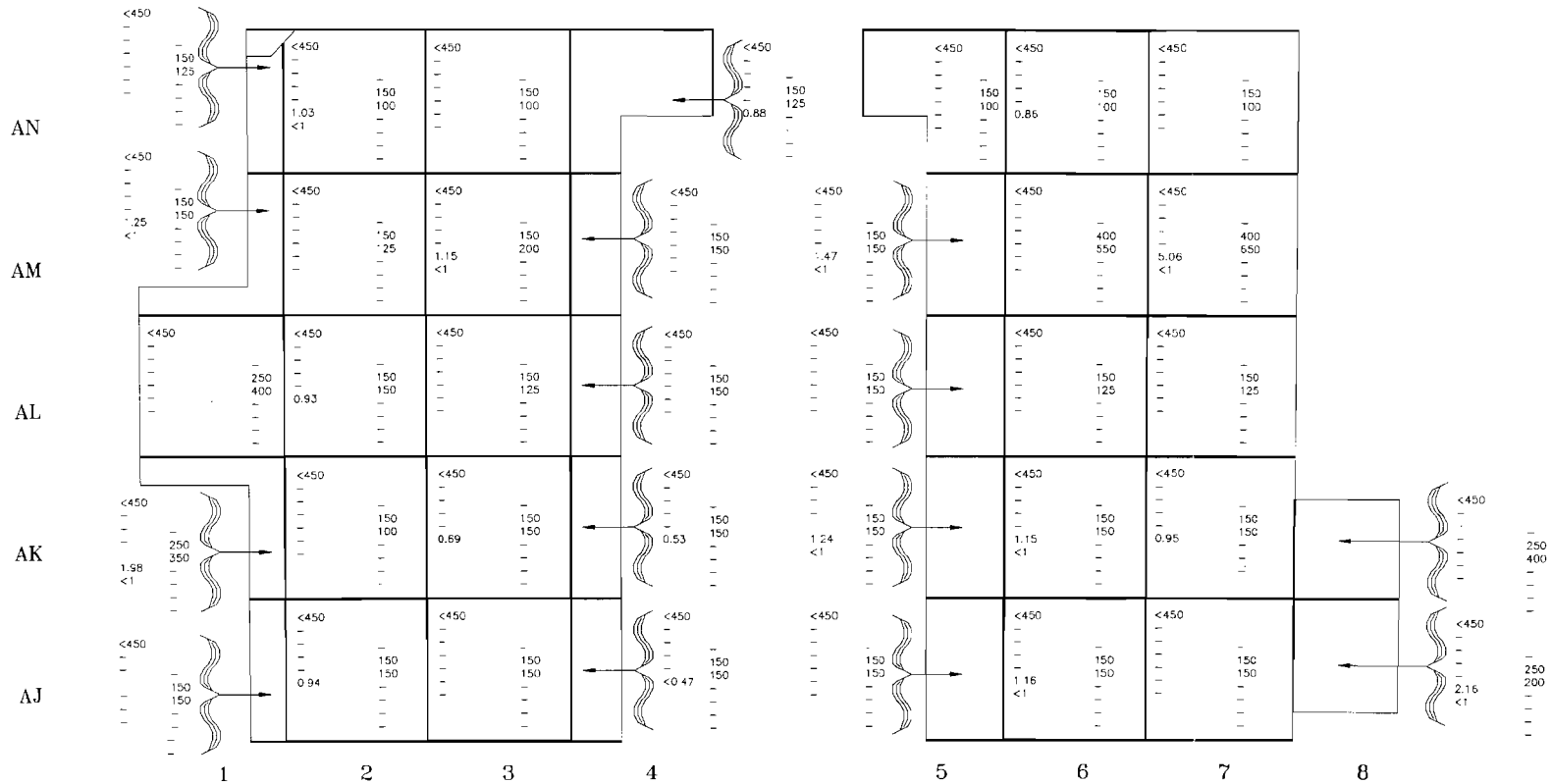


Sample Data

<450 – IM-247/PD Results (µµCi/20cm²)
200 – IM-253/PD (HV-1 PHA) (bkg.)
300 – IM-253/PD (HV-1 PHA) (cpm)
7000 – IM-253/PD (HV-2 GROSS) (bkg.)
7300 – IM-253/PD (HV-2 GROSS) (cpm)
1.82 – MCA Gross Gamma Eq. Co-60 (pCi/g)
<1 – MCA Specific Co-60 Results (pCi/g)

1. Pier Q

e. Localized Grid Maps

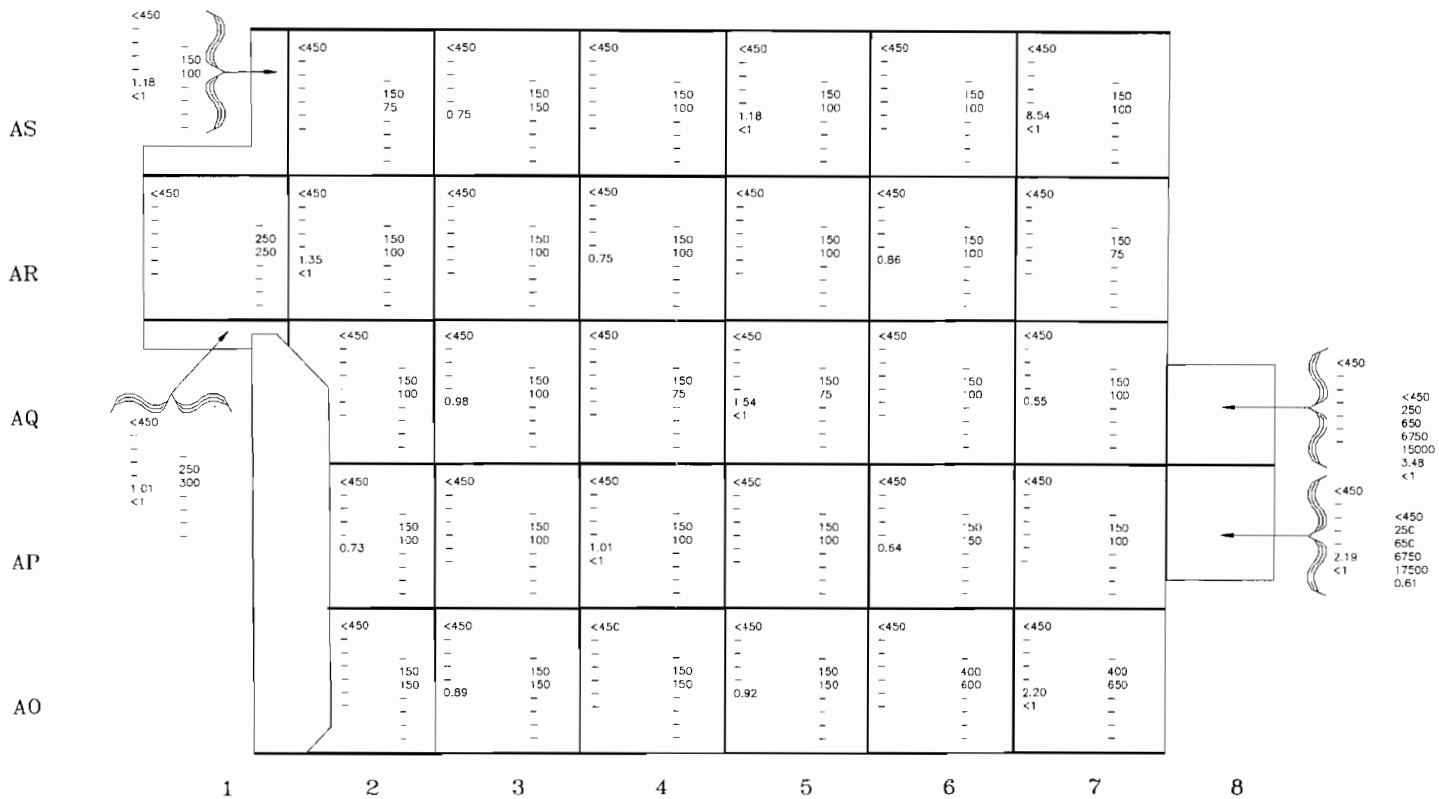


Sample Data

- <450 – IM-247/PD Results (μμCi/20cm²)
- 200 – IM-253/PD (HV-1 PHA) [bkg.]
- 300 – IM-253/PD (HV-1 PHA) [cpm]
- 7000 – IM-253/PD (HV-2 GROSS) [bkg.]
- 7300 – IM-253/PD (HV-2 GROSS) [cpm]
- 1.82 – MCA Gross Gamma Eq. Co-60 [pCi/g]
- <1 – MCA Specific Co-60 Results [pCi/g]

1. Pier Q

e. Localized Grid Maps

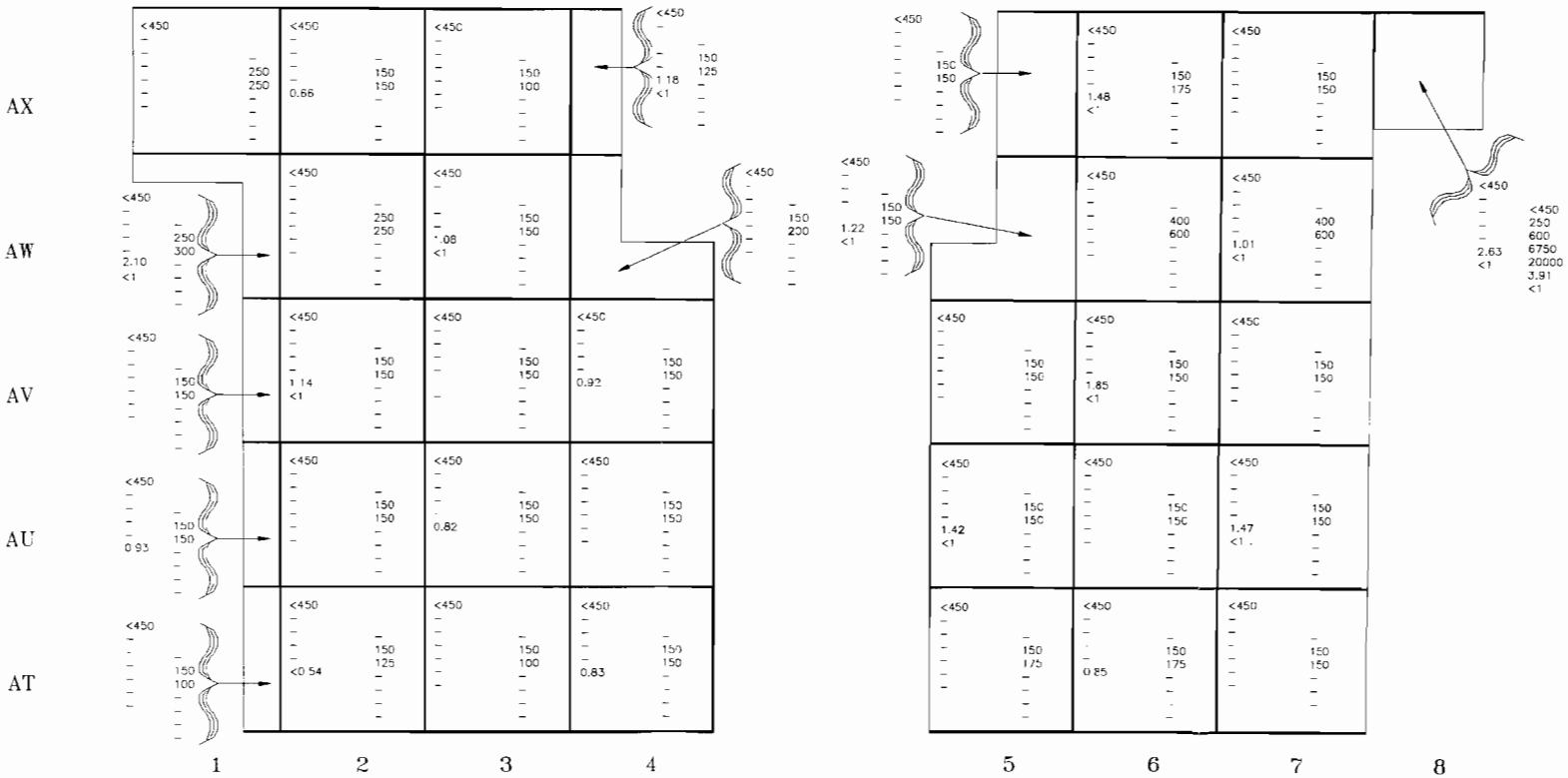


Sample Data

<450 – IM-247/PD Results [μμC/20cm²]
200 – IM-253/PD (HV-1 PHA) [bkg]
300 – IM-253/PD (HV-1 PHA) [cpm]
7000 – IM-253/PD (HV-2 GROSS) [bkg.]
7300 – IM-253/PD (HV-2 GROSS) [cpm]
1.82 – MCA Gross Gamma Eq. Co-60 [pCi/g]
<1 – MCA Specific Co-60 Results [pCi/g]

1. Pier Q

e. Localized Grid Maps

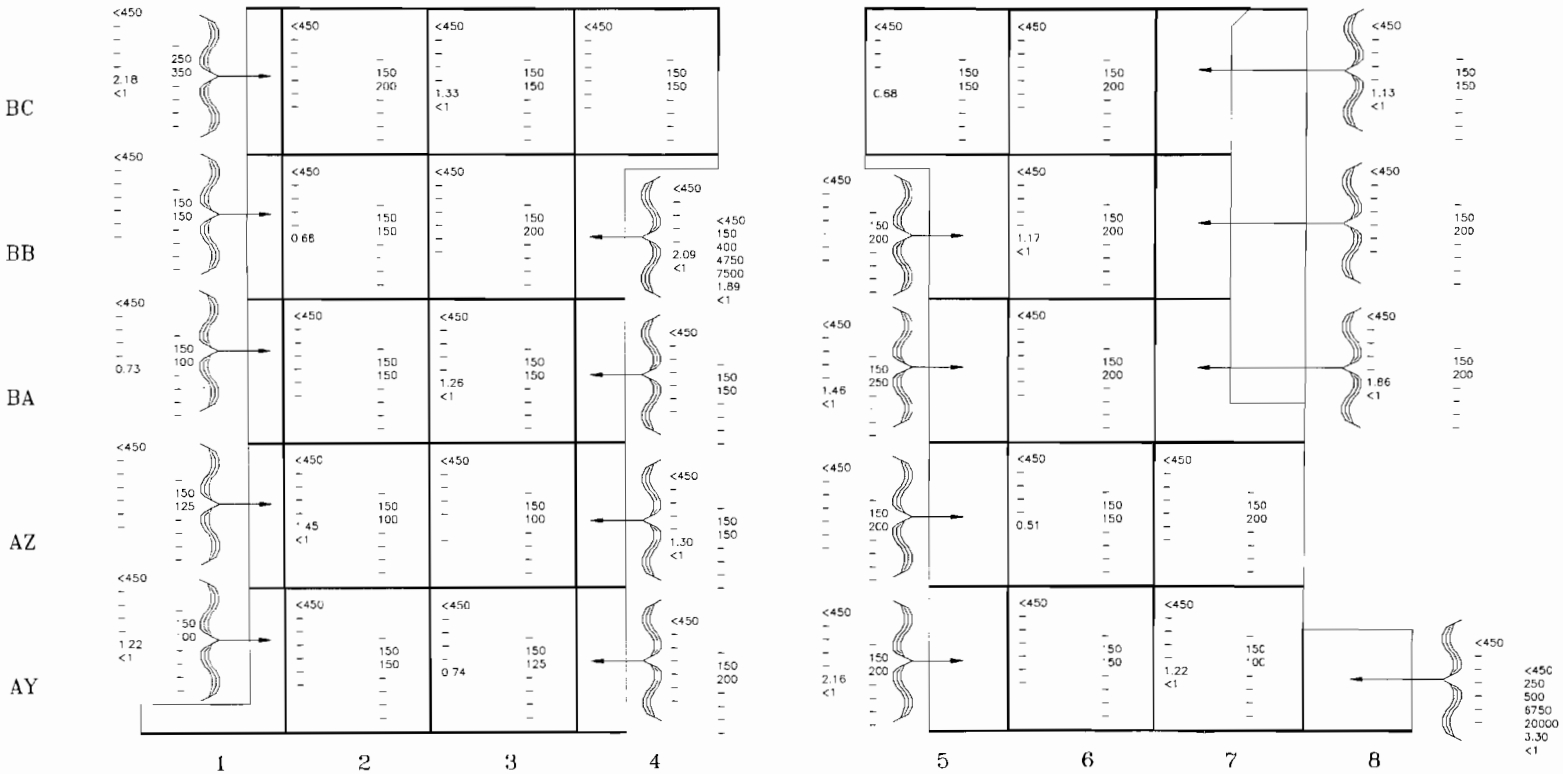


Sample Data

<450 – IM-247/PD Results [μμCi/20cm²]
200 – IM-253/PD (HV-1 PHA) [bkg.]
300 – IM-253/PD (HV-1 PHA) [cpm]
7000 – IM-253/PD (HV-2 GROSS) [bkg.]
7300 – IM-253/PD (HV-2 GROSS) [cpm]
1.82 – MCA Gross Gamma Ec Co-60 [pCi/g]
<1 – MCA Specific Co-60 Results [pCi/g]

1. Pier Q

e. Localized Grid Maps

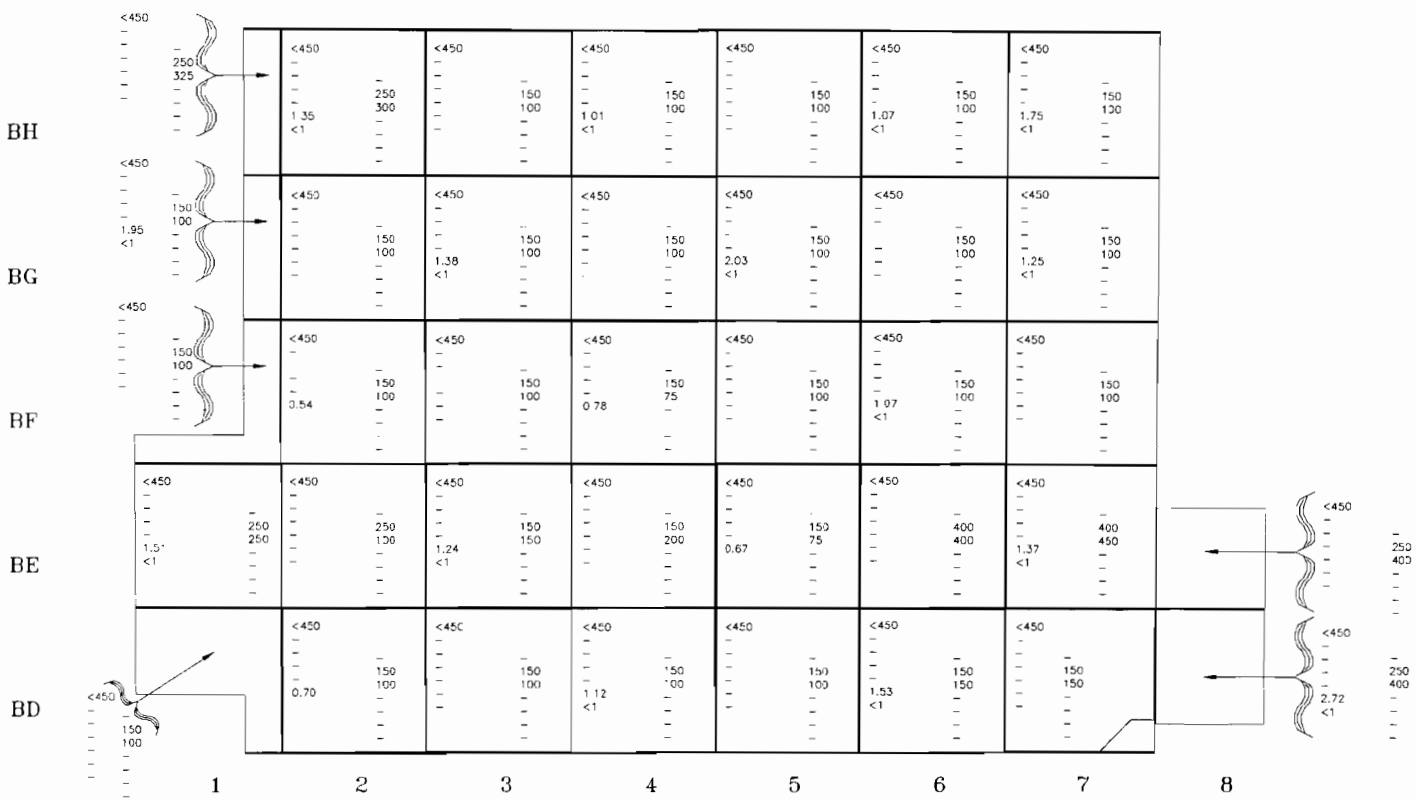


Sample Data

<450 – IM-247/PD Results [μμCi/20cm²]
200 – IM-253/PD (HV-1 PHA) [bkg.]
300 – IM-253/PD (HV-1 PHA) [cpm]
7000 – IM-253/PD (HV-2 GROSS) [bkg.]
7300 – IM-253/PD (HV-2 GROSS) [cpm]
1.82 – MCA Gross Gamma Eq. Co-60 [pCi/g]
<1 – MCA Specific Co-60 Results [pCi/g]

1. Pier Q

e. Localized Grid Maps



Sample Data

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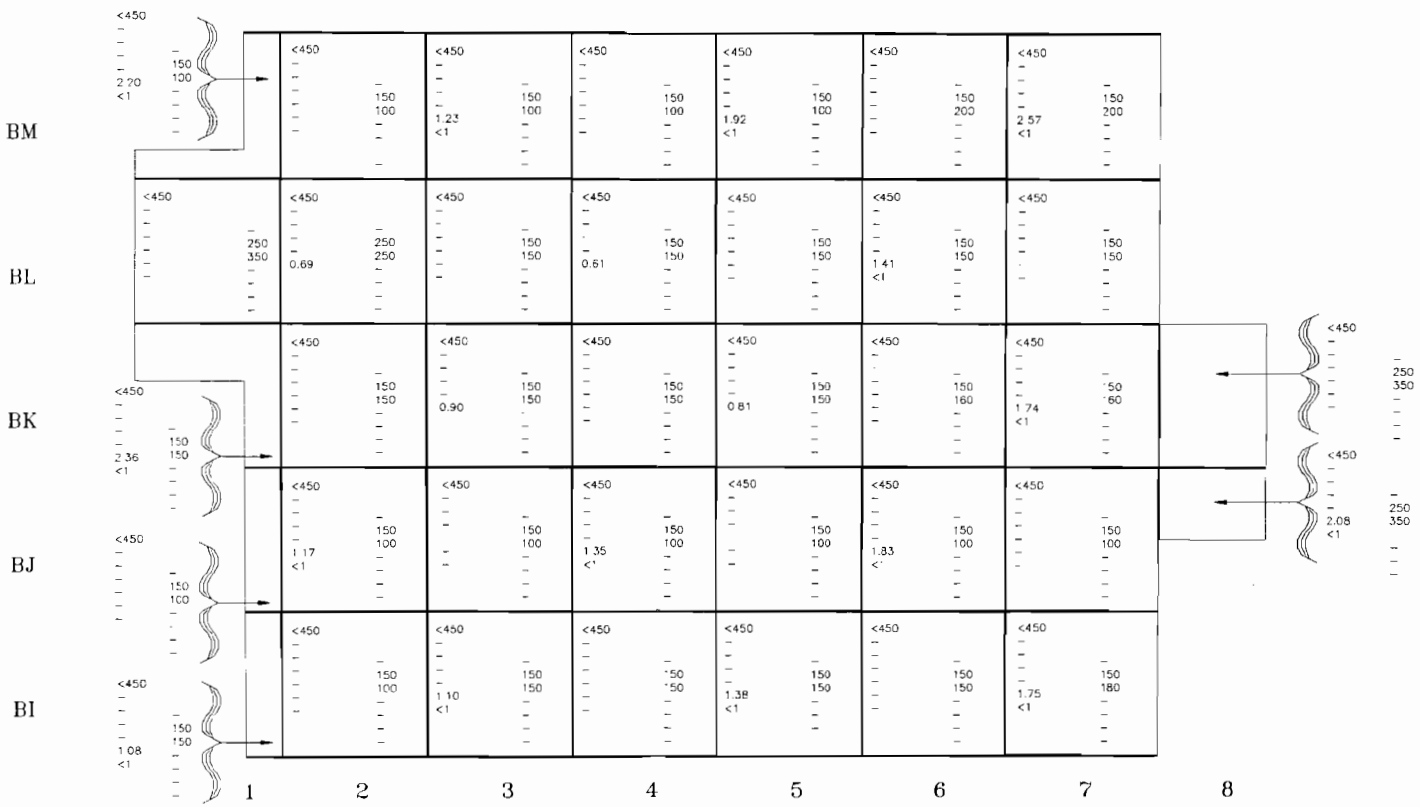
7000 – IM-253/PD (HV-2 GROSS) [bkg.]
7300 – IM-253/PD (HV-2 GROSS) [cpm]
<.82 – MCA Gross Gamma Eq. Co-60 [pCi/g]
<1 – MCA Specific Co-60 Results [pCi/g]

1. **Pier Q**

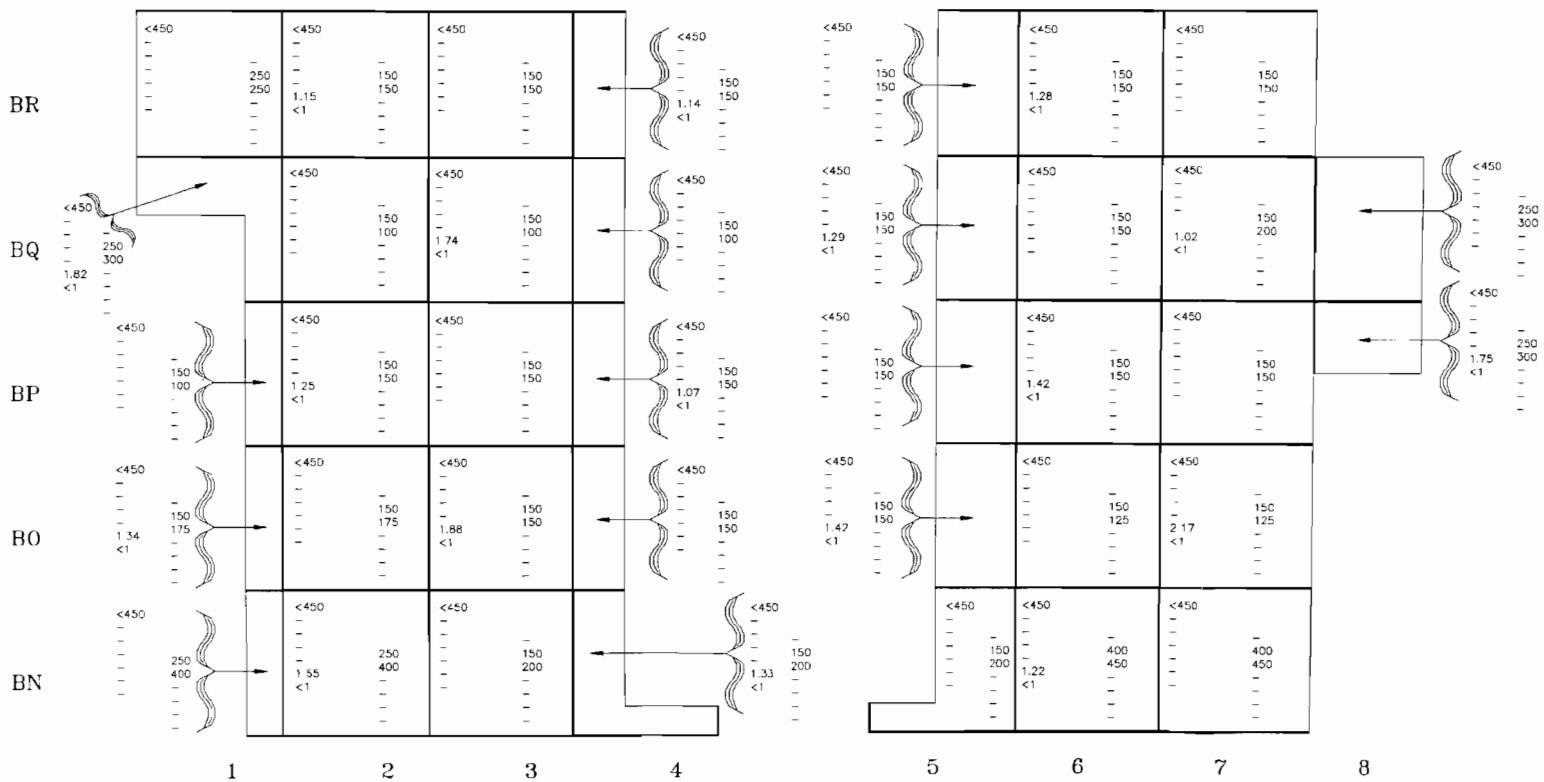
e. **Localized Grid Maps**



Sample Data
<450 – IM-247/PD Results [μμCi/20cm²]
200 – IM-253/PD (HV-1 PHA) [bkg.]
300 – IM-253/PD (HV-1 PHA) [cpm]
7000 – IM-253/PD (HV-2 GROSS) [bkg.]
7300 – IM-253/PD (HV-2 GROSS) [cpm]
.82 – MCA Gross Gamma Eq. Co-60 [pCi/g]
<1 – MCA Specific Co-60 Results [pCi/g]

1. Pier Q

e. Localized Grid Maps

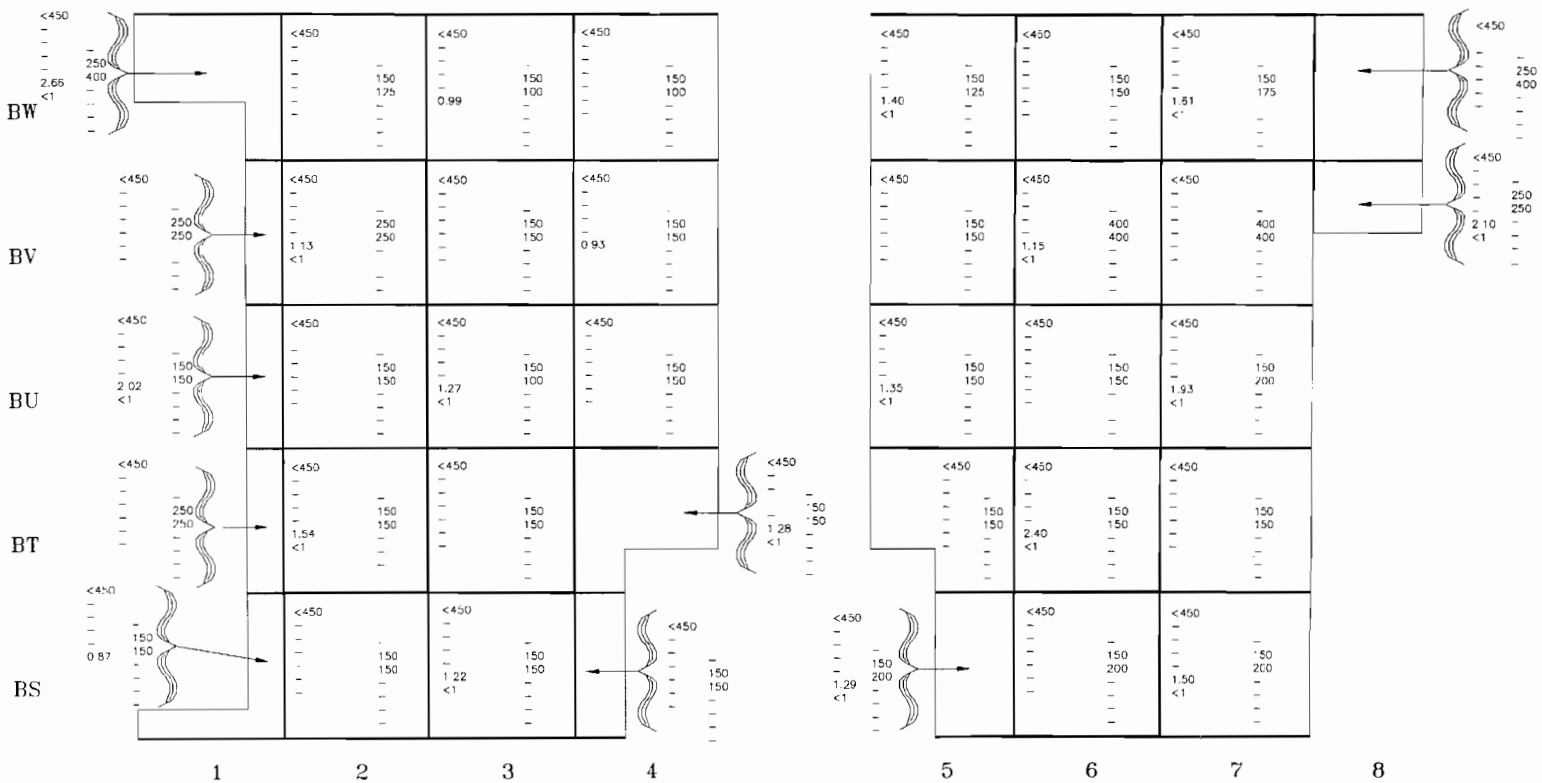


Sample Data

<450 – IM-247/PD Results [μμCi/20cm²]
200 – IM-253/PD (HV-1 PHA) [bkg.]
300 – IM-253/PD (HV-1 PHA) [cpm]
7000 – IM-253/PD (HV-2 GROSS) [bkg.]
7300 – IM-253/PD (HV-2 GROSS) [cpm]
1.82 – MCA Gross Gamma Eq Co-60 [pCi/g]
<1 – MCA Spec/rc Co-60 Results [pCi/g]

1. Pier Q

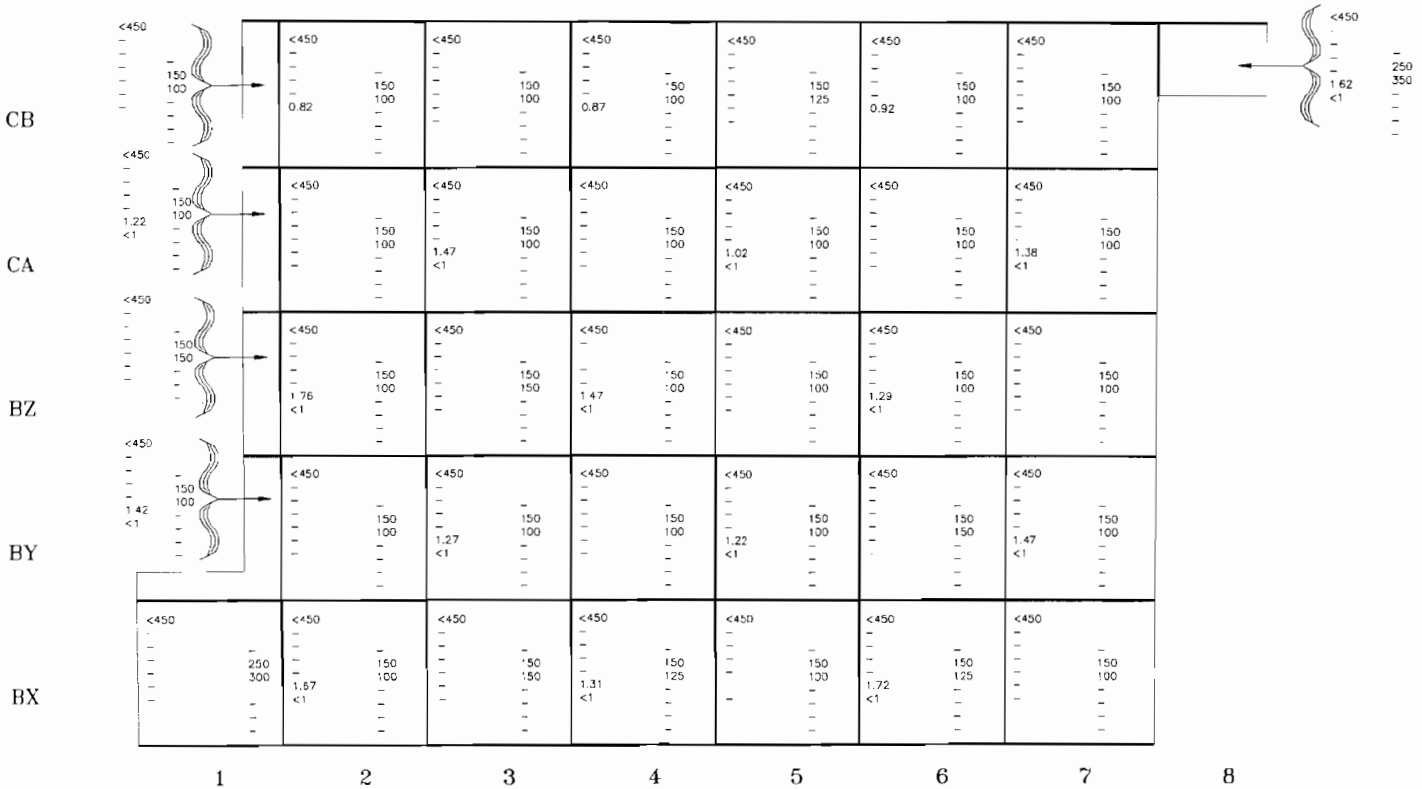
e. Localized Grid Maps



Sample Data
<450 – IM-247/PD Results [µCi/20cm²]
200 – IM-253/PD (HV-1 PHA) [bkg.]
300 – IM-253/PD (HV-1 PHA) [cpm]
7000 – IM-253/PD (HV-2 GROSS) [bkg.]
7300 – IM-253/PD (HV-2 GROSS) [cpm]
1.82 – MCA Gross Gamma Eq. Co-60 [pCi/g]
<1 – MCA Specific Co-60 Results [pCi/g]

1. Pier Q

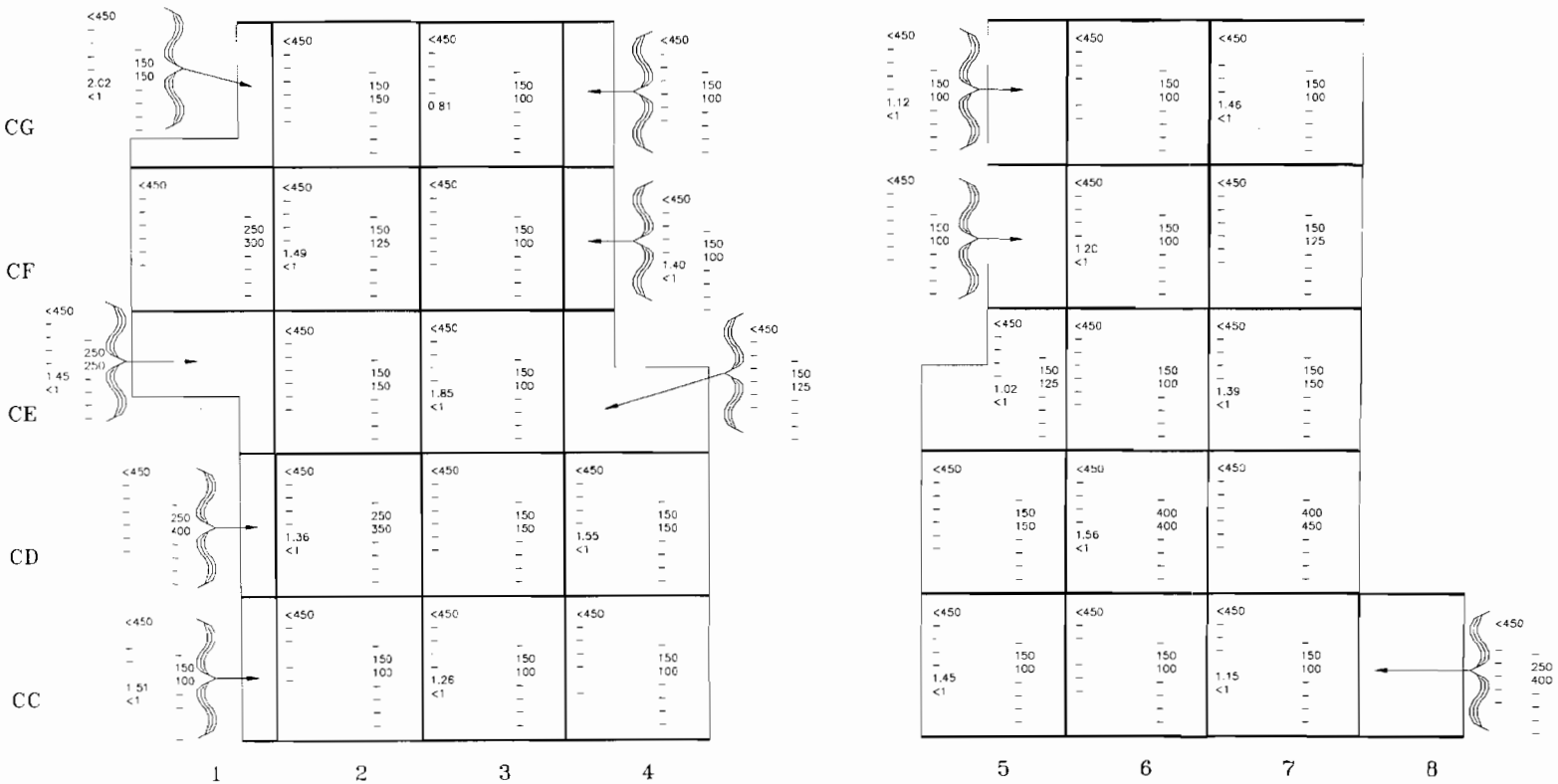
e. Localized Grid Maps



Sample Data
<450 – IM-247/PD Results [μμCi/20cm²]
200 – IM-253/PD (HV-1 PHA) [bkg.]
300 – IM-253/PD (HV-1 PHA) [cpm]
7000 – IM-253/PD (HV-2 GROSS) [bkg.]
7300 – IM-253/PD (HV-2 GROSS) [cpm]
1.82 – MCA Gross Gamma Eq. Co-60 [pCi/g]
<1 – MCA Specific Co-60 Results [pCi/g]

1. **Pier Q**

e. **Localized Grid Maps**



Sample Data
<450 – IM-247/PD Results [μμCi/20cm²]
200 – IM-253/PD (HV-1 PHA) [bkg.]
300 – IM-253/PD (HV-1 PHA) [cpm]
7000 – IM-253/PD (HV-2 GROSS) [bkg.]
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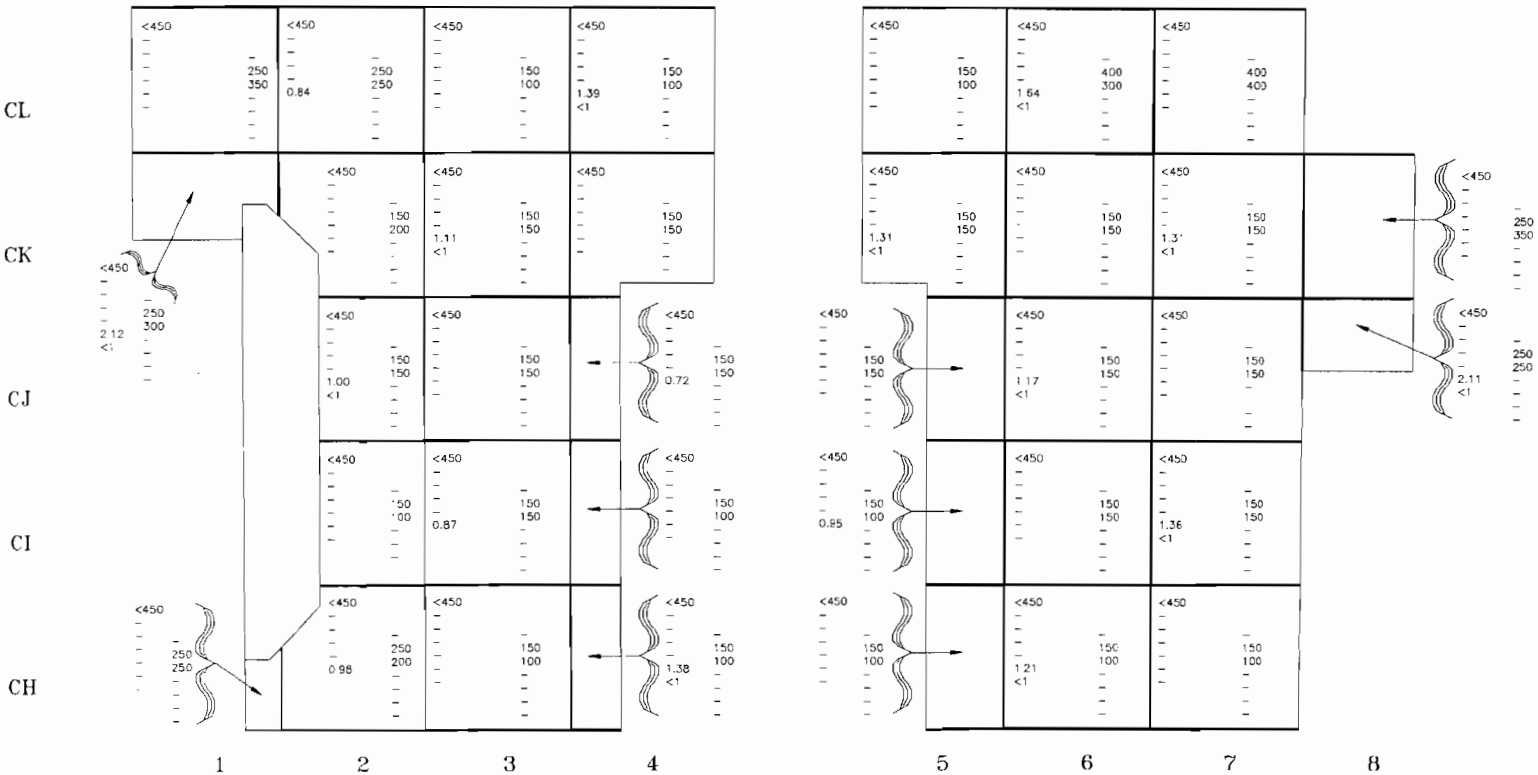
1.82 – MCA Gross Gamma Eq. Co-60 [pCi/g]
<1 – MCA Specific Co-60 Results [pCi/g]

1. Pier Q

e. Localized Grid Maps



Sample Data

<450 – IM-247/PD Results [μμCi/20cm²]
200 – IM-253/PD (HV-1 PHA) [bkg.]
300 – IM-253/PD (HV-1 PHA) [cpm]
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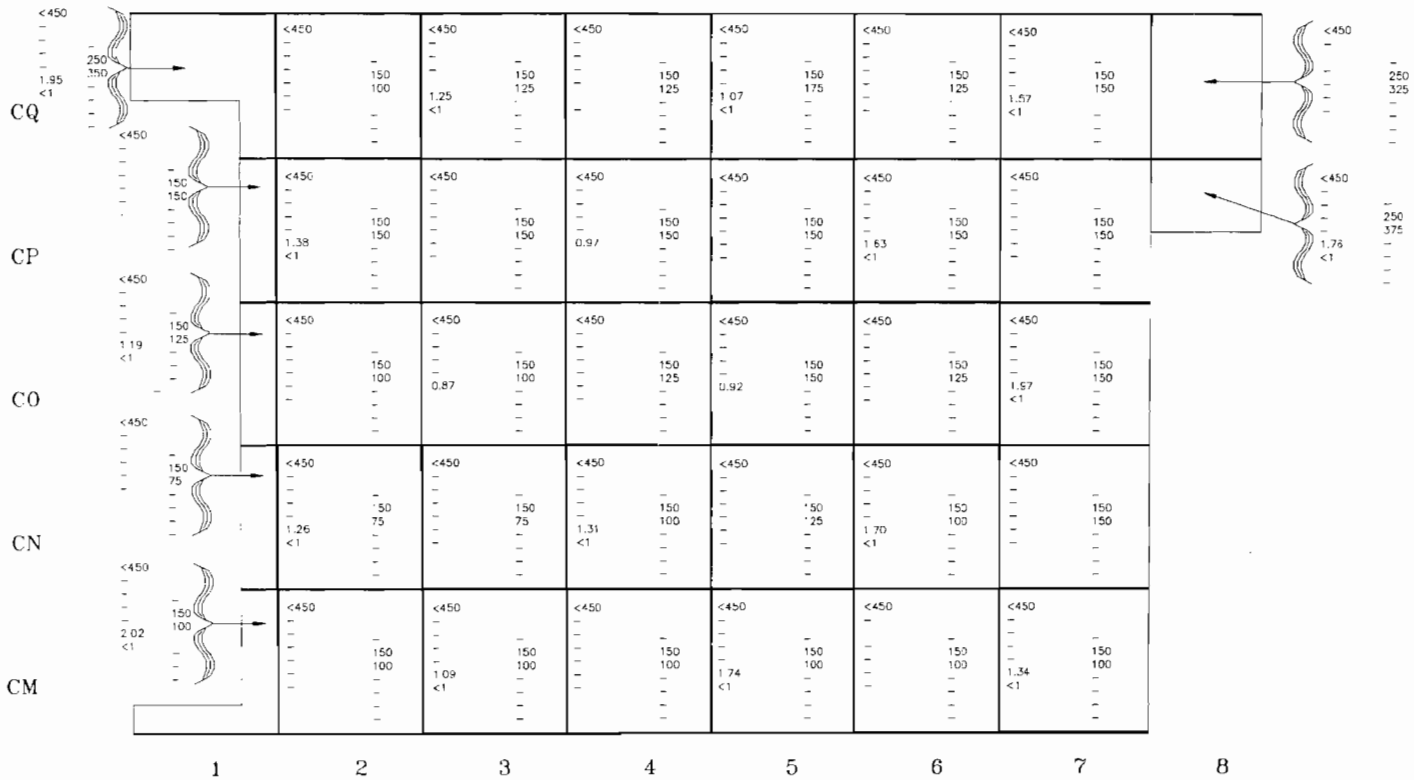
7300 – IM-253/PD (HV-2 GROSS) [cpm]
1.82 – MCA Gross Gamma Eq. Co-60 [pCi/g]
<1 – MCA Specific Co-60 Results [pCi/g]

1. Pier Q

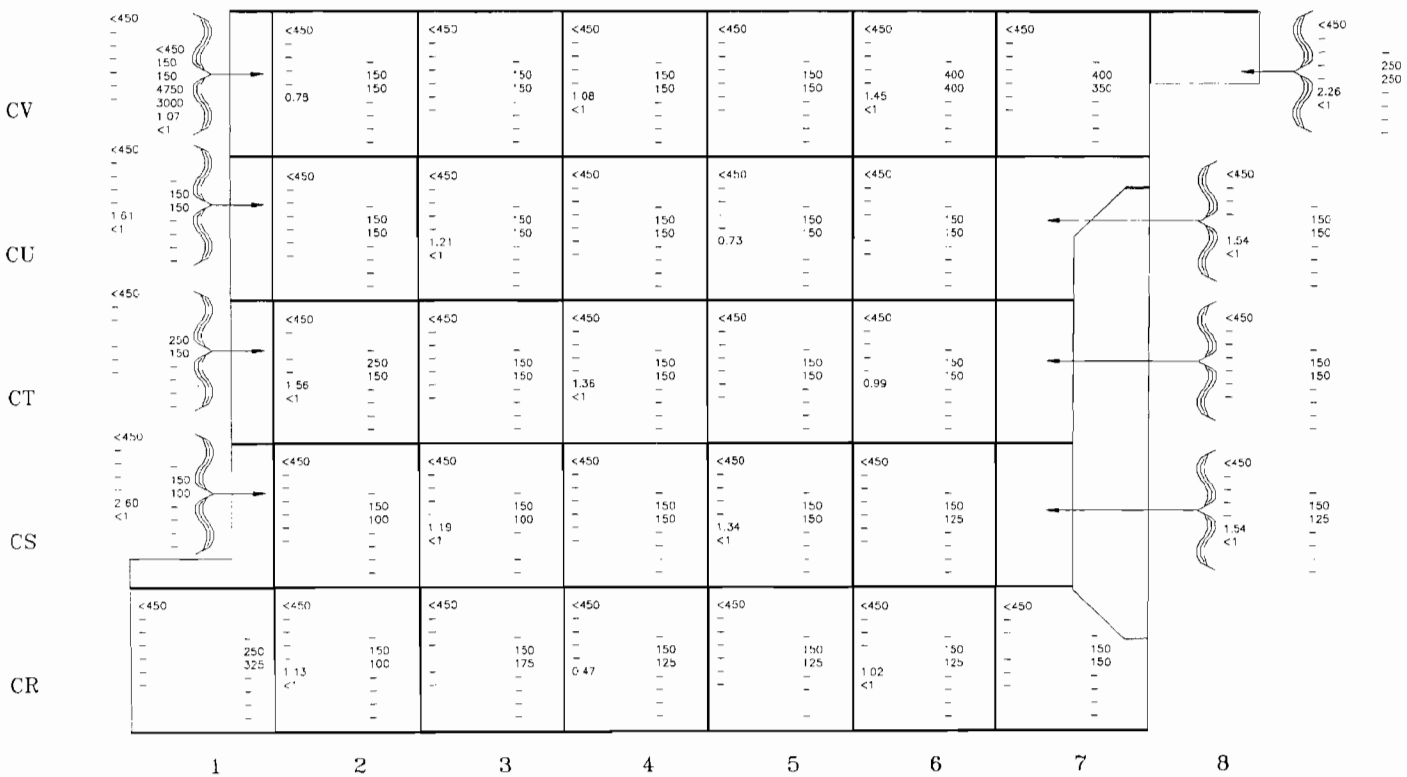
e. Localized Grid Maps



Sample Data
<450 – IM-247/PD Results [μμCi/20cm²]
200 – IM-253/PD (HV-1 PHA) [bkg.]
300 – IM-253/PD (HV-1 PHA) [cpm]
7000 – IM-253/PD (HV-2 GROSS) [bkg.]
7300 – IM-253/PD (HV-2 GROSS) [cpm]
1.82 – MCA Gross Gamma Eq Co-60 [pCi/g]
<1 – MCA Specific Co-60 Results [pCi/g]

1. **Pier Q**

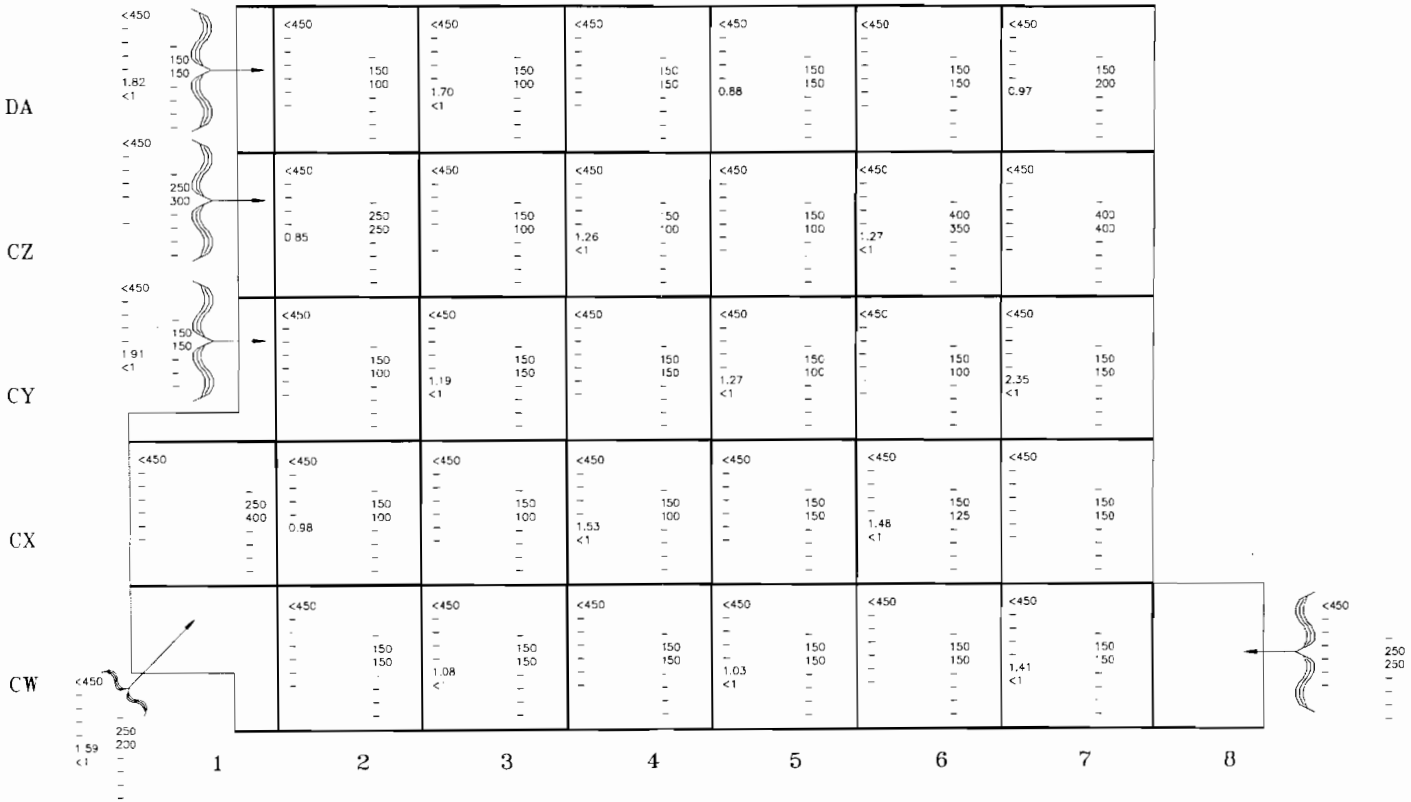
e. **Localized Grid Maps**



Sample Data
<450 – IM-247/PD Results [μμCi/20cm²]
200 – IM-253/PD (HV-1 PHA) [bkg.]
300 – IM-253/PD (HV-1 PHA) [cpm]
7000 – IM-253/PD (HV-2 GROSS) [bkg.]
7300 – IM-253/PD (HV-2 GROSS) [cpm]
1.82 – MCA Gross Gamma Eq. Co-60 [pCi/g]
<1 – MCA Specific Co-60 Results [pCi/g]

1. Pier Q

e. Localized Grid Maps

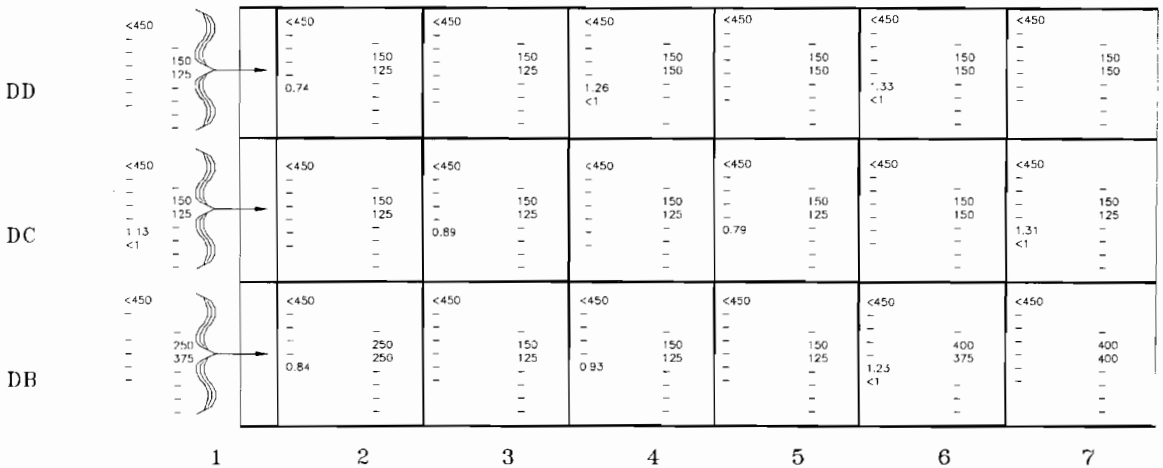


Sample Data

< 450 – IM-247/PD Results [μμCi/20cm²]
200 – IM-253/PD (HV-1 PHA) [bkg.]
300 – IM-253/PD (HV-1 PHA) [cpm]
7000 – IM-253/PD (HV-2 GROSS) [bkg.]
7300 – IM-253/PD (HV-2 GROSS) [cpm]
1.82 – MCA Gross Gamma Eq. Co-60 [pCi/g]
<1 – MCA Specific Co-60 Results [pCi/g]

1. Pier Q

e. Localized Grid Maps



Sample Data

<450 – IM-247/PD Results [μμCi/20cm²]
200 – IM-253/PD (HV-1 PHA) [bkg.]
300 – IM-253/PD (HV-1 PHA) [cpm]
7000 – IM-253/PD (HV-2 GROSS) [bkg.]
7300 – IM-253/PD (HV-2 GROSS) [cpm]
1.82 – MCA Gross Gamma Eq. Co-60 [pCi/g]
<1 – MCA Specific Co-60 Results [pCi/g]

1. Pier Q

f. Prior To Photographs

Entrance, facing east.

1. Pier Q

f. Prior To Photographs

Viewing north.

1. Pier Q

g. After Photographs

Head of pier, facing east.

1. Pier Q

g. After Photographs

Midway of pier, facing west.

1. Pier Y

a. Introduction:

Pier Y is located in grid D-4 of the Charleston Naval Station map and was constructed in 1942. Pier Y is also identified as structures 332 and 331.

(1) **Description:**

Structure 332 is approximately 1300 feet long and 10 feet wide oriented east into the Cooper River. This section is constructed of concrete pilings supporting a concrete slab surface. Structure 332 leads into the main section of structure 331 which is approximately 400 feet long and 7 feet wide. This section is constructed of wood pilings and wooden planks. From the main section of structure 331, two perpendicular segments extend south into the Cooper River. Each segment is approximately 400 feet long and 12 feet wide.

(2) **Brief History:**

(a) **Use:** This pier was constructed as part of the U.S. naval shore establishment expansion program and was authorized to berth various naval vessels. This facility is used as a Degaussing Station.

(b) **Radiological History:** This structure was certified to berth nuclear vessels, however, there are no available records of berthing nuclear vessels on this pier.

(3) **Survey Requirements:**

Nuclear Ship Berthing Area surveys. Group 2 surveys were performed on the pier.

b. Discussion:

Group 2 survey areas were divided into approximately 10' by 10' grids. Where physically possible, each grid was subdivided into two 3' by 3' subsections which were located in areas of highest potential for contamination. One of these subsections was surveyed using the IM-247/PD and the other using the IM-253/PD (HV-1 PHA). Solid material samples were taken from a minimum of 50% of the 10' by 10' grids. Additionally, solid material samples were taken from each 3' by 3' subsection that resulted in levels greater than twice background with the IM-253/PD (HV-1 PHA).

Pier Y was divided into three hundred and forty-six, 10' by 10' grids.

Individual backgrounds were used for this pier. The IM-247/PD and the IM-253/PD (HV-1 PHA and HV-2 GROSS) backgrounds used for the low and high

1. Pier Y

concrete pours were 40, 150, 6,000, and 40, 400 and 10,000 counts per minute respectively. These radiation levels were based upon backgrounds obtained from Building M-1116 and Building 27, respectively. The IM-247/PD and the IM-253/PD (HV-1 PHA and HV-2 GROSS) background radiation levels used for the wooden sections were 20, 50, and 800 counts per minute based upon background radiation levels obtained from the Noisette Creek Bridge.

A total of one hundred and seventy-seven solid material samples were taken. Each solid sample was removed from the grid location indicating the area of highest potential. The following naturally occurring radionuclides were typical isotopes identified during analysis of solid material samples: beryllium 7, lead 212, and lead 214.

c. Summary:

Surveys performed with the IM-247/PD did not detect areas greater than 450 $\mu\mu Ci/20cm^2$.

Surveys performed with the IM-253/PD (HV-1 PHA) detected three areas greater than or equal to twice background.

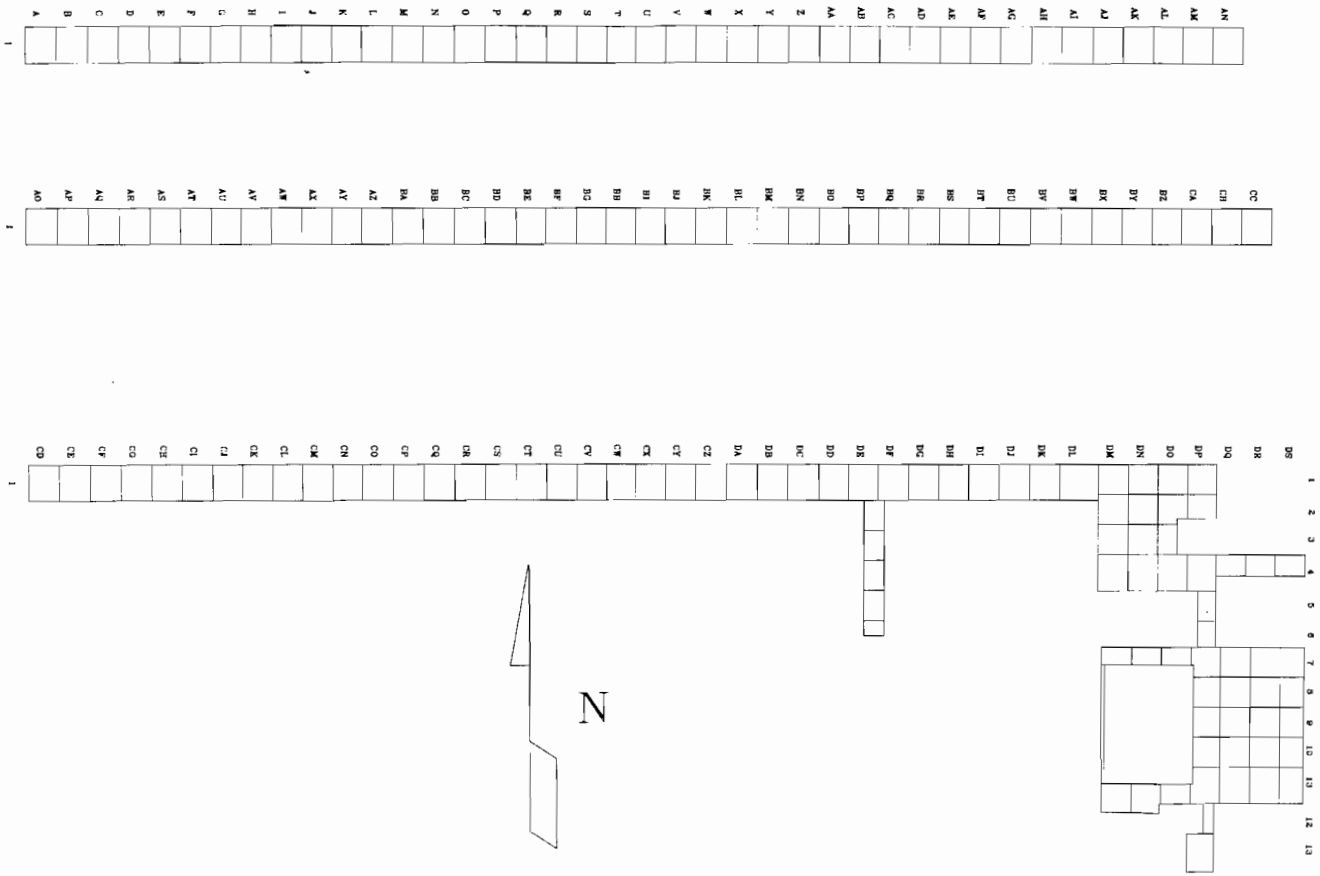
Surveys performed with the IM-253/PD (HV-2 GROSS) detected two areas greater than or equal to twice background.

Analysis performed on solid material samples with the multi-channel analyzer (MCA) detected gross gamma equivalent cobalt 60 levels ranging from a low of less than 0.16 pCi/g to a high of 11.45 pCi/g.

Analysis performed on solid material samples with the MCA for specific cobalt 60 indicated that all solid material samples were less than 1 pCi/g.

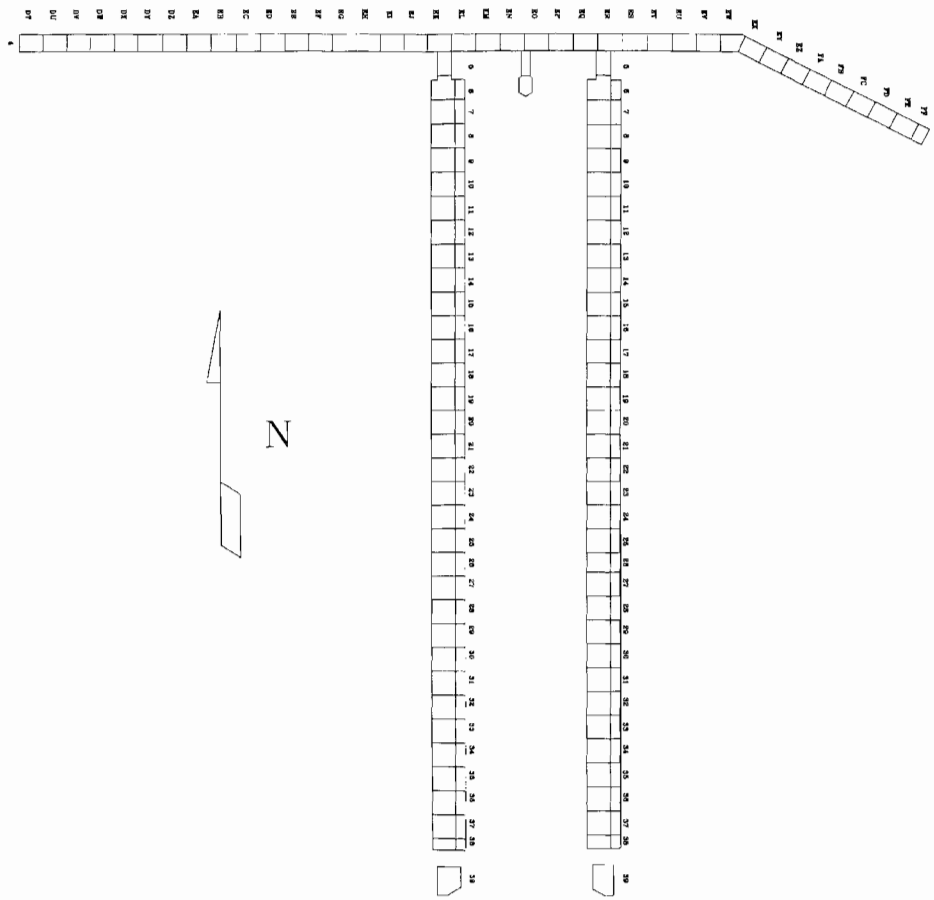
1. **Pier Y**

d. **Overall Grid Map**



1. Pier Y

d. Overall Grid Map



1. Pier Y

e. Localized Grid Maps

E	<450 – – – – 2.09 <1	– 150 150 – – – –	J	<450 – – – – – – –	– 150 125 – – – –
D	<450 – – – – – –	– 400 350 – – – –	I	<450 – – – – 2.47 < 1	– 150 200 – – – –
C	<450 – – – – 2.62 <1	– 400 350 – – – –	H	<450 – – – – – – –	– 150 150 – – – –
B	<450 – – – – – – –	– 400 350 – – – –	G	<450 – – – – 1.71 <1	– 150 125 – – – –
A	<450 – – – – 3.57 <1	– 400 300 – – – –	F	<450 – – – – – – –	– 150 150 – – – –
	1			1	

O	<450 – – – – 1.85 <1	– 150 150 – – – –	T	<450 – – – – – – –	– 150 175 – – – –
N	<450 – – – – – – –	– 150 200 – – – –	S	<450 – – – – 1.99 <1	– 150 150 – – – –
M	<450 – – – – 1.80 <1	– 150 200 – – – –	R	<450 – – – – – – –	– 150 150 – – – –
L	<450 – – – – – – –	– 150 150 – – – –	Q	<450 – – – – 1.76 <1	– 150 200 – – – –
K	<450 – – – – 2.16 <1	– 150 200 – – – –	P	<450 – – – – – – –	– 150 150 – – – –
	1			1	

Y	<450 – – – – 1.66 <1	– 150 175 – – – –	X	<450 – – – – – – –	– 150 150 – – – –
W	<450 – – – – 1.90 <1	– 150 150 – – – –	V	<450 – – – – – – –	– 150 150 – – – –
U	<450 – – – – 1.65 <1	– 150 150 – – – –			
	1				

Sample Data
<450 – IM-247/PD Results [μCi/20cm²]
200 – IM-253/PD (HV-1 PHA) [bkg.]
300 – IM-253/PD (HV-1 PHA) [cpm]
7000 – IM-253/PD (HV-2 GROSS) [bkg.]
7300 – IM-253/PD (HV-2 GROSS) [cpm]
1.82 – MCA Gross Gamma Eq Co-60 [pCi/g]
<1 – MCA Specific Co-60 Results [pCi/g]

AD	<450	–
	–	150
	–	125
	–	–
	–	–
	–	–
	–	–
AC	<450	–
	–	150
	–	150
	–	–
	–	–
	1.75	
	<1	–
AB	<450	–
	–	150
	–	150
	–	–
	–	–
	–	–
	–	–
AA	<450	–
	–	150
	–	125
	–	
	1.39	–
	<1	–
Z	<450	–
	–	150
	–	150
	–	–
	–	–
	–	–
	–	–

1

AI	<450	–
	–	150
	–	150
	–	–
	–	–
	–	–
	1.70	–
	<1	–
AH	<450	–
	–	150
	–	150
	–	–
	–	
	–	–
	–	–
AG	<450	–
	–	150
	–	250
	–	–
	–	–
	1.45	–
	<1	–
AF	<450	–
	–	150
	–	150
	–	–
	–	–
	–	–
	–	–
AE	<450	–
	–	150
	–	150
	–	–
	–	–
	1.53	–
	<1	–

1

AN	<450	–
	–	150
	–	150
	–	–
	–	–
	–	–
	–	–
AM	<450	–
	–	150
	–	150
	–	–
	–	–
	1.71	–
	<1	–
AL	<450	–
	–	150
	–	125
	–	–
	–	–
	–	–
	–	–
AK	<450	–
	–	150
	–	175
	–	–
	–	–
	1.88	–
	<1	–
AJ	<450	–
	–	150
	–	125
	–	–
	–	–
	–	–
	–	–

1

AS	<450	–
	–	150
	–	200
	–	–
	–	–
	1.50	–
	<1	–
AR	<450	–
	–	150
	–	150
	–	–
	–	–
	–	–
	–	–
AQ	<450	–
	–	150
	–	125
	–	–
	–	–
	1.69	–
	<1	–
AP	<450	–
	–	150
	–	125
	–	–
	–	–
	–	–
	–	–
AO	<450	–
	–	150
	–	150
	–	–
	–	–
	1.51	–
	<1	–

1

AX	<450	–
	–	150
	–	150
	–	–
	–	–
	–	–
	–	–
AW	<450	–
	–	150
	–	150
	–	–
	–	–
	1.11	–
	<1	–
AV	<450	–
	–	150
	–	150
	–	–
	–	–
	–	–
	–	–
AU	<450	–
	–	150
	–	150
	–	–
	–	–
	1.86	–
	<1	–
AT	<450	–
	–	150
	–	150
	–	–
	–	–
	–	–
	–	–

1

Sample Data

<450 – IM-247/PD Results [μμCi/20cm²]
200 – IM-253/PD (HV-1 PHA) [bkg.]
300 – IM-253/PD (HV-1 PHA) [cpm]
7000 – IM-253/PD (HV-2 GROSS) [bkg.]
7300 – IM-253/PD (HV 2 GROSS) [cpm]
1.82 – MCA Gross Gamma Eq. Co-60 [pCi/g]
<1 – MCA Specific Co-60 Results [pCi/g]

1. Pier Y

e. Localized Grid Maps

BC	<450	–
	–	150
	–	150
	–	–
	–	–
	1.43	–
	<1	–
BB	<450	–
	–	150
	–	200
	–	–
	–	–
	–	–
	–	–
BA	<450	–
	–	150
	–	150
	–	–
	–	–
	1.30	–
	<1	–
AZ	<450	–
	–	150
	–	200
	–	–
	–	–
	–	–
	–	–
AY	<450	–
	–	150
	–	150
	–	–
	–	–
	1.42	–
	<1	–

1

BH	<450	–
	–	150
	–	150
	–	–
	–	–
	–	–
	–	–
BG	<450	–
	–	150
	–	150
	–	–
	–	–
	1.80	–
	<1	–
BF	<450	–
	–	150
	–	150
	–	–
	–	–
	–	–
	–	–
BE	<450	–
	–	150
	–	150
	–	–
	–	–
	1.14	–
	<1	–
BD	<450	–
	–	150
	–	150
	–	–
	–	–
	–	–
	–	–

1

BM	<450	–
	–	150
	–	150
	–	–
	–	–
	1.26	–
	<1	–
BL	<450	–
	–	150
	–	150
	–	–
	–	–
	–	–
	–	–
BK	<450	–
	–	150
	–	150
	–	–
	–	–
	1.79	–
	<1	–
BJ	<450	
	–	150
	–	150
	–	–
	–	–
	–	–
	–	–
BI	<450	–
	–	150
	–	250
	–	–
	–	–
	1.75	–
	<1	–

1

BR	<450	–
	–	150
	–	100
	–	–
	–	–
	–	–
	–	–
BQ	<450	–
	–	150
	–	150
	–	–
	–	–
	1.91	–
	<1	–
BP	<450	–
	–	150
	–	150
	–	–
	–	–
	–	–
	–	–
BO	<450	–
	–	150
	–	100
	–	–
	–	–
	1.42	–
	<1	–
BN	<450	–
	–	150
	–	150
	–	–
	–	–
	–	–
	–	–

1

BW	<450	–
	–	150
	–	100
	–	–
	–	–
	–	–
	1.38	–
	<1	–
BV	<450	–
	–	150
	–	150
	–	–
	–	–
	–	–
	–	–
BU	<450	–
	–	150
	–	100
	–	–
	–	–
	1.11	–
	<1	–
BT	<450	–
	–	150
	–	100
	–	–
	–	–
	–	–
	–	–
BS	<450	–
	–	150
	–	100
	–	–
	–	–
	1.30	–
	<1	–

1

Sample Data

< 450 – IM-247/PD Results [$\mu\mu$Ci/20cm^2]
200 – IM-253/PD (HV-1 PHA) [bkg.]
300 – IM-253/PD (HV-1 PHA) [cpm]
7000 – IM-253/PD (HV-2 GROSS) [bkg.]
7300 – IM-253/PD (HV-2 GROSS) [cpm]
1.82 – MCA Gross Gamma Eq. Co-60 [pCi/g]
<1 – MCA Specific Co-60 Results [pCi/g]

1. Pier Y

e. Localized Grid Maps

CB	<450	–
	–	150
	–	100
	–	–
	–	–
	–	–
	–	–
CA	<450	–
	–	150
	–	100
	–	–
	–	–
	1.41	–
	<1	–
BZ	<450	–
	–	150
		100
	–	–
	–	–
	–	
	–	–
BY	<450	–
	–	150
	–	100
	–	–
	–	–
	1.23	–
	<1	–
BX	<450	–
	–	150
	–	100
	–	–
	–	–
	–	–
	–	–

1

CG	<450	–
	–	150
	–	100
	–	–
	–	–
	1.87	–
	<1	–
CF	<450	–
	–	150
	–	125
	–	–
	–	–
	–	–
	–	–
CE	<450	–
	–	150
	–	100
	–	–
	–	–
	1.33	–
	<1	–
CD	<450	–
	–	150
	–	150
	–	–
	–	–
	–	–
	–	–
CC	<450	–
	–	150
	–	100
	–	–
	–	–
	1.40	–
	<1	–

1

CL	<450	–
	–	150
	–	100
	–	–
	–	–
	–	–
	–	–
CK	<450	–
	–	150
	–	250
	–	–
	–	–
	1.62	–
	<1	–
CJ	<450	–
	–	150
	–	150
	–	–
	–	–
	–	–
	–	–
CI	<450	–
	–	150
	–	100
	–	–
	–	–
	1.85	–
	<1	–
CH	<450	–
	–	150
	–	125
	–	–
	–	–
	–	–
	–	–

1

CQ	<450	–
	–	150
	–	100
	–	–
	–	–
	1.81	–
	<1	–
CP	<450	–
	–	150
	–	100
	–	–
	–	–
	–	–
	–	–
CO	<450	–
	–	150
	–	200
	–	–
	–	–
	1.12	–
	<1	–
CN	<450	–
	–	150
	–	100
	–	–
	–	–
	–	–
	–	–
CM	<450	–
	–	150
	–	150
	–	–
	–	–
	1.90	–
	<1	–

1

CV	<450	–
	–	150
	–	100
	–	–
	–	–
	–	–
	–	–
CU	<450	–
	–	150
	–	100
	–	–
	–	–
	1.12	–
	<1	–
CT	<450	–
	–	150
	–	100
	–	–
	–	–
	–	–
	–	–
CS	<450	–
	–	150
	–	100
	–	–
	–	–
	1.62	–
	<1	
CR	<450	–
	–	150
	–	100
	–	–
	–	–
	–	–
	–	–

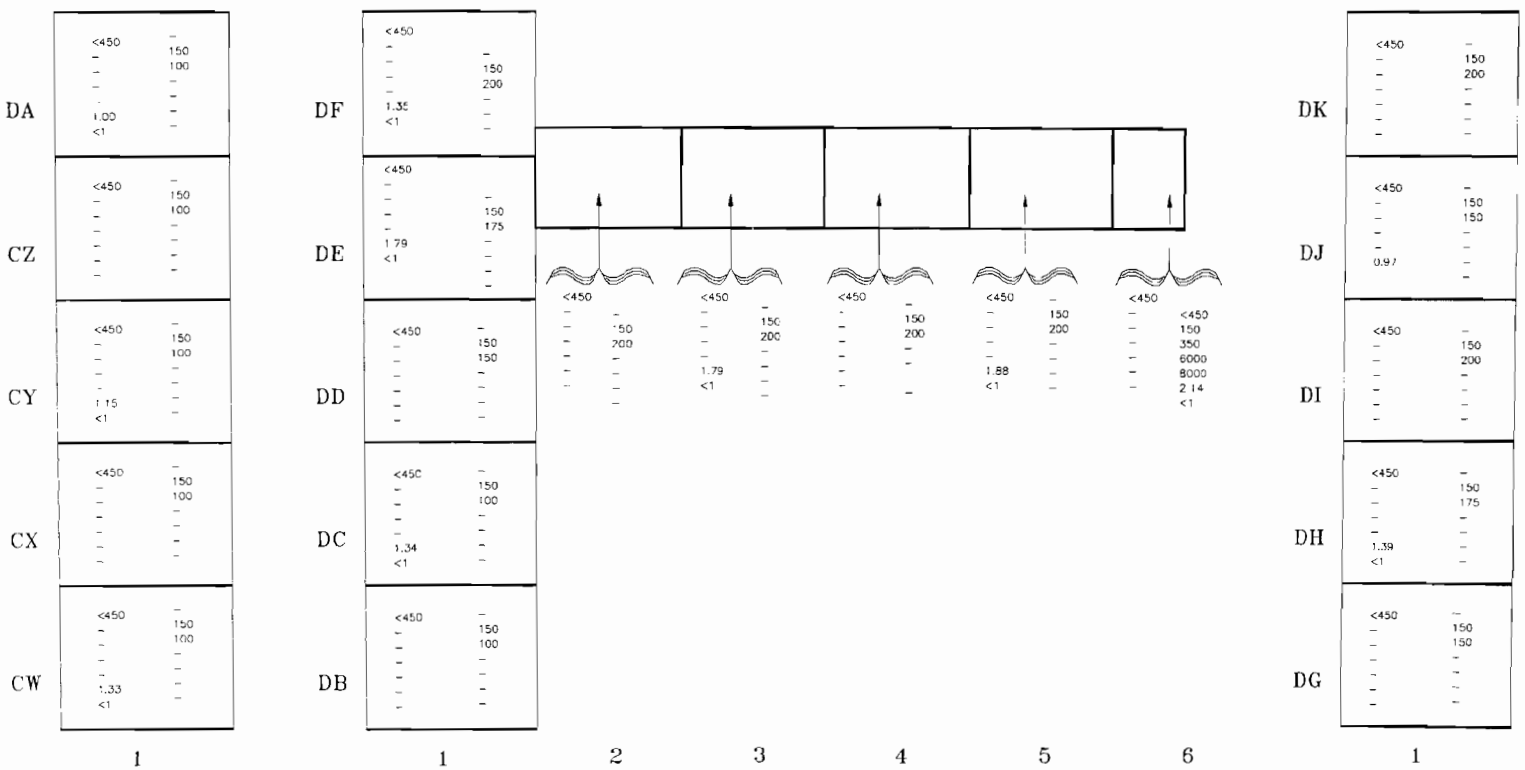
1

Sample Data

<450 – IM-247/PD Results [μCi/20cm^2]
200 – IM-253/PD (HV-1 PHA) [bkg.]
300 – IM-253/PD (HV-1 PHA) [cpm]
7000 – IM-253/PD (HV-2 GROSS) [bkg.]
7300 – IM-253/PD (HV-2 GROSS) [cpm]
1.82 – MCA Gross Gamma Eq. Co-60 [pCi/g]
<1 – MCA Specific Co-60 Results [pCi/g]

1. Pier Y

e. Localized Grid Maps

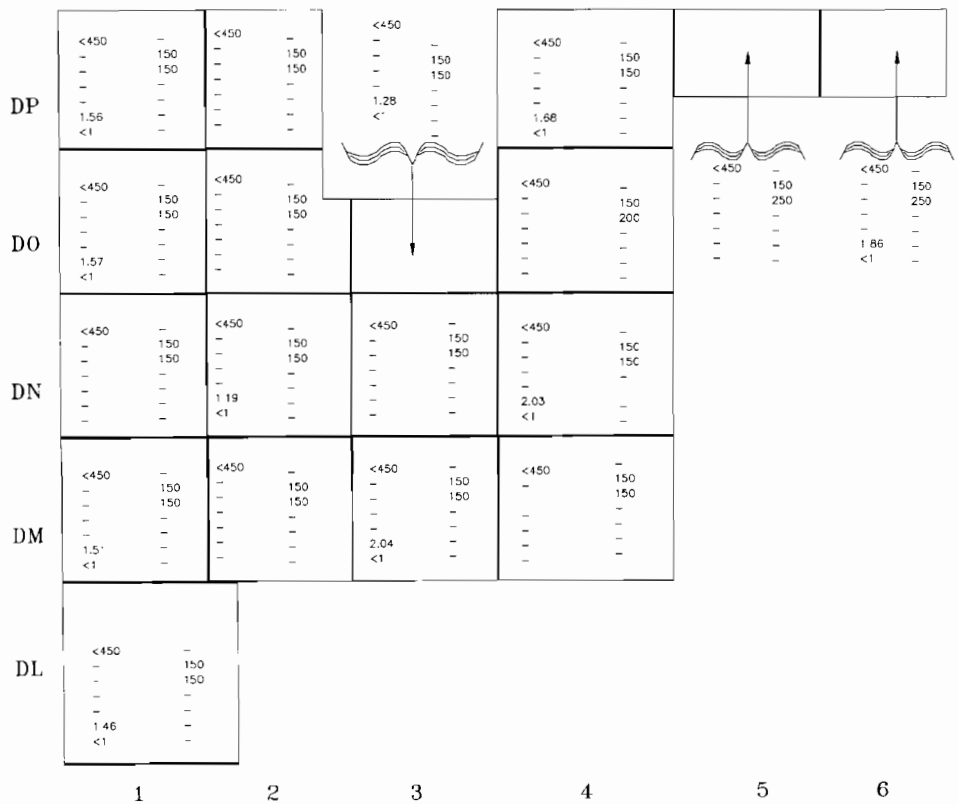


Sample Data

<450 – IM-247/PD Results [μμCi/20cm²]
200 – IM-253/PD (HV-1 PHA) [pkg.]
330 – IM-253/PD (HV-1 PHA) [cpm]
7000 – IM-253/PD (HV-2 GROSS) [pkg.]
7300 – IM-253/PD (HV-2 GROSS) [cpm]
1.82 – MCA Gross Gamma Eq. Co-60 [pCi/g]
<1 – MCA Specific Co-60 Results [pCi/g]

1. Pier Y

e. Localized Grid Maps

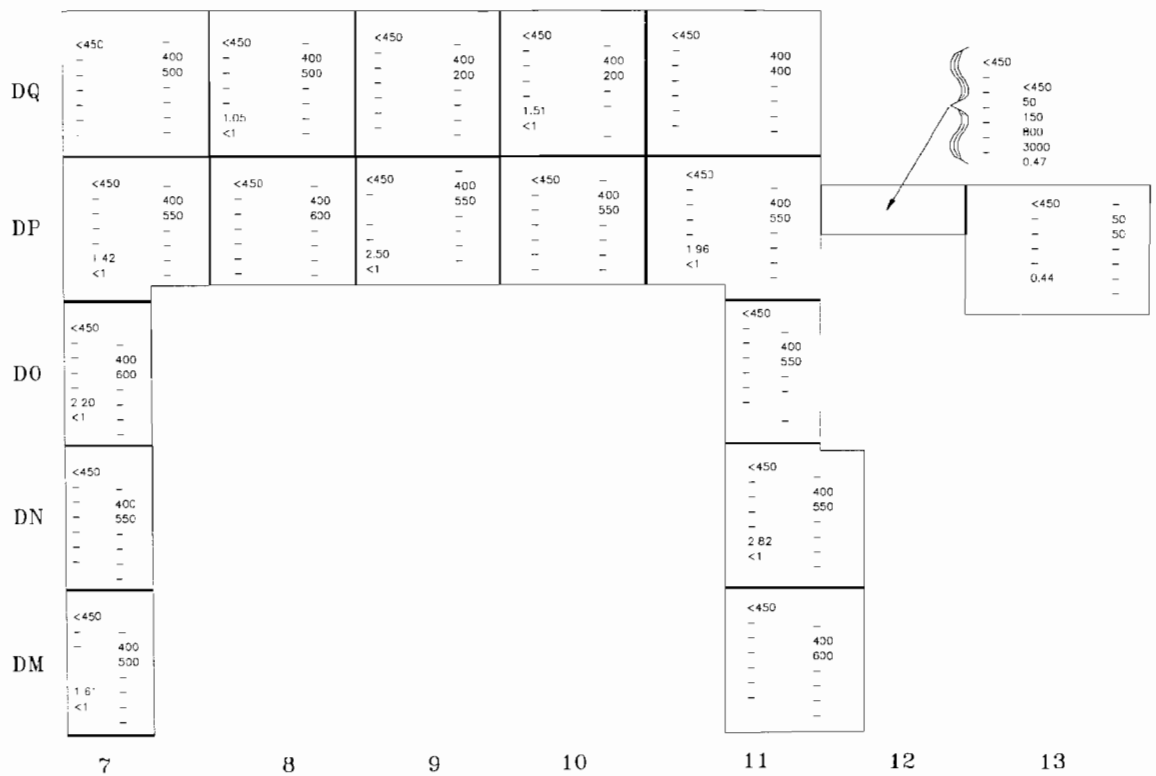


Sample Data

<450 – IM-247/PD Results [μμCi/20cm²]
200 – IM-253/PD (HV-1 PHA) [bkg.]
300 – IM-253/PD (HV-1 PHA) [cpm]
7000 – IM-253/PD (HV-2 GROSS) [bkg.]
7300 – IM-253/PD (HV-2 GROSS) [cpm]
1.82 – MCA Gross Gamma Eq. Co-60 [pCi/g]
<1 – MCA Specific Co-60 Results [pCi/g]

1. Pier Y

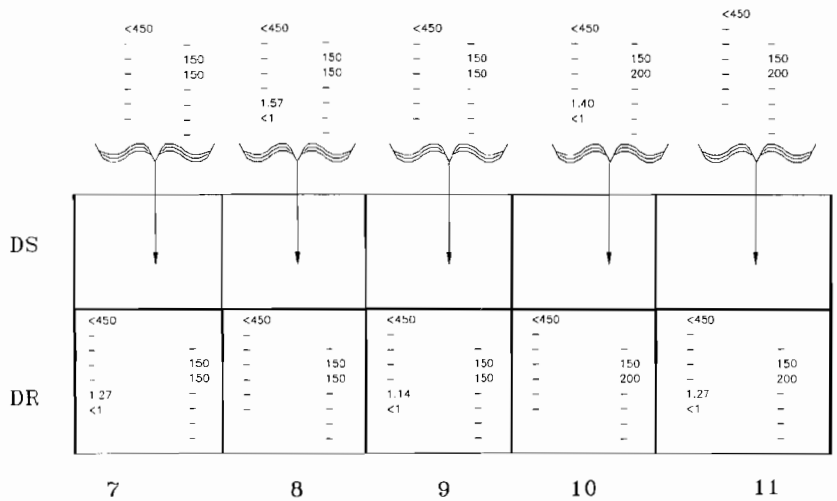
e. Localized Grid Maps



Sample Data
< 450 – IM-247/PD Results [μμC/20cm²]
200 – IM-253/PD (HV-1 PHA) [bkg]
300 – IM-253/PD (HV-1 PHA) [cpm]
7000 – IM-253/PD (HV-2 GROSS) [bkg]
7300 – IM-253/PD (HV-2 GROSS) [cpm]
1.82 – MCA Gross Gamma Eq Co-60 [pCi/g]
<1 – MCA Specific Co-60 Results [pCi/g]

1. Pier Y

e. Localized Grid Maps

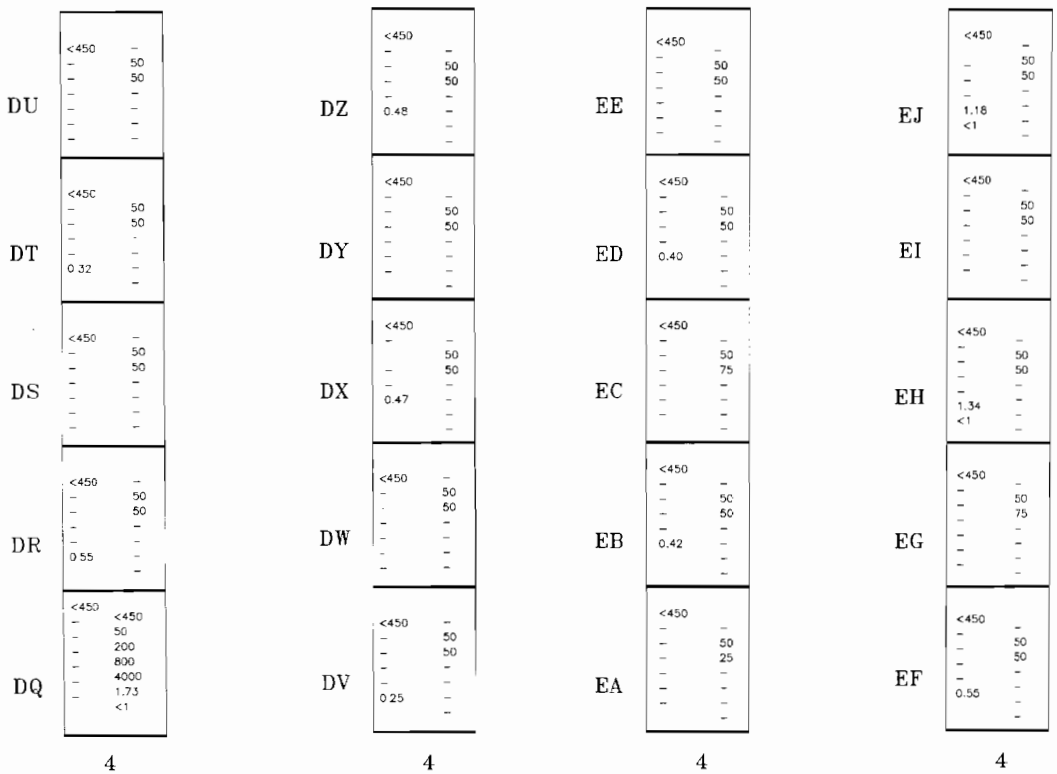


Sample Data

<450 – IM-247/PD Results [μμCi/20cm²]
200 – IM-253/PD (HV-1 PHA) [bkg.]
300 – IM-253/PD (HV-1 PHA) [cpm]
7000 – IM-253/PD (HV-2 GROSS) [bkg.]
7300 – IM-253/PD (HV-2 GROSS) [cpm]
1.82 – MCA Gross Gamma Eq. Co-60 [pCi/g]
<1 – MCA Specific Co-60 Results [pCi/g]

1. Pier Y

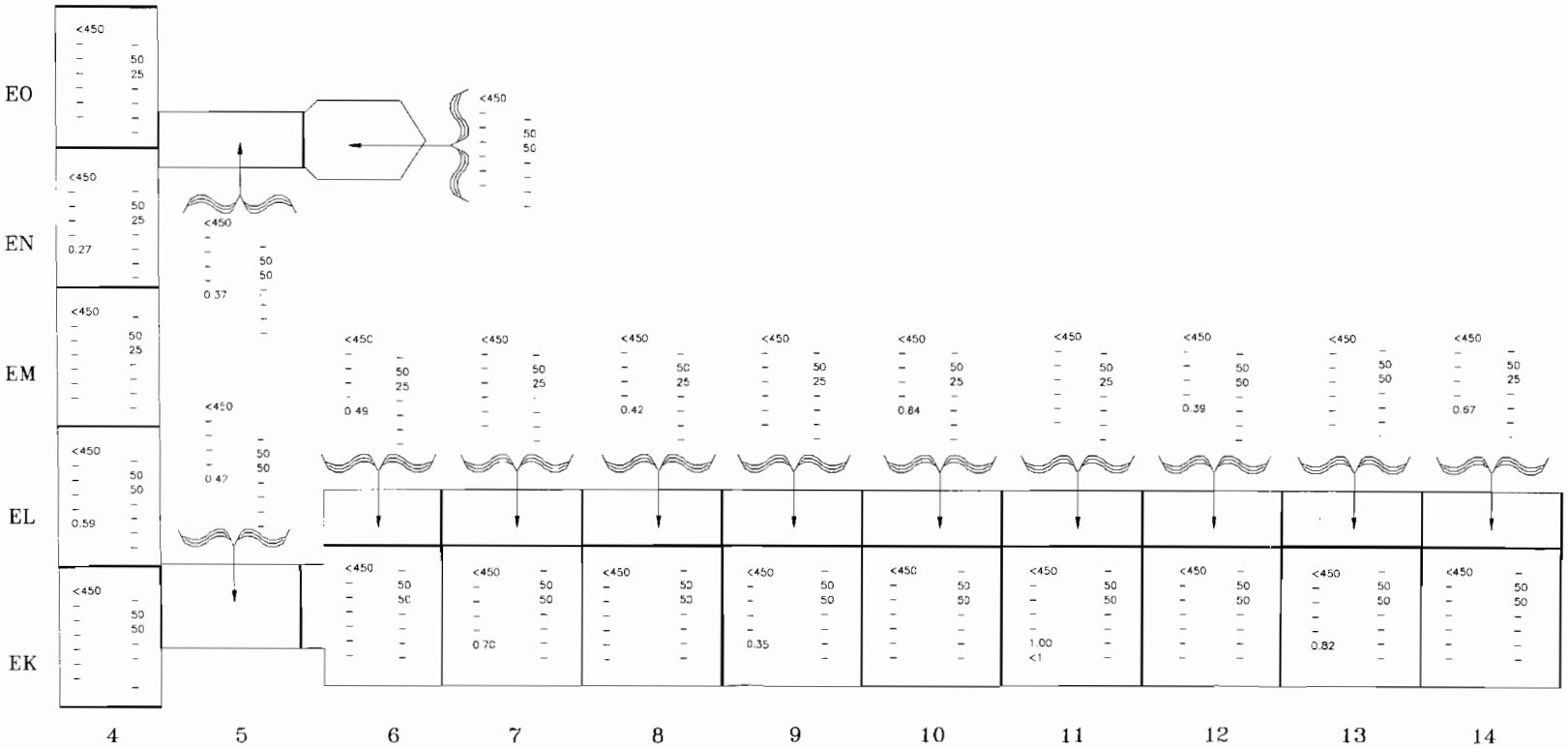
e. Localized Grid Maps



Sample Data
<450 – IM-247/PD Results (μμCi/20cm²)
200 – IM-253/PD (HV-1 PHA) (bkg.)
300 – IM-253/PD (HV-1 PHA) (cpm)
7000 – IM-253/PD (HV-2 GROSS; (bkg.)
7300 – IM-253/PD (HV-2 GROSS; (cpm)
1.82 – MCA Gross Gamma Eq. Co-60 (pCi/g)
<1 – MCA Specific Co-60 Results (pCi/g)

1. Pier Y

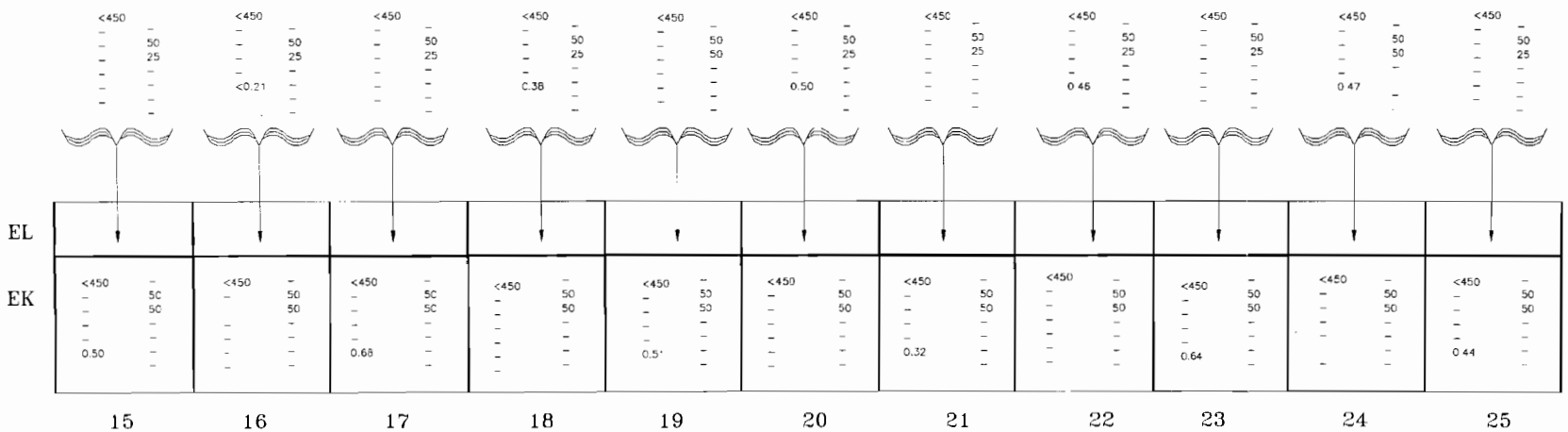
e. Localized Grid Maps



Sample Data
<450 – IM-247/PD Results [μμCi/20cm²]
200 – IM-253/PD (HV-1 PHA) [bkg.]
300 – IM-253/PD (HV-1 PHA) [cpm]
7000 – IM-253/PD (HV-2 GROSS) [bkg.]
7300 – IM-253/PD (HV-2 GROSS) [cpm]
1.82 – MCA Gross Gamma Eq. Co-60 [pCi/g]
<1 – MCA Specific Co-60 Results [pCi/g]

1. Pier Y

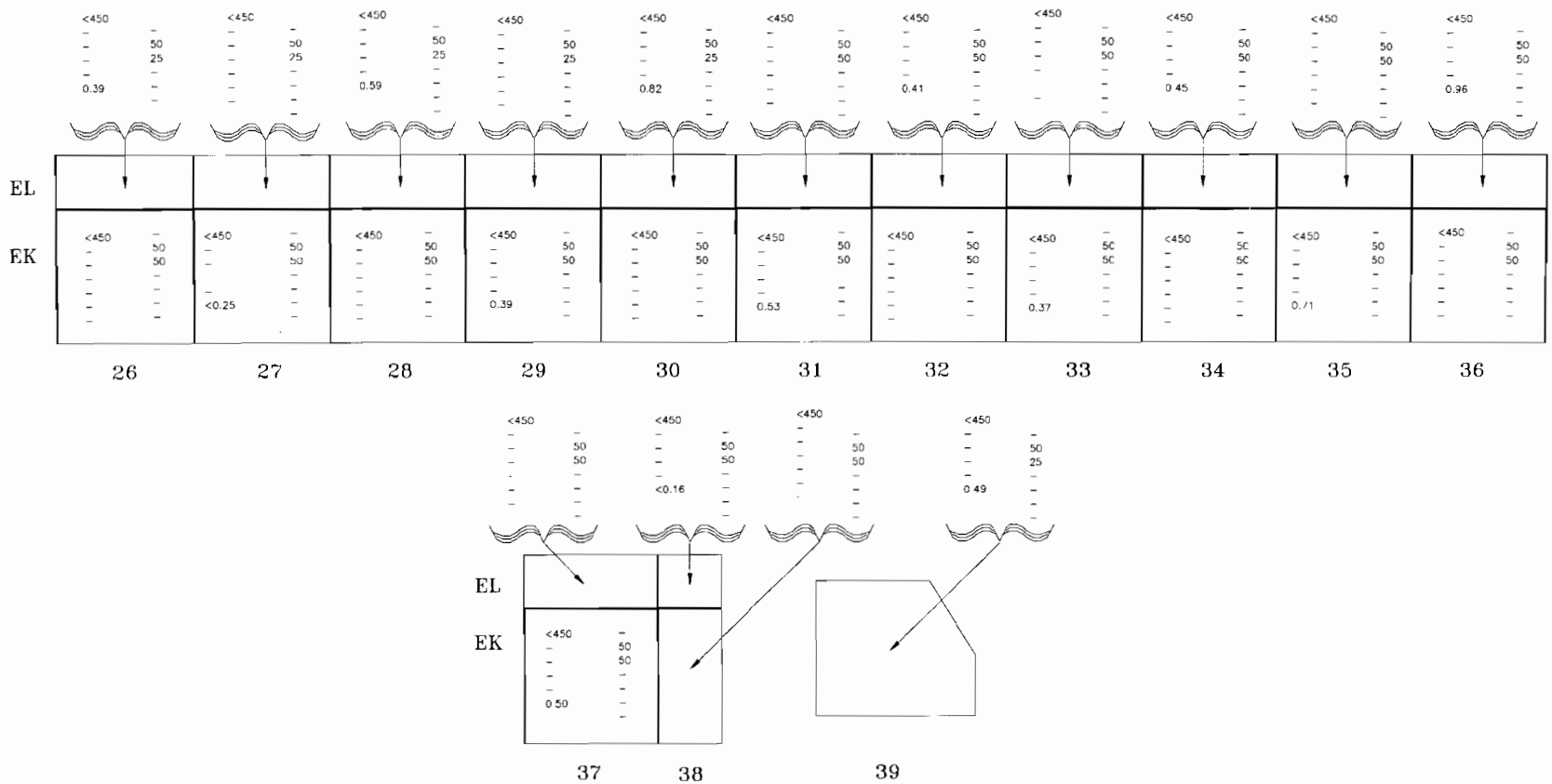
e. Localized Grid Maps



Sample Data
<450 – IM-247/PD Results [μμCi/20cm²]
200 – IM-253/PD (HV-1 PHA) [bkg.]
300 – IM-253/PD (HV-1 PHA) [cpm]
7000 – IM-253/PD (HV-2 GROSS) [bkg.]
7000 – IM-253/PD (HV-2 GROSS) [cpm]
1.82 – MCA Gross Gamma Eq. Co-60 [pCi/g]
<1 – MCA Specific Co-60 Results [pCi/g]

1. Pier Y

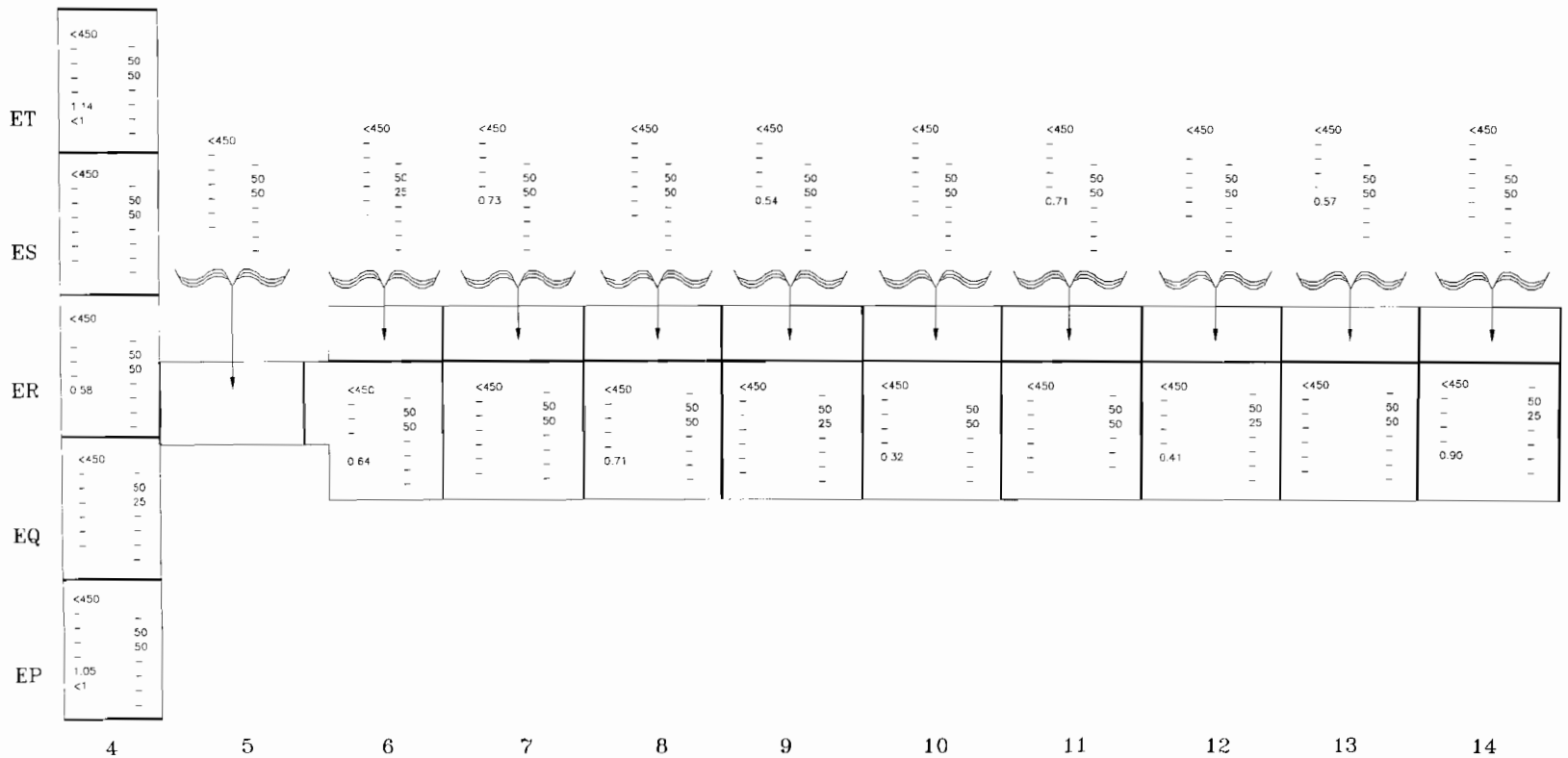
e. Localized Grid Maps



Sample Data
<450 – IM-247/PD Results [μμCi/20cm²]
200 – IM-253/PD (HV-1 PHA) [bkg.]
300 – IM-253/PD (HV-1 PHA) [cpm]
7000 – IM-253/PD (HV-2 GROSS) [bkg.]
7300 – IM-253/PD (HV-2 GROSS) [cpm]
1.82 – MCA Gross Gamma Eq Co-60 [pCi/g]
<1 – MCA Specific Co-60 Results [pCi/g]

1. Pier Y

e. Localized Grid Maps

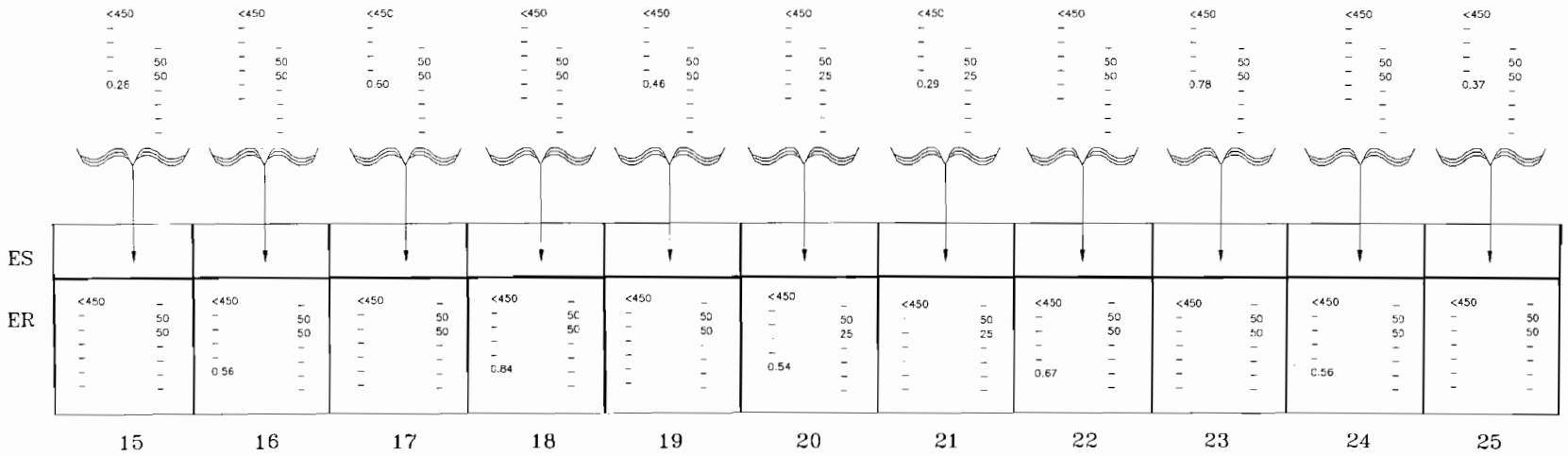


Sample Data

<450 – IM-247/PD Results [μμCi/20cm²]
200 – IM-253/PD (HV-1 PHA) [bkg.]
300 – IM-253/PD (HV-1 PHA) [cpm
7300 – IM-253/PD (HV-2 GROSS) [bkg.]
7300 – IM-253/PD (HV-2 GROSS) [cpm]
1.82 – MCA Gross Gamma Eq. Co-60 [pCi/g]
<1 – MCA Specifc Co-60 Results [pCi/g]

1. Pier Y

e. Localized Grid Maps

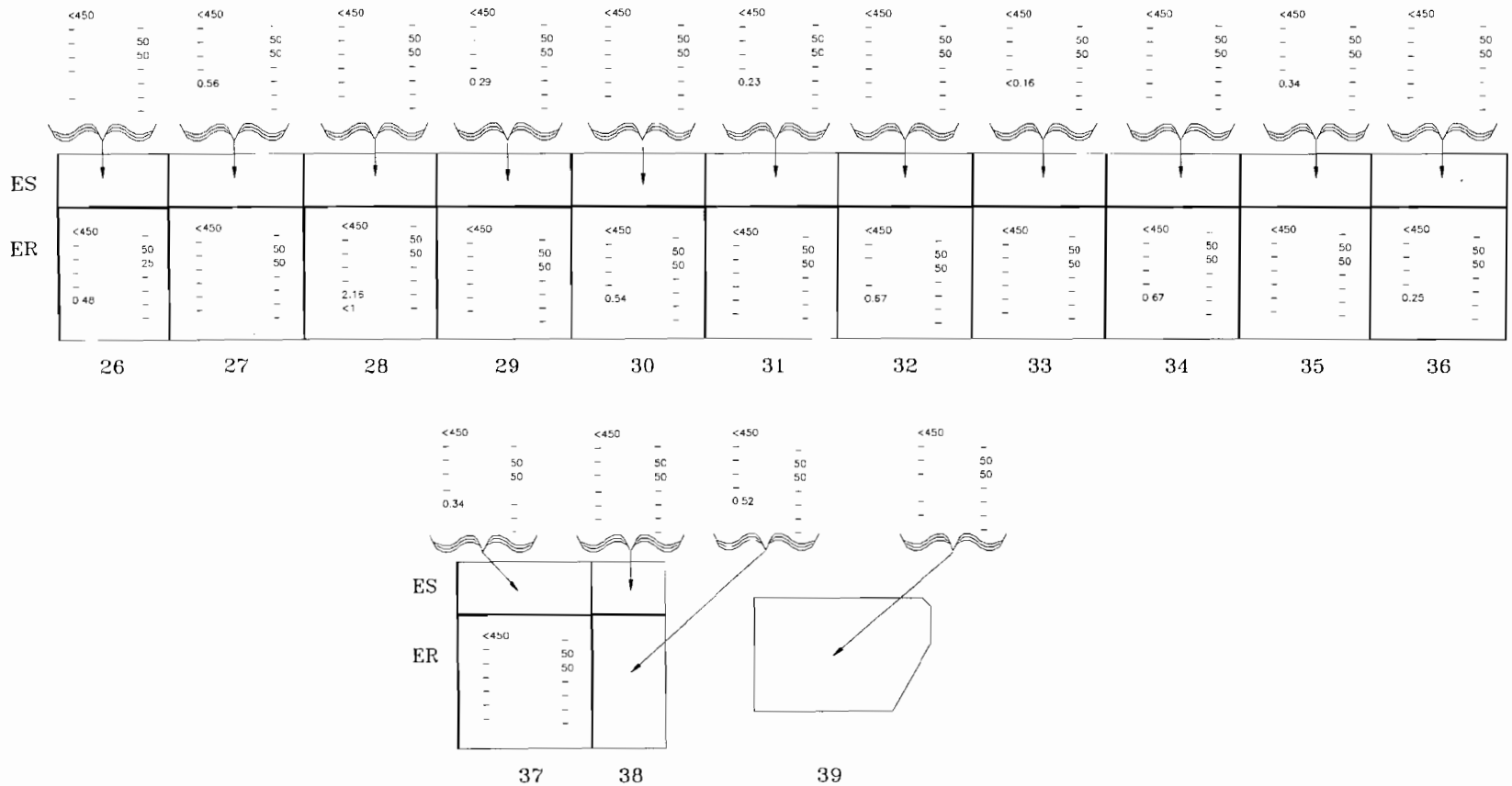


Sample Data

<450 – IM-247/PD Results [μμCi/20cm²]
200 – IM-253/PD (HV-1 PHA) [bkg.]
300 – IM-253/PD (HV-1 PHA) [cpm]
7000 – IM-253/PD (HV-2 GROSS) [bkg.]
7300 – IM-253/PD (HV-2 GROSS) [cpm]
1.82 – MCA Gross Gamma Eq. Co-60 [pCi/g]
<1 – MCA Specific Co-60 Results [pCi/g]

1. Pier Y

e. Localized Grid Maps

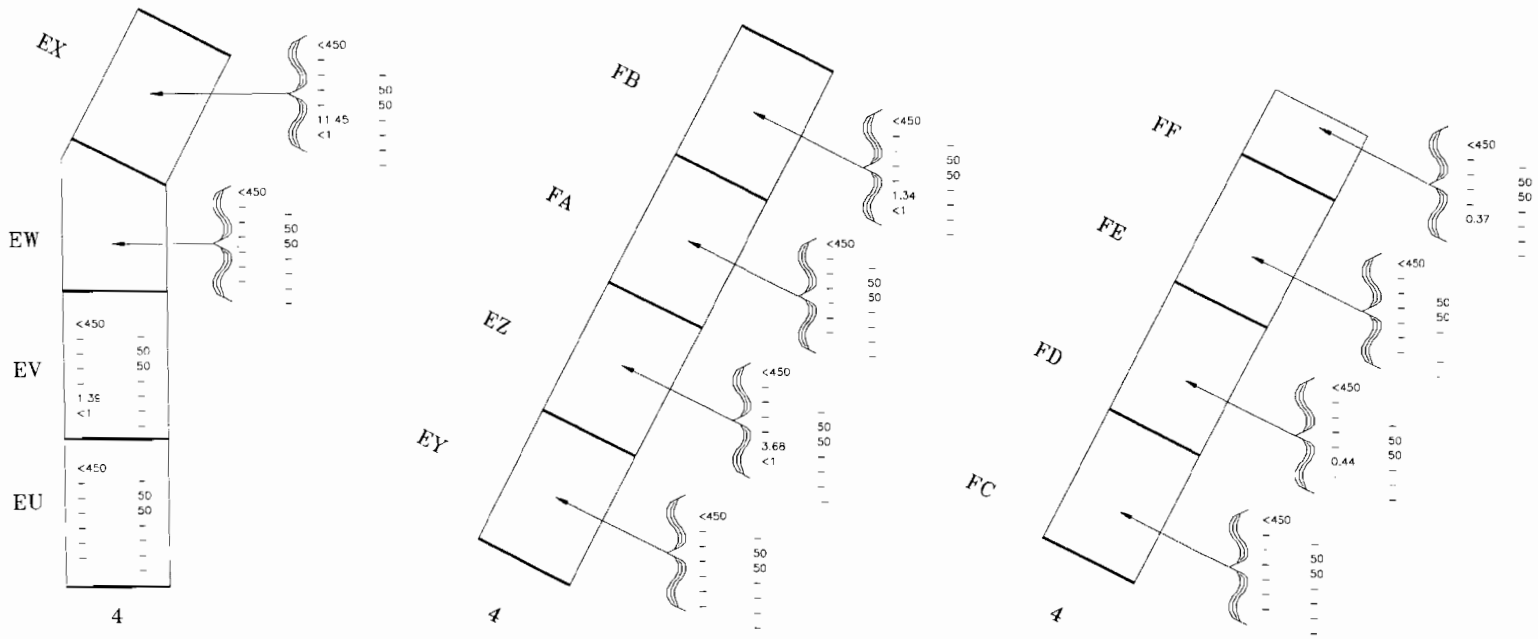


Sample Data

<450 – IM-247/PD Results [μμCi/20cm²]
200 – IM-253/PD (HV-1 PHA) [bkg.]
300 – IM-253/PD (HV-1 PHA) [cpm]
7000 – IM-253/PD (HV-2 GROSS) [bkg.]
7300 – IM-253/PD (HV-2 GROSS) [cpm]
1.82 – MCA Gross Gamma Eq. Co-60 [pCi/g]
<1 – MCA Specific Co-60 Results [pCi/g]

1. Pier Y

e. Localized Grid Maps



Sample Data
<450 – IM-247/PD Results [μμC/20cm²]
200 – IM-253/PD (HV-1 PHA) [bkg.]
300 – IM-253/PD (HV-1 PHA) [cpm]
7000 – IM-253/PD (HV-2 GROSS) [bkg.]
7300 – IM-253/PD (HV-2 GROSS) [cpm]
1.82 – MCA Gross Gamma Eq. Co-60 [pCi/g]
<1 – MCA Specific Co-60 Results [pCi/g]

1. Pier Y

f. Prior To Photographs

Head of structure 332.

1. Pier Y

f. Prior To Photographs

Midway structure 332.

1. Pier Y

f. Prior To Photographs

Viewing Bldg. 659.

1. Pier Y

g. After Photographs

Structure 332.

1. Pier Y

g. After Photographs

Structure 331.

1. Pier Y

g. After Photographs

Sample location Grid ER-4.

1. Piers R and Z

USS FRANK CABLE (AS 40) was tasked by COMSUBLANT to release Piers R and Z . FRANK CABLE developed a survey plan in conjunction with and authorized by COMSUBLANT and FRANK CABLE personnel completed the radiological surveys needed to support unrestricted release of Piers R and Z. FRANK CABLE personnel prepared and submitted to the Commander, Naval Sea System Command (Code 08R) the report, "SUMMARY REPORT FOR THE RELEASE OF PIERS R AND Z, CHARLESTON NAVAL BASE, CHARLESTON, S.C.FOR UNRESTRICTED USE" dated 22 May 1995 Ser 9210-45/0858. The following information was summarized from USS FRANK CABLE prepared report referenced above and patterned after CNSY unrestricted release reports for the purpose of consistency in report format.

a. **Introduction:** Pier R is located in grids J, K, L-26 and Pier Z is located in grids J,K, L-19 of the Charleston Naval Station map. Pier R is also identified as structure 330 and Pier Z as structure 337. A limited survey was conducted to demonstrate that no radioactivity was inadvertently carried into these areas.

(1) **Description:** Pier Z is a double decker pier constructed of concrete. Pier R is made of concrete.

(2) **Brief History:**

(a) **Use:** These piers were used to berth various naval vessels.

(b) **Radiological History:** Pier R was only used once to moor a nuclear powered vessel, the USS SCULPIN, from 12 to 15 January 1987. Pier Z was used in 1990 to moor USS HOLLAND from 27 May to 30 September and in 1992 from 30 January to 3 February and 31 March to 24 April. Pier Z was used to moor USS FRANK CABLE in1992 from 4 August to 9 November. Pier Z was never used to moor nuclear powered vessels. There are no records that indicate radioactive material transfers occurred across Pier R or Z. All radioactive repair work performed at the Charleston Naval Base was performed either on the submarine tender, or on tended submarines. No radioactive repair work was performed on Piers R and Z.

(3) **Survey Requirements:** The pier was surveyed using the techniques listed below to verify that no radioactivity associated with Naval Nuclear Propulsion was inadvertently carried into these areas.

(a) Beginning from the seaward end of each pier, and at intervals of 20', 3' by 3' areas (alternating from the right side to the left) were gridded off. The grid markings ended 40' from beyond the foot of the piers.

(b) Each grid underwent a 100% survey with a frisker (E-140N/DT-304 or equivalent) and a 100% survey with a PRM-5N/SPA-3 in both the HV1-PHA and HV1-GROSS modes. Survey results greater than two times average background with a PRM-5/SPA count-rate meter/scintillation

1. Piers R and Z

average background with a PRM-5/SPA count-rate meter/scintillation probe had to be investigated to determine the cause of the higher reading. Average background was established by measuring levels over similar materials in analogous areas of Charleston Naval Base to determine environmental factors which affected radiation levels. The sites selected for background determination had never been exposed to Naval Nuclear Propulsion Program radioactive material.

(c) One material sample was taken from the ground covering in each grid and analyzed with a multi channel analyzer.

b. Discussion: The radiation detection/indicating (radiac) and sampling equipment used by FRANK CABLE in surveying Piers R and Z, as well as the techniques employed during use of this equipment, are discussed below:

(a) Equipment Used for Performing Surveys (Beta, Gamma):

Surveys (beta-gamma contamination) were performed using a DT-304/PDR probe in conjunction with an E-140N rate meter. These surveys were performed by slowly scanning surfaces with the DT-304/PDR probe held within one-half inch of the surface to detect both loose surface and fixed radioactive contamination. Survey results are reported in micro-micro-curies/frisk (uuci/frisk). The instruments were response checked with a source of known activity each day they were in use. This check consisted of verifying that the needle of the rate meter responded correctly to a source of known value and was not merely a check to see if the meter needle moved. The instruments used were calibrated within the last six months as required by procedures.

(b) Equipment Used for Performing Gamma Scintillation Surveys:

Gamma scintillation surveys were performed using the Eberline Instrument Corporation (EIC) Model PRM-5N count rate meter with an Eberline Model SPA-3 Scintillation Probe assembly or equivalent in both the HV-1/PHA mode and HV-2/GROSS mode. These surveys were performed by slowly moving the probe over the surface with the probe held within one-half inch of the surface, scanning all vertical and horizontal surfaces. The surveyors stopped approximately every 15 seconds, or when an audible increase in the count rate warranted investigation, to measure the count rate. Results of these surveys were reported in counts per minute. The instruments were response checked with a source of known activity each day they were in use. This check consisted of verifying that the needle of the rate meter responded correctly to a source of known value and was not merely a check to see if the meter needle moved. The portable RADIAC instruments used for these surveys were calibrated within the last six months as required by NAVSEA procedures.

1. Piers R and Z

(c) Sample Gathering Techniques:

Solid samples are samples of surface material collected in plastic zip lock bags. All samples were obtained by using hand chipping tools. All solid material samples were isotopically analyzed by Charleston Naval Shipyard Radiation Health personnel.

(d) Personnel:

Personnel who performed surveys and sampling of Piers R and Z areas were given detailed training, completed a qualification program, and exercised verbatim compliance with written work procedures. Personnel qualified as Radiological Controls Monitors (RCM's) in accordance with NAVSEA 389-0153 performed the actual surveys with non-RCM's assigned to survey teams as recorders. Survey team performance was regularly monitored by supervisory radiological controls personnel and IMANPY representatives.

(e) Backgrounds:

Average background radiation levels were established each day for areas surveyed. Three individual background measurements were taken outside of the survey area and averaged to provide the background comparison count rate for the area being surveyed. Background determination locations were chosen based on materials which were consistent with materials in the area being surveyed. Background measurements were made in locations which were never exposed to radioactivity associated with the Naval Nuclear Propulsion Program. Daily background levels for PRM-5N HV1/PHA mode surveys varied between 283 and 550 cpm. PRM-5N HV2/GROSS mode backgrounds varied between 6250 and 12500 cpm. E-140N background levels varied between 56 and 80 cpm.

(f) Pier R was divided into 30 3' by 3' grids. Pier Z was divided into 126 3' by 3' grids.

(g) A total of 156 solid material samples were taken. The following naturally occurring radionuclides were typical isotopes identified during analysis of solid material samples: actinium 228, bismuth 214, lead 212, lead 214, potassium 40, radium 226, and thallium 208.

c. Summary:

Surveys performed with the IM-247/PD did not detect areas greater than 450$\mu\mu$Ci/20cm^2.

Surveys performed with the IM-253/PD (HV-1 PHA) did not detect areas greater

1. Piers R and Z

than or equal to twice background.

Surveys performed with the IM-253/PD (HV-2 GROSS) did not detect areas greater than or equal to twice background.

Analysis performed on solid material samples with the multi-channel analyzer (MCA) detected gross gamma equivalent cobalt 60 levels ranging from a low of less than 1.0 pCi/g to a high of 3.8 pCi/g.

Analysis performed on solid material samples with the MCA for specific cobalt 60, indicated that all solid material samples were less than 1 pCi/g.

CHARLESTON NAVAL BASE PIER R MATERIAL ANALYSIS DATA

	HV1/PHA (CPM)		HV2/GROSS (CPM)		E-140N (CPM)		Solid Material Samples(pCi/g)	
GRID	BKG	SURVEY	BKG	SURVEY	BKG	SURVEY	0.1-2.1 MeV	1.1-1.4 MeV
1.	283	400	7083	8000	67	80	2.0	<1
2.	283	400	7083	8500	67	70	1.8	<1
3.	283	350	7083	11500	67	70	2.0	<1
4.	283	350	7083	7000	67	80	2.3	<1
5.	283	350	7083	8000	67	70	2.0	<1
6.	283	350	7083	9000	67	80	2.8	<1
7.	283	300	7083	6500	67	80	2.8	<1
8.	283	400	7083	8000	67	70	2.1	<1
9.	283	450	7083	8500	67	80	2.3	<1
10.	350	400	7666	8000	80	70	1.4	<1
11.	350	400	7666	9000	80	70	1.5	<1
12.	325	425	7000	7750	80	70	2.0	<1
13.	350	350	7666	7500	80	70	2.1	<1
14.	542	500	12500	9000	76	70	3.2	<1
15.	350	250	7666	6750	80	60	1.8	<1
16.	542	450	12500	9000	76	70	2.2	<1
17.	350	350	7666	7500	80	60	2.6	1.0
18.	542	550	12500	15000	76	90	4.8	1.2
19.	350	450	7666	9000	80	70	3.1	1.1
20.	542	500	12500	15000	76	80	4.6	1.2
21.	350	400	7666	1000	80	70	3.3	1.0
22.	325	375	7000	7500	80	70	2.1	<1
23.	350	400	7666	9500	80	70	1.9	<1
24.	325	425	7000	7000	80	70	1.8	<1
25.	500	500	12500	10000	76	70	2.9	<1
26.	542	525	12500	12500	76	90	2.4	<1
27.	500	500	12500	12500	76	70	2.9	<1
28.	542	600	12500	15000	76	80	3.8	<1
29.	542	375	12500	7500	76	80	1.7	<1
30.	283	375	7083	9500	70	60	1.8	<1

1. Piers R and Z

CHARLESTON NAVAL BASE PIER Z MATERIAL ANALYSIS DATA

	HV1/PHA (CPM)		HV2/GROSS (CPM)		E-140N (CPM)		Solid Material Samples(pCi/g)		
GRID	BKG	SURVEY	BKG	SURVEY	BKG	SURVEY	0.1-2.1 MeV	1.1-1.4 MeV	Notes
1.	550	450	12000	15000	56	70	1.5	<1	2
2.	550	550	12500	15000	60	30	N/A	N/A	1,2
3.	550	400	12000	12500	56	80	2.1	<1	2
4.	475	325	12500	12500	60	70	1.6	<1	2
5.	500	575	12500	20000	56	40	2.2	<1	2
6.	550	500	12500	15000	60	40	2.0	<1	2
7.	550	400	12000	12500	56	60	1.6	<1	2
8.	475	375	12500	12500	60	70	2.3	<1	2
9.	550	450	12000	15000	56	80	1.5	<1	2
10.	475	325	12500	12500	60	80	1.9	<1	2
11.	500	500	12500	17500	56	30	1.9	<1	2
12.	550	550	12500	15000	60	60	2.2	<1	2
13.	550	450	12000	15000	56	80	1.4	<1	2
14.	475	350	12500	12500	60	80	2.6	<1	2
15.	500	525	12500	17500	56	40	1.9	<1	2
16.	550	500	12000	15000	60	50	2.2	<1	2
17.	550	400	12000	12500	56	80	2.0	<1	2
18.	475	350	12500	12500	60	80	2.5	<1	2
19.	500	500	12500	17500	56	40	1.9	<1	2
20.	550	500	12000	15000	60	40	2.5	<1	2
21.	550	550	12000	14000	60	40	2.5	<1	2
22.	475	350	12500	12500	60	80	1.9	<1	2
23.	500	450	12500	15000	60	80	1.7	<1	2
24.	500	475	12500	12500	56	90	1.6	<1	2
25.	500	400	12500	17500	60	80	2.8	1.0	2
26.	500	600	12500	15000	56	90	1.5	<1	2
27.	550	575	12000	13000	60	50	2.0	<1	2
28.	500	625	12500	15000	56	90	2.4	<1	2
29.	500	450	12500	15000	60	80	2.2	<1	2
30.	500	525	12500	12500	56	80	2.6	1.0	2
31.	550	525	12000	15000	60	50	2.6	<1	2
32.	500	600	12500	15000	56	80	2.6	<1	2
33.	500	450	12500	15000	60	80	2.3	<1	2
34.	500	575	12500	15000	56	70	1.8	<1	2
35.	550	600	12000	15000	60	60	<1	<1	2
36.	500	600	12500	15000	56	70	2.0	<1	2
37.	550	600	12000	16000	60	50	2.0	<1	2

Note (1) Surface sample not taken due to grid being metal grating.
Note (2) Different Background levels taken due to differences in construction materials containing naturally occurring radioactivity.

1. Piers R and Z

	HV1/PHA (CPM)		HV2/GROSS (CPM)		E-140N (CPM)		Solid Material Samples(pCi/g)		
GRID	BKG	SURVEY	BKG	SURVEY	BKG	SURVEY	0.1-2.1 MeV	1.1-1.4 MeV	Notes
38.	500	625	12500	15000	56	80	2.2	<1	2
39.	500	550	12500	20000	60	90	2.6	<1	2
40.	500	600	12500	15000	56	80	2.3	<1	2
41.	500	450	12500	15000	60	80	2.2	<1	2
42.	500	625	12500	15000	56	80	2.1	<1	2
43.	550	550	12000	15000	60	60	2.2	<1	2
44.	500	600	12500	15000	56	60	2.2	<1	2
45.	550	500	12000	12500	60	50	2.4	<1	2
46.	500	600	12500	15000	56	80	2.2	<1	2
47.	500	425	12500	14000	60	50	1.8	<1	2
48.	500	600	12500	12500	56	80	2.4	<1	2
49.	500	475	12500	16000	60	50	2.3	<1	2
50.	500	575	12500	12500	56	80	2.4	1.2	2
51.	550	575	12000	14000	60	70	2.4	<1	2
52.	500	575	12500	15000	56	70	2.4	<1	2
53.	500	400	12500	14000	60	50	1.1	<1	2
54.	500	575	12500	15000	56	70	2.4	<1	2
55.	550	575	12000	14000	60	50	2.0	<1	2
56.	500	350	12500	14000	60	80	1.8	<1	2
57.	500	525	12500	16000	60	40	2.3	<1	2
58.	500	450	12500	17000	60	70	2.7	1.2	2
59.	550	550	12000	12000	60	60	1.9	1.2	2
60.	550	550	12000	13000	60	70	1.5	1.0	2
61.	500	450	12500	12000	60	60	2.4	<1	2
62.	550	550	12000	13000	60	70	2.8	<1	2
63.	550	450	12000	12000	60	60	1.6	<1	2
64.	550	500	12000	12000	60	80	2.8	1.0	2
65.	500	350	12500	7000	60	80	3.1	1.0	2
66.	550	450	12000	10000	60	80	1.8	<1	2
67.	550	450	12000	11000	60	50	3.4	<1	2
68.	350	350	6250	7000	60	80	3.2	1.5	
69.	350	400	6250	7500	56	60	1.6	<1	
70.	350	375	6250	7000	60	50	1.8	<1	
71.	350	400	6250	7500	60	60	2.0	<1	
72.	350	350	6250	6500	60	60	1.4	<1	
73.	350	300	6250	7000	60	80	2.4	<1	
74.	350	325	6250	6250	60	60	1.8	<1	
75.	350	350	6250	6500	56	60	2.3	<1	
76.	350	350	6250	7000	60	60	2.8	<1	
77.	350	325	6250	6250	60	60	2.0	<1	
78.	350	275	6250	6000	60	60	2.2	<1	

Note (2) Different Background levels taken due to differences in construction materials containing naturally occurring radioactivity.

1. Piers R and Z

	HV1/PHA (CPM)		HV2/GROSS (CPM)		E-140N (CPM)		Solid Material Samples(pCi/g)		
GRID	BKG	SURVEY	BKG	SURVEY	BKG	SURVEY	0.1-2.1 MeV	1.1-1.4 MeV	Notes
79.	350	300	6250	7000	60	80	1.7	<1	
80.	350	350	6250	6000	60	60	2.6	<1	
81.	350	350	6250	6250	56	60	2.3	<1	
82.	350	375	6250	6000	60	70	1.7	<1	
83.	350	300	6250	7000	60	80	1.5	<1	
84.	350	350	6250	7250	60	60	2.7	<1	
85.	350	350	6250	6250	60	60	2.0	<1	
86.	350	425	6250	6250	60	60	1.8	<1	
87.	350	350	6250	6000	56	50	2.2	1.0	
88.	350	350	6250	6000	60	50	2.4	1.0	
89.	350	300	6250	7000	60	80	2.0	<1	
90.	350	400	6250	6250	60	60	2.1	<1	
91.	350	350	6250	7000	60	60	2.9	<1	
92.	350	350	6250	6500	60	60	2.1	<1	
93.	350	350	6250	6500	56	60	2.7	<1	
94.	350	350	6250	6500	60	60	2.2	<1	
95.	350	250	6250	7250	60	90	2.6	1.0	
96.	350	425	6250	6500	60	80	2.2	<1	
97.	350	375	6250	7000	60	60	2.1	<1	
98.	350	350	6250	6000	60	60	2.0	<1	
99.	350	350	6250	6000	56	50	2.2	<1	
100.	350	450	6250	7250	60	80	2.0	<1	
101.	350	300	6250	7250	60	80	2.7	<1	
102.	350	400	6250	7250	60	70	1.7	<1	
103.	350	425	6250	10000	60	60	2.5	<1	
104.	350	500	6250	9500	60	60	2.6	<1	
105.	350	350	6250	7500	60	80	2.6	<1	
106.	350	400	6250	7500	60	70	2.2	<1	
107.	350	300	6250	6000	56	50	2.5	<1	
108.	350	400	6250	6750	60	50	2.5	<1	
109.	350	400	6250	6500	60	60	2.3	1.0	
110.	350	350	6250	6750	60	60	2.4	<1	
111.	350	350	6250	7250	56	60	2.0	1.2	
112.	350	300	6250	7000	60	60	2.3	<1	
113.	350	350	6250	6750	60	70	2.8	1.0	
114.	350	450	6250	7750	60	80	2.3	<1	
115.	350	225	6250	7000	60	60	3.5	1.4	
116.	350	400	6250	7250	60	50	2.6	<1	
117.	350	375	6250	8000	60	60	2.2	<1	
118.	350	350	6250	7250	60	70	2.0	<1	
119.	350	350	6250	7250	56	50	2.9	1.1	
120.	350	400	6250	9000	60	60	2.6	<1	
121.	350	375	6250	7500	60	70	2.4	<1	
122.	350	425	6250	9250	60	70	2.9	<1	

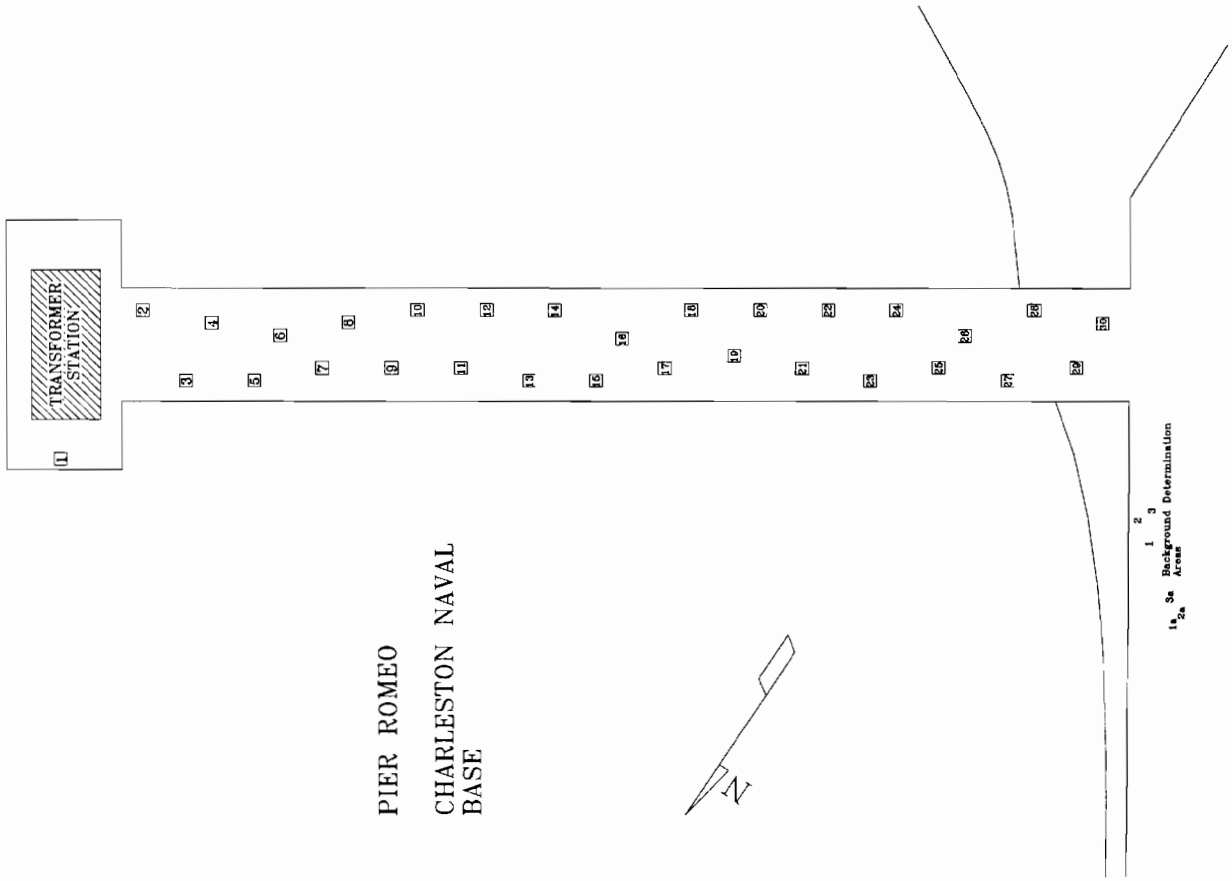
1. Piers R and Z

	HV1/PHA (CPM)		HV2/GROSS (CPM)		E-140N (CPM)		Solid Material Samples(pCi/g)		
GRID	BKG	SURVEY	BKG	SURVEY	BKG	SURVEY	0.1-2.1 MeV	1.1-1.4 MeV	Notes
123.	350	375	6250	8000	60	60	1.5	<1	
124.	350	425	6250	9000	60	60	1.9	<1	
125.	350	350	6250	7500	56	50	2.9	<1	
126.	350	400	6250	8000	60	60	2.2	<1	

All material samples were isotopically analyzed by Charleston Naval Shipyard Radiation Health personnel, and no detectable cobalt 60 was found in any sample (no cobalt 60 photo peaks were observed). All of the samples were found to contain naturally occurring radioactivity, including actinium 228, bismuth 214, lead 212, lead 214, potassium 40, radium 226 and thallium 208, none of which are associated with Naval Nuclear Propulsion Program operations.

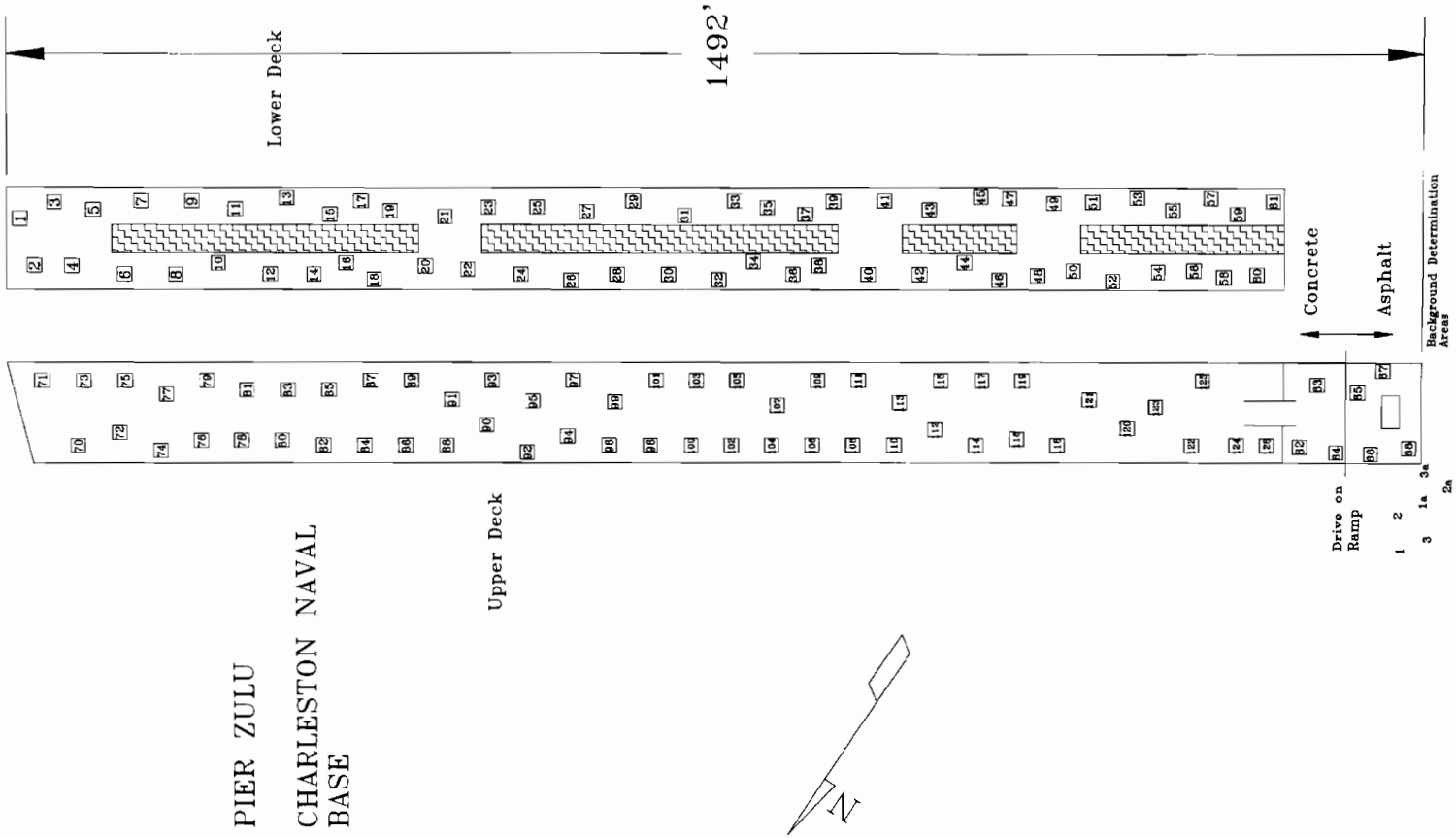
1. Piers R and Z

d. Site Map, Pier Romeo



1. Piers R and Z

d. Site Map, Pier Zulu



1. Piers R and Z

e. After Photographs, Pier Romeo

Viewing East

1. Piers R and Z

e. After Photographs, Pier Romeo

Viewing East

1. Piers R and Z

e. After Photographs, Pier Romeo

Viewing west

1. Piers R and Z

e. After Photographs, Pier Romeo

Viewing West

1. Piers R and Z

e. After Photographs, Pier Zulu

Viewing from Pier Mike

1. Piers R and Z

e. Piers R and Z

Parking Lot viewing west

1. Piers R and Z

e. After Photographs, Pier Zulu

Upper deck viewing east

1. Piers R and Z

e. After Photographs, Pier Zulu

Lower deck viewing west

1. Piers R and Z

e. After Photographs, Pier Zulu

Lower deck viewing west

1. Piers R and Z

e. After Photographs, Pier Zulu

Lower deck

2.1 Building 641

USS FRANK CABLE (AS 40) was tasked by COMSUBLANT to release Buildings 641, 646, 646A, and FBM-61. FRANK CABLE developed a survey plan in conjunction with and authorized by COMSUBLANT and FRANK CABLE personnel completed the radiological surveys needed to support unrestricted release of Buildings 641, 646, 646A, and FBM-61. FRANK CABLE personnel prepared and submitted to the Commander, Naval Sea System Command (Code 08R) the reports, "SUMMARY REPORT FOR THE RELEASE OF BUILDING 641, CHARLESTON NAVAL STATION, CHARLESTON, S.C. FOR UNRESTRICTED USE" dated 21 Mar 1995 Ser 9210-45/0514 and "SUMMARY REPORT FOR THE RELEASE OF BUILDINGS 646, 646A, and FBM-61 CHARLESTON NAVAL STATION, CHARLESTON, S.C. FOR UNRESTRICTED USE" dated 25 Aug 1994 Ser 9210-45/1229. The following information was summarized from USS FRANK CABLE prepared reports referenced above and patterned after CNSY unrestricted release reports for the purpose of consistency in report format.

a. Introduction:

Building 641 located on Charleston Naval Station, Charleston, S.C. has been classified as a Group 1 Area.

(1) Description:

Building 641 is a single story warehouse type structure with cement block walls, a concrete floor and a sheet metal roof. The interior has been partitioned into offices and a storage area using wood framing, wall board and a suspended ceiling.

(2) Brief History:

(a) **Use:** Building 641 has been used by Submarine Squadron FOUR personnel for shore-based administrative office space. Portions of Building 641 were used for the training and administration of Naval Nuclear Propulsion Program personnel.

(b) **Radiological History:** Building 641 has never been used for radioactive material storage, radioactive repair work or as a radioactive material transfer route, but the building was frequented by nuclear qualified personnel.

b. Discussion:

Group 1 surveys were performed using CNSY Radiological Engineering Division Group 1 Survey Instructions. Surveys were performed using the DT-304/PDR probe in conjunction with an E-140N or RAM 3400 and the PRM-5N/SPA-3 (HV-1 PHA and HV-2 GROSS). A direct scan survey of surfaces requiring investigation was performed using a E-140N or RAM 3400 with DT-304/PDR Probe. A 100 percent survey was performed of the general area, along with

2.1 Building 641

detailed surveys of approximately one-third of desks, lockers, drawers and their associated contents using the PRM-5N/SPA-3 operating in the HV1-PHA mode. A 25 percent survey was performed of areas and contents using the HV2-Gross mode. Any significant indications equal to or greater than two times average background were thoroughly investigated by performing additional surveys with the IM-247/PD, PRM-5N/SPA (HV-1 PHA and HV-2 GROSS Mode), and by removing solid material samples. No twice background areas were found, therefore no solid material samples were required to be taken.

The IM-247/PD and the IM-253/PD (HV-1 PHA and HV-2 GROSS) pre-determined backgrounds were set by measuring levels in similarly constructed buildings in areas not normally traversed by nuclear qualified personnel.

Actual backgrounds used were established each day for each area where surveys were performed. Five individual background measurements were taken in the survey area and averaged to provide the background comparison count rate for the area being surveyed, or background levels were taken in areas away from Naval Nuclear Propulsion Program personnel administration or training areas. Where necessary, background determination locations were chosen based on construction materials which were consistent with construction materials in the area being surveyed.

c. Summary:

Surveys performed in accordance with the Group 1 survey requirements did not detect any radioactivity associated with the Naval Nuclear Propulsion Program, thus no additional surveys or decontamination work were required as a result of these surveys.

2.2 Buildings 646, 646A, and FBM-61

a. Introduction:

Buildings 646, 646A, and FBM-61 located on Charleston Naval Station, Charleston, S.C. has been classified as a Group 1 Area.

(1) **Description:**

Buildings 646 and 646A are three story brick and concrete structures. The interior of both buildings has been partitioned into office and conference rooms. Building FBM-61 is a large three story brick veneer structure with cement block walls, concrete floors, and concrete roof.

(2) **Brief History:**

(a) **Use:** Buildings 646 and 646A and portions of building FBM-61 were used for the training administration of Naval Nuclear Propulsion Program personnel consisting of submarine, squadron and group staff personnel. In Building FBM-61 only common areas and spaces which were used for training Naval Nuclear Propulsion Program personnel were searched. Janitorial and maintenance spaces, and spaces not used for the training were not searched.

(b) **Radiological History:** Buildings 646, 646A, and FBM-61 were not used for radioactive work, as transfer routes for radioactive material, or for handling or storage of radioactive material associated with the Naval Nuclear Propulsion Program, and were evaluated as low potential areas for finding any program related radioactivity. Building FBM-61 required additional surveys for General Radioactive Material (GRAM). GRAM surveys were performed in the weld shop where thoriated welding rods were stored and used and in a storage locker where radioactive electron tubes were stored.

b. Discussion:

Group 1 surveys were performed using CNSY Radiological Engineering Division Group 1 Survey Instructions. Surveys were performed using the DT-304/PDR probe in conjunction with an E-140N or RAM 3400 and the PRM-5N/SPA-3 (HV-1 PHA and HV-2 GROSS). A direct scan survey of surfaces requiring investigation was performed using a E-140N or RAM 3400 with DT-304/PDR Probe. A 100 percent survey was performed of the general area, along with detailed surveys of desks, lockers, drawers and their associated contents using the PRM-5N/SPA-3 operating in the HV1-PHA mode. A 25 percent survey was

2.2 Buildings 646, 646A, and FBM-61

performed of areas and contents using the HV2-GROSS mode. Any significant indications equal to or greater than two times average background were thoroughly investigated by performing additional surveys with the IM-247/PD, PRM-5N/SPA (HV-1 PHA and HV-2 GROSS mode), and by removing solid material samples. No twice background areas were found, therefore no solid material samples were required to be taken.

Direct scan survey of equipment, welding electrode storage containers and ventilation ducting in the Weld Room were conducted using the E-140 frisker with DT-304/PDR probe. Since the main radionuclide of concern in this area was the thorium 232 contained in thoriated welding electrodes stored and used in this area the E-140N frisker and DT-304/PDR probe was selected because of its' sensitivity to the radioactive daughters of thorium 232 that are also present in materials containing thorium.

The IM-247/PD and the IM-253/PD (HV-1 PHA and HV-2 GROSS) pre-determined backgrounds were set by measuring levels in similarly constructed buildings in areas not normally traversed by nuclear qualified personnel.

Actual backgrounds used were established each day for each area where surveys were performed. Five individual background measurements were taken in the survey area and averaged to provide the background comparison count rate for the area being surveyed, or background levels were taken in areas away from Naval Nuclear Propulsion Program personnel administration or training areas. Where necessary, background determination locations were chosen based on construction materials which were consistent with construction materials in the area being surveyed.

c. Summary:

Surveys performed in accordance with the Group 1 survey requirements did not detect any radioactivity associated with the Naval Nuclear Propulsion Program, thus no additional surveys or decontamination work were required as a result of these surveys.

3. Bldg X-10

USS FRANK CABLE (AS 40) was tasked by COMSUBLANT to release Building X-10. FRANK CABLE developed a survey plan in conjunction with and authorized by COMSUBLANT and FRANK CABLE personnel completed the radiological surveys needed to support unrestricted release of Building X-10. FRANK CABLE personnel prepared and submitted to the Commander, Naval Sea System Command (Code 08R) the report, "SUMMARY REPORT FOR THE RELEASE OF BUILDING X-10, CHARLESTON NAVAL STATION, CHARLESTON, S.C.FOR UNRESTRICTED USE" dated 21 March 1995 Ser 9210-45/0512. The following information was summarized from USS FRANK CABLE prepared report referenced above and patterned after CNSY unrestricted release reports for the purpose of consistency in report format.

a. **Introduction:** Building X-10 is located in grid H-23 of the Charleston Naval Station map. A limited survey was conducted to demonstrate that no radioactivity was inadvertently carried into this area.

(1) **Description:** Building X-10 is a single story warehouse type structure with cement block walls, an asphalt floor and a wood-framed roof with asphalt shingles. The interior has been partitioned into various storage areas using expanded metal enclosures.

(2) **Brief History:**

(a) **Use:** Building X-10 has been used as a supply receiving facility for Charleston Naval Base Personnel.

(b) **Radiological History:** A portion of Building X-10 was used to store radioactive material, a portable effluent tank (PET), during a hurricane in 1982.

(3) **Survey Requirements:** The building was surveyed using the techniques listed below to verify that no radioactivity associated with Naval Nuclear Propulsion was inadvertently carried into these areas.

(a) A portion of Building X-10 is a Group 3 radioactive material storage area. The floor of this Group 3 area was divided into 5' by 5' grids. No other areas have been used to store radioactive material nor has any area been used for radiological repair work or as a radioactive material transfer route.

(b) Each grid underwent a 100% survey with a frisker (E-140N/DT-304 or equivalent) and a 100% survey with a PRM-5N/SPA-3 in the HV-1/PHA mode and 25% survey in the HV-1/GROSS mode. Survey results greater than two times average background with a PRM-5/SPA count-rate meter/scintillation probe had to be investigated to determine the cause of the higher reading. Average background was established by measuring levels over similar materials in analogous areas of Charleston Naval Base to determine environmental factors which affected radiation

3. Bldg X-10

Naval Base to determine environmental factors which affected radiation levels. The sites selected for background determination had never been exposed to Naval Nuclear Propulsion Program radioactive material.

(c) One material sample was taken from the ground covering in each grid and analyzed with a multi channel analyzer.

b. Discussion: The radiation detection/indicating (radiac) and sampling equipment used by FRANK CABLE in surveying Building X-10, as well as the techniques employed during use of this equipment, are discussed below:

(a) Equipment Used for Performing Surveys (Beta, Gamma):

Surveys (beta-gamma contamination) were performed using a DT-304/PDR probe in conjunction with an E-140N rate meter. These surveys were performed by slowly scanning surfaces with the DT-304/PDR probe held within one-half inch of the surface to detect both loose surface and fixed radioactive contamination. Survey results are reported in micro-micro-curies/frisk (uuci/frisk). The instruments were response checked with a source of known activity each day they were in use. This check consisted of verifying that the needle of the rate meter responded correctly to a source of known value and was not merely a check to see if the meter needle moved. The portable RADIAC instruments used for these surveys were calibrated within the last six months as required by NAVSEA procedures.

(b) Equipment Used for Performing Gamma Scintillation Surveys:

Gamma scintillation surveys were performed using the Eberline Instrument Corporation (EIC) Model PRM-5N count rate meter with an Eberline Model SPA-3 Scintillation Probe assembly or equivalent in both the HV-1/PHA mode and HV-2/GROSS mode. These surveys were performed by slowly scanning surfaces with the probe held within one-half inch of the surface and perpendicular to the surface to detect gamma radiation. The instruments were response checked with a source of known activity each day they were in use. This check consisted of verifying that the needle of the rate meter responded correctly to a source of known value and was not merely a check to see if the meter needle moved. The portable RADIAC instruments used for these surveys were calibrated within the last six months as required by NAVSEA procedures.

(c) Sample Gathering Techniques:

Solid samples are samples of surface material collected in plastic zip lock bags. All samples were obtained by using hand chipping tools. All solid material samples were isotopically analyzed by Charleston Naval

3. Bldg X-10

radioactivity in the gross energy range (0.1-2.1 MeV) and the cobalt 60 energy range (1.1-1.4 MeV).

(d) Personnel:

Personnel who performed surveys and sampling of Building X-10 areas were given detailed training, completed a qualification program, and exercised verbatim compliance with written work procedures. Personnel qualified as Radiological Controls Monitors (RCM's) in accordance with NAVSEA 389-0153 performed the actual surveys with non-RCM's assigned to survey teams as recorders. Survey team performance was regularly monitored by supervisory radiological controls personnel.

(e) Backgrounds:

Average background radiation levels were established each day for areas surveyed. Three individual background measurements were taken in areas constructed from analogous construction materials averaged to provide the background comparison count rate for the area being surveyed. Background determination locations were chosen based on materials which were consistent with materials in the area being surveyed. Daily background levels for PRM-5N HV-1/PHA mode surveys varied between 341 and 400 cpm. PRM-5N HV-2/GROSS mode backgrounds varied between 9333 and 15000 cpm. E-140N background levels varied between 60 and 70 cpm.

(f) Building X-10 was divided into 39 5' by 5' grids.

(g) A total of 39 solid material samples were taken. The following naturally occurring radionuclides were typical isotopes identified during analysis of solid material samples: actinium 228, bismuth 214, lead 212, lead 214, potassium 40, and thallium 208.

c. Summary:

Surveys performed with the IM-247/PD did not detect areas greater than 450$\mu\mu$Ci/20cm^2.

Surveys performed with the IM-253/PD (HV-1/PHA) did not detect areas greater than or equal to twice background.

Surveys performed with the IM-253/PD (HV-2/GROSS) did not detect areas greater than or equal to twice background.

Analysis performed on solid material samples with the multi-channel analyzer (MCA) detected gross gamma equivalent cobalt 60 levels ranging from a low of less than 1.0 pCi/g to a high of 6.5 pCi/g.

3. Bldg X-10

less than 1.0 pCi/g to a high of 6.5 pCi/g.

Analysis performed on solid material samples with the MCA for specific cobalt 60, indicated that all solid material samples were less than 1 pCi/g.

CHARLESTON NAVAL BASE BUILDING X-10 MATERIAL ANALYSIS DATA

GRID	HV-2/GROSS (CPM)		HV-2/PHA (CPM)		E-140N (CPM)		Solid Material Samples (pCi/g)	
	BKG	SURVEY	BKG	SURVEY	BKG	SURVEY	0.1-2.1 MeV	1.1-1.4 MeV
A-1	15000	15000	400	450	70	80	3.5	1.3
A-2	15000	15000	400	450	70	80	5.2	1.5
A-3	15000	15000	400	475	70	70	4.5	1.1
B-1	15000	15000	400	450	70	80	3.1	<1
B-2	15000	N/A	400	425	70	90	4.1	1.4
B-3	15000	N/A	400	450	70	70	5.1	1.5
C-1	15000	N/A	400	425	70	100	3.3	<1
C-2	15000	15000	400	475	70	110	3.8	<1
C-3	15000	N/A	400	425	70	90	4.2	<1
D-1	15000	N/A	400	400	70	90	4.5	<1
D-2	15000	N/A	400	425	70	100	2.0	<1
D-3	15000	14750	400	400	70	110	4.0	<1
E-1	15000	N/A	400	425	70	80	1.9	<1
E-2	15000	N/A	400	400	70	100	4.9	1.1
E-3	15000	N/A	400	425	70	110	4.4	<1
F-1	15000	12500	400	400	70	90	5.8	2.0
F-2	15000	N/A	400	400	70	80	4.0	1.0
F-3	15000	N/A	400	375	70	110	4.7	1.6
G-1	15000	N/A	400	425	70	100	5.6	1.0
G-2	15000	10000	400	400	70	80	4.2	1.1
G-3	15000	N/A	400	450	70	100	6.1	1.3
H-1	15000	N/A	400	425	70	90	4.9	1.4
H-2	15000	N/A	400	425	70	90	3.8	1.2
H-3	15000	12500	400	425	70	110	2.1	<1
I-1	15000	N/A	400	450	70	110	6.5	1.4
I-2	15000	N/A	400	400	70	100	3.9	1.0
I-3	15000	N/A	400	425	70	90	4.4	1.2
J-1	9333	9200	383	425	60	70	3.4	1.2
J-2	9333	N/A	383	400	60	80	4.1	<1
J-3	9333	N/A	383	425	60	80	5.0	1.2
K-1	9333	N/A	383	450	60	80	3.4	<1
K-2	9333	9500	383	400	60	60	3.7	<1
K-3	9333	N/A	383	425	60	70	3.4	1.0
L-1	9333	N/A	383	475	60	70	3.9	1.0
L-2	9333	N/A	383	400	60	70	2.7	<1
L-3	9333	9250	383	425	60	70	3.8	<1

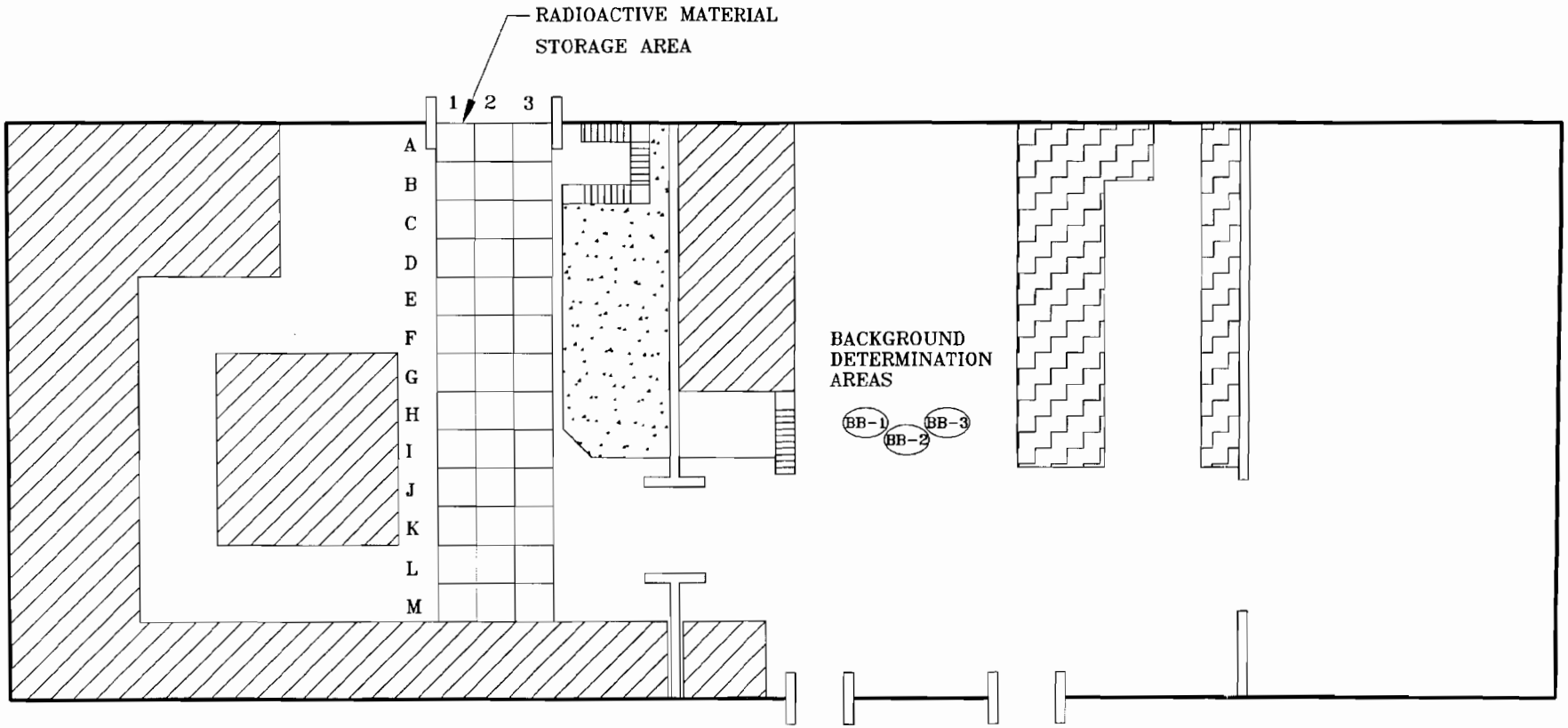
3. Bldg X-10

M-1	11333	N/A	341	400	60	80	4.1	<1
M-2	11333	N/A	341	400	60	70	3.3	1.1
M-3	11333	12500	341	400	60	80	3.7	1.3

All solid material samples analyzed by Charleston Naval Shipyard Radiation Health personnel had no detectable cobalt 60 in any sample (no cobalt 60 photopeaks were observed). All of the samples were found to contain naturally occurring radioactivity including actinium 228, bismuth 214, lead 212, lead 214, potassium 40, and thallium 208.

3. Bldg X-10

d. Site Map, Building X-10



3. Bldg X-10

e. After Photograph

RAM Storage Area, viewing south.

3. Bldg X-10

e. After Photograph

RAM Storage Area, viewing north.