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DRAFT RESOURCE CONSERVATION AND RECOVERY ACT FACILITY INVESTIGATION
REPORT VOLUME 8 OF 12 APPENDICES A AND B ZONE L CNC CHARLESTON SC
12/18/1998
ENSAFE INC.

**DRAFT ZONE L
RCRA FACILITY INVESTIGATION REPORT
CHARLESTON NAVAL COMPLEX**

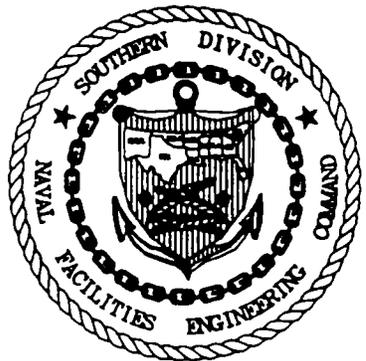


**VOLUME 8 OF 12
APPENDICES A TO B**

**CTO-029
CONTRACT NO: N62467-89-D-0318**

Prepared for:

**Department of the Navy
Southern Division
Naval Facilities Engineering Command
North Charleston, South Carolina**



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December 18, 1998

Appendix A

Detachment Cross Connects Reports

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A.1.0 INTRODUCTION

The Zone L RFI Work Plan specifies dye injection testing for cross-connects be done in sanitary sewer lines (SWMU 37) associated with industrial sources listed in Zone L RFI Work Plan Appendix C. A cross-connect is the improper connection of the sanitary sewer, including gravity pipe lines, manholes, and latrines, to the storm sewer system. Appendix C, industrial sources, lists current and former facilities where the potential of a release of hazardous materials to the environment exists. The focus of this investigation is to identify cross-connects with the sanitary sewer system downstream of the listed industrial sources which result in improper discharges of wastes to the surface water bodies such as the Cooper River. Eighteen facilities were dye injection tested and are listed in the table below.

**Table A.1.0
 Dye Injection Tested Buildings**

Building Number	Industrial Source Building Name	Date
3	Inside Machine Shop	1906
5	Woodworking Shop	1904
6	Forge Shop and Propeller Repair Shop	1967
9	Temporary Service Shop	1906
13	QA Office, Laboratory and Supply Administration	1906
44	Old Plate Shop	1941
68	Battery Shop	1942
69	Storehouse, Receiving and Shipping(Former Galvanizing Shop, Bldg 1176)	1942
74	Galvanizing/Pickling Plant	1920
177	Electric and Electronics Shop	1955
187	Module Maintenance Facility, Operations	1962
218	Missile Ordnance System Shop	1969
221	Lead Storage Facility	1970
226	Plating Plant and Pumps, Valves & Hydraulics	1976

**Table A.1.0
 Dye Injection Tested Buildings**

Building Number	Industrial Source Building Name	Date
236	Operations Center and Pipefitting Office	1982
1119	Former Location of Galvanizing Shop	1922
1189	Dry cleaner and Laundry Facility	1942
1797	Acid Waste Treatment Facility	1975

Former facility Buildings 1025 and 1030 listed in Appendix C no longer exist. These areas have newer buildings, 3 and 74 for 1025 and 1119 for 1030, located on or nearby which were dye injection tested in there place. Building 1189 was added to the list of buildings required to be dye injection tested at Ensafe's request.

A.2.0 FIELD INVESTIGATIONS

Engineering review of facility plumbing drawings and engineering facility walk through inspections determined the location of points for injection of tracer dye into all primary effluent sanitary sewer pipelines exiting each facility under investigation. Intracid Rhodamine WT liquid dye, developed for water tracing and certified for use in drinking water was the dye of choice for testing. For water sample analysis, A 10-AU digital field fluorometer manufactured by Turner Designs was incorporated. Fluorometer sensitivity levels are 0.1 parts per billion of Intracid Rhodamine WT in extremely polluted water. A fluorometer dye standard was set at 100 parts per billion. A premixed distilled water/dye solution at rates of 40-50 ml along with full flow potable water was supplied to injection points for at least two hours or until dye was detected in the storm sewer.

Engineering review of shipyard sanitary and storm sewer system schematics as well as field inspections determined points of inspection at manholes and/or out falls for the presence of tracer

dye in the storm sewer system. Positive indication of dye in the storm sewer was set at 100 parts per billion for two or more consecutive samples and/or sampling trend indicating sharp rise in dye concentration with confirmed visual observation of dye which was pink in color.

A.2.1 Site/Facility Specific Dye Injection Testing

Sections of the facility's sanitary sewer lines or if possible, all lines exiting the building were dye injection tested simultaneously for at least two hours or when dye was discovered in designated storm sewer manholes/outfalls. A quality assurance check was incorporated into the dye testing during dye injection. Sanitary sewer manholes down stream of injection points were inspected for dye to verify proper tie in to the sanitary sewer system using the Charleston Naval Shipyard Public Works Drawing H410-238 and 239 "Sewage Collection System". Sanitary sewer dye sample analysis was performed using the same equipment as used for storm sewer analysis. If no indication of dye was found in the sanitary sewer, a possible cross-connect may exist which would alert testing personnel that dye in the storm system will most likely be found.

For the storm sewer manhole numbering scheme, refer to Charleston Naval Shipyard Public Works Drawing H409-72, 75, and 76 "Storm Drainage". For the sanitary sewer manhole numbering scheme, refer to Charleston Naval Shipyard Public Works Drawing H410-238 and 239 "Sewage Collection System".

A.2.1.1 Building 3, Machine Shop, Dye Injection Testing

Building 3 was dye injection tested on December 10, 1997. Twelve sites, 7 latrines, 1 floor drain, 1 janitor's sink and 3 shop sinks were simultaneously dye injected. A quality assurance check was performed at sanitary sewer Manholes 169-A and 204 to verify dye present. The storm sewer was monitored at Manholes 23/3 and 27/4. Test samples indicated dye present at storm sewer Manhole 23/3. A cross-connect exists to storm sewer Outfall 23.

A.2.1.2 Building 5, Wood Working Shop, Dye Injection Testing

Building 5 was dye injection tested on December 12, 1997. Three sites, 2 latrines and an office shower were simultaneously dye injected. A quality assurance check was performed at sanitary sewer Manholes 192 and 204-A to verify dye present. The storm sewer was monitored at Manholes 23/9/4 and 27/4. Test samples indicated no dye present and no cross-connect exists.

A.2.1.3 Building 6, Forge and Propeller Repair Shop, Dye Injection Testing

Building 6 was dye injection tested on December 16, 1997. Four sites, 1 latrine, 2 floor drains, and a funnel drain were simultaneously dye injected. A quality assurance check was performed at sanitary sewer Manhole 166-C to verify dye present. The storm sewer was monitored at Manhole 23/6. Test samples indicated no dye present and no cross-connect exists.

A.2.1.4 Building 9, Forge and Service Shop, Dye Injection Testing

Building 9 was dye injection tested on December 12, 1997. Eleven sites, 7 latrines, 1 floor drain, 1 sump drain, 1 funnel drain and a shop sink were simultaneously dye injected. A quality assurance check was performed at sanitary sewer Manholes 238, 247, and 250 to verify dye present. The storm sewer was monitored at Manhole 30/7. Test samples indicated dye present at storm sewer Manhole 30/7. A cross-connect exists to storm sewer Outfall 30.

A.2.1.5 Building 13, Laboratory, Dye Injection Testing

Building 13 was dye injection tested on December 15, 1997. Twelve sites, 2 latrines, 2 floor drains, 1 funnel drain, 1 janitor's sink, 1 office sink and 5 laboratory sinks were simultaneously dye injected. A quality assurance check was performed at sanitary sewer Manhole 238 to verify dye present. The storm sewer was monitored at Manhole 30/7/1/5. Test samples indicated dye present at storm sewer Manhole 30/7/1/5. A cross-connect exists to storm sewer Outfall 30.

A.2.1.6 Building 44, Plating Shop, Dye Injection Testing

Building 44 was dye injection tested on November 26, 1997. Four sites, 3 latrines and an office sink were simultaneously dye injected. A quality assurance check was performed at sanitary sewer Manholes 192 and 204-A to verify dye present. The storm sewer was monitored at Manhole 27/4. Test samples indicated no dye present and no cross-connect exists.

A.2.1.7 Building 68, Battery Acid Facility, Dye Injection Testing

Building 68 was dye injection tested on November 20 and 21, 1997. Five sites, 1 latrine and a drain clean-out on November 20 and 3 floor drains on November 21 were dye injected. A quality assurance check was performed at sanitary sewer Manhole 312 to verify dye present. The storm sewer was monitored at Manholes 41/1, 41/1-A and 41/2. Test samples indicated dye present at storm sewer Manhole 41/2. A cross-connect exists to storm sewer Outfall 41.

A.2.1.8 Building 69, Storehouse and Former Galvanizing Shop, Dye Injection Testing

Building 69 was dye injection tested on November 25, 1997. Four sites, 2 latrines, 1 lunch room sink and a floor drain were simultaneously dye injected. A quality assurance check was performed at sanitary sewer Manholes 300-A, and 313 to verify dye present. The storm sewer was monitored at Manhole 38/4. Test samples indicated dye present at storm sewer Manhole 38/4. A cross-connect exists to storm sewer Outfall 38.

A.2.1.9 Building 74, Former Galvanizing site, Dye Injection Testing

Building 74 was dye injection tested on December 8, 1997. One site, a latrine, was dye injected. A quality assurance check was performed at sanitary sewer Manhole 171 to verify dye present. The storm sewer was monitored at Manhole 23/3/1-A. Test samples indicated no dye present and no cross-connect exists.

A.2.1.10 Building 177, Electronics Shop, Dye Injection Testing

Building 177 was dye injection tested on December 8, 1997. Five sites, 3 latrines and 2 floor drains were simultaneously dye injected. A quality assurance check was performed at sanitary sewer Manhole 247 to verify dye present. The storm sewer was monitored at Manholes 30/7/3 and 30/9. Test samples indicated dye present at storm sewer Manhole 30/9. A cross-connect exists to storm sewer Outfall 30.

A.2.1.11 Building 187, Module Maintenance Facility, Dye Injection Testing

Building 187 was dye injection tested on December 4, 1997. Four sites, 2 latrines, a floor drain and a shop sink were simultaneously dye injected. A quality assurance check was performed at sanitary sewer Manhole 270 to verify dye present. The storm sewer was monitored at Manholes 32/7 and 34/5/1/1. Test samples indicated no dye present and no cross-connect exists.

A.2.1.12 Building 218, Missile Ordnance Shop, Dye Injection Testing

Building 218 was dye injection tested on December 4, 1997. Two sites, a latrine and a funnel drain were simultaneously dye injected. A quality assurance check was performed at sanitary sewer Manholes 297 and 298 and dye was not present. The sanitary tie in from the building is not accurate with the sanitary sewer schematic and the correct down stream sanitary sewer manhole was not found. The storm sewer was monitored at Manhole 34/2. Test samples indicated no dye present and no cross-connect exists.

A.2.1.13 Building 221, Lead Storage Facility, Dye Injection Testing

Building 221 was dye injection tested on December 2, 1997. Two sites, an emergency shower drain and a floor drain were simultaneously dye injected. A quality assurance check was performed at sanitary sewer Manhole 171 to verify dye present. The storm sewer was monitored at Manhole 21/3/1 A. Test samples indicated no dye present and no cross-connect exists.

A.2.1.14 Building 226, Plating Plant, Dye Injection Testing

Building 226 was dye injection tested on December 2, 1997. Four sites, 2 latrines, 1 trench drain and a lunch room sink were simultaneously dye injected. A quality assurance check was performed at sanitary sewer Manhole 168 to verify dye present. The storm sewer was monitored at Manhole 23/5. Test samples indicated no dye present and no cross-connect exists.

A.2.1.15 Building 236, Pipefitting Shop, Dye Injection Testing

Building 236 was dye injection tested on December 17, 1997. Two sites, a latrine and a floor drain simultaneously were dye injected. A quality assurance check was performed at sanitary sewer Manhole 279 to verify dye present. The storm sewer was monitored at Manholes 32/1 and 33/5. Test samples indicated no dye present and no cross-connect exists.

A.2.1.16 Building 1119, Former Galvanizing Site, Dye Injection Testing

Building 1119 was dye injection tested on December 3, 1997. Two latrines were simultaneously dye injected. A quality assurance check was performed at sanitary sewer Manhole 200 to verify dye present. The storm sewer was monitored at Manhole 27/27-1/1 and at Outfall 27. Test samples indicated dye present at storm sewer Outfall 27. A cross-connect exists to storm sewer Outfall 27.

A.2.1.17 Building 1189, Former Dry Cleaning and Laundry Facility, Dye Injection Testing

Building 1189 was dye injection tested on November 18, 1997. Two sites, 1 PVC and 1 cast-iron clean-out were dye injected. A quality assurance check was performed at sanitary sewer Manholes 260 and 260-A to verify dye present. The storm sewer was monitored at Manhole 37/12. Test samples indicated no dye present and no cross-connect exists.

A.2.1.18 Building 1797, Acid Waste Treatment Basin, Dye Injection Testing

On November 17, 1997, dye test unable to be performed. Single basin discharge line for acid waste is plugged at sanitary sewer Manhole 310. Basin discharge line does not drain standing water. Per basin drawings and engineering evaluation no cross-connect exists.

A.2.2 Site/Facility Specific Individual Cross-Connect Isolation

Buildings 3, 9, 13, 68, 69, 177 and 1119 were dye injection tested and determined to have cross-connects. Each of these Buildings' exiting sanitary sewer lines, through the process of elimination, was checked for dye in the storm sewer for at least two hours or when dye was discovered in designated storm sewer manholes/outfalls.

A.2.2.1 Building 3, Machine Shop, Dye Injection Testing Cross-Connect Isolation

Building 3 was dye injection tested on February 24 through February 26, 1998. Three individual dye injection tests were done. The first test injected 6 latrines and no dye was found. The second injected two shop floor drains in southwest corner and dye was found at storm Manhole 23/3. The third test injected five shop and latrine sinks and no dye was found. The storm sewer was monitored at Manholes 23/3 for all tests. Test samples indicated dye present at storm sewer Manhole 23/3. A cross-connect exists from shop floor drains in southwest corner to storm sewer Outfall 23.

A.2.2.2 Building 9, Forge and Service Shop, Dye Injection Testing Cross-Connect Isolation

Building 9 was dye injection tested on March 11 through March 19, 1998. Seven individual dye injection tests were done. The first test injected 4 latrines in the south wing and mid-section; no dye was found. The second test injected three shop latrines in the north wing and mid-section; dye was found at storm sewer Manhole 30/7. The third test injected one north wing latrine; no dye was found. The fourth test injected one mid-section shop sink; dye was found at storm sewer

Manhole 30/7. The fifth test injected one mid-section floor drain; no dye was found. The sixth test injected one south wing sump drain; dye was found at storm sewer Manhole 30/7. The seventh test injected one south wing cooling system funnel drain; dye was found at storm Manhole 30/7. The storm sewer was monitored at Manholes 30/7 for all tests. Test samples indicated dye present at storm sewer Manhole 30/7. Cross-connects exist from a latrine, shop sink, sump floor drain and numerous funnel drains throughout the south wing to storm sewer Outfall 30.

An addition to the other cross-connects found, a sink in north wing, which presently has plumbing disconnected, ties into the storm drain and is a cross-connect when the plumbing is reattached.

A.2.2.3 Building 13, Laboratory, Dye Injection Testing Cross-Connect Isolation

Building 13 was dye injection tested on March 2 through March 10, 1998. Six individual dye injection tests were done. The first test injected one floor drain in the vault area; no dye was found. The second test injected two latrines and a janitor's closet on the first floor and first floor annex; dye was not found. The third test injected one first floor annex sink and a second floor office sink; dye was found at storm sewer Manhole 30/7/1/3. The fourth test injected two second floor laboratory sinks; dye was found at storm sewer Manhole 30/7/1/3. The fifth test injected one first floor laboratory sink; dye was found at storm sewer Manhole 30/7/1/3. The sixth test injected one third floor Air Conditioning room drain; no dye was found. The storm sewer was monitored at Manholes 30/7/1/3 for all tests. Test samples indicated dye present at storm sewer Manhole 30/7/1/3. Cross-connects exist from a first floor annex sink and all office and laboratory sinks throughout the first and second floor to storm sewer Outfall 30.

Note per visual inspection, first floor laboratory sink piping exists rear window and drains at storm sewer catch basin.

A.2.2.4 Building 68, Battery Acid Facility, Dye Injection Testing Cross-Connect Isolation

Building 68's two initial dye injection tests on November 20, 1997 isolated the cross-connect. No additional injection tests were needed. A cross-connects exists from all Building 68 floor drains to storm sewer Outfall 41.

A.2.2.5 Building 69, Storehouse and Former Galvanizing Shop, Dye Injection Testing Cross-Connect Isolation

Building 69 was dye injection tested on February 10 through February 17, 1998. Four individual dye injection tests were done. The first test injected two latrines, one in separate facility outside, the other in the newer section; no dye was found. The second test injected one latrine on east side; no dye was found. The third test injected one lunch room sink; no dye was found. The fourth test injected a mechanical room floor drain; dye was found at storm Manhole 38/4. The storm sewer was monitored at Manhole 38/4 for all tests. Test samples indicated dye present at storm sewer Manhole 38/4. A cross-connects exists from floor drains and eye wash station leaving the Building 69 mechanical room on the northwest end to storm sewer Outfall 38.

A.2.2.6 Building 177, Electronics Shop, Dye Injection Testing Cross-Connect Isolation

Building 177 was dye injection tested on February 19 through February 23, 1998. Two individual dye injection tests were done. The first test injected two latrines, on the first floor; no dye was found. The second test injected two mechanical room floor drains along the west side. The storm sewer was monitored at Manholes 30/9 and 30/7/3 for all tests. Test samples indicated dye present at storm sewer Manhole 30/9. A cross-connects exists from all three floor drains leaving the Building 177 mechanical rooms along the west wall to storm sewer Outfall 30

A.2.2.7 Building 1119, Former Galvanizing Site, Dye Injection Testing Cross-Connect Isolation

Building 1119's initial dye injection test on December 3, 1997 isolated the building cross-connect. No additional injection tests were needed. A cross-connect exists from the two Building 1119 latrines to storm sewer Outfall 27.

A.3.0 SUMMARY

**Interim Measures SWMU-37 Dye Test
 Cross-Connect Locations**

Building Number	Building Name	Outfall of Cross-Connect	Location of Cross-Connects
1119	Former Location Galvanizing Shop, 1941	27	Two restroom facilities
3	Inside Machine Shop, 1906	23	Two floor drains in south west corner shop room
68	Former Battery Acid Facility, 1942	41	All floor drains (28 total)
69	Storehouse, Former Galvanizing Shop, 1980	38	Two floor drains and a eyewash station in and near the mechanical room
13	QA Office and Laboratory, 1906	30	All laboratory sinks on the first and second floors including the annex, (20 total) and two floor drains in the annex.
177	Electric and Electronics Shop, 1955	30	Two floor drains and two sump drains in the west annex
9	Temporary service Shop, 1906	30	Large restroom facility in north wing, all cooling systems drains, (10 total) and one sump drain in the south wing foundry. Two shop sinks in the north wing and mid section.

CAD drawings Figure A-1 through A-15 are provided to show cross-connected industrial sources and storm sewers. Figures A-16 through A-18 show DPT sample locations along the sewer lines of the buildings that were investigated for cross connects. *The Process Closure Completion Report For SWMU-37 Dye Test Cross-Connect Resolution in Buildings 3, 9, and 68* details the actions taken by the Environmental Detachment of Charleston in eliminating the cross connects in the buildings mentioned above.

A.4.0 REFERENCE LIST

Ensafe/Allen & Hoshall, October 1995. *Final Zone L RFI Work Plan*

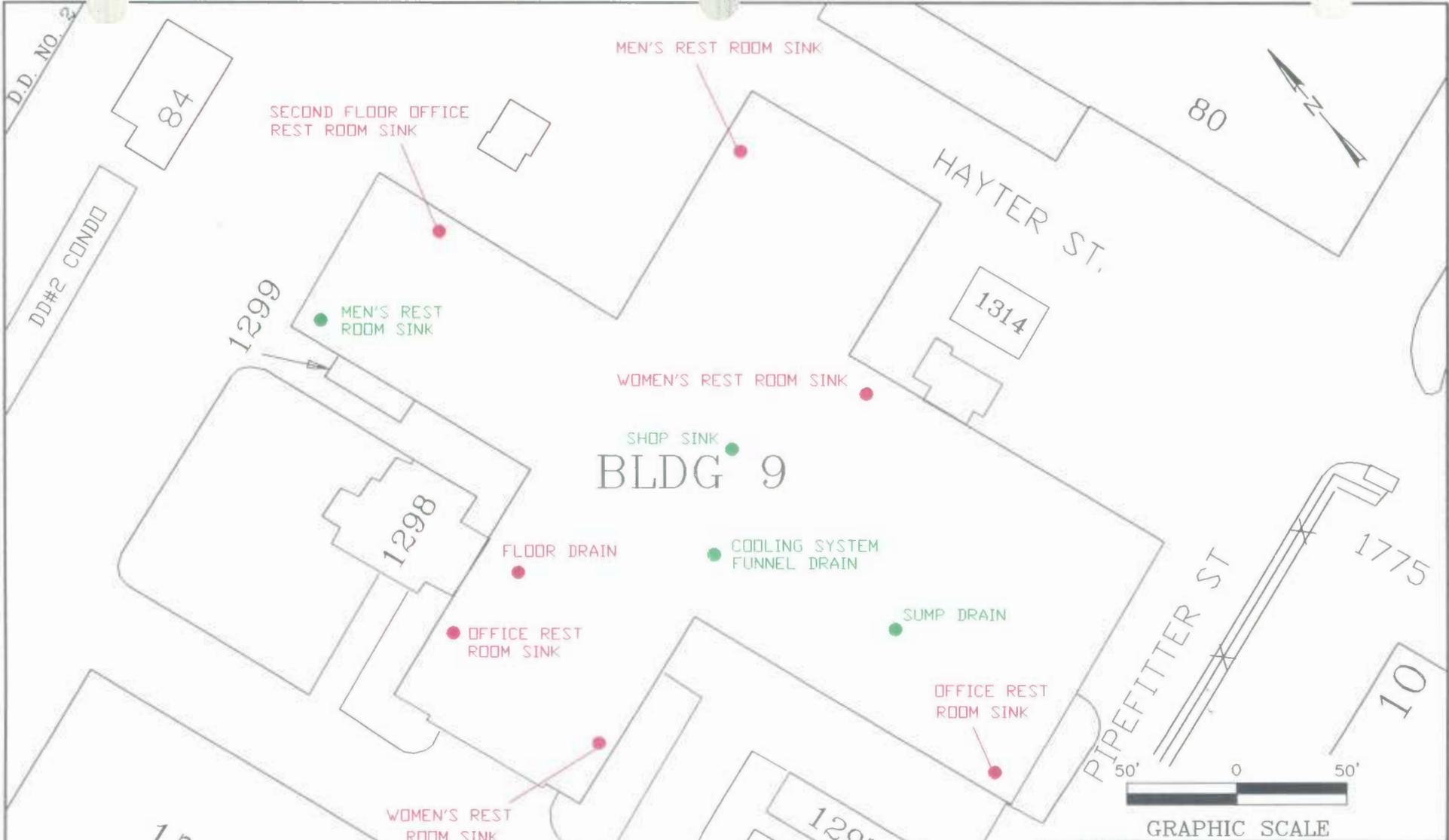
Charleston Naval Shipyard, February 1995. *Public Works Drawing No. H410-239 "Sewage Collection System Area-5"*.

Charleston Naval Shipyard, April 1994. *Public Works Drawing No. H410-239 "Sewage Collection System Area-6"*.

Charleston Naval Shipyard, April 1975. *Public Works Drawing No. H409-72 "Storm Drainage Area No.2"*.

Charleston Naval Shipyard, April 1975. *Public Works Drawing No. H409-75 "Storm Drainage Area No.5"*.

Charleston Naval Shipyard, April 1975. *Public Works Drawing No. H409-76 "Storm Drainage Area No.6"*.



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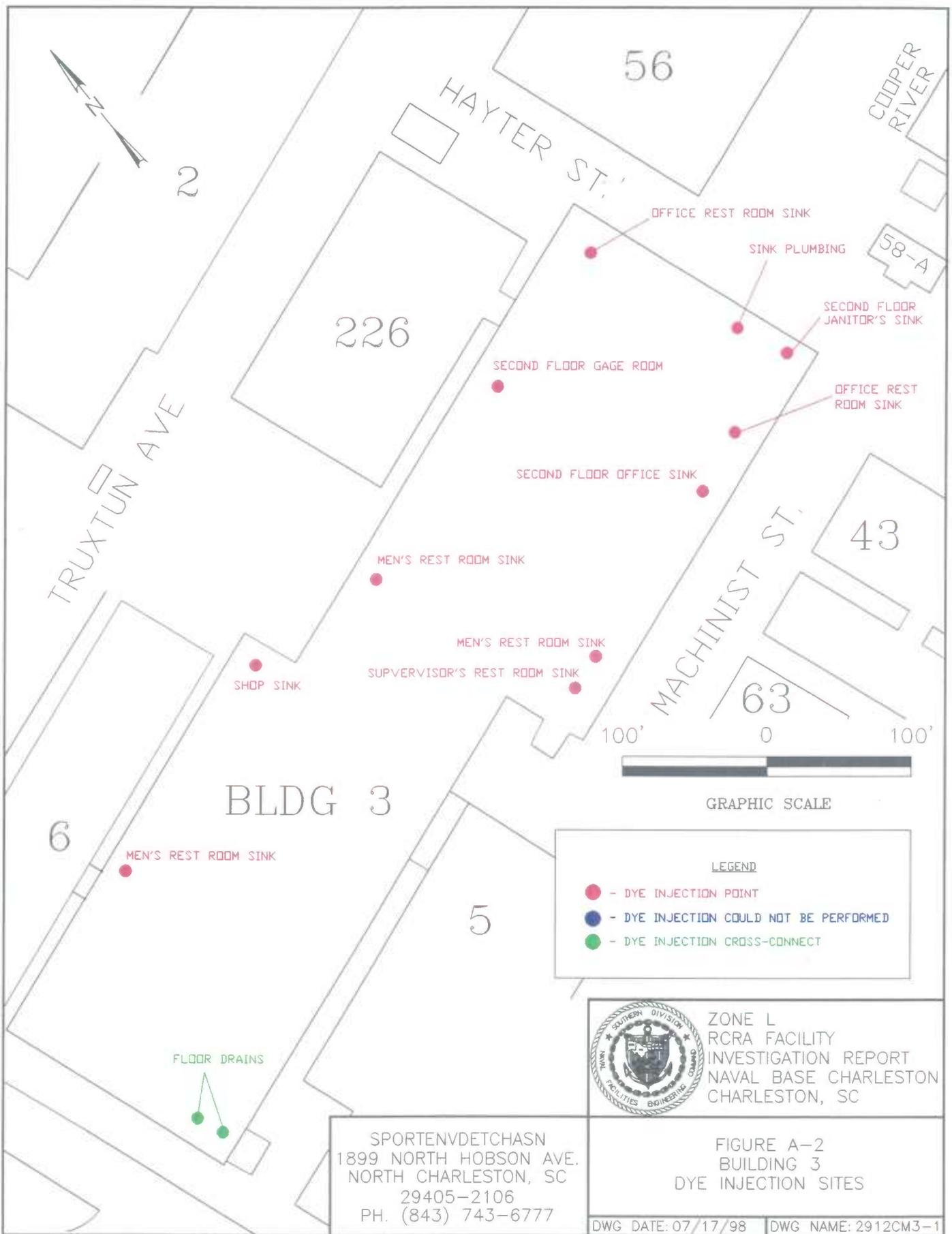
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- - DYE INJECTION CROSS CONNECT

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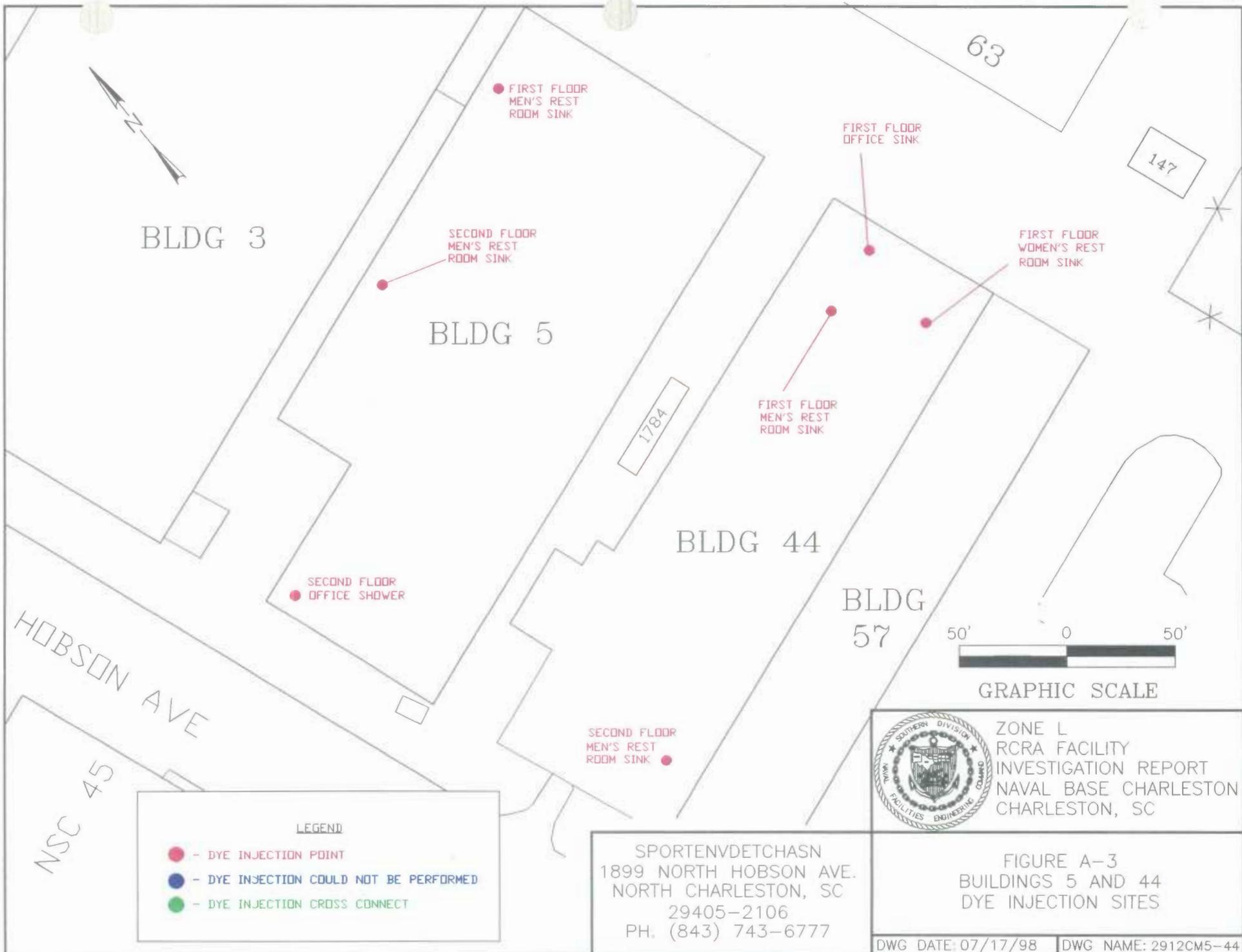
FIGURE A-1
 BUILDING 9
 DYE INJECTION SITES



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FIGURE A-2
 BUILDING 3
 DYE INJECTION SITES



BLDG 3

BLDG 5

BLDG 44

BLDG 57

HOBSON AVE

NSC 45

63

147

1784

FIRST FLOOR
MEN'S REST
ROOM SINK

SECOND FLOOR
MEN'S REST
ROOM SINK

SECOND FLOOR
OFFICE SHOWER

SECOND FLOOR
MEN'S REST
ROOM SINK

FIRST FLOOR
OFFICE SINK

FIRST FLOOR
MEN'S REST
ROOM SINK

FIRST FLOOR
WOMEN'S REST
ROOM SINK



GRAPHIC SCALE

LEGEND

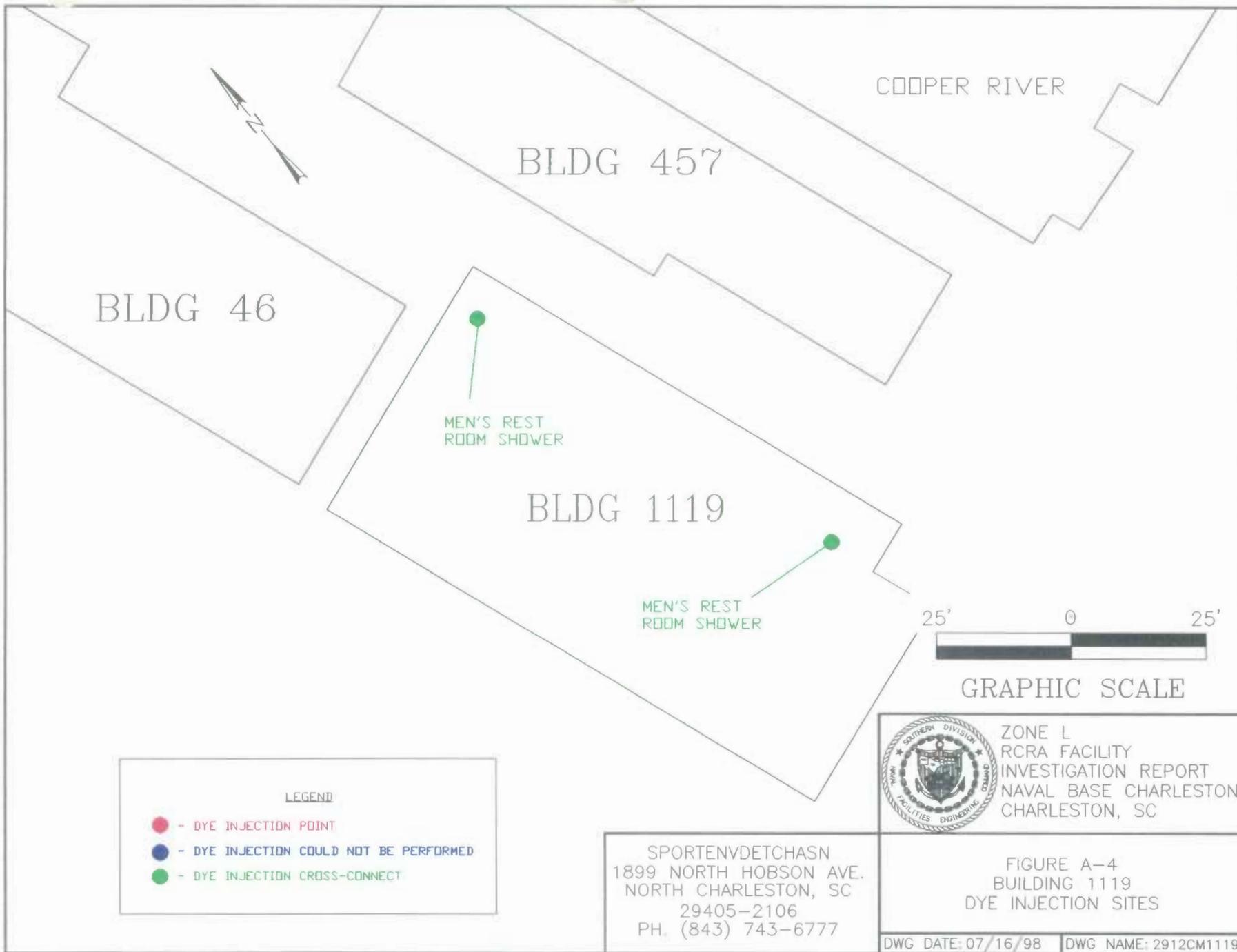
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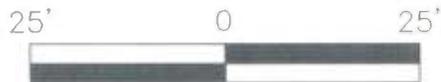
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FIGURE A-3
BUILDINGS 5 AND 44
DYE INJECTION SITES





GRAPHIC SCALE



PVC CLEAN OUT



BLDG 1189

CAST IRON CLEAN OUT



COFER ST

225

LEGEND

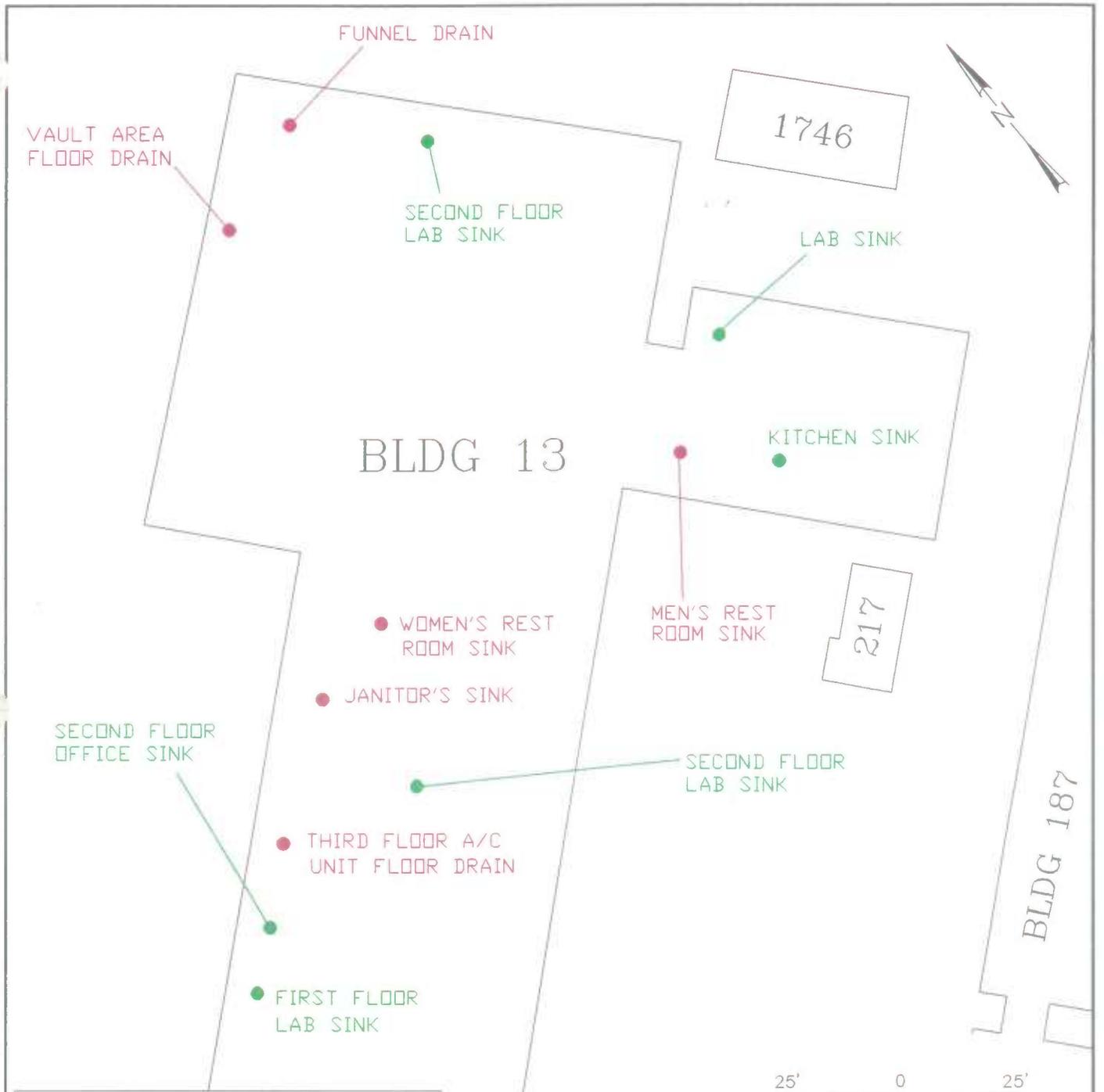
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- - DYE INJECTION COULD NOT BE PERFORMED
- - DYE INJECTION CROSS-CONNECT



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FIGURE A-5
BUILDING 1189
DYE INJECTION SITES



LEGEND

- - DYE INJECTION POINT
- - DYE INJECTION COULD NOT BE PERFORMED
- - DYE INJECTION CROSS-CONNECT



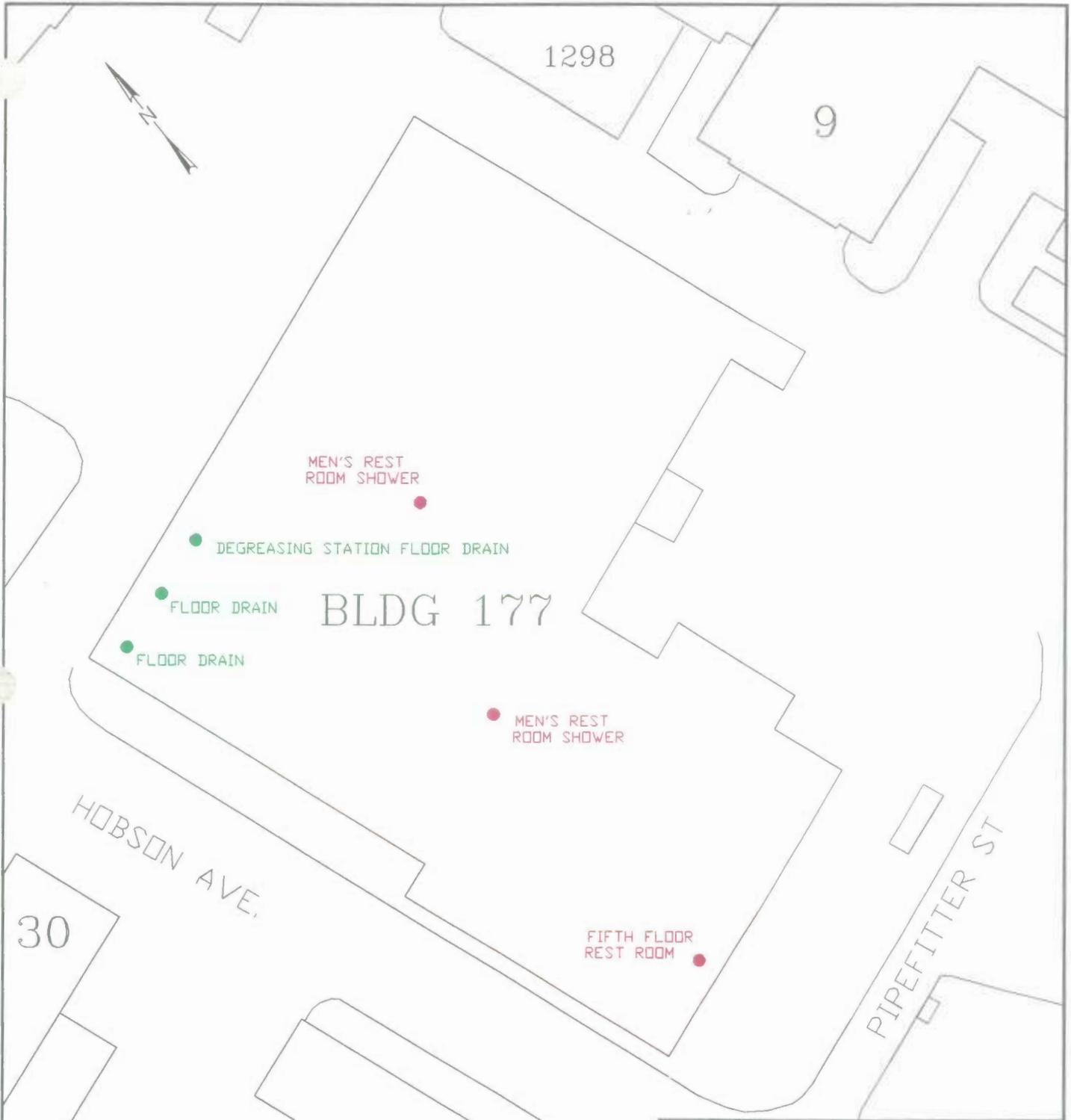
GRAPHIC SCALE



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FIGURE A-6
BUILDING 13
DYE INJECTIONS SITES



- LEGEND**
- - DYE INJECTION POINT
 - - DYE INJECTION COULD NOT BE PERFORMED
 - - DYE INJECTION CROSS-CONNECT

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FIGURE A-7
 BUILDING 177
 DYE INJECTION SITES

COOPER RIVER



1797
BASIN

BASIN DISCHARGE OUTLET
PLUGGED AT SANITARY
MANHOLE

BATTERY CRACKING
PAD - FACILITY

1278

(CONCRETE)

1435



LEGEND

- - DYE INJECTION POINT
- - DYE INJECTION COULD NOT BE PERFORMED
- - DYE INJECTION CROSS CONNECT



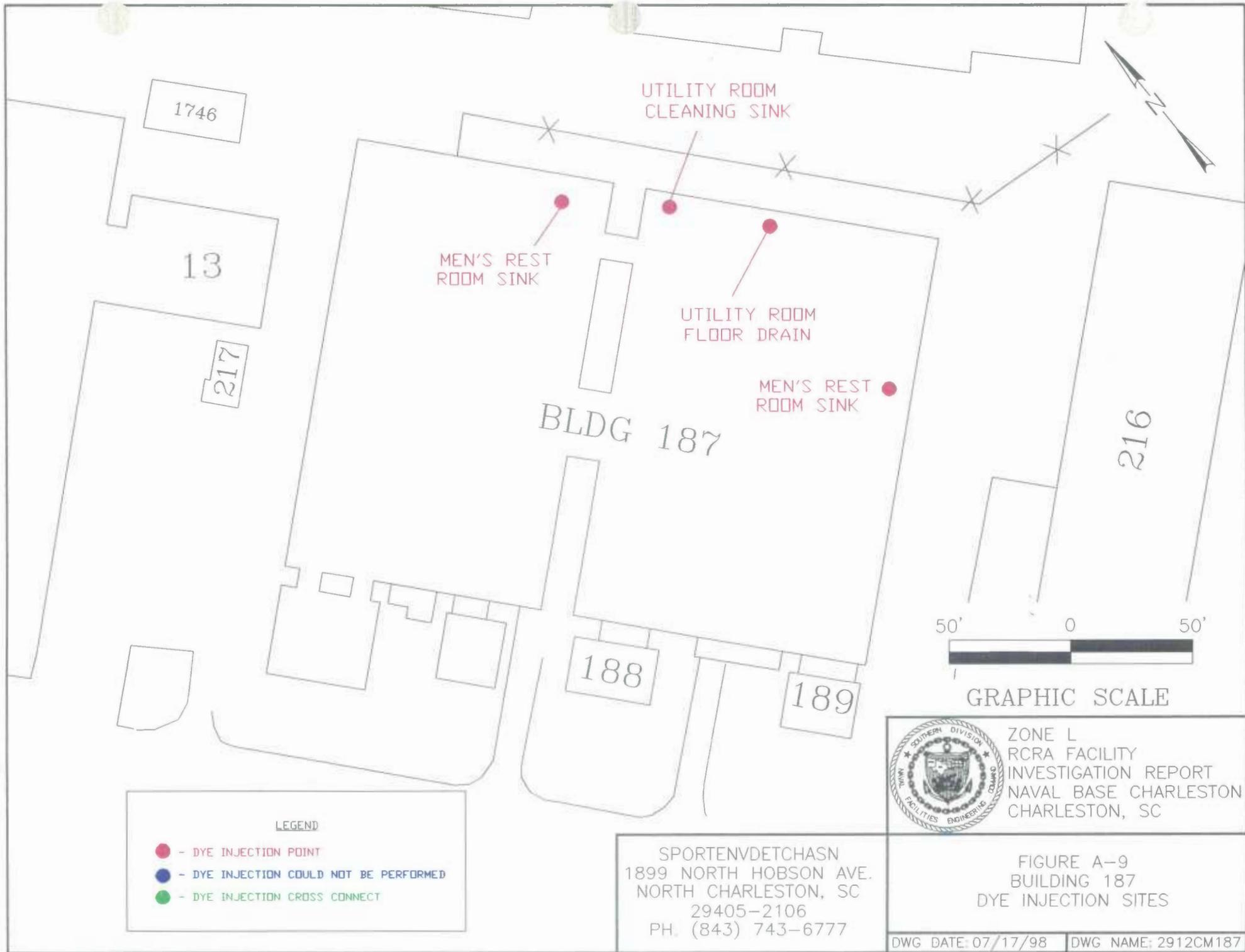
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FIGURE A-8
BASIN 1797
DYE INJECTION SITES

DWG DATE: 07/17/98

DWG NAME: 2912CM1797





LEGEND

- - DYE INJECTION POINT
- - DYE INJECTION COULD NOT BE PERFORMED
- - DYE INJECTION CROSS-CONNECT



GRAPHIC SCALE

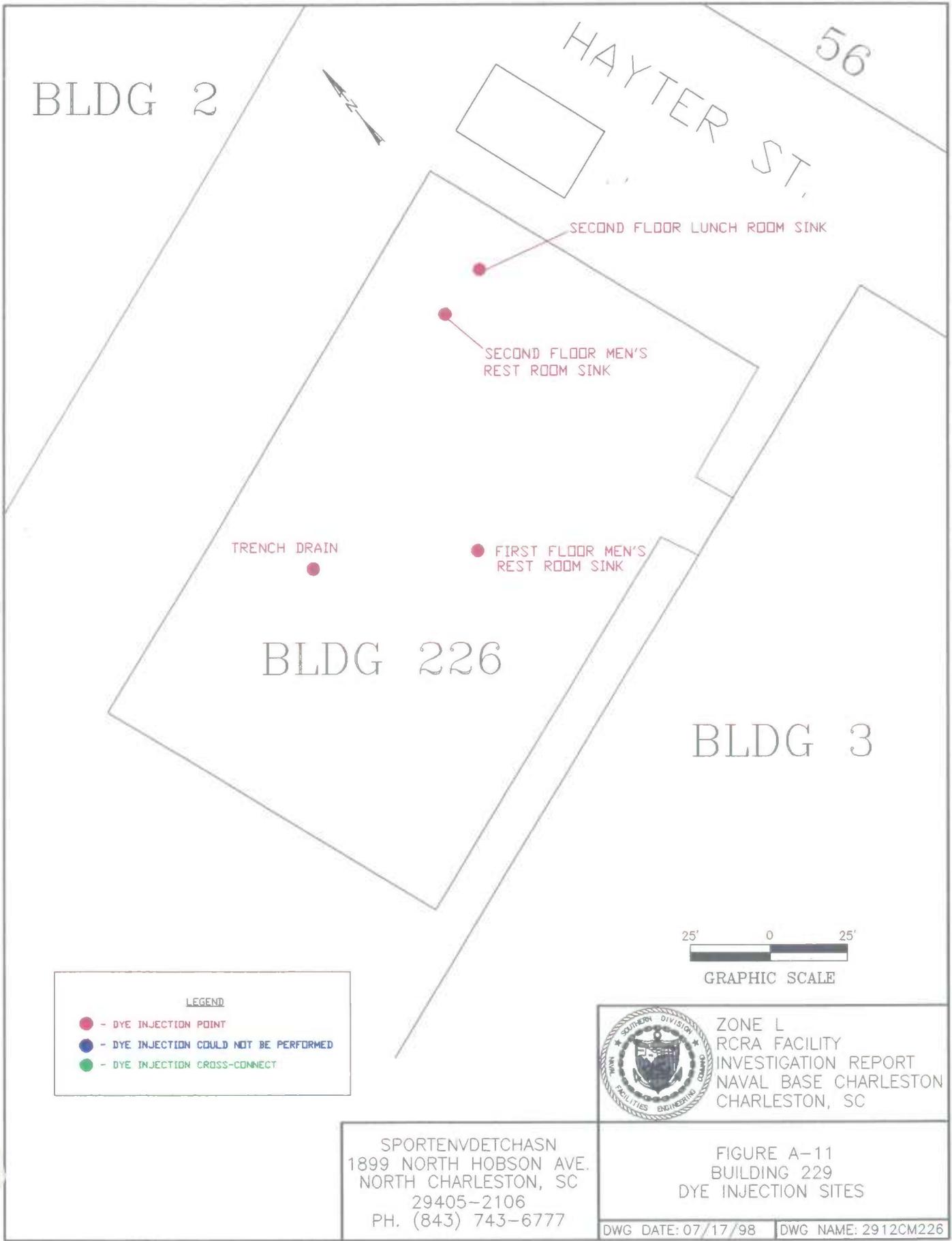


ZONE L
RCRA FACILITY
INVESTIGATION REPORT
NAVAL BASE CHARLESTON
CHARLESTON, SC

SPORTENVDECHASN
1899 NORTH HOBSON AVE.
NORTH CHARLESTON, SC
29405-2106
PH. (843) 743-6777

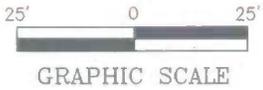
FIGURE A-10
BUILDING 218
DYE INJECTION SITES

DWG DATE: 07/17/98 DWG NAME: 2912CM218



LEGEND

- - DYE INJECTION POINT
- - DYE INJECTION COULD NOT BE PERFORMED
- - DYE INJECTION CROSS-CONNECT

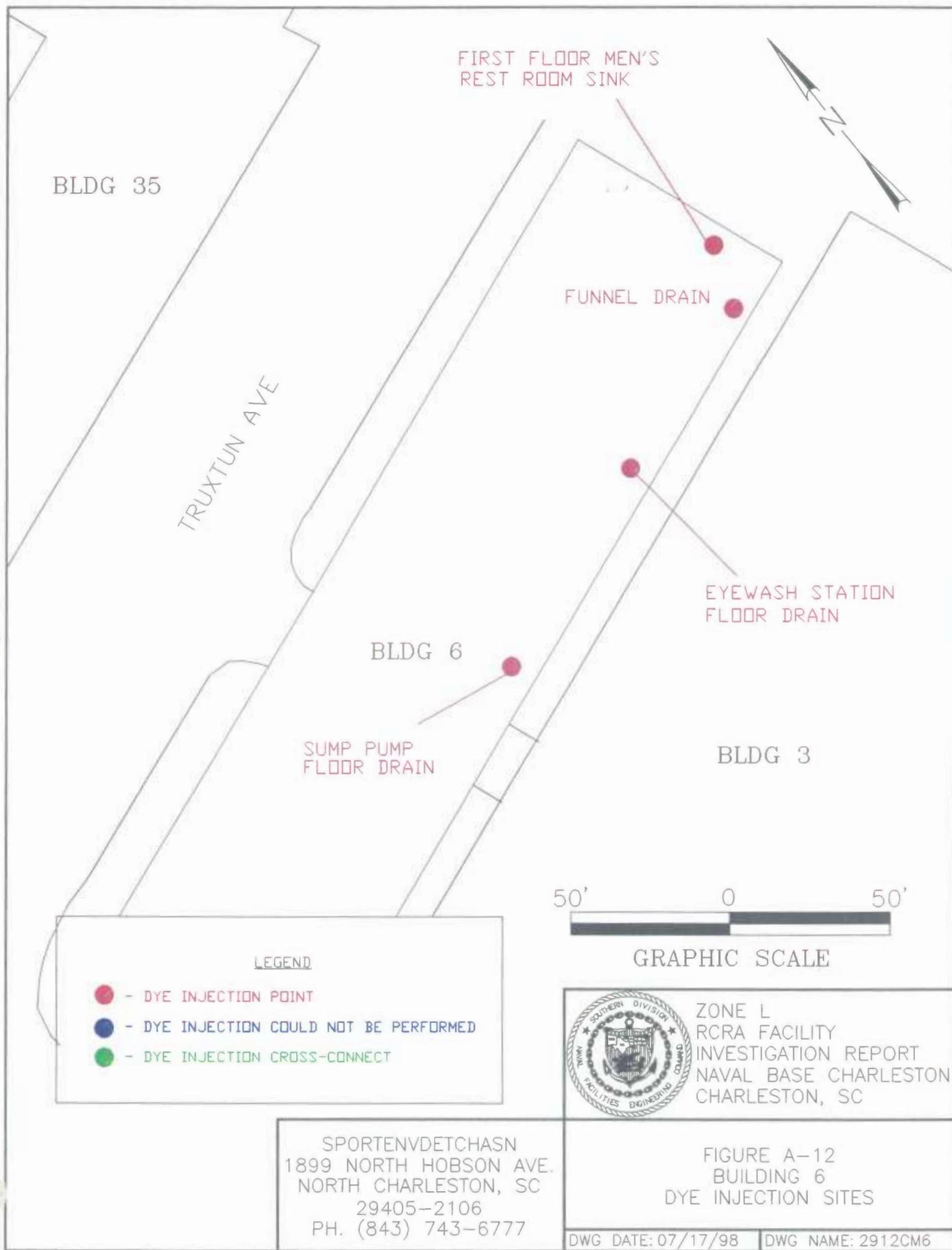


ZONE L
 RCRA FACILITY
 INVESTIGATION REPORT
 NAVAL BASE CHARLESTON
 CHARLESTON, SC

SPORTENVDECHASN
 1899 NORTH HOBSON AVE.
 NORTH CHARLESTON, SC
 29405-2106
 PH. (843) 743-6777

FIGURE A-11
 BUILDING 229
 DYE INJECTION SITES

DWG DATE: 07/17/98 DWG NAME: 2912CM226



BLDG 35

FIRST FLOOR MEN'S REST ROOM SINK

TRUXTUN AVE

FUNNEL DRAIN

EYEWASH STATION FLOOR DRAIN

BLDG 6

SUMP PUMP FLOOR DRAIN

BLDG 3



GRAPHIC SCALE

LEGEND

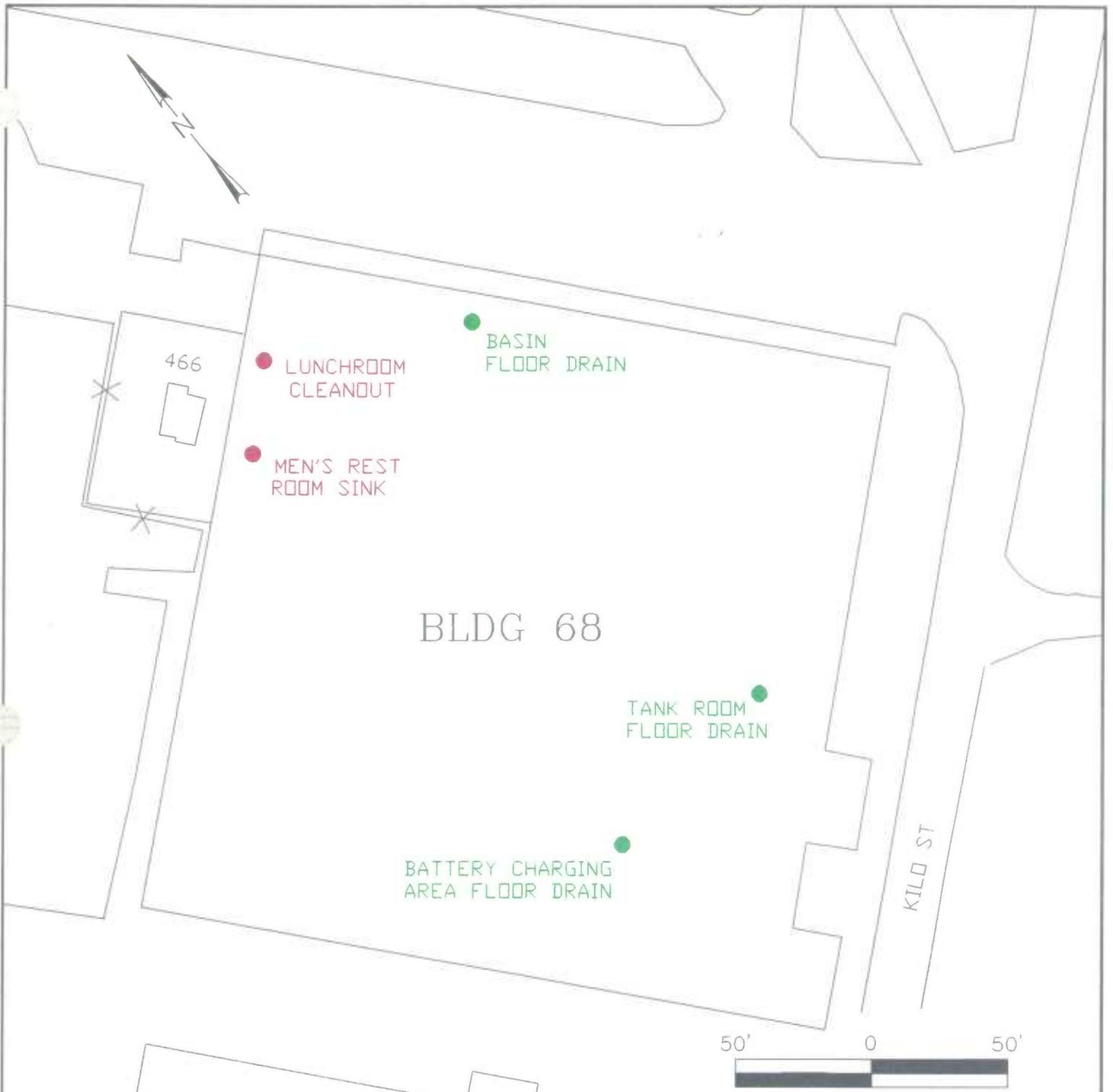
- - DYE INJECTION POINT
- - DYE INJECTION COULD NOT BE PERFORMED
- - DYE INJECTION CROSS-CONNECT



ZONE L
RCRA FACILITY
INVESTIGATION REPORT
NAVAL BASE CHARLESTON
CHARLESTON, SC

SPORTENVDETHASN
1899 NORTH HOBSON AVE.
NORTH CHARLESTON, SC
29405-2106
PH. (843) 743-6777

FIGURE A-12
BUILDING 6
DYE INJECTION SITES



LEGEND

- - DYE INJECTION POINT
- - DYE INJECTION COULD NOT BE PERFORMED
- - DYE INJECTION CROSS CONNECT

1824

50' 0 50'

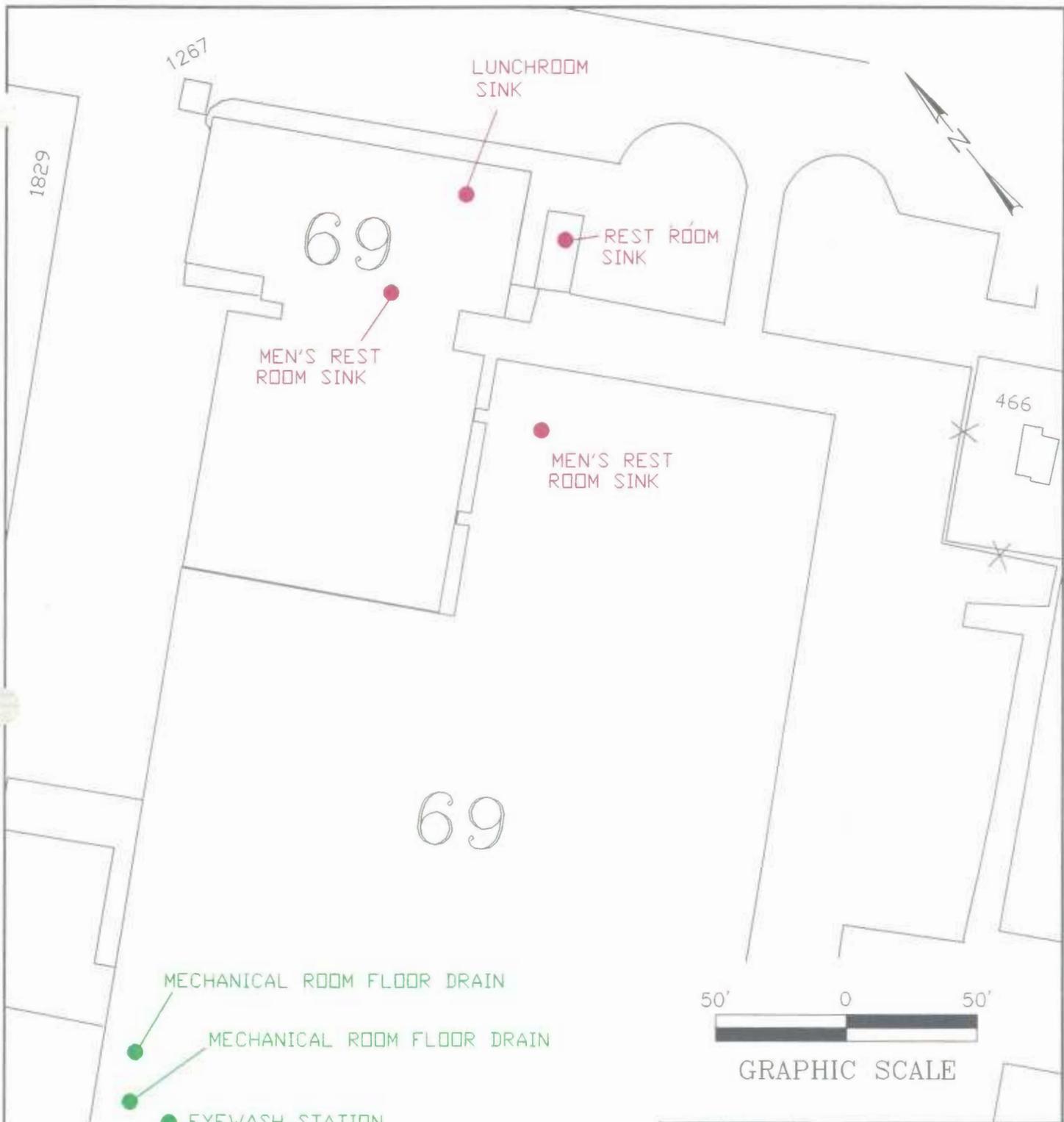
GRAPHIC SCALE



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CHARLESTON, SC

SPORTENVDETHASN
1899 NORTH HOBSON AVE.
NORTH CHARLESTON, SC
29405-2106
PH. (843) 743-6777

FIGURE A-13
BUILDING 68
DYE INJECTION SITES



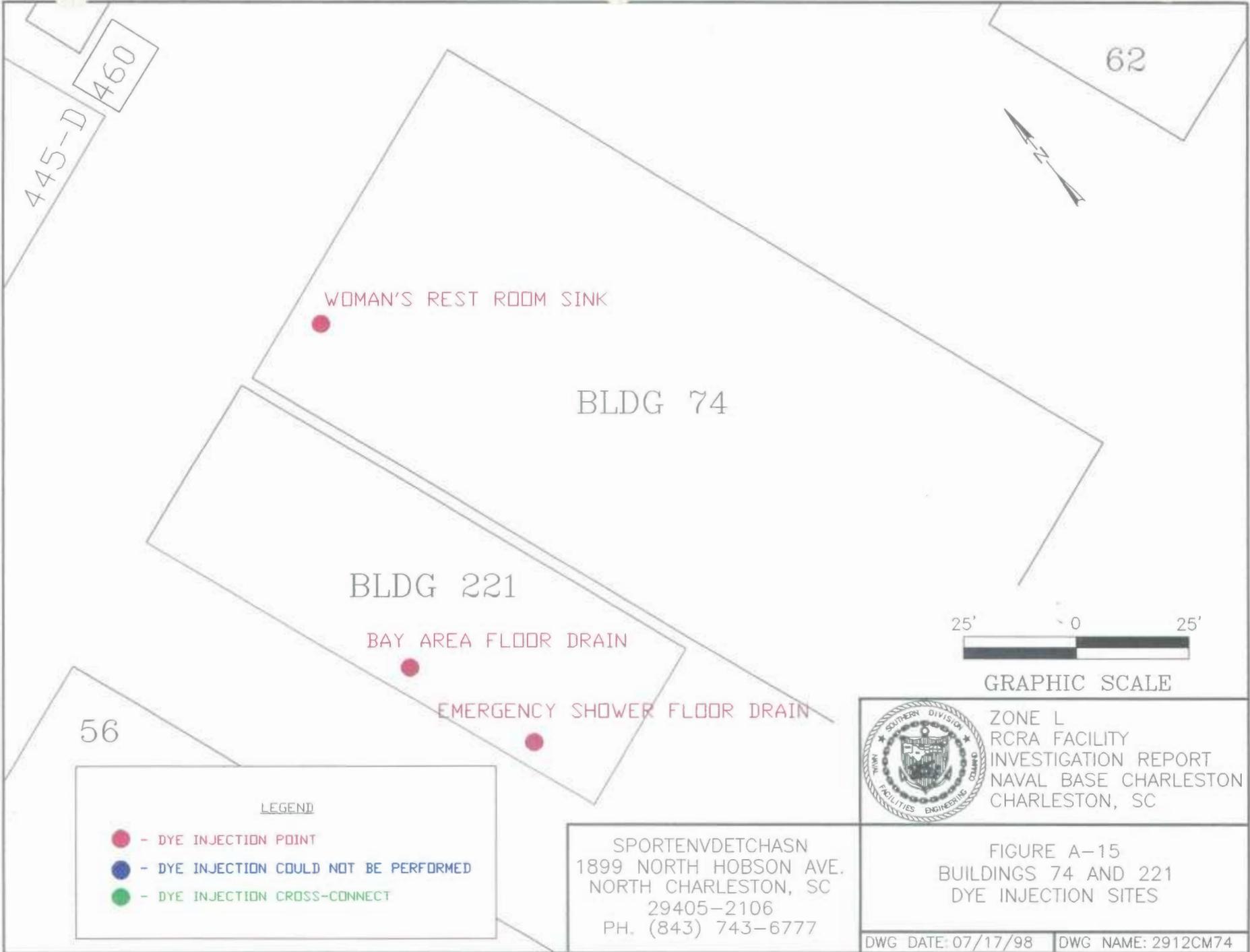
- LEGEND**
- - DYE INJECTION POINT
 - - DYE INJECTION COULD NOT BE PERFORMED
 - - DYE INJECTION CROSS CONNECT



ZONE L
 RCRA FACILITY
 INVESTIGATION REPORT
 NAVAL BASE CHARLESTON
 CHARLESTON, SC

SPORTENVDETHASN
 1899 NORTH HOBSON AVE.
 NORTH CHARLESTON, SC
 29405-2106
 PH. (843) 743-6777

FIGURE A-14
 BUILDING 69
 DYE INJECTION SITES



445-D
460

62

WOMAN'S REST ROOM SINK

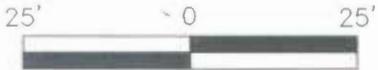
BLDG 74

BLDG 221

BAY AREA FLOOR DRAIN

EMERGENCY SHOWER FLOOR DRAIN

56



GRAPHIC SCALE

LEGEND

- - DYE INJECTION POINT
- - DYE INJECTION COULD NOT BE PERFORMED
- - DYE INJECTION CROSS-CONNECT



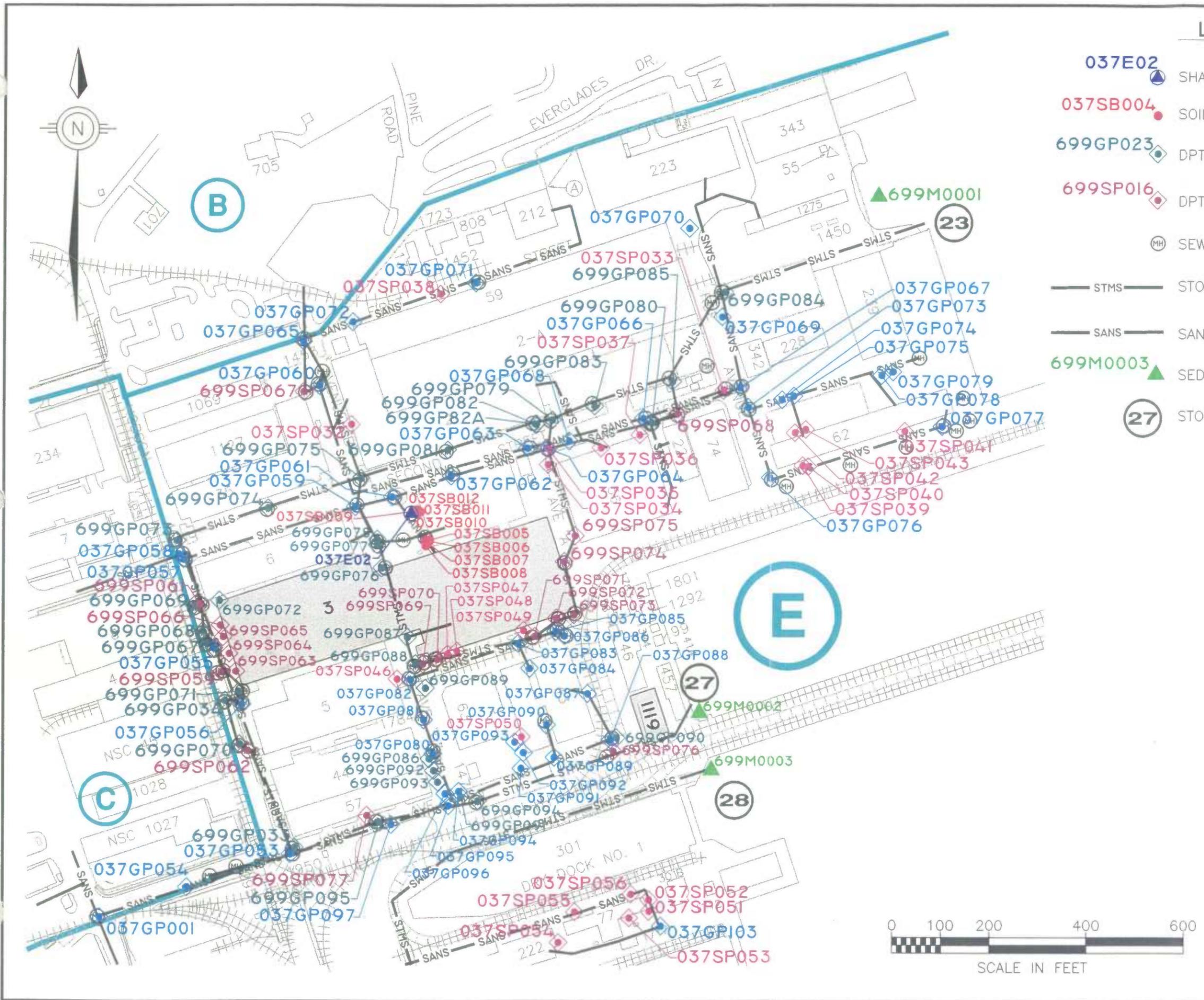
ZONE L
RCRA FACILITY
INVESTIGATION REPORT
NAVAL BASE CHARLESTON
CHARLESTON, SC

SPORTENVDETHASN
1899 NORTH HOBSON AVE.
NORTH CHARLESTON, SC
29405-2106
PH. (843) 743-6777

FIGURE A-15
BUILDINGS 74 AND 221
DYE INJECTION SITES

LEGEND:

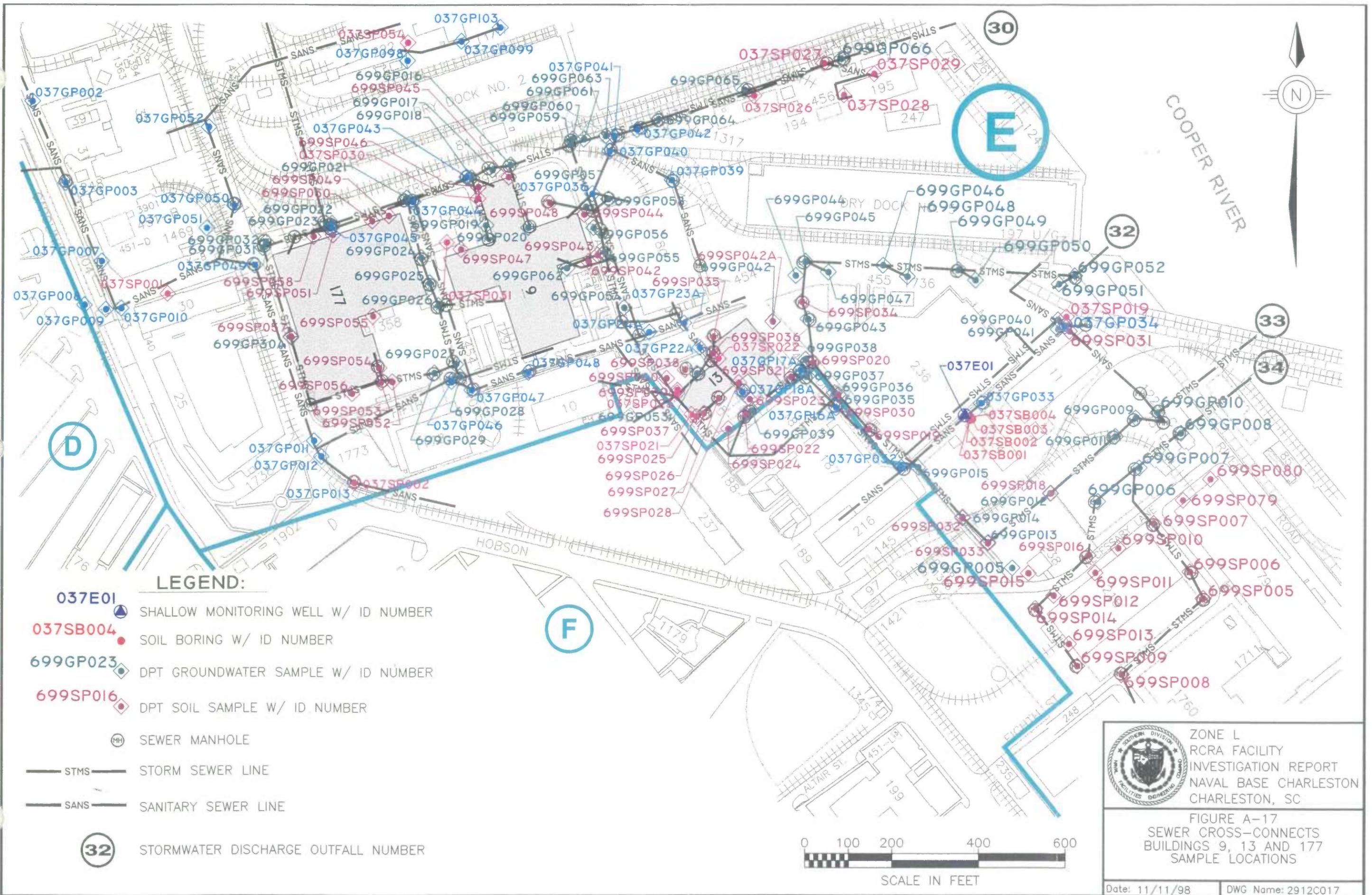
- 037E02 SHALLOW MONITORING WELL W/ ID NUMBER
- 037SB004 SOIL BORING W/ ID NUMBER
- ◆ 699GP023 DPT GROUNDWATER SAMPLE W/ ID NUMBER
- ◆ 699SP016 DPT SOIL SAMPLE W/ ID NUMBER
- MH SEWER MANHOLE
- STMS STORM SEWER LINE
- SANS SANITARY SEWER LINE
- ▲ 699M0003 SEDIMENT SAMPLE W/ ID NUMBER
- 27 STORMWATER DISCHARGE OUTFALL NUMBER



ZONE L
RCRA FACILITY
INVESTIGATION REPORT
NAVAL BASE CHARLESTON
CHARLESTON, SC

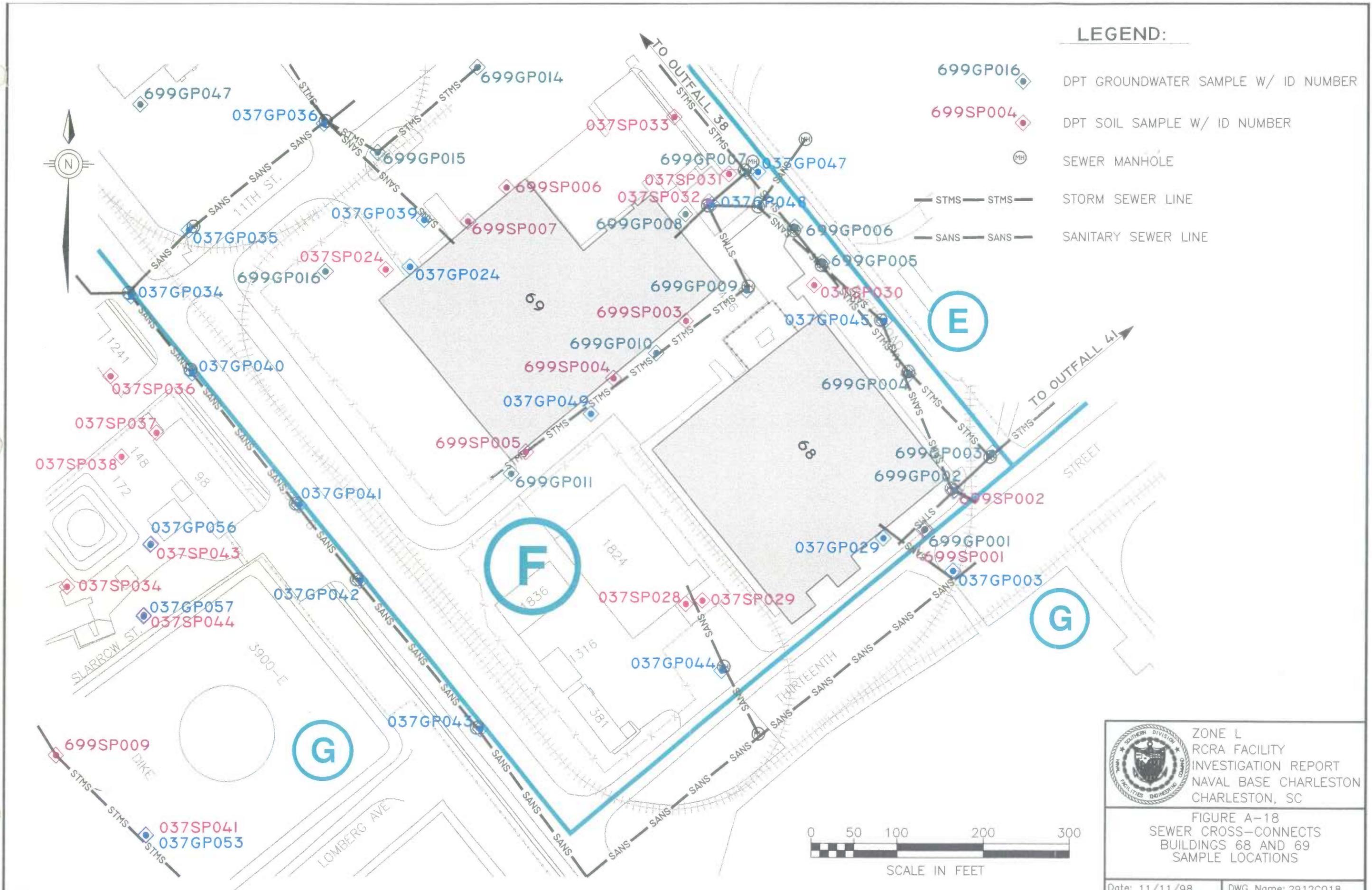
FIGURE A-16
SEWER CROSS-CONNECTS
BUILDINGS 3 AND 1119
SAMPLE LOCATIONS

Date: 11/11/98
DWG Name: 2912C016



LEGEND:

- 699GP016 DPT GROUNDWATER SAMPLE W/ ID NUMBER
- 699SP004 DPT SOIL SAMPLE W/ ID NUMBER
- SEWER MANHOLE
- STORM SEWER LINE
- SANITARY SEWER LINE

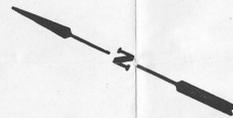


	ZONE L RCRA FACILITY INVESTIGATION REPORT NAVAL BASE CHARLESTON CHARLESTON, SC
	FIGURE A-18 SEWER CROSS-CONNECTS BUILDINGS 68 AND 69 SAMPLE LOCATIONS
	Date: 11/11/98 DWG Name: 2912C018

REVISIONS				
SYM	DESCRIPTION	MADE BY	DATE	APPROV
-	UPDATE	GDM	7/4/83	TKL

COOPER RIVER

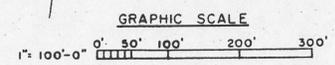
FLOOD EBB



- LEGEND**
- MANHOLE.
 - 7/2 MANHOLE NUMBER (OUTFALL NO./MANHOLE NO.)
 - CATCH BASIN.
 - C.O. CLEAN OUT.
 - D.S. DOWN SPOUT.
 - ⑦ OUTFALL NUMBER.
 - R.C. REINFORCED CONCRETE.
 - C.M. CORRUGATED METAL.
 - 5 MATCH SHEET AREA NO.

NOTE:
ALL LINES ARE V.C. UNLESS OTHERWISE NOTED.

P. W. DWG. NO. H409-7		DEPARTMENT OF THE NAVY NAVAL FACILITIES ENGINEERING COMMAND CHARLESTON NAVAL SHIPYARD, CHARLESTON, S.C.	
DESIGNED:	DUKE	<p align="center">STORM DRAINAGE AREA NO. 2</p>	
DRAWN:	SEAY		
CHECKED:	SEAY		
IN. INSP.:	SEAY		
APPROVED:	<i>[Signature]</i>		
DIRECTOR DESIGN DIVISION:	DATE	SIZE:	CODE IDENT. NO.
OFFICER IN CHARGE:	DATE	NAV. FAC. DRAWING NO.	CONSTR. CONTR. NO.
SATURDAY:	DATE	SCALE 1"=100'	SPEC
DATE			SHEET 2 OF 13



3

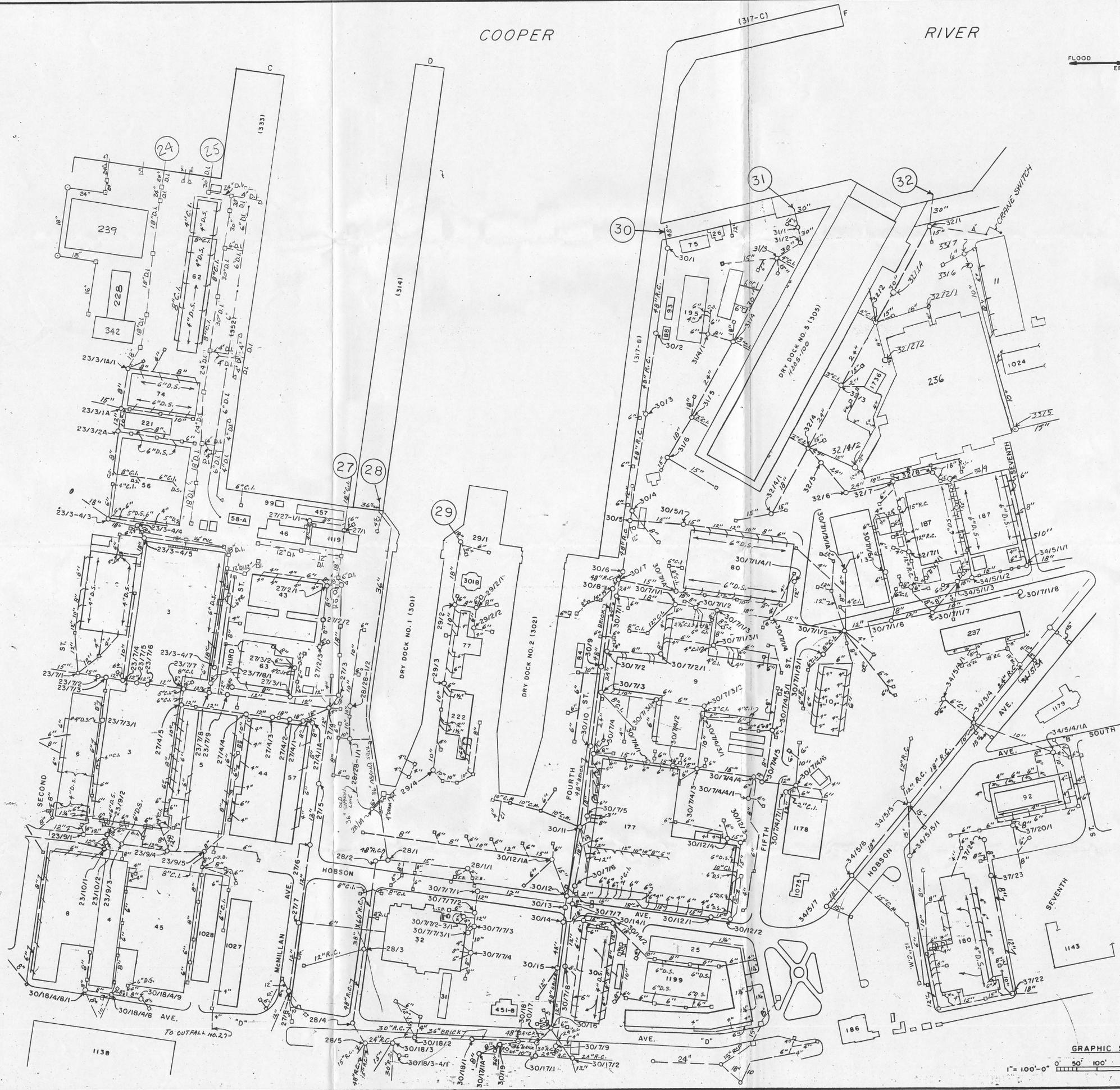
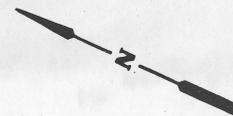
4

COOPER

RIVER

REVISIONS				
SYM	DESCRIPTION	MADE BY	DATE	APPROV
-	UPDATE	GDM	7/10/83	YFL

FLOOD
EBB



LEGEND

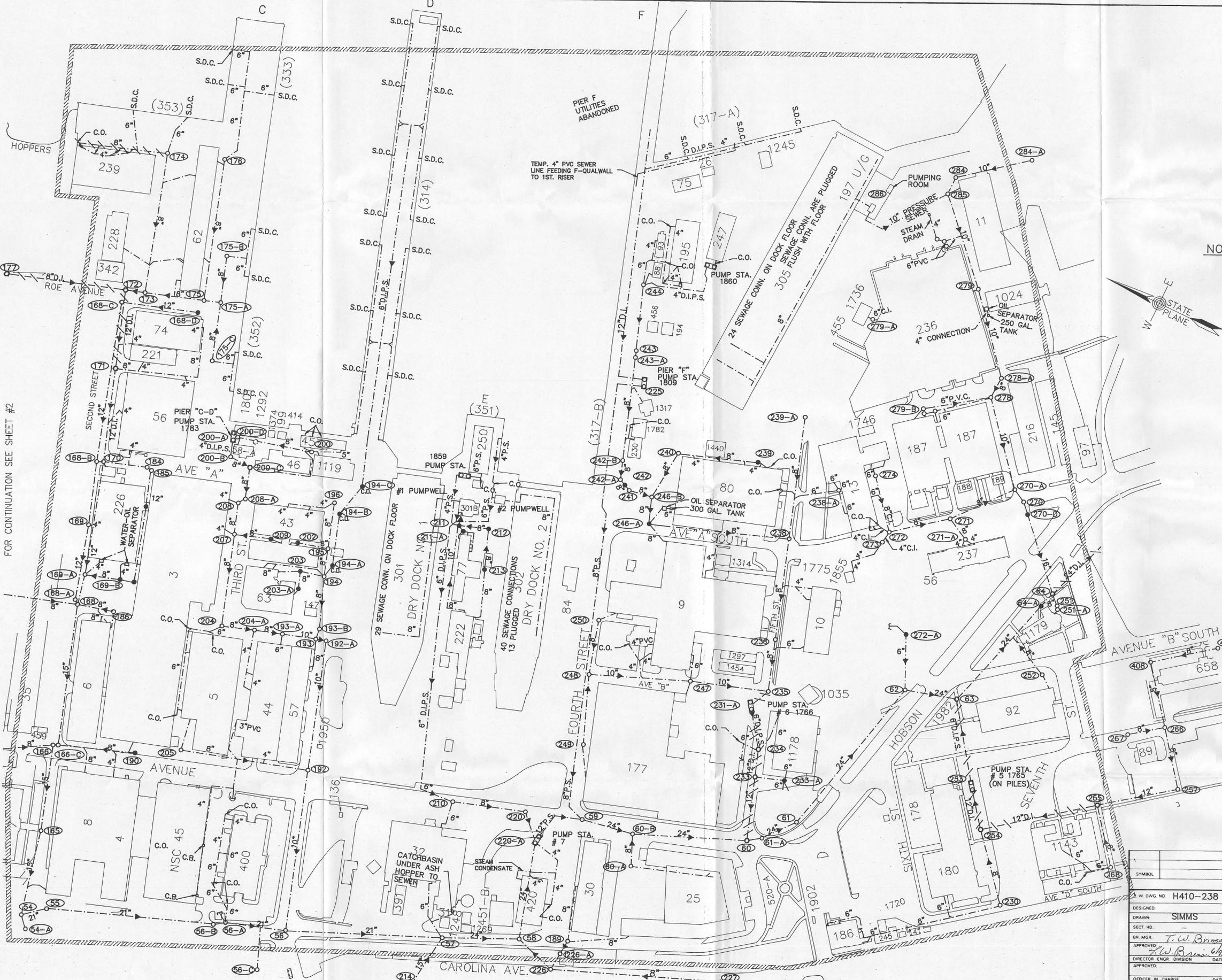
- MANHOLE.
- 30/7 MANHOLE NUMBER (OUTFALL NO. MANHOLE NO.)
- CATCH BASIN.
- C.O. CLEAN OUT.
- D.S. DOWN SPOUT.
- ③0 OUTFALL NUMBER.
- R.C. REINFORCED CONCRETE.
- C.M. CORRUGATED METAL.
- 4 MATCH SHEET AREA NO.
- D.I. DUCTILE IRON
- △ STEAM TRENCH DRAIN

NOTE:
ALL LINES ARE V.C. UNLESS OTHERWISE NOTED.

P. W. DWG. NO. H409-75		DEPARTMENT OF THE NAVY NAVAL FACILITIES ENGINEERING COMMAND	
DESIGNED: DUKE		CHARLESTON NAVAL SHIPYARD, CHARLESTON, S.C.	
CHECKED: SEAY			
IN. NO. 41515			
APPROVED: <i>[Signature]</i> 4/1/83			
DIRECTOR DESIGN DIVISION		DATE	
APPROVED: <i>[Signature]</i> 4/1/83			
OFFICIAL IN CHARGE		DATE	
SATISFACTORY TO: <i>[Signature]</i> 4/1/83			
SIZE: 11"	CODE IDENT. NO.	NAV. FAC. DRAWING NO.	
SCALE: 1" = 100'		CONSTR. CONTR. NO.	
		SHEET 5 OF 5	

GRAPHIC SCALE

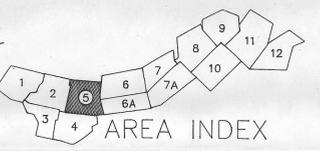
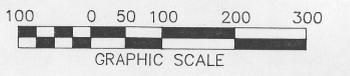
1" = 100'-0" 0 50 100 200 300



NOTE:
 FOR DEFICIENCIES OR PROBLEM AREAS CHECK "WASTE WATER FACILITIES EVALUATION REPORT" CONTRACT # N62467-88-D-1604 BY DAVIS & FLOYD MARCH 1990

- LEGEND**
- LINE ON PILES
 - MANHOLE
 - MANHOLE-ESTIMATED LOCATION
 - MANHOLE ON PILES
 - LIFT STATION
 - SANITARY SEWER
 - PLUG
 - DIRECTION OF FLOW
 - SEPTIC TANK
 - P.S. PRESSURE SEWER
 - C.O. CLEAN OUT
 - C.I. CAST IRON
 - D.I. DUCTILE IRON
 - S.D.C. SHIP DRAINAGE CONNECTION
 - V.C. VITRIFIED CLAY
 - P.V.C. POLYVINYL CHLORIDE
 - PP POLYPROPYLENE
 - AREA LIMITS

NOTES:
 ALL BUILDING SEWERS ARE 4" UNLESS OTHERWISE NOTED.
 ALL PIPES ARE V.C. UNLESS OTHERWISE NOTED.



AREA 5

SYMBOL	DESCRIPTION	DATE	APPROVAL
REVISIONS			
DESIGNED: H410-238		DEPARTMENT OF THE NAVY NAVAL FACILITIES ENGINEERING COMMAND	
DRAWN: SIMMS		CHARLESTON NAVAL SHIPYARD, CHARLESTON, S. C.	
SEWAGE COLLECTION SYSTEM			
AREA-5			
FEBRUARY 1995			
BR. MGR. T. W. Brinson	DATE	REQUEST NO.	NAV. FAC. DRAWING NO.
APPROVED: T. W. Brinson	DATE	CONSTR. CONTR. NO.	
DIRECTOR ENGR. DIVISION	DATE	SCALE 1"=100'	SHEET 5 OF 14
OFFICER IN CHARGE	DATE		
SATISFACTORY TO	DATE		

FOR CONTINUATION SEE SHEET #2

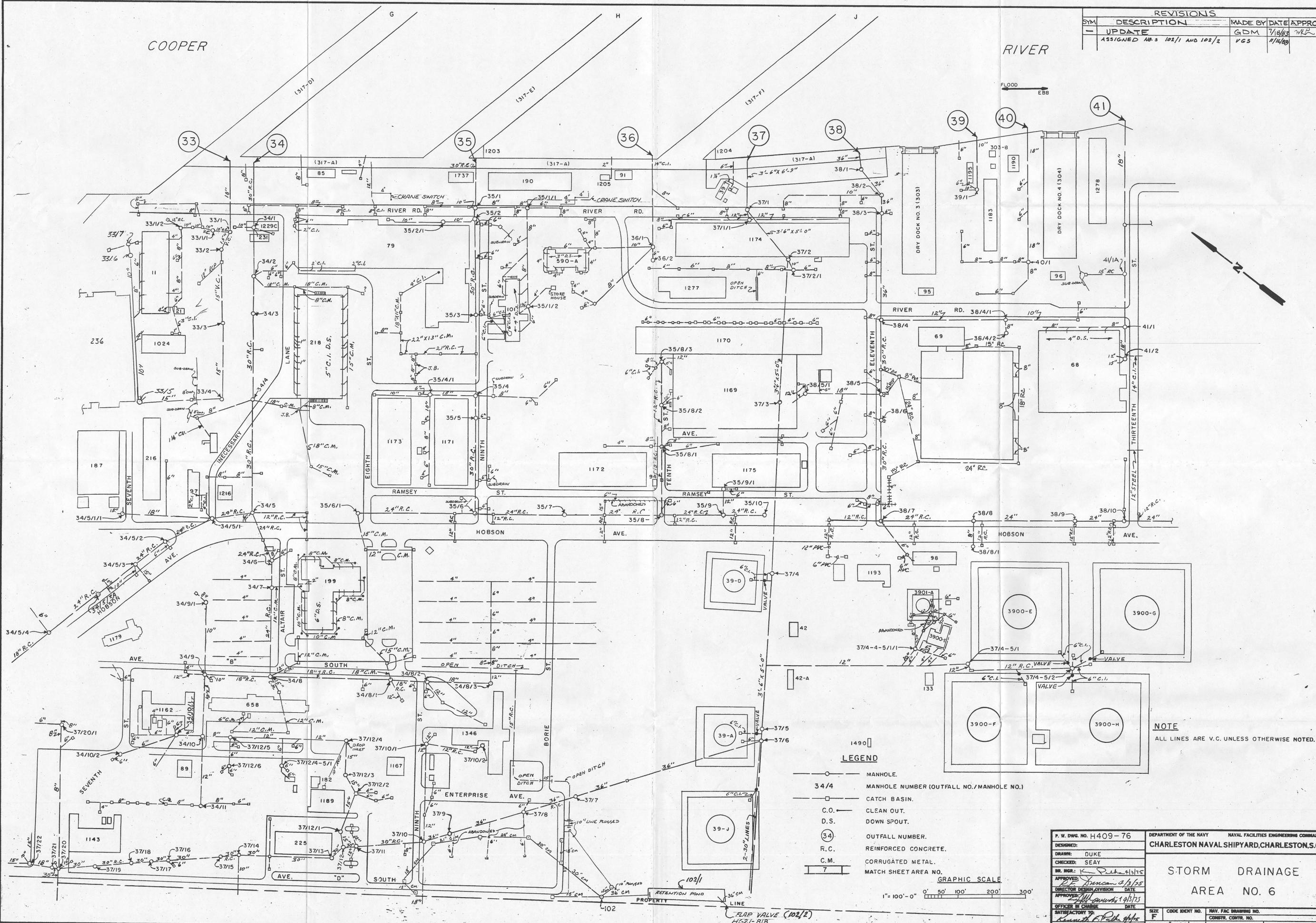
FOR CONTINUATION SEE SHEET #4

FOR CONTINUATION SEE SHEETS 6/1

COOPER

RIVER

REVISIONS			
SYM	DESCRIPTION	MADE BY	DATE APPROV
-	UPDATE	GDM	1/18/83
	ASSIGNED NO. 3 102/1 AND 102/2	VGS	11/14/83



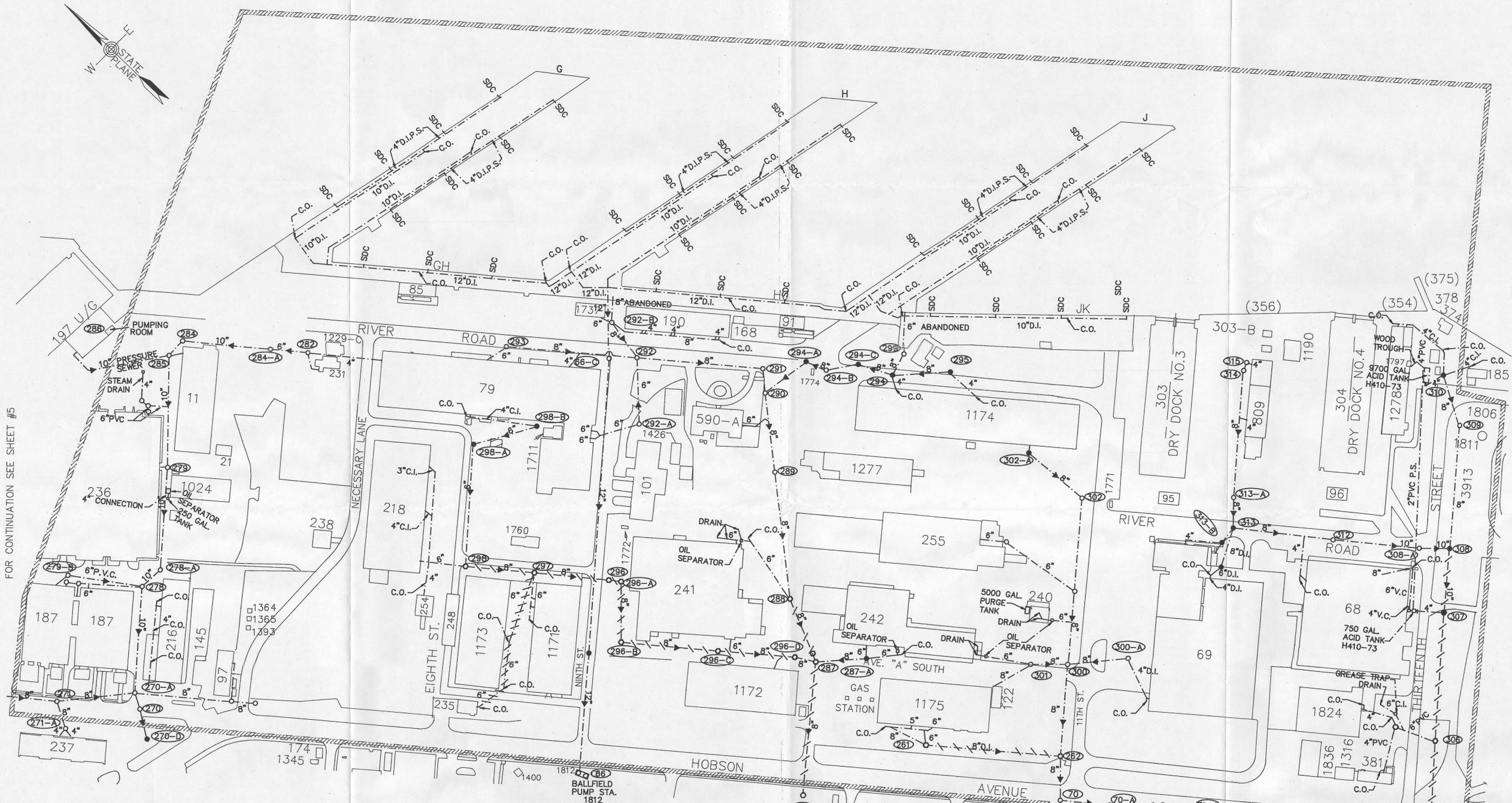
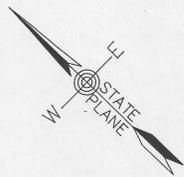
NOTE
ALL LINES ARE V.C. UNLESS OTHERWISE NOTED.

- LEGEND**
- MANHOLE.
 - 34/4 MANHOLE NUMBER (OUTFALL NO./MANHOLE NO.)
 - CATCH BASIN.
 - C.O. CLEAN OUT.
 - D.S. DOWN SPOUT.
 - (34) OUTFALL NUMBER.
 - R.C. REINFORCED CONCRETE.
 - C.M. CORRUGATED METAL.
 - 7 MATCH SHEET AREA NO.

GRAPHIC SCALE
1" = 100'-0" 0' 50' 100' 200' 300'

P. W. DWG. NO. H409-76		DEPARTMENT OF THE NAVY NAVAL FACILITIES ENGINEERING COMMAND	
DESIGNED: DUKE		CHARLESTON NAVAL SHIPYARD, CHARLESTON, S.C.	
CHECKED: SEAY			
APPROVED: [Signature]			
DIRECTOR DESIGN DIVISION			
DATE: 11/14/83			
OFFICE: [Signature]			
DATE: 11/14/83			
SIZE: F	CODE IDENT NO.	NAV. FAC. DRAWING NO.	CONSTR. CONTR. NO.
SCALE: 1" = 100'	SPEC		SHEET 6 OF 11

STORM DRAINAGE
AREA NO. 6



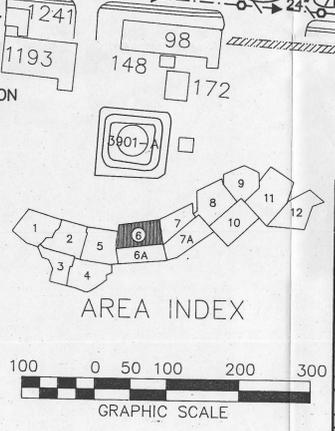
FOR CONTINUATION SEE SHEET #5

FOR CONTINUATION SEE SHEETS 8,9

NOTE:
 FOR DEFICIENCIES OR PROBLEM AREAS
 CHECK "WASTE WATER FACILITIES
 EVALUATION REPORT" CONTRACT #
 N62467-88-D-1604 BY DAVIS & FLOYD
 MARCH 1990

NOTES:
 ALL BUILDING SEWERS ARE 4" UNLESS
 OTHERWISE NOTED.
 ALL PIPES ARE V.C. UNLESS OTHERWISE
 NOTED.

- LEGEND**
- LINE ON PILES
 - MANHOLE
 - MANHOLE—ESTIMATED LOCATION
 - MANHOLE ON PILES
 - LIFT STATION
 - SANITARY SEWER
 - PLUG
 - DIRECTION OF FLOW
 - SEPTIC TANK
 - P.S.—PRESSURE SEWER
 - C.O.—CLEAN OUT
 - C.I.—CAST IRON
 - D.I.—DUCTILE IRON
 - S.D.C.—SHIP DRAINAGE CONNECTION
 - V.C.—VITRIFIED CLAY
 - P.V.C.—POLYVINYL CHLORIDE
 - PP—POLYPROPYLENE



AREA 6

SYMBOL	DESCRIPTION	DATE	APPROVAL
REVISIONS			
P.W. DWG. NO. H410-239		DEPARTMENT OF THE NAVY	
DESIGNED: SIMMS		NAVAL FACILITIES ENGINEERING COMMAND	
DRAWN: SIMMS		CHARLESTON NAVAL SHIPYARD, CHARLESTON, S.C.	
SEWAGE COLLECTION SYSTEM			
AREA-6			
APRIL 1994			
BR. MGR. <i>T.W. Brinson</i>	DATE	REQUEST NO.	NAV. FAC. DRAWING NO.
DIRECTOR ENGR. DIVISION	DATE	SATISFACTORY TO:	CONSTR. CONTR. NO.
OFFICER IN CHARGE	DATE	SCALE 1"=100'	SHEET 6 OF 14

FOR CONTINUATION SEE SHEET #7

Appendix B
Well Boring Logs

Project: ZONE L - Naval Base Charleston	Coordinates: 2315266.78 E, 380025.85 N
Location: Charleston, SC	Surface Elevation: 10.3 feet msl
Started at 1340 on 5-20-97	TOC Elevation: 12.69 feet msl
Completed at 1435 on 5-20-97	Depth to Groundwater: 11.47 feet TOC Measured: 5-27-97
Drilling Method: 4.25" ID (7.5" OD) HSA with split spoon sampler	Groundwater Elevation: 122 feet msl
Drilling Company: Alliance Environmental (SC cert. # 889)	Total Depth: 15.0 feet
Geologist: S.Weatherford	Well Screen: 5.0 to 14.7 feet

DEPTH IN FEET	LITHOLOGIC SAMPLE	ANALYTICAL SAMPLE	SAMPLE NO.	OVA (ppm)	% RECOVERY	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	ELEV. (ft-msl)	WELL DIAGRAM
								Surface conditions: grass Cuttings: orange-brown, loose; sandy-soil.		
			0					Sand: orange; loose; silty.	7.3	
5			1	0	100	SM		Sand: orange-brown; loose; fine; silty; damp.		
			2	0	100			Sand: tan; clayey; loose; wet.	3.3	
			3	0	100	SC		Sand: red-tan-brown-green; clayey; loose.	3	
10			4	0	50	SC		Sand: olive green-red; clayey.	7	
			5	0	70			Clay: green-brown; w/ fine to silty sand; wet.	21 27	
15			6	0	100	CL			4.7	
20										

Project: ZONE L - Naval Base Charleston	Coordinates: 2315136.27 E, 379112.74 N
Location: Charleston, SC	Surface Elevation: 7.1 feet msl
Started at 1320 on 5-22-97	TOC Elevation: 9.42 feet msl
Completed at 1425 on 5-22-97	Depth to Groundwater: 5.11 feet TOC Measured: 5-30-97
Drilling Method: 4.25" ID (7.5" OD) HSA with split spoon sampler	Groundwater Elevation: 4.31 feet msl
Drilling Company: Alliance Environmental (SC cert. # 889)	Total Depth: 12.0 feet
Geologist: S.Weatherford	Well Screen: 2.0 to 11.7 feet

DEPTH IN FEET	LITHOLOGIC SAMPLE	ANALYTICAL SAMPLE	SAMPLE NO.	OVA (ppm)	% RECOVERY	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	ELEV. (ft-msl)	WELL DIAGRAM
								Surface conditions: grass; fill. Cuttings: brown; gravelly fill.		
			0			Fill	Fill: brown-black-grey; sandy.	4.1		
5			1	0	70	SM	Sand: tan-green; medium to fine; silty; wet.	2.7 2.1		
						OH	Clay: blue-green w/ black; fat.	1.1 0.8		
			2	0	75	SC	Sand: blue-green; clayey; wet.	0		
10			3	0	5	OH	Clay: blue-green; soft; fat; organic; wet.	19		
20			4	0	100			3.9		

Project: ZONE L - Naval Base Charleston

Coordinates: 2318476.76 E, 375311.16 N

Location: Charleston, SC

Surface Elevation: 9.0 feet msl

Started at 1515 on 5-22-97

TOC Elevation: 9.11 feet msl

Completed at 1605 on 5-22-97

Depth to Groundwater: 3.88 feet TOC Measured: 6-16-97

Drilling Method: 4.25" ID (7.5" OD) HSA with split spoon sampler

Groundwater Elevation: 5.23 feet msl

Drilling Company: Alliance Environmental (SC cert. # 889)

Total Depth: 12.5 feet

Geologist: S.Weatherford

Well Screen: 2.5 to 12.2 feet

DEPTH IN FEET	LITHOLOGIC SAMPLE	ANALYTICAL SAMPLE	SAMPLE NO.	OVA (ppm)	% RECOVERY	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	ELEV. (ft-msl)	WELL DIAGRAM
								Surface conditions: concrete. Cuttings: brown; sandy fill.		
				0			Fill	Fill: olive-blue; clayey; sandy.	6	
5			1	0	50		Fill	Fill: olive-blue-brown; clayey-sand; sandy-clay.	4	
			2	0	50		Fill	Fill: grey-green-blue; loose; clayey-sand w/ heavy diesel odor.	2	
			3	30	75		OL OH	Clay: blue-green; soft; fat; organic; wet.	0	
10			4	25	50				1	
15										
20										

Project: ZONE L - Naval Base Charleston	Coordinates: 2319425.71 E, 373034.58 N
Location: Charleston, SC	Surface Elevation: 10.2 feet msl
Started at 0920 on 5-20-97	TOC Elevation: 13.25 feet msl
Completed at 1020 on 5-20-97	Depth to Groundwater: 7.80 feet TOC Measured: 5-30-97
Drilling Method: 4.25" ID (7.5" OD) HSA with split spoon sampler	Groundwater Elevation: 5.45 feet msl
Drilling Company: Alliance Environmental (SC cert. # 889)	Total Depth: 14.0 feet
Geologist: S.Weatherford	Well Screen: 4.0 to 13.7 feet

DEPTH IN FEET	LITHOLOGIC SAMPLE	ANALYTICAL SAMPLE	SAMPLE NO.	OVA (ppm)	% RECOVERY	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	ELEV. (ft-msl)	WELL DIAGRAM
								Surface conditions: grass Cuttings: brown-tan, loose loamy soil.		
5			1	0	100		SC CL	Sand: brown-orange; loose; clayey; soft.	7.2	
							SC	Sand: orange to tan w/ green mottling; w/ stiff clay.	5.2	
			2	0	70		CL	Clay: grey-green; stiff; sandy; damp.	3.8 3.2	
10			3	0	75		CL	Clay: grey-green; sandy; loose; stiff; grades to clayey sand at bottom of sample.	1.7 1.2	
			4	0	100		CL OL	Clay: grey-green w/ tan-orange mottling; silty; w/ fine sand; fat; wet.	0.8	
15			5	0	100		OH	Clay: grey-green; silty; stiff to fat; organic; damp. Marsh clay.	3.8	
			6	0	100				4.8	end cap
20										borehole collapsed

Project: ZONE L - Naval Base Charleston	Coordinates: 2324612.7 E, 3711422 N
Location: Charleston, SC	Surface Elevation: 9.1 feet msl
Started at 1030 on 5-21-97	TOC Elevation: 8.97 feet msl
Completed at 1130 on 5-21-97	Depth to Groundwater: 4.26 feet TOC Measured: 5-28-97
Drilling Method: 4.25" ID (7.5" OD) HSA with split spoon sampler	Groundwater Elevation: 4.71 feet msl
Drilling Company: Alliance Environmental (SC cert. # 889)	Total Depth: 13.0 feet
Geologist: S.Weatherford	Well Screen: 3.0 to 12.7 feet

DEPTH IN FEET	LITHOLOGIC SAMPLE	ANALYTICAL SAMPLE	SAMPLE NO.	OVA (ppm)	% RECOVERY	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	ELEV. (ft-msl)	WELL DIAGRAM
								Surface conditions: concrete Cuttings: ROC, fill; loose tan sand.		
			0			SP	Sand: brown; loose; fine to medium; damp.	8.1 5.7		
5			1	0	20	SP SC	Sand: brown; loose; fine; damp; become medium with clay at 5.4'.	4.1 3.5		
			2	0	30		No recovery			
			3	0	0	CL ML	Clay: gray-green-blue; loose; silty; sandy w/ shells.	.1		
10						SW	Sand: gray-green; medium to coarse; w/ shells and phosphate nodules.	.9 1.3		
			4	0	70	SW	Sand: as above.	1.9		
			5	0	100			3.9		
15										
20										

Project: ZONE L - Naval Base Charleston	Coordinates: 2325058.07 E, 371420.80 N
Location: Charleston, SC	Surface Elevation: 6.6 feet msl
Started at 1220 on 5-21-97	TOC Elevation: 6.61 feet msl
Completed at 1445 on 5-21-97	Depth to Groundwater: 4.05 feet TOC Measured: 5-29-97
Drilling Method: 4.25" ID (7.5" OD) HSA with split spoon sampler	Groundwater Elevation: 2.56 feet msl
Drilling Company: Alliance Environmental (SC cert. # 889)	Total Depth: 12.0 feet
Geologist: S.Weatherford	Well Screen: 2.0 to 11.7 feet

DEPTH IN FEET	LITHOLOGIC SAMPLE	ANALYTICAL SAMPLE	SAMPLE NO.	OVA (ppm)	% RECOVERY	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	ELEV. (ft-msl)	WELL DIAGRAM
								Surface conditions: assphalt Cuttings: brown-tan, loose; fine; sandy-soil-fill.		
						FILL	Fill: brown; loose; sandy.	3.8		
						SM	Sand: grey-green-blue; fine; silty; wet.	2.8		
5			1	0	100	ML	Clay: olive-drab; silty; soft; w/ coarse sand, shell hash, and phosphate nodules; damp.	1.6		
						ML CL	Clay: olive-drab; silty; soft; damp.	0.4		
						SW SM	Sand: grey-green-blue; medium to coarse; w/ shell hash; wet.	1.4 1.9		
			3	0	75	GC SC	Sand: blue-green; coarse; w/ shells and phosphate nodules; becoming fine sand w/ shells and clay lenses; heavy sulfur odor.	2.4 3.6		
			4	0	60					
10										
15										
20										

Project: ZONE L - Naval Base Charleston

Coordinates: 231675179 E, 379868.50 N

Location: Charleston, SC

Surface Elevation: 6.5 feet msl

Started at 0830 on 5-21-97

TOC Elevation: 6.39 feet msl

Completed at 0940 on 5-21-97

Depth to Groundwater: 2.24 feet TOC Measured: 5-27-97

Drilling Method: 4.25" ID (7.5" OD) HSA with split spoon sampler

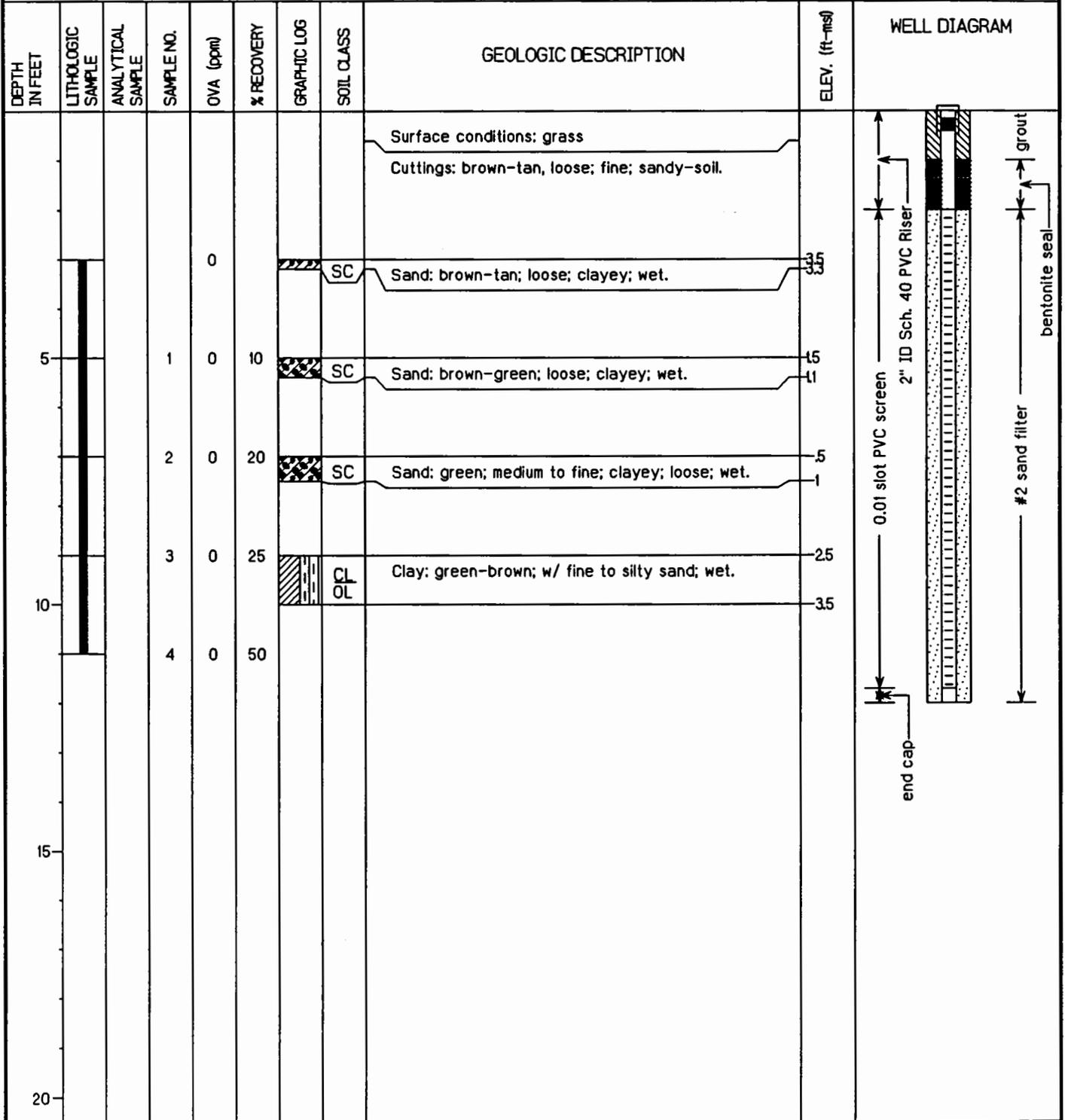
Groundwater Elevation: 4.15 feet msl

Drilling Company: Alliance Environmental (SC cert. # 889)

Total Depth: 12.0 feet

Geologist: S.Weatherford

Well Screen: 2.0 to 11.7 feet



Project: ZONE L - Naval Base Charleston	Coordinates: 2315061.05 E, 379102.08 N
Location: Charleston, SC	Surface Elevation: 8.5 feet msl
Started at 1200 on 5-22-97	TOC Elevation: 11.19 feet msl
Completed at 1305 on 5-22-97	Depth to Groundwater: 5.80 feet TOC Measured: 5-30-97
Drilling Method: 4.25' ID (7.5' OD) HSA with split spoon sampler	Groundwater Elevation: 5.39 feet msl
Drilling Company: Alliance Environmental (SC cert. # 889)	Total Depth: 13.0 feet
Geologist: S.Weatherford	Well Screen: 3.0 to 12.7 feet

DEPTH IN FEET	LITHOLOGIC SAMPLE	ANALYTICAL SAMPLE	SAMPLE NO.	OVA (ppm)	% RECOVERY	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	ELEV. (ft-msl)	WELL DIAGRAM
								Surface conditions: grass; fill Cuttings: black-green; clayey; sandy; fill; w/ coal.		
0						Fill	Fill: green-blue-black; clayey; sandy; w/ coal.	5.5		
1					100	Fill	Fill: as above.	3.5		
2					10	OL OH	Clay: blue-green; soft; fat; silty; wet to damp.	2.5		
3					15	OL OH	Clay: as above.	1.5		
4					5	OL OH	Clay: as above.	2.5		
5					70			3.9		

Project: ZONE L - Naval Base Charleston	Coordinates: 2316876.87 E, 377057.77 N
Location: Charleston, SC	Surface Elevation: 9.1 feet msl
Started at 0900 on 5-22-97	TOC Elevation: 9.20 feet msl
Completed at 1002 on 5-22-97	Depth to Groundwater: 3.92 feet TOC Measured: 6-18-97
Drilling Method: 4.25" ID (7.5" OD) HSA with split spoon sampler	Groundwater Elevation: 5.28 feet msl
Drilling Company: Alliance Environmental (SC cert. # 889)	Total Depth: 13.0 feet
Geologist: S.Weatherford	Well Screen: 3.0 to 12.7 feet

DEPTH IN FEET	LITHOLOGIC SAMPLE	ANALYTICAL SAMPLE	SAMPLE NO.	OVA (ppm)	% RECOVERY	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	ELEV. (ft-msl)	WELL DIAGRAM
								Surface conditions: concrete Cuttings: brown; loose; sandy; fill.		
				0		Fill	Fill	Fill: brown-black-green; loose; sandy fill w/ heavy diesel odor.	8.1	
5			1	79	70	Fill	Fill	Fill: brown-black sand; brown-green-black clayey sand; heavy diesel odor.	4.7 4.1	
			2	77	70	CL	CL	Clay: grey-green-blue; loose; w/ fine to medium, silty sand; wet; heavy diesel odor.	2.7 2.1	
10			3	270	50	CL	CL	Clay: gray-blue; loose; sandy; wet.	1.1 1.1	
			4	120	75	SM SP	SM SP	Sand: tan to grey; fine to medium; wet; heavy diesel odor.	0.9 1.4	
			5	5.0	75	SM SP CL CH	SM SP CL CH	Sand: tan-green; medium to fine grained; some silt; loose; wet. Clay: grey-orange; stiff; fat; damp to dry.	1.9 2.9 3.9	
15										
20										

Project: ZONE L - Naval Base Charleston	Coordinates: 2319283.53 E, 372857.80 N
Location: Charleston, SC	Surface Elevation: 11.1 feet msl
Started at 1745 on 5-20-97	TOC Elevation: 10.87 feet msl
Completed at 0850 on 5-20-97	Depth to Groundwater: 8.00 feet TOC Measured: 5-30-97
Drilling Method: 4.25' ID (7.5' OD) HSA with split spoon sampler	Groundwater Elevation: 2.87 feet msl
Drilling Company: Alliance Environmental (SC cert. # 889)	Total Depth: 15.0 feet
Geologist: S.Weatherford	Well Screen: 5.0 to 14.7 feet

DEPTH IN FEET	LITHOLOGIC SAMPLE	ANALYTICAL SAMPLE	SAMPLE NO.	OVA (ppm)	% RECOVERY	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	ELEV. (ft-msl)	WELL DIAGRAM
								Surface conditions: asphalt Cuttings: ROC, asphalt, and damp, clayey loose sand.		
0						SC	Sand: brown-red; loose; clayey; soft.	8.1 7.9		
1					10	SC SM	Sand: brown-tan; clayey; silty; loose.	6.1 5.6		
2					25	CL SC	Clay: gray-green; sandy; damp.	4.1		
3					75	CL SC	Clay: as above.	2.8 2.1		
4					75	CH	Clay: tan-brown; silty; stiff; wet.	.6 .1		
5					100	CL	Clay: tan-brown-green; sandy; wet.	1.9		
6					100	OH	Clay: gray-green; silty; stiff; fat; organic; damp. Marsh clay.	2.9 3.9		

Project: ZONE L - Naval Base Charleston

Coordinates: 2323590.80 E, 369014.40 N

Location: Charleston, SC

Surface Elevation: 8.8 feet msl

Started at 1510 on 5-20-97

TOC Elevation: 10.95 feet msl

Completed at 1610 on 5-20-97

Depth to Groundwater: 5.61 feet TOC Measured: 5-29-97

Drilling Method: 4.25" ID (7.5" OD) HSA with split spoon sampler

Groundwater Elevation: 5.34 feet msl

Drilling Company: Alliance Environmental (SC cert. # 889)

Total Depth: 14.0 feet

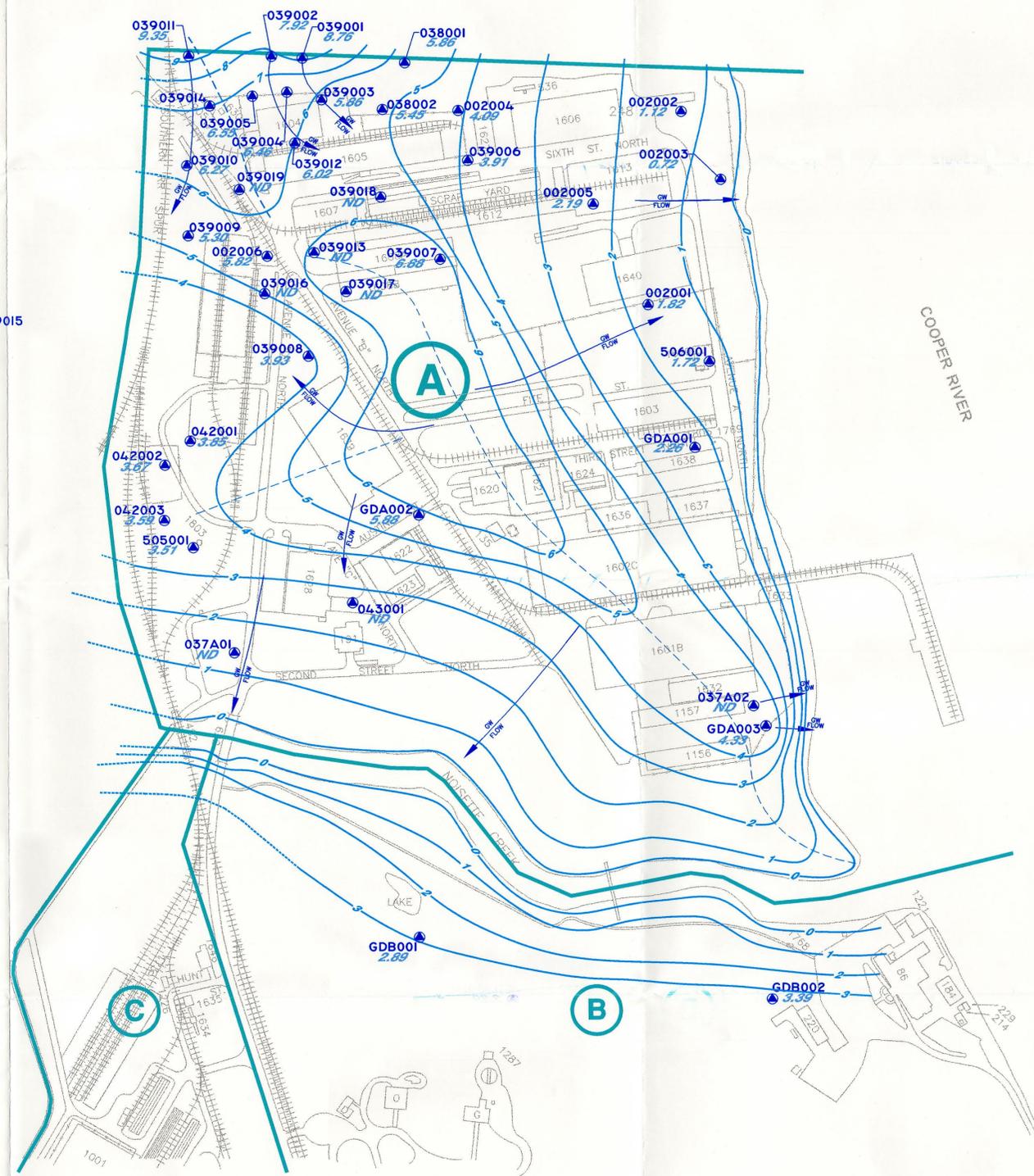
Geologist: S.Weatherford

Well Screen: 4.0 to 13.7 feet

DEPTH IN FEET	LITHOLOGIC SAMPLE	ANALYTICAL SAMPLE	SAMPLE NO.	OVA (ppm)	% RECOVERY	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	ELEV. (ft-msl)	WELL DIAGRAM
								Surface conditions: grass Cuttings: brown-tan, loose loamy soil and wet black sand.		<p>WELL DIAGRAM</p> <p>2' ID Sch. 40 PVC Riser</p> <p>0.01 slot PVC screen</p> <p>#2 sand filter</p> <p>bentonite seal</p> <p>end cap</p> <p>grout</p>
5			1	0	75		SM	Sand: brown; fine to silty.	5.8	
							SM	Sand: grey-green-black; loose; silty; wet.	4.3 3.8 3.3	
			2	0	25		SM	Sand: brown; silty; loose; wet.	1.8	
10			3	0	100		SM		12	
			4	0	100		OH	Clay: grey-green; silty; stiff; fat; organic; damp. Marsh clay.		
15			5	81	75				3.7	
20										

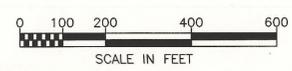
Project: <i>ZONE L - Naval Base Charleston</i>	Coordinates: <i>2325762.17 E, 369177.41 N</i>
Location: <i>Charleston, SC</i>	Surface Elevation: <i>6.4 feet msl</i>
Started at <i>1615 on 5-21-97</i>	TOC Elevation: <i>8.55 feet msl</i>
Completed at <i>1735 on 5-21-97</i>	Depth to Groundwater: <i>4.80 feet TOC</i> Measured: <i>5/29/97</i>
Drilling Method: <i>4.25" ID (7.5" OD) HSA with split spoon sampler</i>	Groundwater Elevation: <i>3.75 feet msl</i>
Drilling Company: <i>Alliance Environmental (SC cert. # 889)</i>	Total Depth: <i>13.0 feet</i>
Geologist: <i>S.Weatherford</i>	Well Screen: <i>3.0 to 12.7 feet</i>

DEPTH IN FEET	LITHOLOGIC SAMPLE	ANALYTICAL SAMPLE	SAMPLE NO.	OVA (ppm)	% RECOVERY	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	ELEV. (ft-msl)	WELL DIAGRAM
								Surface conditions: grass Cuttings: tan, loose loamy soil.		
				0			SC	Sand: red-tan-green; clayey.	3.4	
5			1	0	70		CL CH	Clay: olive-green; stiff; sandy w/ oyster shells.	1.4	
									1.4	
			2	0	50		SC	Sand: gray-green-blue; loose; clayey; wet.	0.6	
									1.1	
			3	0	25		SC	Sand: as above.	2.8	
10							ML CL	Clay: olive-tan; silty; soft; wet.	3.6	
			4	0	100		OL CL	Clay: blue-green; silty; soft; fat; damp.	4.8	
									5.8	
			5	0	50					
15										
20										



LEGEND:

- **GDA003**
4.33 SHALLOW MONITORING WELL W/ ID NUMBER AND GROUNDWATER ELEVATION
- GROUNDWATER ELEVATION CONTOUR - MEAN SEA LEVEL (DASHED WHERE INFERRED)
- GROUNDWATER FLOW DIRECTION
- - - GROUNDWATER DIVIDE



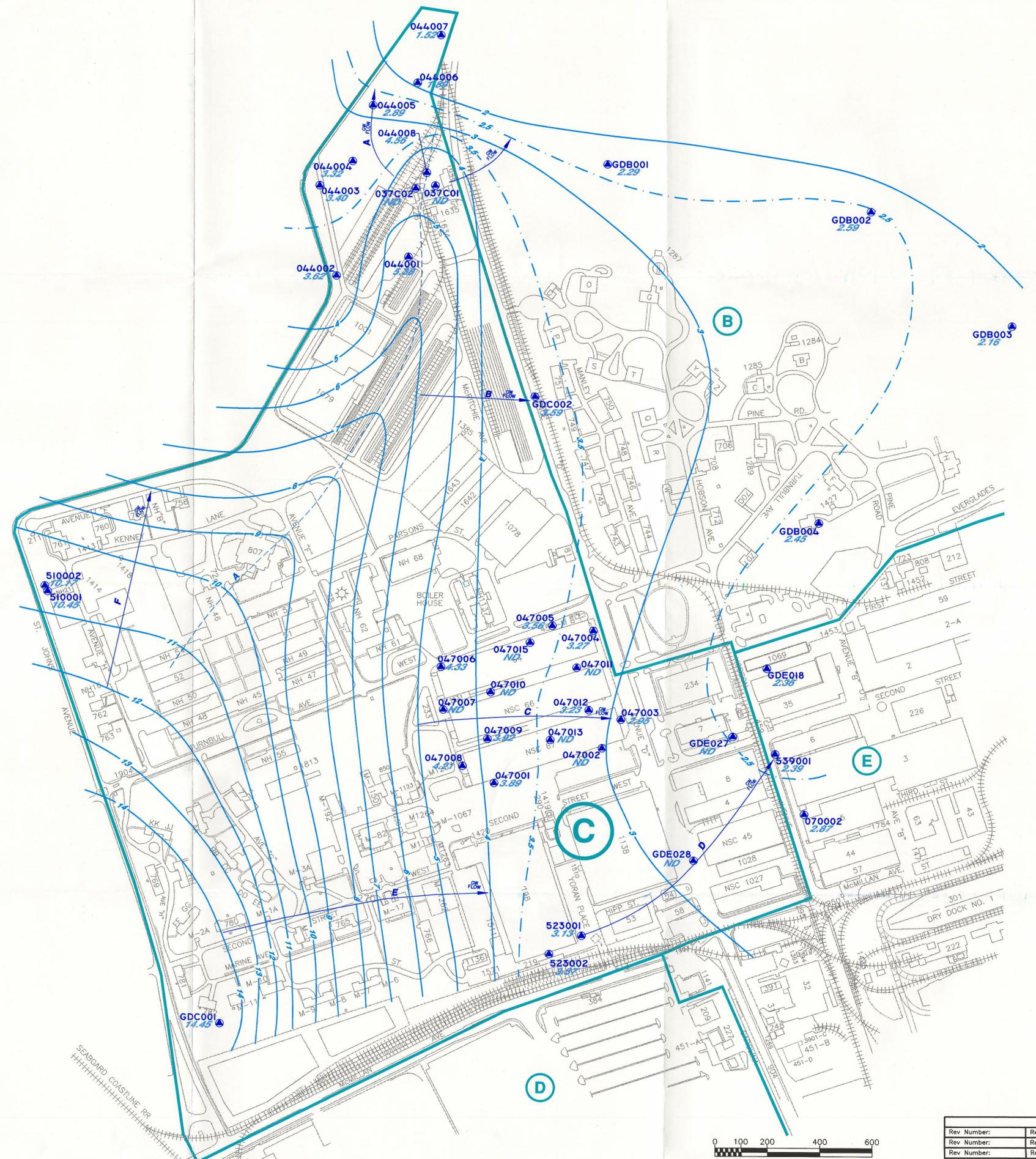
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Rev Number:	Rev Date:	Rev By:

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FIGURE B.1
SHALLOW GROUNDWATER
ELEVATION CONTOURS
FROM ZONE A RFI REPORT

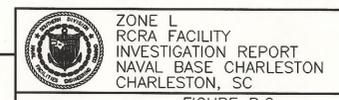
Dr by: W. FAULK	Tr by: —
Clk by: P. BAYLEY	Appr by: T. HAVERKOST
Date: 12/07/98	DWG Name: 2912139

Sheet 1
Of 1



LEGEND:

- 047005 3.55 SHALLOW MONITORING WELL W/ ID NUMBER AND GROUNDWATER ELEVATION
- ND = NO DATA
- 3 GROUNDWATER ELEVATION CONTOUR - MEAN SEA LEVEL
- FLOW GROUNDWATER FLOW DIRECTION
- - - GROUNDWATER DIVIDE

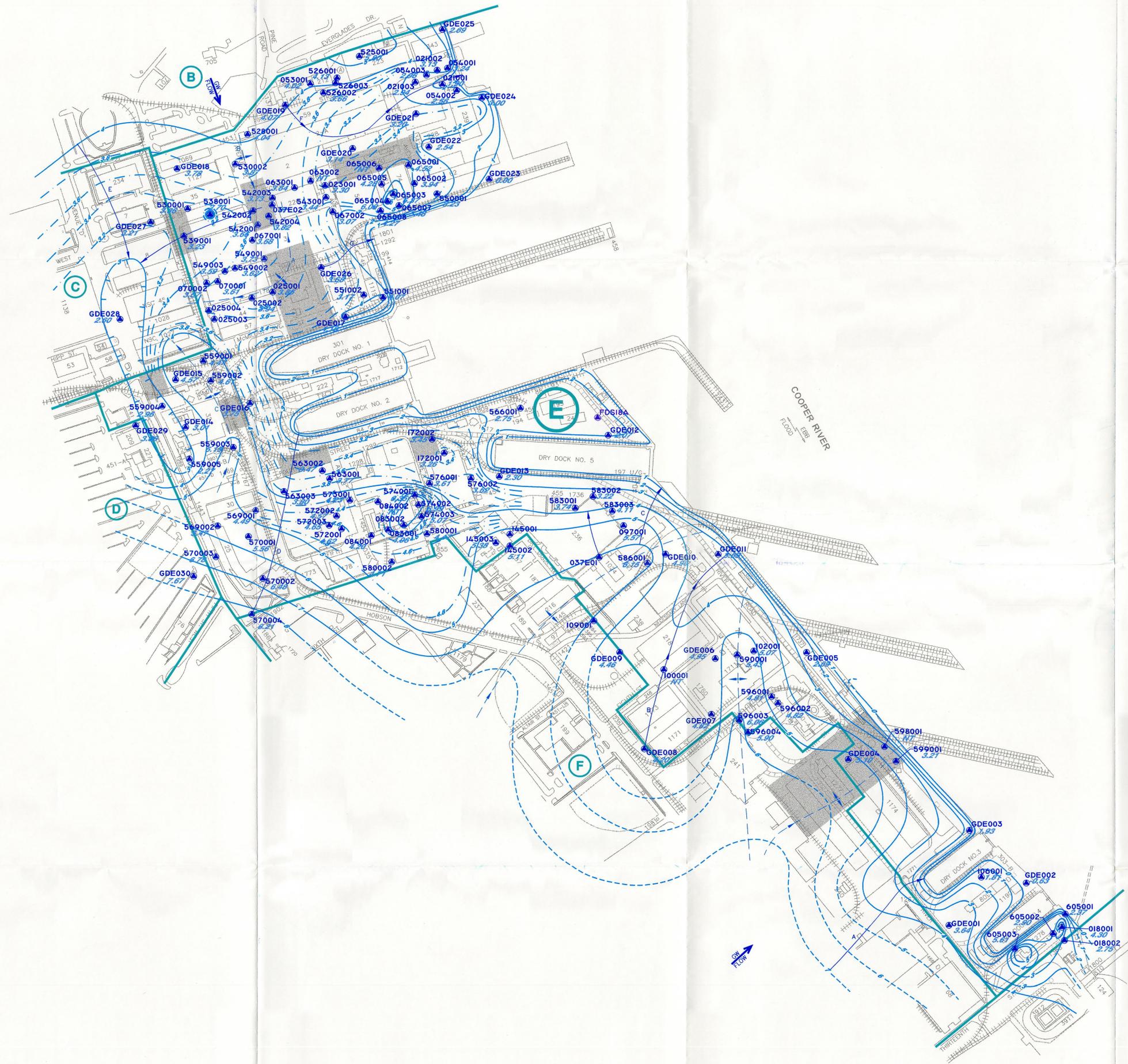


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FIGURE B.2
SHALLOW GROUNDWATER
ELEVATION CONTOURS
FROM ZONE C RFI REPORT

Dr by: W. FAULK	Tr by: -
Ck by: P. BAYLEY	Appr by: T. HAVERKOST
Date: 12/07/98	DWG Name: 2912C140

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Rev Number:	Rev Date:	Rev By:
Rev Number:	Rev Date:	Rev By:
Rev Number:	Rev Date:	Rev By:



LEGEND:

- GDE003 1.83 SHALLOW MONITORING WELL W/ ID NUMBER AND GROUNDWATER ELEVATION
- 3.6 GROUNDWATER ELEVATION CONTOUR - MEAN SEA LEVEL (DASHED WHERE INFERRED)
- 3.6 INTERMEDIATE GROUNDWATER ELEVATION CONTOUR MEAN SEA LEVEL
- 1.83 GROUNDWATER FLOW DIRECTION
- GROUNDWATER DIVIDE
- AREAS WITH ORGANIC COMPOUND DETECTION EXCEEDANCES

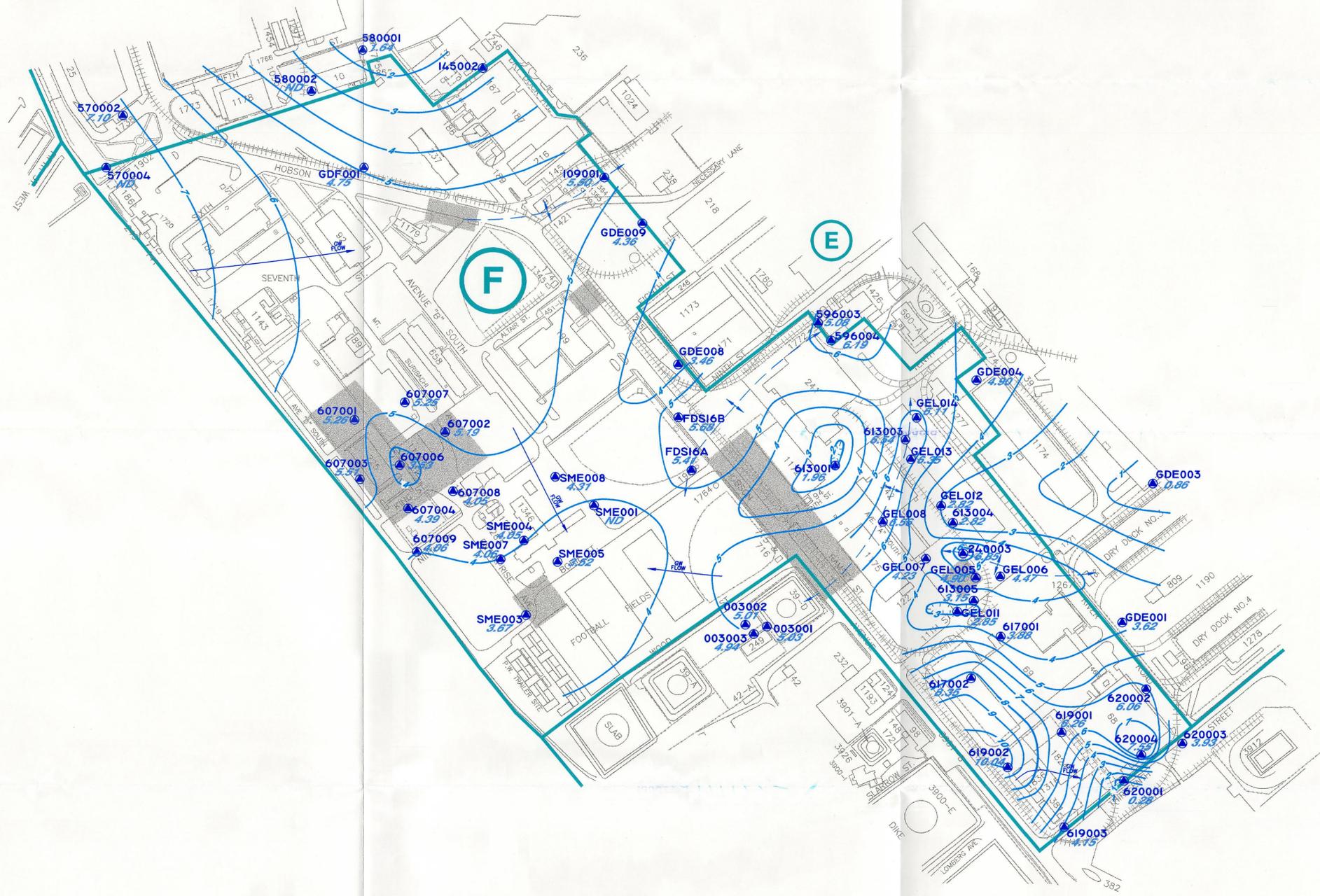


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FIGURE B.3
SHALLOW GROUNDWATER
ELEVATION CONTOURS
FROM ZONE E RFI REPORT

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Rev Number:	Rev Date:	Rev By:
Rev Number:	Rev Date:	Rev By:
Rev Number:	Rev Date:	Rev By:





LEGEND:

- 619002
1.83 ● SHALLOW MONITORING WELL W/ ID NUMBER AND GROUNDWATER ELEVATION
- ND = NO DATA
- GROUNDWATER ELEVATION CONTOUR - MEAN SEA LEVEL (DASHED WHERE INFERRED)
- GROUNDWATER FLOW DIRECTION
- - - GROUNDWATER DIVIDE
- AREAS WITH ORGANIC COMPOUND DETECTION EXCEEDENCES

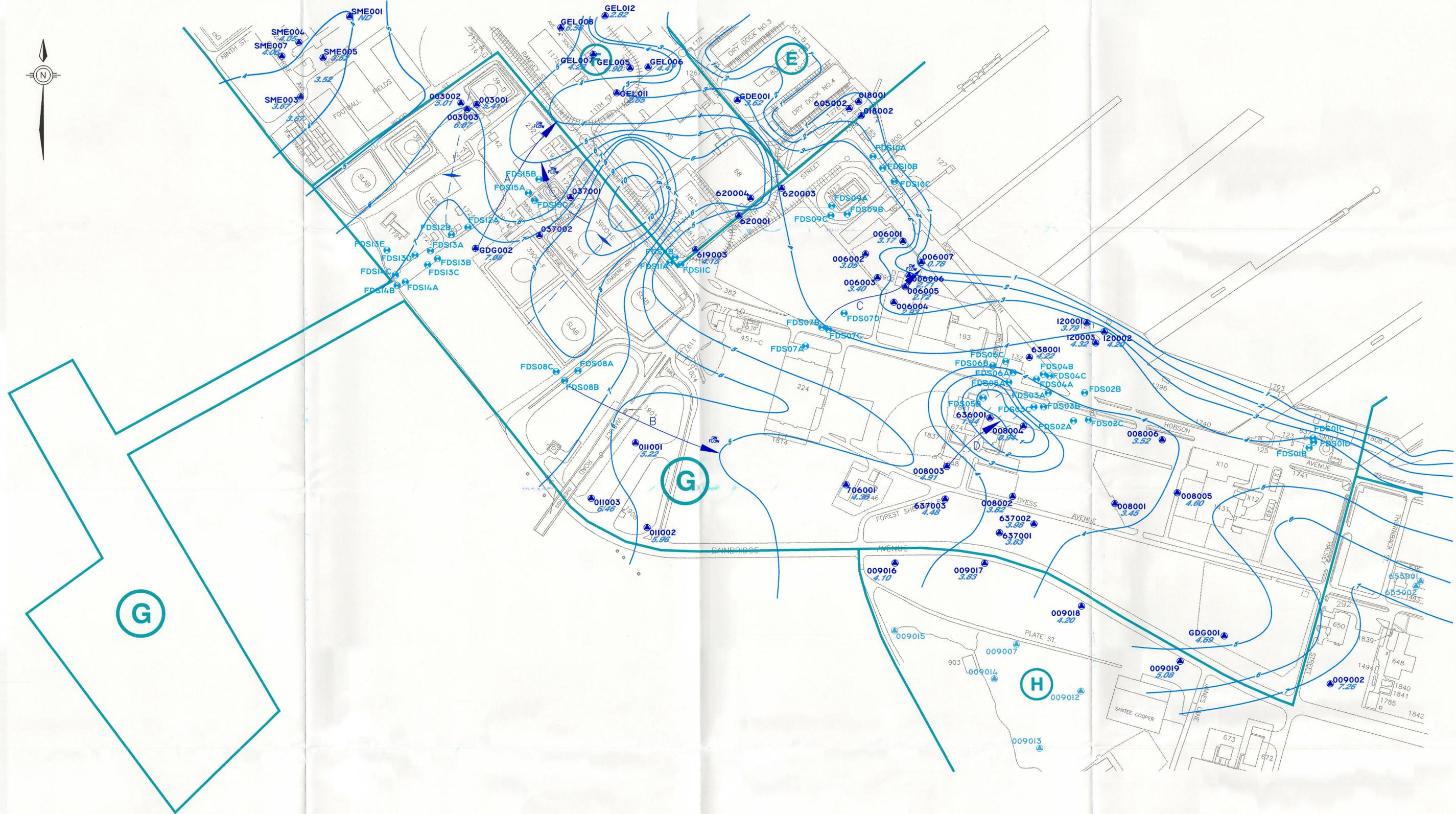
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FIGURE B.4
SHALLOW GROUNDWATER
ELEVATION CONTOURS
FROM ZONE F RFI REPORT

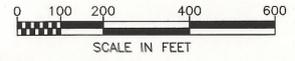
Dr by: W. FAULK	Tr by: -
Ck by: P. BAYLEY	Appr by: T. HAVERKOST
Date: 12/14/98	DWG Name: 2912C142

Sheet 1
Of 1



LEGEND:

-  SHALLOW MONITORING WELL W/ ID NUMBER AND GROUNDWATER ELEVATION
-  GROUNDWATER ELEVATION CONTOUR - MEAN SEA LEVEL (DASHED WHERE INFERRED)
-  GROUNDWATER FLOW DIRECTION
-  GROUNDWATER DIVIDE
-  FUEL DISTRIBUTION SYSTEM MONITORING WELL W/ ID NUMBER



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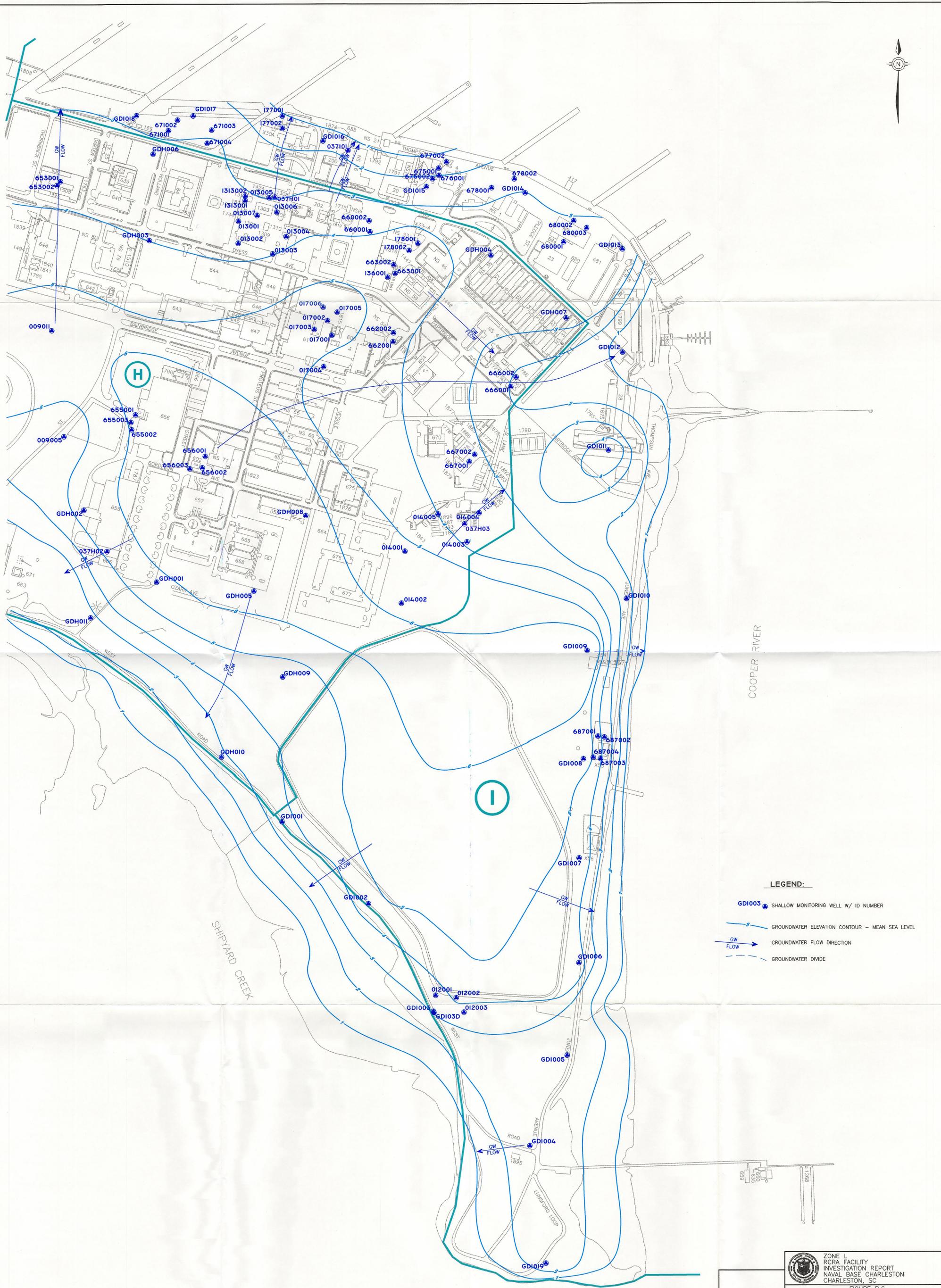


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FIGURE B.5
SHALLOW GROUNDWATER
ELEVATION CONTOURS
FROM ZONE G RFI REPORT

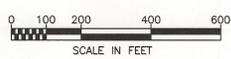
Dr by: W. FAULK	Tr by: -
Ck by: C. VERNON	Appr by: T. HAVERKOST
Date: 12/11/98	DWG Name: 2912C143

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Of 1



LEGEND:

- GDI003 SHALLOW MONITORING WELL W/ ID NUMBER
- GROUNDWATER ELEVATION CONTOUR - MEAN SEA LEVEL
- GROUNDWATER FLOW DIRECTION
- GROUNDWATER DIVIDE



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Rev Number:	Rev Date:	Rev By:
Rev Number:	Rev Date:	Rev By:
Rev Number:	Rev Date:	Rev By:

		ZONE I RCRA FACILITY INVESTIGATION REPORT NAVAL BASE CHARLESTON CHARLESTON, SC	
FIGURE B.6 SHALLOW GROUNDWATER ELEVATION CONTOURS FROM ZONE H AND I RFI REPORTS			
Dr by:	W. FAULK	Tr by:	-
Ck by:	P. BAYLEY	Appr by:	T. HAVERKOST
Date:	12/12/98	DWG Name:	2912C144
		Sheet	1
		Of	1