



DEPARTMENT OF THE NAVY

CRANE DIVISION
NAVAL SURFACE WARFARE CENTER
300 HIGHWAY 361
CRANE, INDIANA 47522-5000

N00164.AR.000598
NSWC CRANE
5090.3a

IN REPLY REFER TO:

5090 11-1-2000
Ser 095/0244

November 1, 2000

U.S. Environmental Protection Agency, Region V
Waste, Pesticides, & Toxics Division
Waste Management Branch
Illinois, Indiana, and Michigan Section
Attn: Mr. Peter Ramanauskas (DW-8J)
77 West Jackson Blvd.
Chicago, IL 60604

Dear Mr. Ramanauskas:

Crane Division, Naval Surface Warfare Center (NAVSURFWARCENDIV Crane) submits, for your review and approval, two copies of the draft October 2000 Quarterly Interim Progress Reports (IPR) for April 1 through June 30, 2000 as enclosure (1). Enclosure (2) is the required certification statement.

NAVSURFWARCENDIV Crane point of contact is
Ms. Christine D. Freeman, Code 09511, telephone 812-854-4423.

Sincerely,

JAMES M. HUNSICKER
Director Environmental Protection
Department
By direction
of the Commander

Encls:

- (1) IPR OCT 2000 (APR - JUN 2000)
- (2) Certification Statement

Copy to: (w/o encls)
Administrative Record
IDEM (D. Griffin)
SOUTHNAVFACENGCOM (Code 1864)
SOUTHNAVFACENGCOM ROICC
TOLTEST Crane

**Naval Facilities Engineering Command
Naval Surface Warfare Center
Crane, Indiana**

**Full-Scale Operations
Soils Bioremediation Facility**

**Quarterly Interim Progress Report
2nd Quarter 2000
April 1 – June 30
NSWC Crane
Crane, Indiana**

TOLTEST, INC.

QUARTERLY INTERIM PROGRESS REPORT
2nd Quarter 2000
APRIL 1 – JUNE 30

FULL-SCALE OPERATIONS
SOILS BIOREMEDIATION FACILITY
NAVAL SURFACE WARFARE CENTER CRANE, INDIANA

ENVIRONMENTAL JOB ORDER CONTRACT
CONTRACT NO. N68950-96-D-0052
TOLTEST PROJECT NUMBER 37324.01

Submitted to:

OFFICER IN CHARGE OF NAVFAC CONTRACTS
NAVAL SURFACE WARFARE CENTER
CRANE, INDIANA

Submitted by:

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Post-excavation Sample Grids (2 pages total)

EXECUTIVE SUMMARY

This interim progress report has been prepared by TolTest, Inc. (TolTest) for Southern Division, Naval Facilities Engineering Command. This report documents the progress at the Bioremediation Facility (Biofacility) for treatment of explosives-contaminated soil at the Naval Surface Warfare Center (NSWC) Crane, Indiana. On March 27, 1999, TolTest assumed responsibility for the excavation and treatment of contaminated soil at the Biofacility. This report summarizes the work actions performed from April 1 through June 30, 2000 pursuant to the requirements of the approved *Full-Scale Operational Plan* and the *Quality Assurance Project Plan*. Full-scale bioremediation operations started in April 1998. All interim measures work actions have been performed in accordance with approved plans.

The scope of work includes initial site characterization by sampling and analysis, excavation and screening of explosives-contaminated soil, transportation of screened soil for treatment to the Biofacility, process monitoring and confirmatory sampling of the compost windrows, and disposal of treated soil.

All initial characterization sampling at Mine Fill "A" is complete. No initial characterization sampling was completed at Mine Fill "B" during this reporting period. In-process field screening is ongoing and post-excavation sampling for grids in MFB indicate that clean-up goals have been achieved in most grids. Contamination has been left in-place in some grids due to the presence of rock, utilities, or buildings.

A total of 1845.97 tons of screened soil from Mine Fill B was transported to the Biofacility during this reporting period. A total of 21 new windrows were constructed during this reporting period, from windrow 153 to windrow 173. Twenty-one windrows achieved Day Last status during this period: windrows 149 to 169. A total of 4,874.1 tons of contaminated soil was treated during this time period: 4,642 tons to residential cleanup levels and 232.1 tons to industrial clean up levels.

1.0 INTRODUCTION

This interim progress report has been prepared by ToITest for the Southern Division, Naval Facilities Engineering Command to document the progress of the full-scale bioremediation operation of explosives-contaminated soil at NSWC Crane, Crane, Indiana. It summarizes the work actions performed by ToITest during the period April 1 through June 30, 2000 pursuant to the requirements of the approved *Full-Scale Operational Plan (OP)* [MK, 1998a] and the *Quality Assurance Project Plan (QAPP)* [MK, 1998b]. Full-scale bioremediation operations started in April 1998. ToITest assumed responsibility on March 27, 1999 from Morrison Knudsen Corp. after the completion of their contract.

NSWC Crane, located in southwestern Indiana, provides support for equipment shipboard weapons systems, and ordnance. This site also supports Crane Army Ammunition Activity, which includes production and renovation, storage, shipment, and demilitarization and disposal of conventional ammunition. Explosive-compounds contaminated soils resulting from the above operations have been identified at four solid waste management units (SWMUs): Ammunition Burning Ground (SWMU-03/10); Rockeye Munitions Facility (RKY) - (SWMU-10/15); Mine Fill "A" (MFA) - (SWMU-12/14); and Mine Fill "B" (MFB) - (SWMU-13/14).

On-site bioremediation of the high-explosives contaminated soil utilizing a windrow composting process has been selected as the preferred treatment alternative for the Interim Measures at these four SWMUs.

The scope of work includes initial site characterization by sampling and analysis, excavation and screening of explosives-contaminated soil, transportation of screened soil for treatment at the Biofacility, process monitoring, confirmatory sampling, disposal of treated soil, and site restoration.

2.0 EXCAVATION

Field activities (discussed below) were conducted at MFB during this reporting period. Work activities at the excavation site included: in-process sampling, post-excitation sampling, soil excavation, soil screening, and vegetation establishment. All fieldwork activities were performed in accordance with procedures included in the *Full-Scale OP* [MK, 1998a] and the *QAPP* [MK, 1998b]. Final drawings showing grid locations, post-excitation sample locations, and extent of excavation will be included in the Interim Measures Report for Bioremediation.

2.1 Pre-Excavation Sampling

Pre-excitation sampling was performed to provide initial site characterization and delineate the extent of contamination. Pre-excitation samples were analyzed for SWMU-specific compounds by an off-site analytical laboratory.

A minimum of three soil samples are normally obtained from each grid for characterization of the soil prior to excavation. Explosive compounds and metals analyses were completed on composite samples obtained from zero to 12-inches in depth and 24 to 36-inches in depth. On occasion, the presence of rock or other obstacles prohibited obtaining the deeper composite sample. Volatile organic compounds (VOCs) analysis were completed on grab samples obtained at 12-inches.

The horizontal boundaries of explosive constituents have been delineated by buildings, roads, railroad tracks, and grids with either no detectable levels of the respective constituent or levels that are below the cleanup goals. To date, no metals or VOCs have been detected above clean-up action levels in any sample.

2.1.1 Mine Fill "A"

Pre-excitation soil sampling at MFA is complete.

2.1.2 Mine Fill "B"

No pre-excitation sampling was completed at Mine Fill B during this time period.

2.1.3 Rockeye

No pre-excitation sampling was completed at Rockeye during this time period.

2.2 In-Process Excavation Soil Sampling

In-process excavation soil sampling is performed to assist the field crew in planning excavation activities. Field screening test kits are used for testing RDX levels in the in-process soil samples to provide quick analytical results.

All grids from which post-excavation samples were obtained (discussed in section 2.3 below) were first sampled and screened for RDX. When RDX screening indicates that remaining contamination is below industrial levels, then post-excavation samples are obtained.

2.3 Post-Excavation Soil Sampling

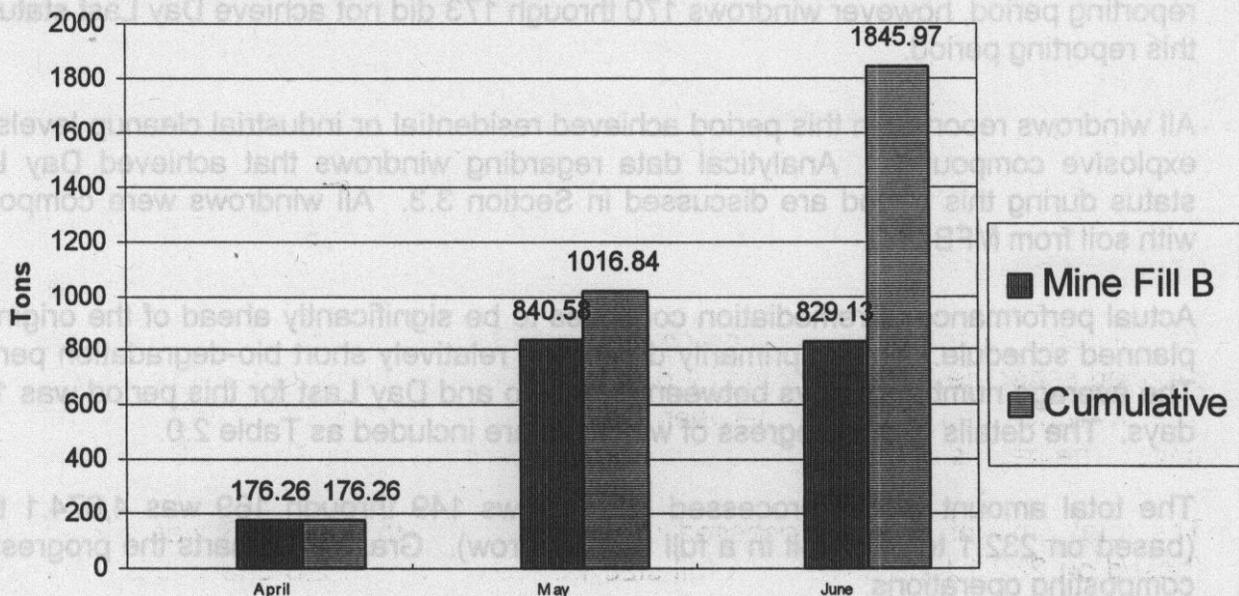
Post-excavation soil sampling (i.e., confirmation samples) is performed to provide confirmation that the excavation meets established industrial cleanup goals. Confirmation samples are analyzed for SWMU-specific compounds by an off-site analytical laboratory.

Post-excavation samples were obtained from grid 276 at building 166 and grids 122, 123, 124, 128, 131, 137, and 138 at building 171. Analytical results indicated that remaining soil contamination in these grids is less than industrial cleanup goals. Refer to the Post-excavation Sample Grid maps for location of these grids.

2.4 Soil Excavation and Screening

Soil excavation continued at MFB around Building 171 only. During this reporting period, 1845.97 tons of soil were excavated and screened. The monthly totals of screened soil and cumulative amounts for this reporting period are listed in Table 1.0 and are shown in Graph 1.0.

**GRAPH 1.0
NSWC CRANE
SOIL EXCAVATION AND SCREENING VOLUMES**



3.0 COMPOSTING OPERATIONS

Treatment of high-explosives contaminated soil by composting involves microbial degradation of the explosives by optimizing the availability of organic material, temperature, moisture content, pH, and oxygen. The composting operation process description is provided in Section 5.0 of the approved *Full-Scale OP* [MK, 1998a].

3.1 Amendments

The compost mix used in full-scale operations consists of 25% soil, 15% chicken manure, and 60% straw by volume. A sufficient volume of straw has been delivered to satisfy the straw requirements for processing the remaining soil from MFA, MFB, and RKY. Chicken manure continues to be trucked to the Biofacility on an as-needed basis in quantities sufficient to support operations.

3.2 Windrow Construction and Treatment

Field screening has been performed at least weekly to monitor RDX levels within each windrow. Field screening of treated compost for TNT is not completed since RDX is a better indicator of contaminant degradation than TNT. Final compost samples are collected once the field test kits indicated RDX levels are below industrial clean-up goals. The day that final compost samples are collected for off-site laboratory confirmation analysis is referred to as Day Last.

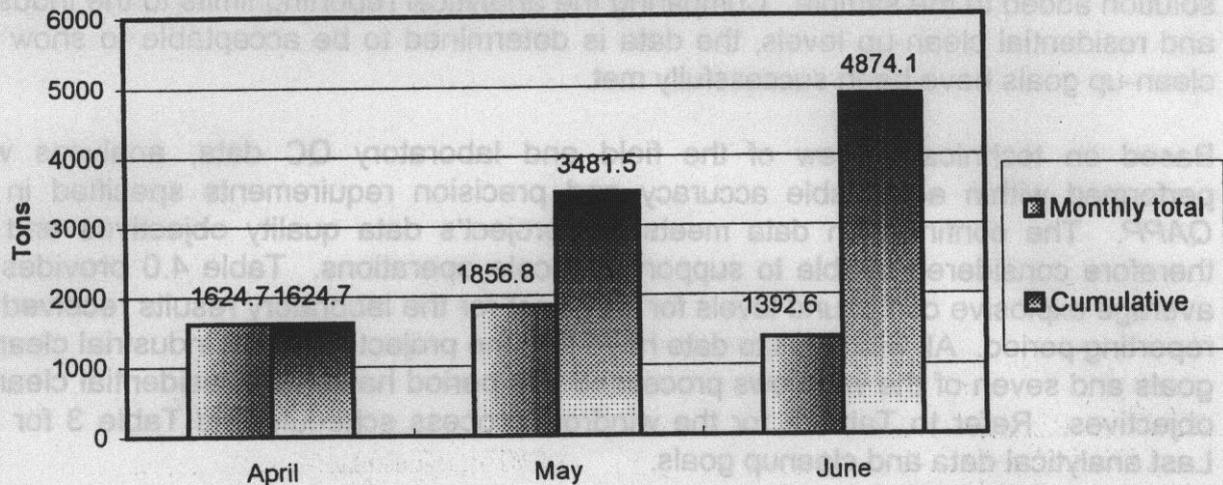
Twenty-one windrows (149 through 169) achieved Day Last status during this reporting period (i.e. analytical results were received before the end of this period). Windrows 149 through 152 were constructed in the previous reporting period and Day Last status was achieved in this period. Windrows 153 through 173 were constructed in this reporting period, however windrows 170 through 173 did not achieve Day Last status in this reporting period.

All windrows reported in this period achieved residential or industrial cleanup levels for explosive compounds. Analytical data regarding windrows that achieved Day Last status during this period are discussed in Section 3.3. All windrows were composed with soil from MFB.

Actual performance of remediation continues to be significantly ahead of the originally planned schedule. This is primarily due to the relatively short bio-degradation period. The average number of days between Day Zero and Day Last for this period was 10.4 days. The details of the progress of windrows are included as Table 2.0.

The total amount of soil processed in windrows 149 through 169 was 4,874.1 tons (based on 232.1 tons of soil in a full size windrow). Graph 2.0 charts the progress of composting operations.

GRAPH 2.0
NSWC CRANE BIOFACILITY SOIL PROCESSED VOLUMES



3.3 Analytical Data Interpretation and Validation

Table 3.0 provides this quarter's laboratory analytical results for HMX, RDX, and TNT, and the regulatory cleanup goals. All windrow results represent an average of 15 individual data points (five cross sections, three sample locations per cross section). Day Last results are given for each windrow, demonstrating the effectiveness of the bio-degradation process. Day Zero samples are no longer collected on compost with soil from either MFA or MFB.

All data associated with windrow monitoring was verified, and at least 10% of the samples were validated and compared with field and laboratory quality control (QC) sample data to assess the data's usability for supporting full-scale operations. Data was verified by reviewing chain-of-custody forms, sample preservation records, analytical holding times, requested turnaround times, sample data in comparison to QC data, and reporting requirements. In addition, more than 10% of the data was validated using the validation procedures specified in Section 9.2.2 of the QAPP.

Analytical results for the trip blanks, field blanks, equipment rinsates, and field duplicates were evaluated to identify potential sources of error introduced during sampling, transportation and storage. Field QC performed with the monitoring of windrows has been performed according to the requirements defined in the QAPP.

Laboratory QC consists of method blank, sample matrix spike (MS), sample matrix spike duplicate (MSD), surrogate, laboratory control sample (LCS), and laboratory control sample duplicate (LCSD) analyses to evaluate laboratory accuracy and

precision. Laboratory quality control was performed consistent with the requirements of the QAPP. Method blanks, LCS, LCSD, and surrogates were acceptable in every analytical batch. Day Last data did not show interference with spiking solutions because initial concentrations were low in comparison to the concentration of spiking solution added to the sample. Comparing the analytical reporting limits to the industrial and residential clean-up levels, the data is determined to be acceptable to show that clean-up goals have been successfully met.

Based on technical review of the field and laboratory QC data, analyses were performed within acceptable accuracy and precision requirements specified in the QAPP. The confirmation data meets the project's data quality objectives and are therefore considered usable to support full-scale operations. Table 4.0 provides the average explosive compound levels for Day Last for the laboratory results received this reporting period. All windrows to date have met the project objective industrial clean-up goals and seven of the windrows processed this period have meet residential clean-up objectives. Refer to Table 2 for the windrow process schedule and Table 3 for Day Last analytical data and cleanup goals.

4.0 DISPOSITION OF TREATED SOIL AND SITE RESTORATION

Treated soil (compost) has been transported back to the SWMU of origination (MFB) either to the permanent storage area or used as backfill. Disposal activity to date is shown in Table 2.0. Field-generated drawings showing backfill placement of treated compost are included as attachments in Figures. Site restoration (seeding, mulching, and watering) has been or will be implemented at all areas where TolTest has backfilled treated soil.

5.0 STATUS OF VARIOUS REPORTS

The "Sampling and Analysis Plan for Supplemental Toxicity Sampling of Composted Material from Mine Fill A and Mine Fill B" has been accepted by the U.S. EPA Region V.

6.0 QUALITY CONTROL

Quality control inspections included excavation site operations, composting operations, sampling activities, field test kit analyses, and facility maintenance. Quality control checks were performed at required intervals using the field inspection checklists provided in Appendix F of the approved *Full-Scale OP* [MK, 1998a]. Copies of all inspection records are maintained at the Biofacility office.

During this period, 108 individual items were verified and no deficiencies were identified. Immediate actions were taken to correct any minor findings observed.

7.0 SAFETY AND INDUSTRIAL HYGIENE

7.1 General Safety

During this period 6,979.3 man-hours were expended by ToITest. There were no OSHA recordable injuries. The project has a cumulative total of 40,721.5 man-hours.

13 formal safety inspections were performed during this quarter. No significant findings of an imminent or serious nature were found. Immediate actions were taken to correct any minor findings observed. Daily informal walk-around safety inspections reinforced and improved the worker safety performance.

7.2 Industrial Hygiene Sampling

During this period total dust, airborne explosive compounds, and ammonia monitoring were performed. Ammonia samples were taken at the Biofacility by colorimetric methods. Sampling indicated ammonia levels greater than the occupational exposure limits of 50 ppm permissible exposure limit (PEL) and 25 ppm (TLV). Sampling commenced on Day 0 of the windrow life cycle and continued until the levels were below 25 ppm (TLV). The chicken manure amendment was the primary contributor to ammonia concentrations. Full-face air purifying respirators with ammonia cartridges were worn during windrow formation and during composting activities when ammonia levels were 25 ppm (TLV) or above. Ammonia was localized near each pile and was significantly affected by natural ventilation of the building, moisture in the windrow, and turning of the windrow. The maximum ammonia level detected was 150 ppm. The average maximum ammonia concentration during construction on Day: 0 was 50 ppm; Day 1 was 39 ppm; Day 2 was 71; Day 3 was 49 ppm, and by Day 10 the average was 15 ppm.

Ammonia samples were collected by Passive Dosimeter Tubes. These tubes were placed on individuals and concentrations were calculated according to the amount of time worn. The highest concentration recorded was 15 ppm/hr. The average was 10 ppm/hr.

Airborne dust sampling for explosive compounds was performed at the Biofacility. Three area samples and four personnel samples were collected over a period of four hours. All samples were below the 1.5 mg/m^3 8 hour time weighted average exposure limit.

Wipe sampling for explosive residues was performed at the Biofacility. Five area samples were collected from the laboratory trailer, shower trailer, office trailer, and lunchroom. The explosive HMX was detected in five samples at an average of 10 ug/wipe, RDX was detected in five samples at an average of 3 ug/wipe, and 3NT was detected in one sample at 10 ug/wipe.

Noise monitoring was performed using an Audio Dosimeter. The highest time-weighted average level of exposure was 87.0 decibels (dBa), the average was 77.96 dBa. The highest one-second average sound level recorded was greater than 141 dBa, the average was at least 114.16 dBa. Associates are required to wear hearing protection when noise levels exceed 85 dBa during a weighted network steady state, or 140 dBa impulse, regardless of the duration of exposure.

In summary, ammonia monitoring indicates respiratory protection is warranted during the first eight days of the windrow life cycle. Monitoring for airborne explosive compounds showed no hazards to be significant enough for concern. Wipe sample analysis indicates that personnel decontamination procedures need to be stressed and adhered to. Noise monitoring indicates a need for hearing protection while working around heavy equipment at the site.

8.0 FACILITY MAINTENANCE AND REPAIRS

- Installed new fuel hose on the 1,000 gallon Farm Co-op tank
- Repaired the sheet metal on the north side of Building N
- Inserted reinforcement bar into the bumper blocks at the Biofacility parking lot to hold the blocks in place
- Moved the antennas for the truck scale to facilitate better reception of the signal
- Cut undergrowth from the truck scales to the office trailer to facilitate better reception of the signal.

9.0 REFERENCES

- MK, 1998a. *Full-Scale Operational Plan for Soils Bioremediation Facility, NSWC Crane, Crane, Indiana*. Delivery Order Number 0009, Contract Number N62467-93-D-1106. Prepared by Morrison Knudsen Corporation, Environmental Services Group. Revision 2, March 12, 1998.
- MK, 1998b. *Quality Assurance Project Plan for Full-Scale Operations, Soils Bioremediation Facility, NSWC Crane, Crane, Indiana*. Delivery Order Number 0009, Contract Number N62467-93-D-1106. Prepared by Morrison Knudsen Corporation, Environmental Services Group. Revision 2, March 12, 1998.

TABLES

TABLE 1.0
FULL-SCALE OPERATIONS SOIL EXCAVATION QUANTITIES
April through June 2000
Quantity (Tons)

Period	Mine Fill A	Mine Fill B	Rockeye	Cumulative
Previously reported	20,239.11	15,843.54	0.00	36,082.65
April	0.00	176.26	0.00	36,258.91
May	0.00	840.58	0.00	37,099.49
June	0.00	829.13	0.00	37,928.62
Reporting Period Total	0.00	1,845.97	0.00	1,845.97
Site Total	20,239.11	17,689.51	0.00	

**TABLE 2.0
 WINDROW PROCESS SCHEDULE**

Windrow #	Start Date	Day Zero	Day Last	Lab Results Received	Complete Unload	Ton Processed	Soil Qty Ton Processed	Processed to Residential or Industrial Levels	Compost Disposal Location	Grid Disposal Locations
149	3/13/00	3/13/00	3/27/00	4/2/00	4/2/00	232.1	20629.2	Residential	Permanent	na
150	3/17/00	3/17/00	3/27/00	4/2/00	4/2/00	232.1	20861.3	Residential	Permanent B-166	105,118,215,225,226,246
151	3/24/00	3/24/00	4/5/00	4/11/00	4/11/00	232.1	21093.4	Residential	Permanent	na
152	3/30/00	3/31/00	4/12/00	4/18/00	4/19/00	232.1	21325.5	Residential	Permanent	na
153	4/3/00	4/4/00	4/19/00	4/25/00	4/25/00	232.1	21557.6	Residential	Permanent	na
154	4/3/00	4/4/00	4/19/00	4/19/00	4/25/00	232.1	21789.7	Residential	Permanent	na
155	4/11/00	4/12/00	4/24/00	4/29/00	5/1/00	232.1	22021.8	Residential	Permanent	na
156	4/18/00	4/19/00	4/28/00	5/4/00	5/4/00	232.1	22253.9	Residential	Permanent	na
157	4/26/00	4/26/00	5/5/00	5/11/00	5/11/00	232.1	22486	Residential	Permanent	na
158	4/27/00	4/27/00	5/8/00	5/14/00	5/15/00	232.1	22718.1	Residential	Permanent	na
159	5/1/00	5/1/00	5/10/00	5/16/00	5/16/00	232.1	22950.5	Residential	Permanent	na
160	5/4/00	5/5/00	5/16/00	5/22/00	5/22/00	232.1	23182.3	Residential	Permanent	na
161	5/11/00	5/12/00	5/22/00	5/28/00	5/28/00	232.1	23414.4	Residential	Permanent	na
162	5/15/00	5/15/00	5/25/00	5/31/00	5/31/00	232.1	23646.5	Residential	Permanent	na
163	5/17/00	5/17/00	5/25/00	5/31/00	5/31/00	232.1	23878.6	Residential	Permanent	na
164	5/22/00	5/22/00	6/1/00	6/7/00	6/7/00	232.1	24110.7	Residential	permanent	na
165	5/30/00	5/31/00	6/9/00	6/15/00	6/15/00	232.1	24342.8	Residential	Permanent	na
166	5/31/00	6/1/00	6/9/00	6/15/00	6/15/00	232.1	24574.9	Residential	Permanent	na
167	6/1/00	6/2/00	6/12/00	6/18/00	6/19/00	232.1	24807	Residential	Permanent	na
168	6/7/00	6/8/00	6/16/00	6/22/00	6/22/00	232.1	25039.1	Residential	Permanent	na
169	6/15/00	6/16/00	6/23/00	6/29/00	6/29/00	232.1	25271.2	Industrial	Bldg. 166	103,115,227,228,244,256

TABLE 3.0
EXPLOSIVE COMPOUNDS DAY LAST ANALYTICAL DATA (ppm)

WINDROW #	DAY #	HMX	RDX	TNT
149	14	0.9	2.3	3.8
150	10	1	1.2	0.9
151	12	0.9	1.1	2.8
152	12	0.9	1.2	0.4
153	15	1.2	1.4	0.5
154	15	0.7	0.6	0.4
155	12	0.5	0.8	1.3
156	9	1.5	1.2	0.6
157	9	1.3	1.7	0.5
158	11	2.4	2.3	0.4
159	9	0.7	2.9	0.6
160	11	0.4	0.8	0.5
161	10	0.6	0.8	0.5
162	10	0.9	2.1	0.7
163	8	1	3.8	0.4
164	10	1.5	3.3	0.5
165	9	0.5	1.5	0.5
166	8	0.9	1.2	0.4
167	10	0.4	0.6	1.1
168	8	0.6	2.6	0.5
169	7	0.7	6.6	1.1
CLEANUP GOALS	Residential	3,300	4	15
	Industrial	34,000	17	64

TABLE 4.0
AVERAGE DAY LAST EXPLOSIVE COMPOUNDS LEVELS

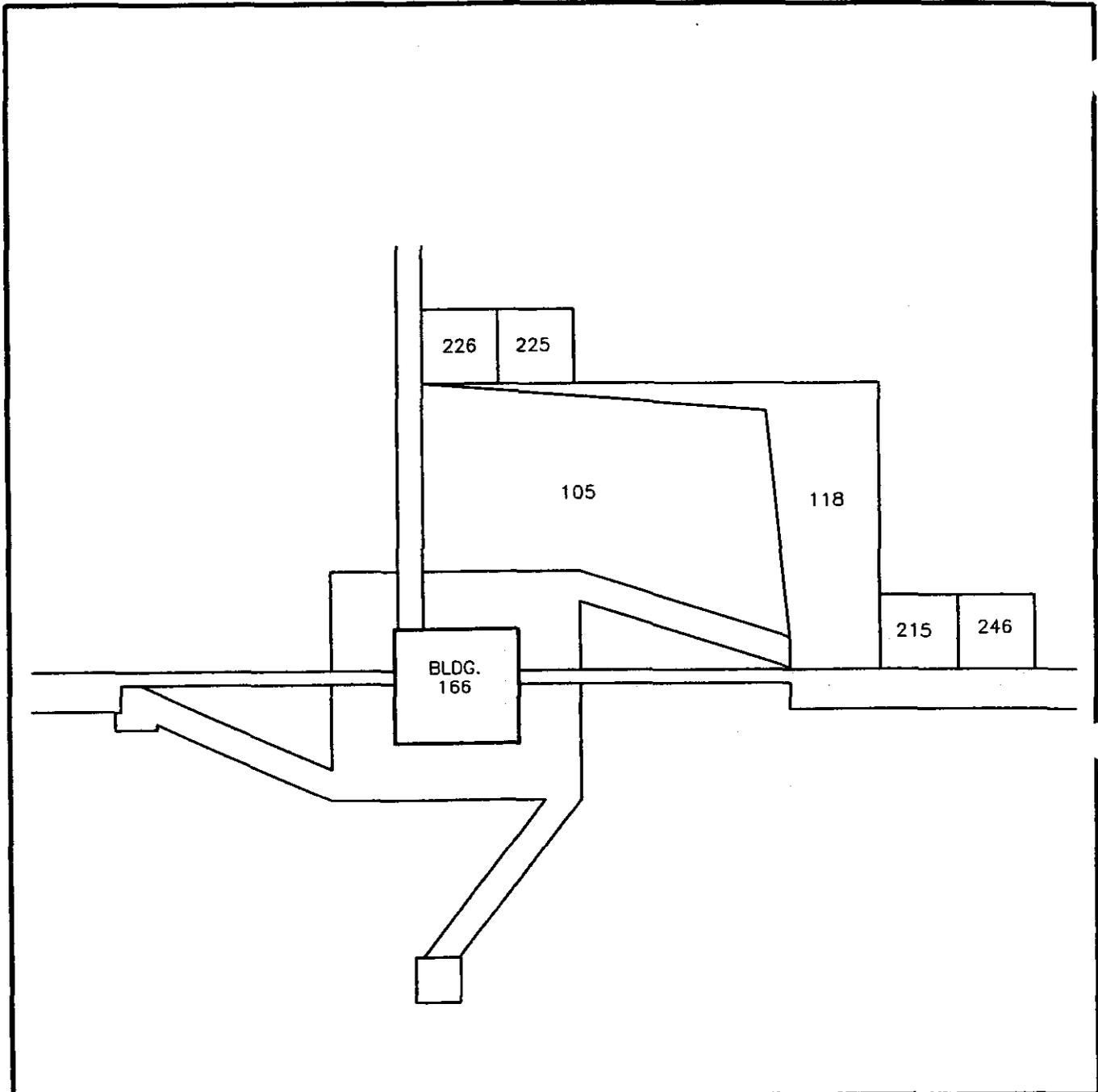
	ppm
HMX	0.9
RDX	1.9
TNT	0.9

Day 0 samples are no longer collected for compost containing MFA or MFB soil.

FIGURES:

**WINDROW LOCATION MAPS
BUILDING 166 and PERMANENT PLACEMENT AREA,
and
POST-EXCAVATION SAMPLE GRIDS
for
MFB**

NORTHWEST CORNER OF BUILDING 166



MEASUREMENTS ARE APPROXIMATE
NOT TO SCALE

R = RESIDENTIAL
I = INDUSTRIAL



WINDROW LOCATION MAP

BACKFILL OPERATIONS
GRIDS: #105, 118, 215, 225, 226, 246
WINDROWS: 1/2 #150(R)
NAVAL SURFACE WARFARE CENTER
NORTHWEST CORNER OF BUILDING 166, MINE FILL B
CRANE, INDIANA

PREPARED FOR
NAVAL FACILITIES ENGINEERING COMMAND
NSWC CRANE, IN

DRAWN MRC\08-08-00 CHECKED

REVISED APPROVED

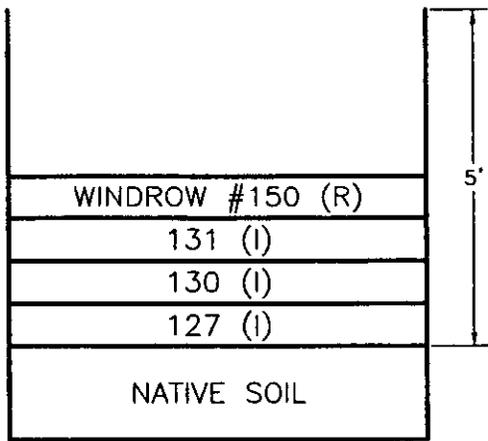
JOB NO.: 37324.01

SHEET NUMBER

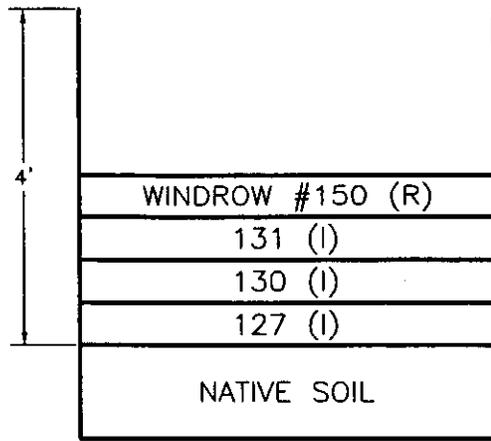
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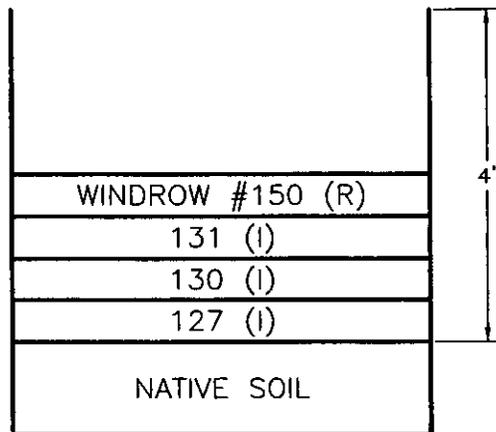
NORTHWEST CORNER OF BUILDING 166



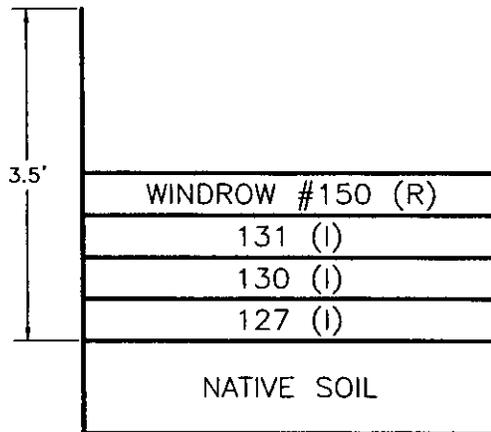
GRID #105



GRID #118



GRIDS #215



GRID #225

MEASUREMENTS ARE APPROXIMATE
NOT TO SCALE

R = RESIDENTIAL
I = INDUSTRIAL



SIDE VIEW

BACKFILL OPERATIONS
GRIDS: #105, 118, 215, 225
WINDROWS: 1/2 #150(R)
NAVAL SURFACE WARFARE CENTER
NORTHWEST CORNER OF BUILDING 166, MINE FILL B
CRANE, INDIANA

PREPARED FOR

NAVAL FACILITIES ENGINEERING COMMAND
NSWC CRANE, IN

DRAWN MRC\08-08-00

CHECKED

REVISED

APPROVED

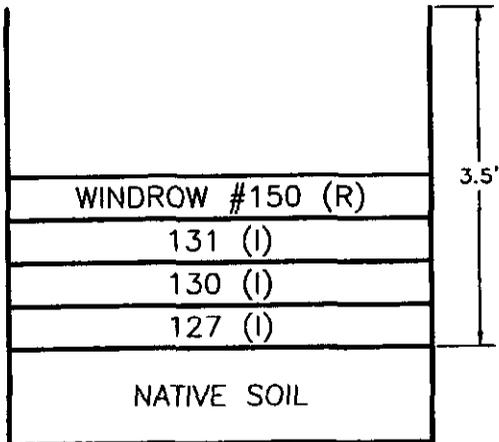
JOB NO.: 37324.01

SHEET NUMBER

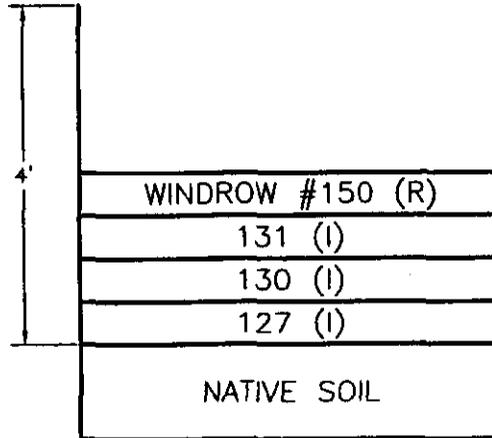
2 of 3

TOLLEST, INC.

NORTHWEST CORNER OF BUILDING 166



GRID #226



GRID #246

MEASUREMENTS ARE APPROXIMATE
NOT TO SCALE

R = RESIDENTIAL
I = INDUSTRIAL



SIDE VIEW

BACKFILL OPERATIONS
GRIDS: #226, 246
WINDROWS: 1/2 #150(R)
NAVAL SURFACE WARFARE CENTER
NORTHWEST CORNER OF BUILDING 166, MINE FILL B
CRANE, INDIANA

PREPARED FOR
NAVAL FACILITIES ENGINEERING COMMAND
NSWC CRANE, IN

DRAWN MRC\08-08-00 CHECKED

REVISED APPROVED

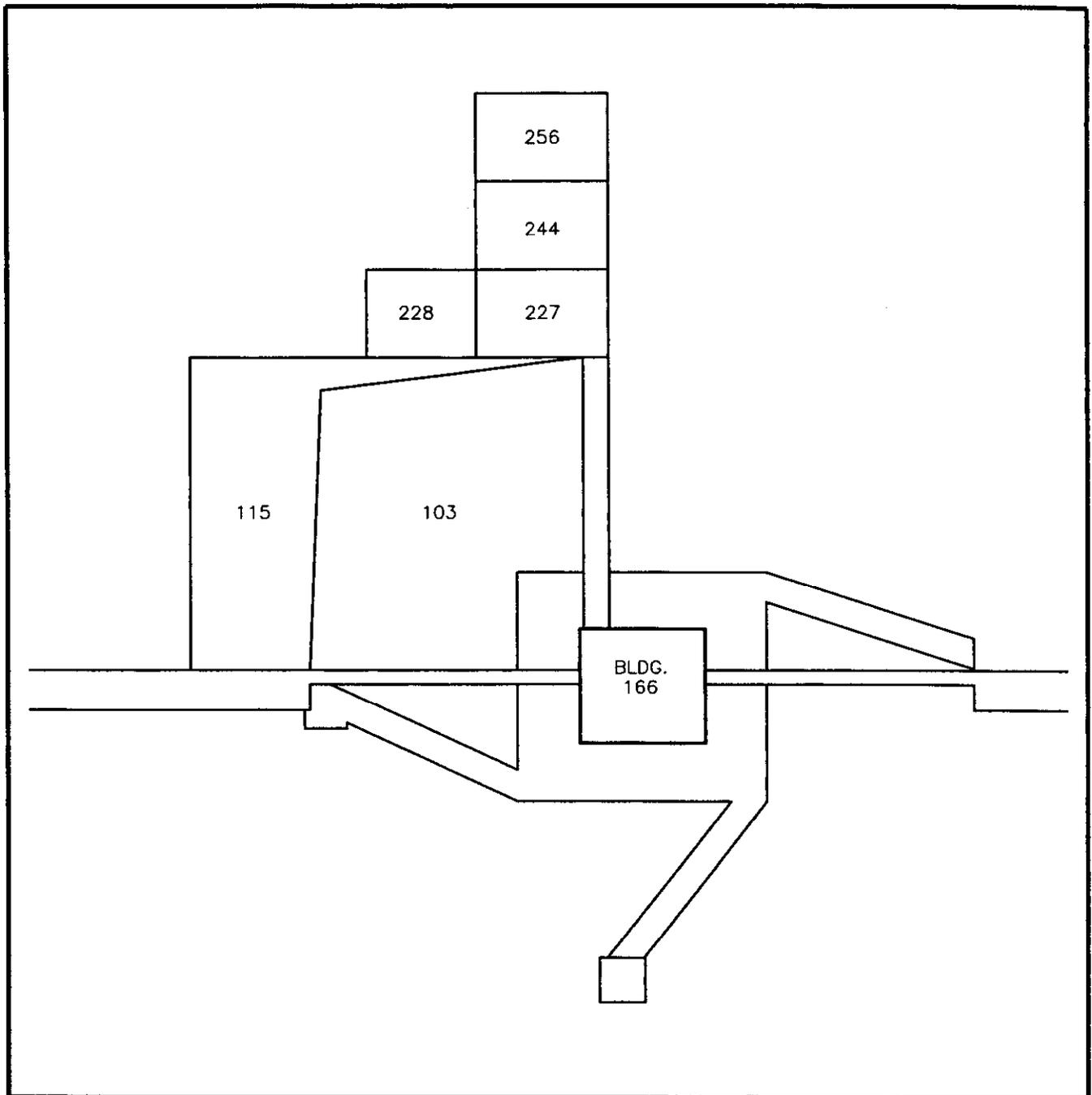
JOB NO.: 37324.01

SHEET NUMBER

3 of 3

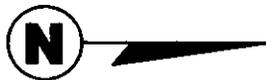


SOUTHWEST CORNER OF BUILDING 166



MEASUREMENTS ARE APPROXIMATE
NOT TO SCALE

R = RESIDENTIAL
I = INDUSTRIAL



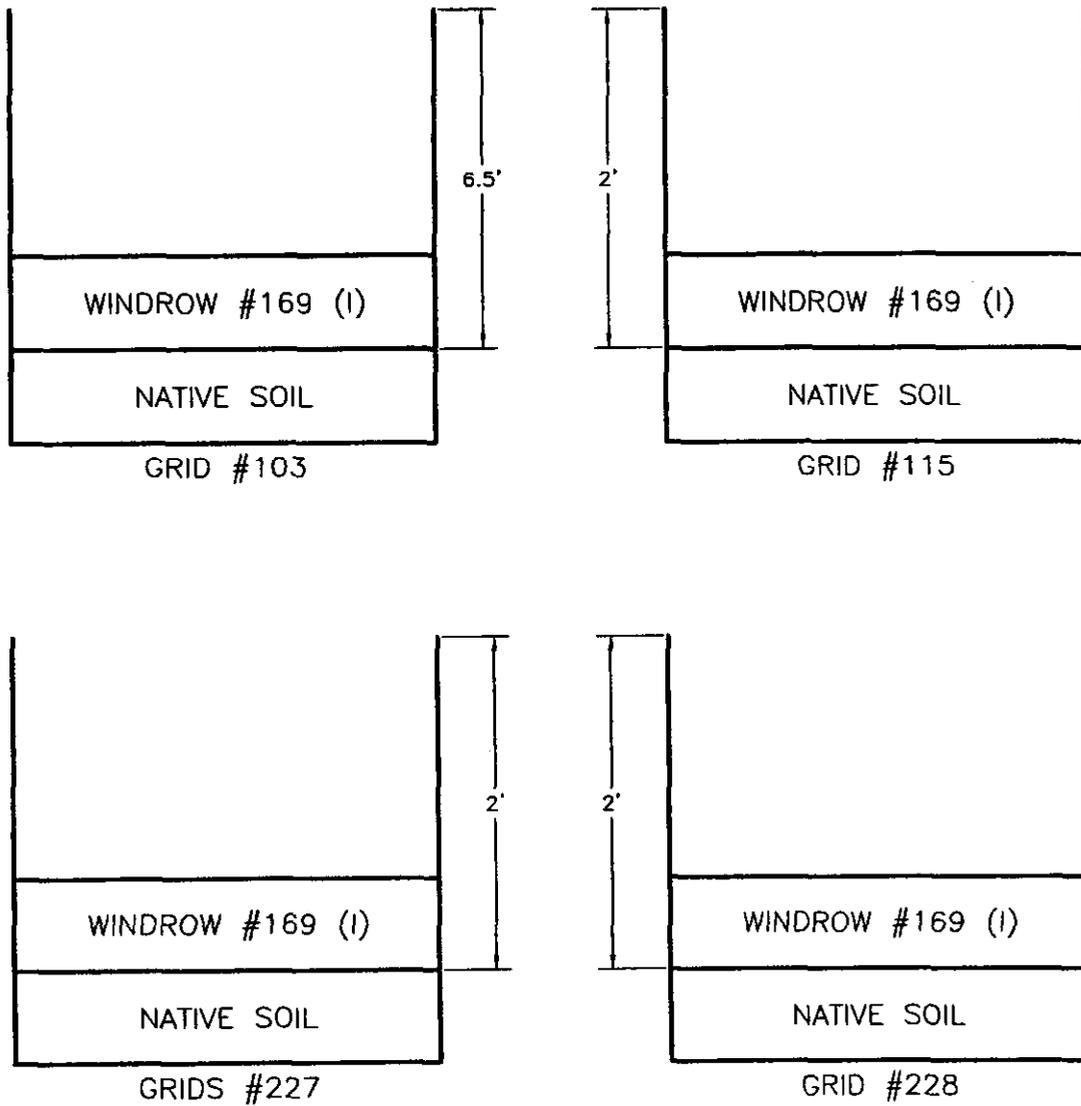
WINDROW LOCATION MAP

BACKFILL OPERATIONS
GRIDS: #103, 115, 227, 228, 244, 256
WINDROWS: #169(I)
NAVAL SURFACE WARFARE CENTER
SOUTHWEST CORNER OF BUILDING 166, MINE FILL B
CRANE, INDIANA

PREPARED FOR
NAVAL FACILITIES ENGINEERING COMMAND
NSWC CRANE, IN

DRAWN MRC\08-08-00	CHECKED
REVISED	APPROVED
JOB NO.: 37324.01	TOLLEST, INC.
SHEET NUMBER 1 of 3	

SOUTHWEST CORNER OF BUILDING 166



MEASUREMENTS ARE APPROXIMATE
NOT TO SCALE

R = RESIDENTIAL
I = INDUSTRIAL



SIDE VIEW

BACKFILL OPERATIONS
GRIDS: #103, 115, 227, 228
WINDROWS: #169(I)
NAVAL SURFACE WARFARE CENTER
SOUTHWEST CORNER OF BUILDING 166, MINE FILL B
CRANE, INDIANA

PREPARED FOR
NAVAL FACILITIES ENGINEERING COMMAND
NSWC CRANE, IN

DRAWN MRC\08-08-00 CHECKED

REVISED APPROVED

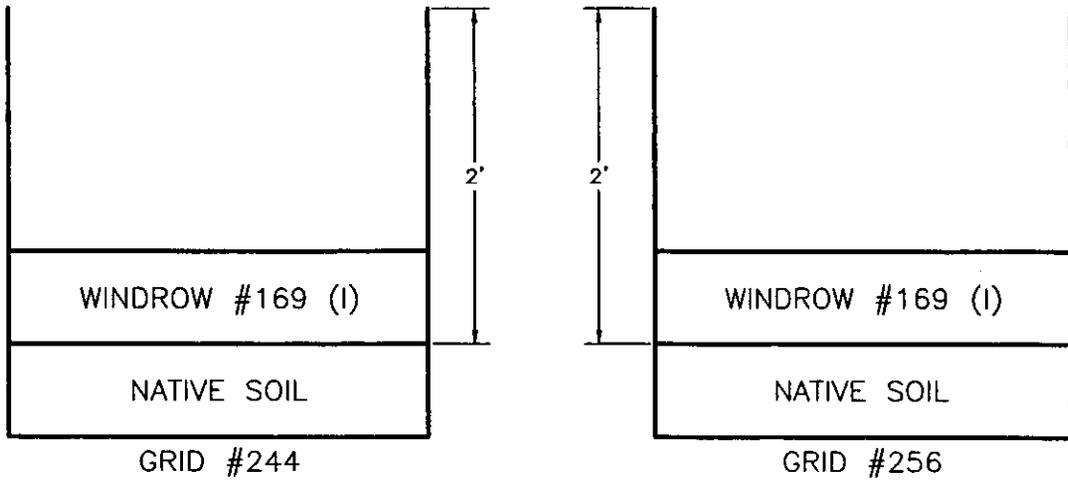
JOB NO.: 37324.01

SHEET NUMBER

2 of 3

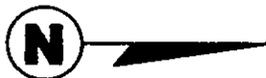


SOUTHWEST CORNER OF BUILDING 166



MEASUREMENTS ARE APPROXIMATE
NOT TO SCALE

R = RESIDENTIAL
I = INDUSTRIAL



SIDE VIEW

BACKFILL OPERATIONS
GRIDS: #244, 256
WINDROWS: #169(I)
NAVAL SURFACE WARFARE CENTER
SOUTHWEST CORNER OF BUILDING 166, MINE FILL B
CRANE, INDIANA

PREPARED FOR
NAVAL FACILITIES ENGINEERING COMMAND
NSWC CRANE, IN

DRAWN MRC\08-08-00

CHECKED

REVISED

APPROVED

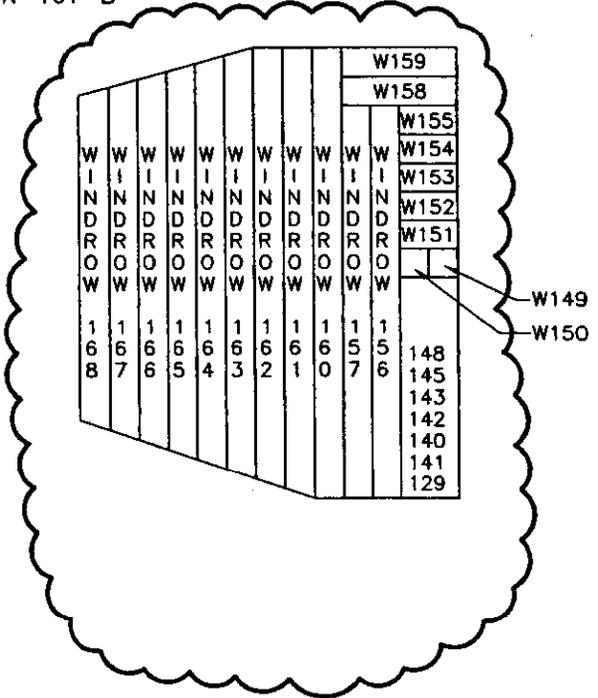
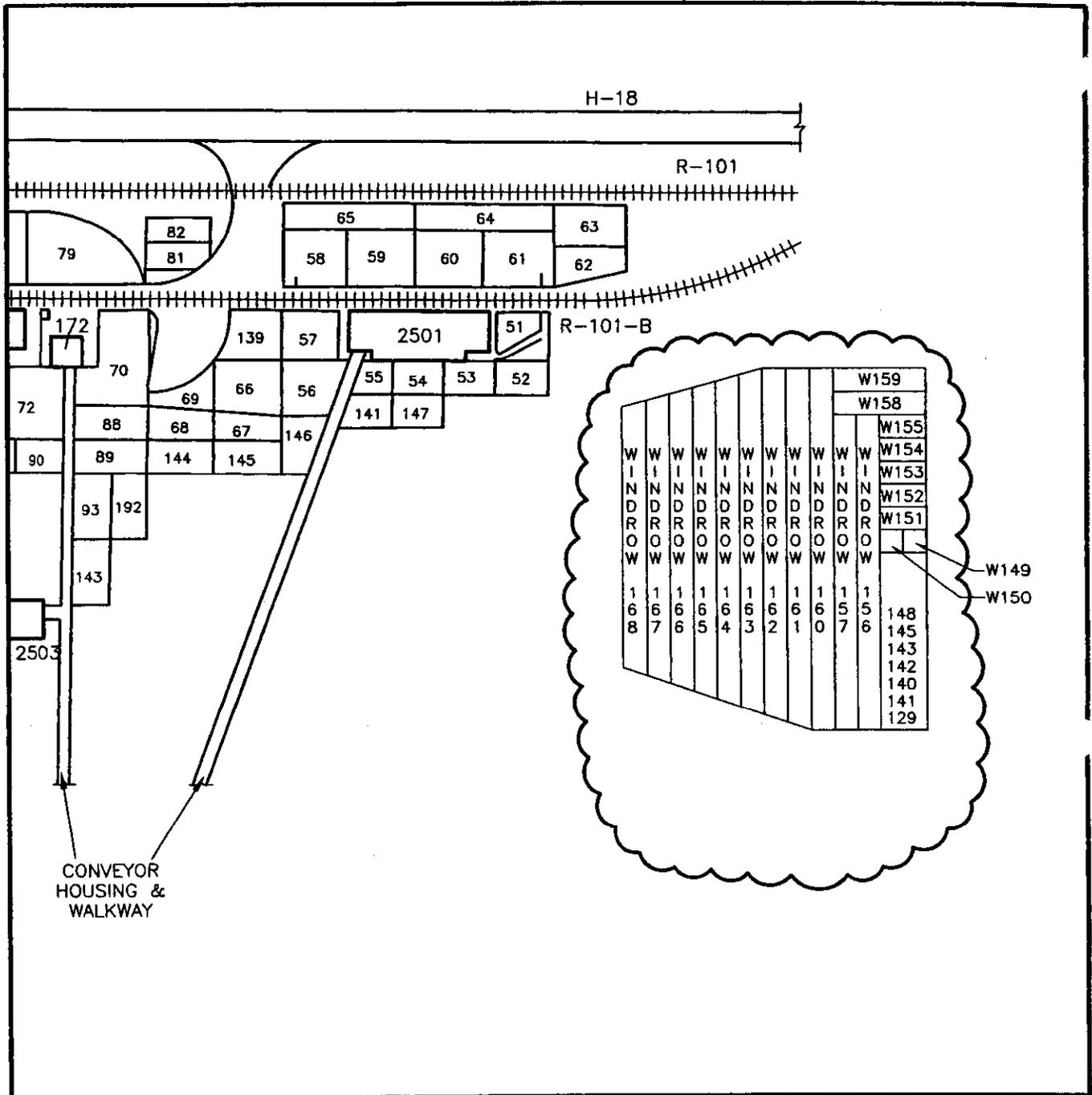
JOB NO.: 37324.01

SHEET NUMBER

3 of 3

TOLLEST, INC.

MINE FILL B - PERMANENT PLACEMENT AREA



MEASUREMENTS ARE APPROXIMATE
NOT TO SCALE

ALL SOILS ARE RESIDENTIAL



WINDROW LOCATION MAP

BACKFILL OPERATIONS
WINDROWS: #149, 1/2 150, 151, 152, 153, 154, 155, 156, 157, 158, 159, 160, 161, 162, 163, 164, 165, 166, 167, 168
NAVAL SURFACE WARFARE CENTER
MINE FILL B - PERMANENT PLACEMENT AREA
CRANE, INDIANA

PREPARED FOR
NAVAL FACILITIES ENGINEERING COMMAND
NSWC CRANE, IN

DRAWN MRC\08-08-00 CHECKED

REVISED APPROVED

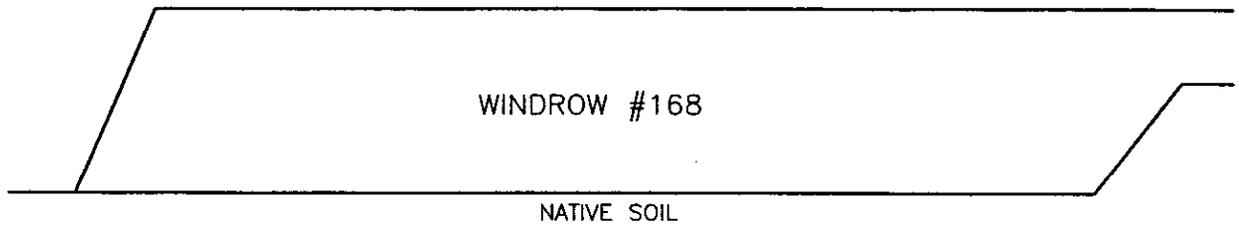
JOB NO.: 37324.01

SHEET NUMBER

1 of 5



MINE FILL B – PERMANENT PLACEMENT AREA



MEASUREMENTS ARE APPROXIMATE
NOT TO SCALE

ALL SOILS ARE RESIDENTIAL



SOUTH END CROSS VIEW

BACKFILL OPERATIONS
WINDROWS: #149, 150, 151, 152, 153, 154, 155, 156, 157, 158, 159, 160, 161, 162, 163, 164, 165, 166, 167, 168
NAVAL SURFACE WARFARE CENTER
MINE FILL B – PERMANENT PLACEMENT AREA
CRANE, INDIANA

PREPARED FOR
NAVAL FACILITIES ENGINEERING COMMAND
NSWC CRANE, IN

DRAWN MRC\08-08-00

CHECKED

REVISED

APPROVED

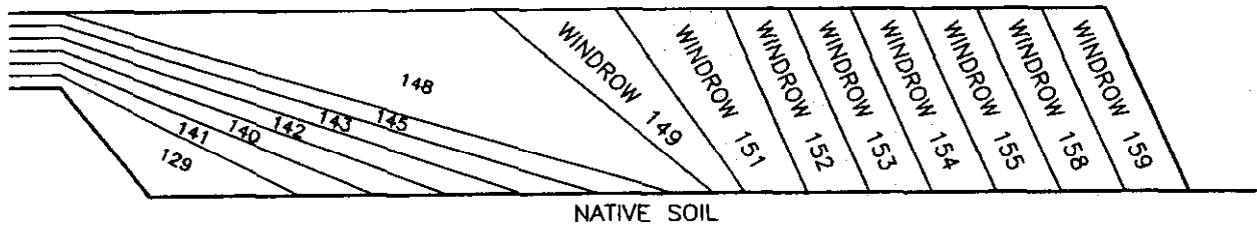
JOB NO.: 37324.01

SHEET NUMBER

2 of 5



MINE FILL B - PERMANENT PLACEMENT AREA



MEASUREMENTS ARE APPROXIMATE
NOT TO SCALE

ALL SOILS ARE RESIDENTIAL



NORTH END CROSS VIEW

BACKFILL OPERATIONS
WINDROWS: #149, 1/2 150, 151, 152, 153, 154, 155, 156, 157
158, 159, 160, 161, 162, 163, 164, 165, 166, 167, 168
NAVAL SURFACE WARFARE CENTER
MINE FILL B - PERMANENT PLACEMENT AREA
CRANE, INDIANA

PREPARED FOR
NAVAL FACILITIES ENGINEERING COMMAND
NSWC CRANE, IN

DRAWN MRC\08-08-00 CHECKED

REVISED APPROVED

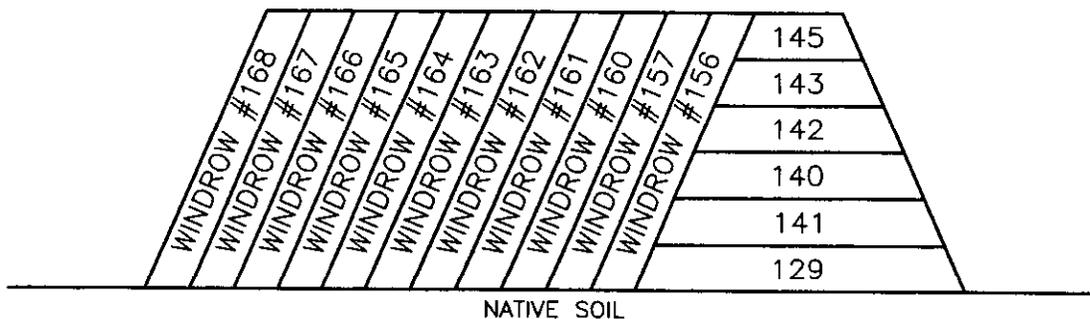
JOB NO.: 37324.01

SHEET NUMBER

3 of 5

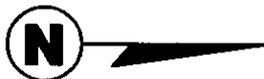
TOLLEST, INC.

MINE FILL B - PERMANENT PLACEMENT AREA



MEASUREMENTS ARE APPROXIMATE
NOT TO SCALE

ALL SOILS ARE RESIDENTIAL



EAST END CROSS VIEW

BACKFILL OPERATIONS
WINDROWS: #149, 150, 151, 152, 153, 154, 155, 156, 157, 158, 159, 160, 161, 162, 163, 164, 165, 166, 167, 168
NAVAL SURFACE WARFARE CENTER
MINE FILL B - PERMANENT PLACEMENT AREA
CRANE, INDIANA

PREPARED FOR
NAVAL FACILITIES ENGINEERING COMMAND
NSWC CRANE, IN

DRAWN MRC\08-08-00

CHECKED

REVISED

APPROVED

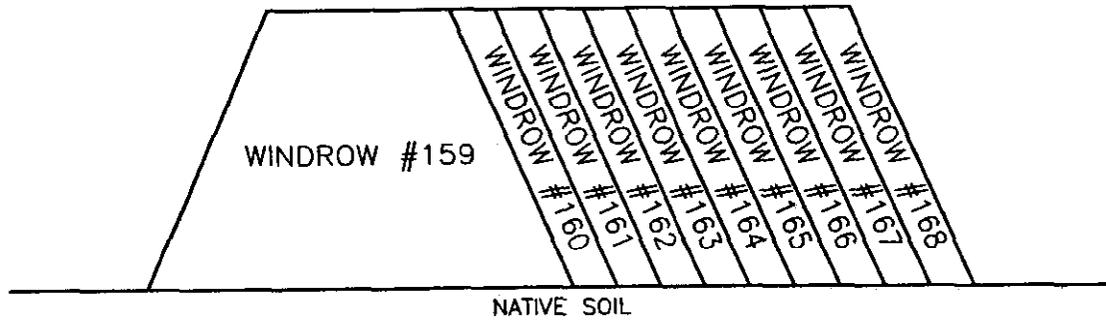
JOB NO.: 37324.01

SHEET NUMBER

4 of 5

TOLLEST, INC.

MINE FILL B - PERMANENT PLACEMENT AREA



MEASUREMENTS ARE APPROXIMATE
NOT TO SCALE

ALL SOILS ARE RESIDENTIAL



WEST END CROSS VIEW

BACKFILL OPERATIONS
WINDROWS: #149, 150, 151, 152, 153, 154, 155, 156, 157, 158, 159, 160, 161, 162, 163, 164, 165, 166, 167, 168
NAVAL SURFACE WARFARE CENTER
MINE FILL B - PERMANENT PLACEMENT AREA
CRANE, INDIANA

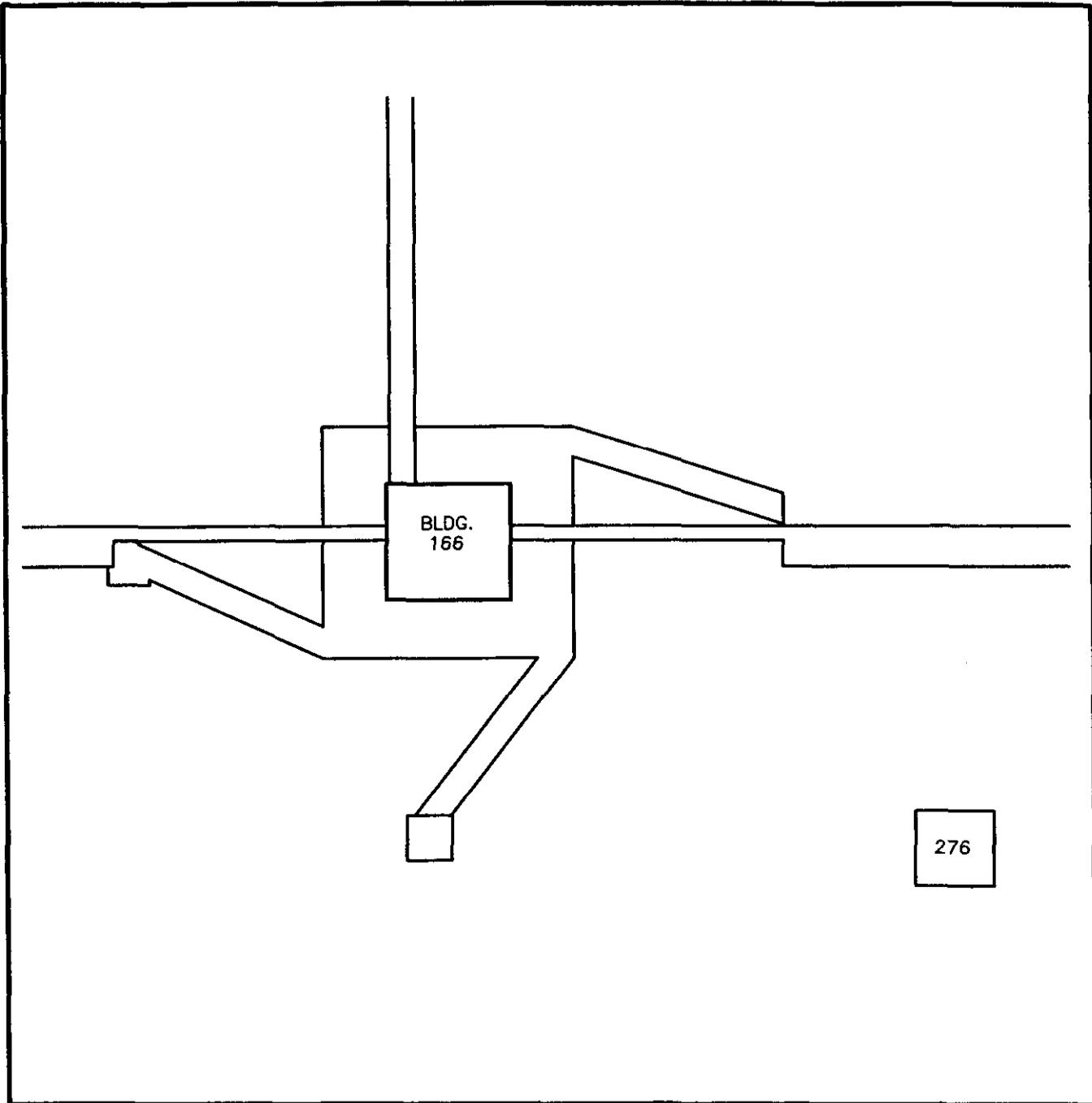
PREPARED FOR
NAVAL FACILITIES ENGINEERING COMMAND
NSWC CRANE, IN

DRAWN MRC\08-08-00	CHECKED
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REVISED	APPROVED
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JOB NO.: 37324.01	TOLLEST, INC.
SHEET NUMBER	

5 of 5



MEASUREMENTS ARE APPROXIMATE
NOT TO SCALE



POST EXCAVATION SAMPLE GRIDS

NAVAL SURFACE WARFARE CENTER
BUILDING 166, MINE FILL B
CRANE, INDIANA

PREPARED FOR
NAVAL FACILITIES ENGINEERING COMMAND
NSWC CRANE, IN

DRAWN MRC\11-01-00

CHECKED

REVISED

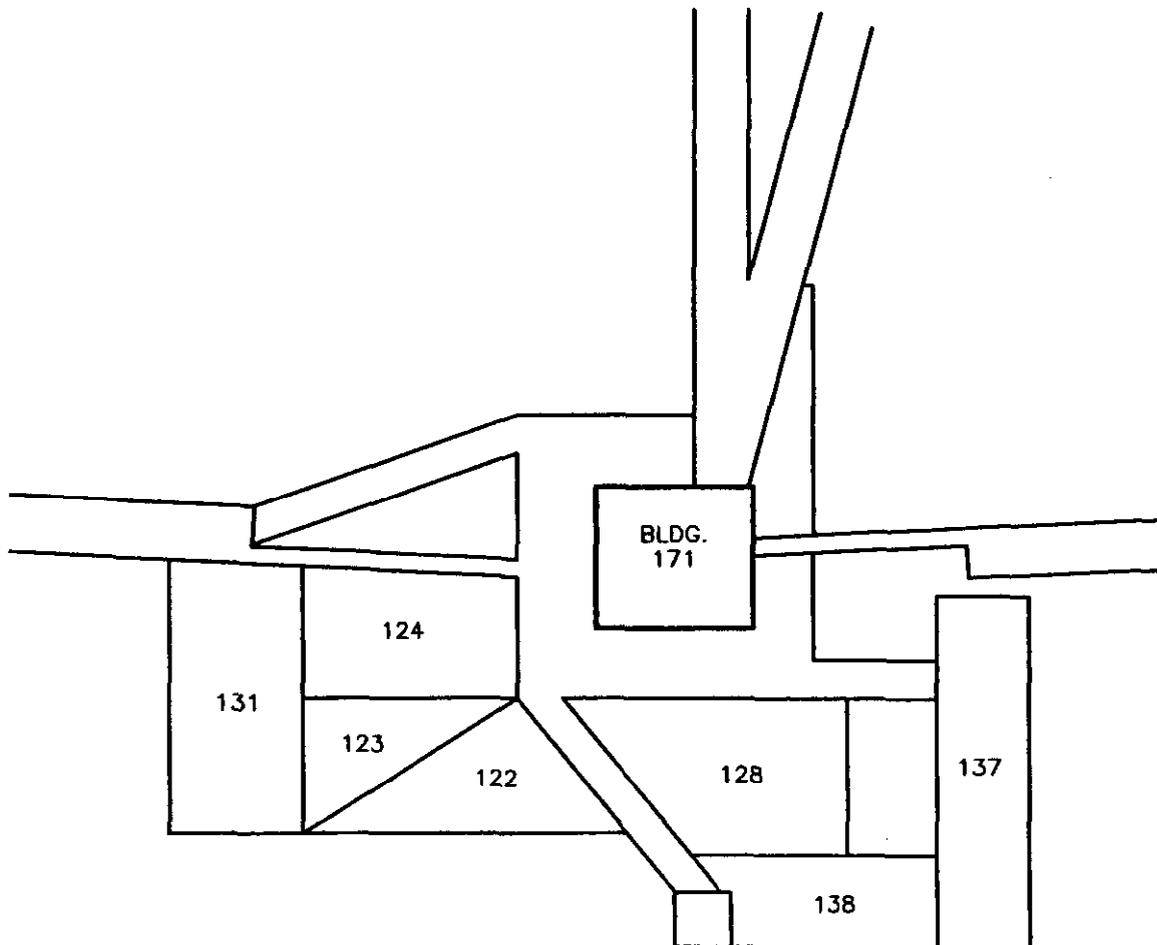
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JOB NO.: 37324.01

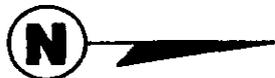
SHEET NUMBER

1 of 2

TOLTEST, INC.



MEASUREMENTS ARE APPROXIMATE
NOT TO SCALE



POST EXCAVATION SAMPLE GRIDS

NAVAL SURFACE WARFARE CENTER
BUILDING 171, MINE FILL B
CRANE, INDIANA

PREPARED FOR
NAVAL FACILITIES ENGINEERING COMMAND
NSWC CRANE, IN

DRAWN MRC\11-01-00

CHECKED

REVISED

APPROVED

JOB NO.: 37324.01

SHEET NUMBER

2 of 2

TQWEST, INC.

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Philip A. Keith, Acting
SIGNATURE

DIRECTOR, ENVIRONMENTAL PROTECTION DEPARTMENT
BY DIRECTION OF THE COMMANDER
TITLE

11/01/00
DATE