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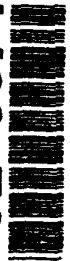
Report of Findings Lake Superior Classified Barrel Disposal Site

Defense Environmental Restoration Program for
Formerly Used Defense Sites

Project No. E05MN025501



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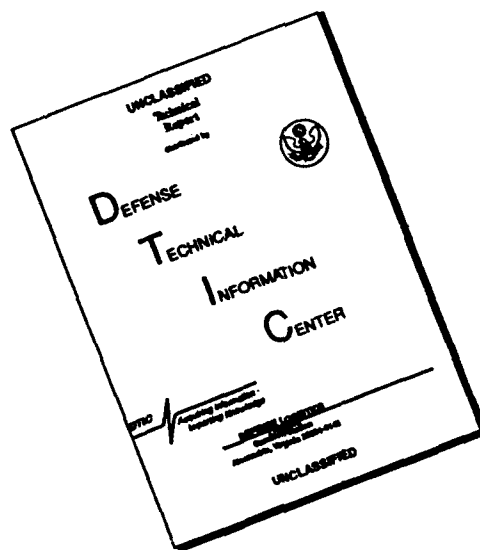


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<p>This report contains findings of underwater surveys and barrel recovery operations conducted in Lake Superior by the U.S. Army Corps of Engineers, St. Paul District in 1990. Twenty-four square miles of lake bottom were electronically surveyed, resulting in the verified location of approximately 105 barrels believed to be classified scrap produced between 1959-1962 by Minneapolis-Honeywell Inc. Two barrels were recovered from a depth of 170 feet, and opened by personnel wearing protective safety equipment. The contents were confirmed by Honeywell personnel to be safety and arming devices for a BLU-3 or BLU-4 anti-personnel grenade/mines. The material had been declassified prior to the initiation of a previous search in 1977. After their discovery, 25 barrels were monitored using an underwater gamma probe. Radiologic data collected in the proximity of the barrels did not indicate any health or safety risks in the area monitored.</p>					
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Defense Environmental Restoration Program
for Formerly Used Defense Sites
Lake Superior Classified Barrel Disposal Site
Duluth, Minnesota
DERP FUDS Project No. E05MNO25500
June 1991

REPORT OF FINDINGS

EXECUTIVE SUMMARY

1. The following report details site activities conducted by the U.S. Army Corps of Engineers, St. Paul District to locate the Lake Superior Classified Barrel Disposal Site for environmental study. The project was authorized under the Defense Environmental Restoration Program for Formerly Used Defense Sites (DERP FUDS) on 23 July 1990. The site was reportedly used by the U.S. Army Armament Materiel Readiness Command (ARRCOM) as a secure location in which to dispose of classified munitions scrap from production lines located at the Twin Cities Army Ammunition's Plant (TCAAP) between 1959 and 1962. This report contains findings of underwater surveys and barrel recovery operations conducted in Lake Superior by the U.S. Army Corps of Engineers, St. Paul District under DERP FUDS Project No. E05MNO25501 between 10 October 1990 and 26 November 1990.

2. Twenty-four square miles of lake bottom were electronically surveyed resulting in the verified location of approximately 105 barrels believed to be classified scrap produced between 1959-1962 by Minneapolis-Honeywell Inc. at TCAAP. Two barrels were recovered from a depth of 170 feet from the lake and opened by personnel wearing protective safety equipment for inspection. The barrels contained cardboard boxes which had been covered with a concrete grout mixture. The boxes were found to contain small metallic castings containing several gears, springs and mechanisms. The contents were confirmed by Honeywell personnel on 7 March 1991 to be safety and arming devices for a BLU-3 or BLU-4 anti-personnel grenade/mines. Some parts were observed to contain M55 detonators which were tested and found to be inert. Contents carried a confidential classification as verified by markings and partial inspection slips recovered with the barrels. Date of packing was determined to be August 1962 from inspection slips recovered with the scrap. The material had been declassified prior to the initiation of a previous search in 1977.

3. After their discovery, 25 barrels were monitored using an underwater gamma probe furnished by the Environmental Protection Agency. The radiologic data collected in the proximity of the barrels did not indicate any health or safety risks exist in the area monitored. Chemical tests of water taken from overpack containers which contained the barrels for approximately three weeks and leachate samples taken from the recovered scrap were also within acceptable MPCA health and safety standards for water.

4. Recommendations pertaining to continuance or cancellation of any further investigative search of this site are not contained within this

document. Refer to the Project Summary Sheet (PSS) for Project No. E05MN025502 for site specific project recommendations.

Defense Environmental Restoration Program
for Formerly Used Defense Sites
Lake Superior Classified Barrel Disposal Site
Duluth, Minnesota
DERP FUDS Site No. E05MNO25500
Project No. E05MNO25501
April 1991

REPORT OF FINDINGS

I. BACKGROUND

1. This report details site activities conducted by the U.S. Army Corps of Engineers, St. Paul District in October 1990 to locate classified scrap ordnance placed into Lake Superior between 1959 and 1962 by the U.S. Army Armament Materiel Readiness Command (ARRCOM). The project was authorized under the Defense Environmental Restoration Program for Formerly Used Defense Sites (DERP FUDS) to inventory the site for potential environmental contamination which might be attributed to Department of Defense (DOD) usage of the site.

2. In 1959, the U.S. Army Armament and Materiel Readiness Command (ARRCOM) located in Rock Island, Illinois, was responsible for supervision of a contract with the Minneapolis-Honeywell (M-H) Regulator Company to produce 2,072,980 assemblies for the M-32 anti-personnel grenade and 670 762mm M-6 (Honest John) rocket assemblies at the Twin Cities Army Ammunition Plant (TCAAP) in New Brighton, Minnesota, under contract DA-11-022-ORD-3319. Design specifications for the ordnance were classified by the U.S. Army to protect the design and manufacturing concepts from being copied. Rejected parts (scrap) from this contract were by default considered classified material which would, by regulation, require the proper security and safeguarding measures designated for classified material disposal. Army Regulation 380-5, Section 5, par. 1-503 denotes that the Confidential classification "shall be applied only to information or material the unauthorized disclosure of which could reasonably be expected to cause damage to national security. Examples of damage include...inspection of classified munitions of war; revelation of performance characteristics, test data, design, and production data on munitions of war."

3. Disposal of classified scrap was the responsibility of M-H as approved by ARRCOM. Records show at least four methods of demolition were attempted over the life of the contract. A smelting furnace had previously been used in Duluth, Minnesota, to melt rejected material into unrecognizable scrap, but for unknown reasons was discontinued in 1959. An attempt to demolish the material using explosives at Camp Ripley in 1959 was unsuccessful, and a proposal to install a permanent "hammermill" at the facility was rejected. The hammermill required continuous supervision and acquisition costs that made it uneconomical. It was ultimately determined that "sinking the material into great depth in Lake Superior was the most economical and secure" method of disposal.

4. ARRCOM contacted the Chicago Ordnance Division who in turn contacted

the U.S. Army Corps of Engineers (COE), North Central Division, and was granted permission to utilize the Duluth Area Office of the St. Paul District COE for disposal services. See Figures 1 & 2. The classified material was packed into 55 gallon drums, trucked to Duluth, Minnesota, under guard, loaded onto COE barges and towed onto the lake and sank into Lake Superior. Documentation prepared by the Commander's representative requesting disposal assistance from the U.S. Army Corps of Engineers in 1959 indicated that the drums contained no "explosive or radiologic" materials.

5. Between 1959 and 1962, ARRCOM requested COE assistance in the disposal of classified material seven times. After 1962, records show that U.S. Steel Corp. in Duluth, Minnesota, was used as a classified smelting facility. Over the three year period in which lake disposal was used, approximately 440 tons of scrap was reportedly placed into Lake Superior. Materials used to contain and ballast the scrap were included in this weight. Although no accurate record of each barrel reportedly disposed has been found, one shipping log suggests that each barrel weighed 40 lbs. dry, which would account for 29 tons of the total disposal.

6. In 1968, a local fisherman, Mr. Stanley Severson, operating the vessel "Hiawatha", reportedly netted several barrels while trawling in an area approximately 7 miles N.E. of Duluth, Minnesota. Newspaper accounts and letters written to the St. Paul District by the "Save Lake Superior Association" several years later relate that the crew found a barrel weighing approximately 700 pounds containing "metal parts, resembling buckshot." The barrels were reportedly inspected onboard the "Hiawatha" and dumped back into the lake in shallower water in the same general area.

7. The discovery of the barrels and subsequent inquiries eventually identified the source of the material, TCAAP, and the agencies which participated in its disposal. Published newspaper accounts in the mid 1970's included an interview with the wife of the captain of the tug "Lake Superior", who believed the material was radioactive material from St. Paul "atomic plant". See Figure 3. From that point onward, speculation over the exact content of the barrels became a matter of intense public speculation. See Figure 4 and associated articles in Appendix A.

8. In 1976, an effort to locate the barrels was authorized by the U.S. Army. A magnetometer search was executed in southwestern part of the lake by the COE Tug Lake Superior and Dr. Thomas Johnson from the University of Minnesota in December 1976. Crews aboard the vessel were reported to have located 20 barrels in accounts taken from local newspapers in Duluth. See Figure 5. Incomplete survey notes prepared by COE personnel documenting approximate triangulations from shore to locations of the tug on the lake were located in record searches for this project; however, no notations which could be used to identify which of the three surveyed sites was the site believed to be where barrels were supposed to have been located. See Figure 6.

9. As a result of this effort and continued public concern, a divers search was initiated by Army Munitions and Chemical Command (AMCCOM-formerly ARRCOM) in 1977 to recover a barrel and produce hard evidence of barrel content. A report, "Final Report on Classified Scrap in Lake Superior, 8 July

1977" (Appendix A), detailed the search effort and included several historical documents pertaining to the disposition of the barrels, affidavits of personnel tasked with contract administration and miscellaneous newspaper accounts of the issue. The exact area searched was not detailed in the report, but it is believed that the areas pinpointed in the 1976 magnetometer search were the focus of three days of underwater activity. The effort was unsuccessful in locating barrels. Public releases cited difficulty, cost and testimony from personnel involved with the production contract, attesting to the harmless nature of the material, as sufficient reason to discontinue recovery efforts.

II. TASKING AND AUTHORIZATION

10. In 1986, the Superfund Amendment and Reauthorization Act (SARA) was passed requiring the Department of Defense (DOD), in consultation with EPA, to undertake an environmental restoration program and to perform appropriate response actions for hazardous substance releases at current and former DOD facilities. Since passage of the bill, the Defense Environmental Restoration Program (DERP) has identified approximately 7060 DOD sites which will be routinely inspected to determine whether DOD usage of a site has resulted in environmental problems attributable to the DOD. The Lake Superior Classified Barrel Disposal Site, DERP Site No. E05MNO25500, was listed among 200 sites believed to be Formerly Used Defense Sites (FUDS) tasked to the St. Paul District by Huntsville Division (CEHND) in 1987 for investigation under the DERP FUDS program.

11. Initial site information came from Mr. Ron Swenson, Chief, Site Assessment Section, Minnesota Pollution Control Agency (MPCA) in November 1989 in the form of a 1985 MPCA report filed with EPA which requested the site be listed as a Potential Hazardous Waste Site. Mr. Al Kliene of the Duluth Area Office provided additional background information files in March 1990. On 5 May 1990 an Inventory Project Report (INPR) was submitted to North Central Division (CENCD) for approval. The report identified the site as having been formerly used by the DOD. The INPR was approved as an eligible site by CENCD on 23 July 1990 and forwarded to Headquarters for project funding.

12. It is standard DERP procedure to perform a Preliminary Assessment (PA) inspection of all project sites for the presence of unsafe debris, ordnance and hazardous or toxic materials which are potential DOD generated environmental hazards. The Lake Superior INPR acknowledged the fact that identification of potential environmental hazards created by the DOD was complicated by the unique location of this site which would require specialized equipment to properly identify and survey the site. The report recommended a two-phased project to first determine the actual area used as the disposal site(s) and collect photographic evidence of location, condition and content of the barrels. If possible, a limited number of debris samples, or a barrel might be recovered for analysis. Results from the phase one study would provide information which would be used to determine whether additional study or remedial activity was warranted or confirm historical records which attest to the barrels as containing harmless scrap which may require no further action. DERP FUDS Project No. E05MNO25501 was authorized on 23 July 1990.

13. Notification of project funding was passed to St. Paul District in September 1990. Contract DACW3790M1118 in the amount of \$16,950.00 was awarded to Hazard Control, Inc. of Minneapolis, Minnesota, on 30 September 1990. A \$200.00 modification was made to the contract in January 1991 to reimburse the Contractor for cellular telephone services provided by the Contractor while on the lake.

III. SITE INVESTIGATIONS, 10-16 October 1990

14. The Scope of Work (SOW) required Hazard Control to conduct field investigations aimed at locating 4 of the 7 reported historical disposal sites for classified military scrap placed in Lake Superior. The four sites targeted in the SOW were believed to be located in waters close to Duluth and lay in shallower sections (<200 feet deep) of the lake. Goals of the project were to electronically survey an area of Lake Superior reported to have the highest concentration of disposal sites and collect photographic or other recoverable evidence of barrel contents if successful in locating a site. The Contractor was briefed on the history of the site, given an inspection tour of available support vessels and docking areas at the Duluth Area Vessel Yard on 5 October 1990. In accordance with the SOW, the Contractor submitted a complete operation and safety plan for planned operations at that time (Appendix B).

15. The SOW for the project recognized that the lake is uncontrolled area which was used by ARRCOM to dispose of materials from TCAAP, but could also contain materials disposed of from other non-documented sources. Therefore, each step of the project emphasized personal safety procedures designed to prevent injury to personnel should hazardous material from any source be encountered. Reports that the barrels could contain radioactive, chemical or explosive materials were considered in preparing site operation and safety plans.

16. On 10 October 1990, the contractor mobilized equipment to the Duluth Area Vessel Yard in Duluth, Minnesota. The COE vessel "David Boyd" and four contractor vessels, "Northern Comfort", "Hey Boy", "Madeline Goodrush" and a two-man submersible were designated search vessels for the effort. Photos 1-4 are of the actual vessels involved with the search. The SOW for the contract called for concentrated electronic search of a twenty square mile area of Lake Superior which records showed as having the highest probability of containing at least four of the reported historical disposal sites.

17. Three vessels were equipped with sidescan sonar detection equipment capable of identifying bottom structures utilizing a sonar "towfish" probe and on-board chart recorder systems (See Photos 5&6). The probe is towed 15-20 feet off the bottom of the lake emitting an electronic signal laterally in either direction normal to the course of the vessel. The sonar detects variations of the bottom of the lake by mapping reflected sonar signals on a chart recorder. Each vessel was crewed with a pilot, navigator, deckhand and equipment technician to "search" each grid for potential disposal sites. The "Northern Comfort" was assigned as the confirmation support vessel by the Contractor. The vessel was equipped with a Remotely Operated Vehicle (ROV),

tow camera, magnetometer and Self Contained Underwater Breathing Apparatus (SCUBA) equipment for verification dives. Grid coordinates are included in Appendix B.

18. Upon completion of mobilization, the vessels went out into 90 ft. of water to conduct a "practice" run for equipment calibration. Two empty 55 gallon barrels which were lashed together and sank to the bottom of the lake. Several passes were then made to familiarize technicians with lake conditions and sonar patterns associated with barrel shapes on the lake bottom. The barrels were recovered at the end of the practice session. See Figure 7 for a sonar print of a practice barrel.

19. Thursday, 11 October 1990 - First Complete Search Day. Weather: Clear, light wind out of the SE, temp. in the mid 40's greeted the first days efforts. At 0800 hours, each boat proceeded to its assigned grid and began sonar mapping. The "David Boyd" proceeded to an area north of the Duluth Pumping Station identified by Mr. Severson as the area where they had netted two barrels in 1968. No barrels were sighted in the location. Each vessel completed a full day of mapping with no confirmed barrel sightings, but several potential areas were noted. Submerged logs, rocks and other depressions were identified by the ROV and tow cameras during the day. A sidescan graph sample of what a submerged log registers is shown in Figure 8. This log was confirmed by tow camera. Sidescan read-outs were collected for analysis on shore should later discoveries show that the actual barrels be confirmed as having a sidescan echo different than those used in practice sessions. Time, location and direction of sweep were recorded on each read-out. Operations were called at 2130 hours with no confirmed barrel sightings.

20. Friday, 12 October 1990. Vessels began sonar mapping at 0800. Weather was again good with light winds out of the southwest and temperatures in the high 40's. Mr. Steve Leppala of MPCA accompanied the COE aboard the "David Boyd" as an observer. Several miscellaneous targets were identified as potential barrel sites; however, once again no definitive sightings were posted. The "Hey Boy" was successful in locating a small shipwreck which was not on current wreckage charts. ROV video and later sport dives confirmed the vessel to be a small tug, the A.C. Adams scuttled in 1928. See Appendix E for further details regarding historical information on the wreckage.

21. Saturday, 13 October 1990. Search efforts began again at 0800 hours. A brisk wind out of the south was making progress difficult. At 1135 hours the "David Boyd" had completed a northward leg in grid "G" and was completing a corner into a southerly leg when a lateral line of targets stretching across the chart recorder registered as the towfish was sinking to its proper depth (See Figure 9). A marker float was dispatched and two additional runs were made bisecting and paralleling (Figure 10) the suspected site. A line of sixty to seventy objects were recorded laying in a southwest to northeasterly path in what was believed to be 180-190 feet of water. The "Northern Comfort" was summoned to the area for visual confirmation. Two or three barrels just out of clear camera range were believed sighted with a tow camera before it captured a clear picture of a barrel sitting on an angle in the silty bottom. The barrel was observed and recorded clearly for a 3-4 second duration. At 1415, the wind had increased sufficiently to cease

operations for the day. Lake conditions (2-3.5 foot swells) were worsening and it was no longer possible to continue mapping. The David Boyd returned to port and a press conference announcing the find was organized by Mr. Ken Gardner, St. Paul District Public Affairs Office.

22. 14 October 1990 (Media/Equipment Demonstration & Search Day #4). In conjunction with our public affairs plan, the morning of 14 October had been designated as a media/equipment demonstration day. The event was scheduled prior to the initiation of field work and was scheduled to coincide with the arrival of the contractor's two man submersible.

23. The event was planned in anticipation of public interest in the search effort. The goal was to provide the media an opportunity to ask questions and observe the contractor's equipment that was being used in the effort. A secondary goal in scheduling the event was to present the information to the media in a setting which might help eliminate private vessels, whether curiosity onlookers or boats contracted by the media, from interfering with scheduled search and recovery operations on the lake. Strict navigation requirements, hundreds of feet of sonar cable trailing the vessels and submarine safety considerations would all be affected by vessels wandering about in the designated search area(s). By scheduling a two hour session for demonstration purposes, at a set time, in an accessible location; it was hoped that outside interference would be kept to a minimum. Upon completion of this phase of the project, only one vessel and a helicopter contracted by a television crew were observed on the lake in the search area.

24. Consultations with the Coast Guard indicated that a restricted zone could be set up which would preclude private vessels from interfering with operations; however, lead time required to file the appropriate request was not available. The search area also encompassed normal navigation channels into Duluth harbor which could not be closed for survey purposes. As a safety precaution, a "Notice to Mariners" was filed with the Coast Guard by the contractor prior to initiating surface operations. Daily announcements were included in the Coast Guard broadcasts warning mariners of the survey in progress. In accordance with Coast Guard regulations, survey flags were flown by all vessels involved with the search operation. Each pilot was advised not to initiate search patterns which would be interrupted by passing freighters until the area was clear.

25. At 1200 hours, three vessels returned to the lake for additional sonar readings. An additional run over the confirmed barrel site aimed at reconfirming location and the number of suspected barrels resulted in a sonar echo graph containing approximately 105 barrels (see Photo 7). This location corresponds to one of the survey locations done in 1976 (Figure 6). The area near McQuade Road and Talmadge River was included in the survey notes.

26. Additional data collected was concentrated approximately one mile off shore from the Lester River to an area near French River where a fishing net blocked further advance. The search area was moved closer to shore than initial search grids due to the discovery of the confirmed site approximately 5000 feet from shoreline. Initial grids had been laid out at one mile from shore as supported by historical documentation which had specified disposal to

be placed at least one mile off shore.

27. No further sites were located. However, the towfish being dragged by the David Boyd did hit bottom (disconnecting the electronics) in an area around the Duluth Pumping station where a bottom formation rose quickly from 140 to near 100 feet. While resetting the probe, rust streaks were noted on the tail assembly, see Photo 8. The David Boyd continued in a northeasterly direction and no further measurements were taken in the area.

IV. SONAR FINDINGS

28. The side scan sonar equipment used in surveying Lake Superior for the barrel disposal sights worked extremely well throughout the project. Lake bottom conditions in the search area were ideal as there is minimal bottom structure to obscure potential disposal sites in this area of the lake. Later observations with the two man submersible indicate a fairly flat bottom covered with a 1-3 inch layer of fine silt throughout the search area. Sonar readings picked up very small debris piles and charted the small bottom anomalies (approximately 6-12 inches high) with a high degree of reliability as confirmed by video survey.

29. Because of the number and difficulty involved with verification of each "hit", confirmation efforts were limited to "highly" graded targets during the search phase of the project. The belief that the barrels would be found intact in this effort, placed a higher value on sonar targets with highly pronounced chart echo. Each target was graded on a scale of one to ten as interpreted by the sonar technician. Reported disposal methods, i.e. large groups of barrels disposed in each historical dump, also led searchers to grade multiple sonar hit patterns higher than individual echoes. Figures 11 through 14 are examples of various side scan sonar echoes of anomalies recorded during field studies.

30. During the four days of sonar mapping, 104 anomalies were located by the side scan sonar on a sounding "hit" list compiled by the Contractor. Each sighting represents a distinct sonar finding or group of findings which has been interpreted by the sonar technician as being a barrel sized object on the lake bottom. Each find was graded by the technician as it was observed for future verification. A record of all significant sonar "hits" was compiled by each vessel and transferred to a map on Figure 11. The map includes all significant hits for areas searched 11-14 October 1990.

31. While only one confirmed barrel site and shipwreck was mapped during this attempt, the sonar map indicates areas of high probability of being barrel sites that remain unverified. Two areas marked on Figure 11 are bottom structures which are not believed to be naturally occurring (See Figures 12 & 13). The sonar print for these areas indicate a series of large and small diameter circular "blotches" in a linear path at the two sites. An attempt to verify the larger blotches (4-5 in a linear path) with a tow camera did not produce any conclusive findings other than small areas of objects that appeared to be like "piles of rock". It was theorized on site that the spots might be ballast or discarded ore from a passing freighter. The map also shows three to four lines of medium graded targets areas which resemble the

pattern of barrels found during in the confirmed site. The debris circles shown in Figure 12 appear at regular intervals along a 2000 foot stretch of a search grid approximately 1 mile southwest of the Duluth water intake.

32. One item of interest remaining from the 1977 survey was the report of "barrel tracks" along the bottom of the lake. Divers reported seeing ridges along the lake bottom that they theorized may have been created by rolling barrels. During this project, side scan sonar clearly showed many "tracks" in the lake bottom. See Figure 14. The "tracks" were explained by side scan technician from the Duluth area as drag marks created by the heavy downriggers used to insure fishing nets proximity to the bottom. This fishing technique was reportedly was common to the area and was probably employed by Mr. Severson in 1968 when they netted a barrel. Much of the survey area contained anomalies of this type. Parallel sets of tracks indicative of fish netting were plainly visible on many sidescan graph read-outs.

33. One sonar print of the small circular anomalies shown in Figure 12 contained a set of trawler drag marks which was observed to bisect the 2000 foot long pattern. At the point of intersection, a large gouge mark was observed in bottom sediments. Speculation that this may have been the location which the "Hiawatha" snared a barrel in 1968 was made. The location was approximately a one mile southwest of the city water intake which loosely corresponds with the historical report. However, because the type of anomaly did not match sonar read-outs that of barrels observed in practice runs, the area was noted as a potential target but not visually verified.

34. Each sidescan target location is at best an approximate location as the accuracy of the sonar, navigation error, cable length and varying vessel speed combine to generalize the area of each target. Attempts at confirming each potential target required close communication between the search and confirmation vessels. Confirmation of a potential barrel find with video equipment required an accurate surface marking of the suspected location by the search vessel. As the sonar probe would pass over a target, the technician monitoring the chart recorder would instruct a deckhand to throw a buoy, with an appropriate amount of anchor rope, as soon as a highly graded target was recognized. This placed the marker, and requested Loran navigation coordinates for the "target", at a minimum, the length of the probe cable from the suspected target. Additional errors in location could be attributed to not correctly recognizing the direction of travel of the search vessel marking the target, range of target port or starboard of the search vessel and variations in probe depth and cable length. Combine the potential errors with the limited visibility of video equipment at 160 feet of depth (5-10 feet) and the difficulty of verifying each target with a tow camera can be recognized. When the confirmed barrel sight was finally located, it took 45 minutes to locate one of the 105 barrels with the tow camera. When an additional attempt to locate the barrels was attempted three days later on a perfectly calm day, it still required 45 minutes. Uncertain location, limited visibility, spacing between barrels and surface conditions make verification of targets with a tow camera a "hit or miss" proposition. While it was a valuable tool in the search phase, the depth and great area to be searched severely limited verification successes with a tow camera. If additional information about the targets contained in Figures 12 or 13 is required, see

paragraph 81 for subsurface verification recommendations.

V. BARREL RECOVERY ATTEMPTS

35. With weather conditions forecasted as worsening, COE support vessels originally scheduled to assist the Contractor on Tuesday, 16 October were requested by the Contractor on Monday, 15 October. As the tug "Lake Superior" was tending the "Coleman" in Superior harbor on Friday, it had to be relocated back to the Duluth COE vessel yard before being able to assist in operations. The tug was required as it was the only vessel in the yard with sufficient anchor chain for operations in 200 feet of water. The two man submersible and all necessary support equipment were placed on the Crane Barge (CB) "Markus". The required floating plant was assembled with the aid of the Tug "Fairchild". Both vessels and the "Hey Boy" departed the boatyard at approximately 1130 hours.

36. The SOW for barrel recovery required the barrels to be placed into protective overpack containers (Photo 9) prior to being removed from the water. As the condition of the barrels was unknown, the overpack containers would serve as protection to the environment and personnel and minimize potential damage or disintegration of the barrels as they were being recovered.

37. The depth of the find also complicated the recovery process. OSHA regulations limit diving operations at 180 feet to a maximum 20 minutes per day with the appropriate on-board safety measures. Dives in excess of 100 feet require an on-site decompression chamber. As pre-project planning could not forecast what condition or depth barrels would be found in, or if any would be located at all, no specialized deep diving teams and support equipment were mobilized for this effort. These alternatives could be contracted as required once site conditions were discovered.

38. Contract provisions required the contractor to have a submersible capable of delivering a net or other remote means of capturing a barrel for salvage. The submersible provided by the contractor utilized a clamping mechanism which when correctly positioned by the pilot would be placed around the circumference, at the centerline of the barrel. A rope tethered to the clamp would then be tensioned by surface personnel, closing its jaws about the barrel. See Photo 2. The line would then be connected to a surface winch, raising the barrel off the bottom off the lake. The barrel could then be moved into shallow water for transfer into protective overpack containers by fully protected divers.

39. The plant arrived on site at 1245 hours and launch of the submersible "Lake Diver" was accomplished using the crane on board the CB Markus at 1330 hours. The pilot of the submersible, Mr. Harold "Webb" Maynard, requested that the first dive (Dive #1) be a reconnaissance dive aimed at familiarizing himself with bottom conditions prior to initiating recovery attempts. A small float was tethered to the submersible to aid in identifying its location and keep the vessel from straying under the barge or into the anchor chain.

40. Upon reaching the bottom, the pilot indicated that he had landed in a group of approximately five barrels, affirming sonar findings which indicated the site contained a multiple barrels. The site had been successfully relocated using Loran coordinates and the surface buoy dispatched when the site was first located.

41. The pilot returned to the surface and readied a retrieval clamp designed to fit around the outside diameter of the barrel. Two attempts were made to try to capture a barrel. In Dive #2, the clamp released prematurely, on Dive #3 no barrels were located and the rope connected to the clamp became entangled in the submersible's propeller. Recovery of the submersible took some time as it drifted along the surface, but it was recovered and one additional a recovery attempt (Dive #4) was made at 1630 hours.

42. After Dive #2 it was discovered that the Geiger counter on-board the submersible had not been activated by the pilot. No indications of radioactivity were noted on Dive #3, and surface checks of the submersible made upon completion of each dive proved negative. Dive #4 took place to the southwest of the initial dives. After returning to the surface, the pilot indicated that the Geiger counter had registered 10-12 times over a minute (single clicks) while descending toward the bottom of the lake, and 3-4 more times as he attempted to capture a barrel. (See Appendix B for pilots affidavit) The pilot was unsuccessful attaching the clamp and he returned to the surface, reported his findings, and as the hour was late, the decision was made to suspend surface operations and return to port at 1900 hours. The submersible, anchor chain and sediments recovered on the anchor were checked with the Geiger counter, but showed no signs of radioactivity.

43. On site recovery operations initiated the next day at 0930 hours. Weather was ideal, zero wind conditions, temperatures in the low 50's. Anchorage was estimated at a spot within 300 feet of the previous day. This observation is based on the relative position of the surface buoy to the anchorage position of the tug on each day. The first dive of the day (Dive #5) was dedicated to performing a limited sweep of the area around the tug for confirmation of the initial Geiger counter reading. Mr. Robert Dempsey of the St. Paul District accompanied the submersible in a search of the area for approximately 40 minutes before a barrel was located. The submersible maneuvered to within 8 inches of a barrel off the side viewport and was visually examined by Messrs. Dempsey and Maynard. Two Geiger counters on board showed no indication of radioactivity at the barrel or at any time during the dive. The submersible returned to the surface and was recovered.

44. It had been decided that if further radioactive readings were detected, the project would be redirected and terminated at that point. As no indication of the earlier reading was reproduced, recovery plans continued. The submersible pilot was instructed to continue recovery attempts while continuing to monitor the area for safety. Consultations with the District Safety Officer, indicated that safe exposure limits for personnel were approximately 40 mR/Hr. The pilot was instructed to abort further attempts if a 20 mR/Hr reading was detected.

45. The radiologic issue raised during Dive #4 was also followed up by the local media and private inquiries to the Nuclear Regulatory Commission (NRC) in the months following the reported Geiger counter reading. The NRC investigated the allegation that radiologic material might have been included in the disposals and found it to be unsubstantiated. Honeywell was asked to review its records of past practices at TCAAP for any radiologic materials which may have existed at the plant during the 1959-1962 timeframe. In its response to the NRC, Honeywell stated that between 1959 & 1962 it " did not use, nor was authorized for, any radioactive materials in its manufacture of munitions." Additional investigation into the issue revealed that Honeywell did not have a permit to have radiologic material at the plant until 1967.

46. After two attempts (Dives #6 & #7) to locate a barrel with the submersible failed, the batteries aboard the submersible required recharge. The lights aboard the submersible were dimming and the pilot requested a two hour recharge period prior to attempting another dive. During the recharge period, a tow camera was then used to locate the barrels and place a buoy as close to a barrel as possible. At 1700 hours a barrel was located and a strobe flasher slid down the buoy line to aid the submersible in its efforts.

47. The submersible was successful in engaging the clamp over the top of of a barrel on Dive #8. The "Northern Comfort" moved over the site and tensioned the line using a small winch. The submersible was recovered and the tug was moved into position over the captured barrel at 1800 hours. The pilot reported that the barrel was oriented at an angle in the bottom sediments and the clamp had to be placed at an angle over the barrel.

48. The line was transferred to the capstan on board the tug and was slowly tensioned. The clamp did not hold, and the barrel was left on the bottom. Operations were called at 1845 hours. Darkness precluded any further attempts. Discussion of why the clamp failed to engage and what could be done to improve its performance ensued on the return trip to port.

49. A meeting was held on-board the tug to discuss whether additional efforts with the contractor would be successful. The original contract would expire that evening and a contract extension would be required for further efforts. It was determined that continued efforts with the submersible were possible, however, problems experienced with locating and securing a firm line to the barrels with the submersible were apparent, and the decision to let the current contract expire was made. Alternate recovery plans would be formulated.

50. 17 October 1990. Storms developed overnight and lake conditions deteriorated to 8 foot breakers on Lake Superior the next morning. With the exception of Saturday afternoon, we experienced six days of calm water during this phase of the project. Residents of the area had warned us of typically fast moving storms which come up quickly in October and we monitored weather channels continuously during our time on the lake. The majority of the search area lie within a half-hour of port which made operations less of a risk than those which might take place farther into the lake.

VI. CONTINUATION PLANS

51. Upon return to the St. Paul District, plans to continue recovery efforts and secure additional project funds were initiated. Normal contracting procedures would require a thirty day advertising and award period for contracts in excess of \$25,000, which would place divers in the lake in late November or early December. As a two to three day diving period was anticipated, potential delays and problems created by divers working in winter diving conditions resulted in the recommendation to discontinue efforts until Spring 1991. Sufficient justification to invoke emergency contracting procedures had not been established during the initial search operations. The barrels observed on the lake bottom did not appear to be releasing material to the environment and the situation did not warrant a declaration of an emergency.

VII. ENVIRONMENTAL PROTECTION AGENCY (EPA) ASSISTANCE

52. The radioactivity issue raised during the last dive on Monday remained a concern with both the COE and MPCA. Although the reading was never duplicated, it was speculated that there might be a single barrel containing radioactive material which was not encountered in Tuesday's confirmation and continued recovery efforts. Coordination by the Minnesota Pollution Control Agency with the Environmental Protection Agency (EPA) Region 5 in Chicago, Illinois, resulted in identification of equipment belonging to two EPA field offices which were capable of deep water radiologic monitoring. EPA'S Emergency Response Team in Edison, N.J., operates a Remotely Operated Vehicle (ROV) capable of operation in the depth of water in which the barrels had been found. Further search located underwater gamma radiation detection equipment, 200 times more sensitive than a standard Geiger counter, operated by EPA's National Air and Radiation Environmental Laboratory (NAREL) in Montgomery, Alabama. After several inquiries it was determined that both pieces of equipment were available for a limited time during the week of 29 October. Arrangements were made on 24 October to conduct a radiologic survey of the site beginning 30 October 1990.

53. Personnel from EPA, MPCA and the COE (Points-of-Contact are listed in paragraph 91) met in Duluth on 29 October and began to adapt the equipment for joint operations. The ROV (see Photo 10) would serve as the "mule" for the non-motorized underwater radiation probe and was equipped with a underwater television camera and sonar. The two pieces of equipment had never been used together at the same site. Several modifications were required to mount the probe so that it did not interfere with motors, sonar and camera. Photo 11 is of the assembled unit being launched for a trial in port.

54. Tuesday, 30 October 1990. After merging cables and completing a brief press conference, the David Boyd carrying COE, MPCA and EPA equipment and observers, left harbor at approximately 1100 hours. Weather: Clear, light winds with temperatures in the mid 50's. Upon arriving at the site, the marker dispatched in the previous search effort was still in place. The effort was concentrated to the northwest of the marker. This corresponded to the approximate location in which the submersible was located when the earlier reading was reported.

55. The ROV proved to be an excellent vehicle for underwater exploration and monitoring at the barrel site. Sonar aboard the ROV was able to identify barrels approximately 100 feet in any direction from the anchorage point and deliver the probe for study of the site while collecting excellent underwater video of barrel condition (see Photo 12). Barrels were generally observed to be in good condition. Oxidation bubbles marred the surface skin of the barrels and some were observed to have large dents believed to have been created by surface handling. Each barrel was observed to have one metal end and one concrete filled end. The observation agreed with historical records which indicated the barrels were filled with concrete to aid in their disposal. Fish were observed in the general area and in two cases the ROV found eel pout resting comfortably atop and under barrels. Several barrels were observed to have numbers etched into the concrete end; however, no definitive markings which could indicate their origin were observed. Underwater video was recorded during these inspections.

56. The underwater monitoring procedure and equipment used by NAREL is detailed in Appendix C will not be reproduced here. Readings were collected by stationing the ROV as close possible to a barrel and allowing the probe to collect data over a 5 or 10 minute period to a 160 channel spectral recorder. The wide range of gamma channels would allow further analysis to identify energy ranges emanating from the suspected source. After collecting the reading the ROV was repositioned away from the barrels, as verified by sonar, and a background measurement (naturally occurring levels of radiation measured at the site) was collected for comparison against barrel readings. As water is an excellent shield from gamma radiation, a 10-20 meter distance was considered adequate distance from barrels to collect background readings.

57. One barrel (Barrel #11) from the group studied exhibited gamma levels above a standard deviation from background readings. The findings of NAREL indicate that if not for its location on the lake bottom, no gamma activity would have been noticeable. The barrel is estimated to have a 0.2 uR/hr increased reading over background readings. This change would not be measurable on dry land where solar radiation exposure rates vary between 1.5-2.0 uR/hr. Theories of why the single drum measured slightly higher are presented here. Paint used on the barrel could contain a small amount of thorium (this barrel appeared to have less corrosion than others observed in the study, supporting the theory of a different paint coating), a natural outcrop of rock located directly below the barrel could have effected the read-out (localized higher background reading), or there could be a very low radiation source in the barrel, such as a radium (luminous) dialface or instrument tube of some kind.

58. A summary of EPA findings is listed in Appendix C. The results indicate that the barrels surveyed "pose no radiological health hazard from external gamma radiation to people handling them or people in their vicinity." The report further states that "exposure levels for these drums does not differ significantly from background". The report recommended further monitoring for alpha and beta radiation once the barrels were opened as concrete and water are excellent shields for this type of radioactive particle.

59. No readings which could verify the measurement reported by the submersible pilot (estimated to be in the .1 mR/hr range by NAREL analysis of the report) were encountered in the three days of EPA site work.

60. Problems encountered during the ROV investigation were generally solved on site and are noted here to aid in planning of investigations of this type in the future. Differences in the two cables, a negative and neutrally buoyant mixture caused the cable assembly to float off the bottom and become tangled in the barrel field as the ROV searched the area. A neutral cable which would lay on the bottom preferred. Anchor slippage created by wind and lake conditions made monitoring difficult. Accurately locating and anchoring over the barrel site sometimes required two or three attempts, anchor slippage in the silt bottom would place the ROV out of range from the barrel string in high water conditions. As the probe required 10-20 minutes at each barrel for monitoring, slippage could not be tolerated or a new data set would have to be collected. This is illustrated by the amount of data collected on two successive days. Tuesday afternoon, lake conditions were ideal and 11 barrels were successfully monitored in approximately 6 hours. Winds on Wednesday made locating and establishing anchorage over the barrels difficult, limiting measurements to 4 barrels in 6 hours. The survey boat David Boyd was an excellent support vessel; however, it was not equipped with a power winch. This required deckhands to manually raise anchor, limiting the size of anchor which could be used. The absence of a working deck at the waterline also impeded launch and recovery of the ROV. A lifeboat hand winch was utilized to raise and lower the equipment.

VIII. BARREL RECOVERY

61. Hazard Control, the contractor who had completed the search phase of this project, had been requested to complete magnetometer readings required by the initial SOW for this project over the barrel site. The readings were required to determine the equipment's capability for locating sites should another remedial project be required. The Contractor agreed to perform the survey while the COE was on site with the EPA. Sample graphs of the magnetometer survey over the confirmed barrel site are presented in Figure 15. In comparing the results of side scan sonar to the magnetometer findings, the advantages of side scan sensing techniques become clearly evident. Bottom conditions and anomalies are registered on sidescan read-outs allowing the operator to observe more than depth and metallic readings as indicated on the magnetometer sample. Should further efforts be mobilized to locate additional sites, side scan equipment is clearly superior for locating under conditions encountered here. If bottom structure is encountered, barrels might be hidden by rock outcrops and other natural formations. A magnetometer might outperform the sidescan in these conditions.

62. The contractor had also developed a remotely operated clamp which was designed to be lowered from a surface boat and be guided by an attached video camera. The clamp was capable of grappling a barrel around its diameter in a three point grab (see Photo 13). The contractor brought the clamp out to the site at 0800 hours, the morning of 30 October, and finding conditions to be ideal, attempted and was successful in engaging a barrel in approximately 165

feet of water. The contractor then followed the previous plan of placing the barrel into shallow water for diver recovery. A second barrel was engaged later that day and relocated to an area near that of the first barrel in 60 ft. of water.

63. Lifting the barrels was accomplished utilizing a series of diver's lift bags secured to the clamp line and inflated by a scuba diver in full protection equipment using a compressed air bottle (see Figure 16). The scuba equipped diver worked at a 40 ft. depth which required four lifts to raise the barrel to an approximate 35 ft. depth from the surface. A video of the second barrel recovery process was recorded. The recovery boat then proceeded into shore until bottom structure was encountered. The clamp was then disconnected remotely and a diver attached a marker buoy to the barrel to identify the spot for recovery efforts. Both barrels were checked by Geiger counters used by the contractor prior to initial movement and by the EPA once they had been relocated. Neither barrel showed indications of radioactivity.

64. On 6 November 1990, divers from the St. Paul District (see paragraph 92 for roster of personnel) dove to the relocated barrels and placed them into protective overpack containers. They were then hoisted aboard the CB Markus tended by the Tug Fairchild (Photos 14 & 15). Each dive required approximately 45 minutes of subsurface time to orient the barrel into the protective container. Each overpack was checked with a Geiger counter as it was brought aboard. The barrels were brought into Duluth Harbor and stored at the Duluth Vessel Yard until plans to open and inspect the containers could be finalized.

65. On site observations taken around the barrels before they were sealed for storage showed that both barrels were filled with concrete from the top to the bottom. One barrel was loaded in a manner that allowed inspection of the metal base, while the other had the concrete rounded end oriented upward. There was a significant amount of corrosion on the barrel surfaces, and small corrosion holes scattered about the top and base of the barrels were common. The numbers 686 were etched into the concrete of one barrel end. The number is believed to be the barrels dry weight after concrete had been poured into the barrel. This was suggested by personnel at Honeywell as being done to document actual shipping weight on each piece for calculating truck loads. Shipping records for a disposal completed in 1960 show typical barrel net weight records on Figure 17.

66. Tamper seals were placed on the barrels by the MPCA prior to placing them in a secure heated storage facility. Arrangements were then finalized for opening.

IX. Opening the Barrels.

67. A contract to open the barrels at the Duluth Vessel Yard was awarded to OHM Inc. of New Hope, Minnesota, on 22 November 1990 for the amount of \$6650.00. The scope of work required the contractor to reduce the barrels into small sections which would then be transported to Pace Laboratories in Golden Valley, Minnesota, for analysis. OHM's proposal included appropriate safety measures to protect personnel from hazards which may have been placed in the

barrels. Level "B" protection and blast shields would be utilized to protect workers from potential chemical or explosive debris.

68. On 27 November at approximately 1200 hours, MPCA tamper seals were removed from the barrels (Photo 16). By 1715 hours, the first of the two barrels when broken open by a backhoe after the exterior shell was sawn off using a carbide blade circular saw (Photo 17). The remaining concrete interior protected a series of tightly packed cardboard boxes containing small 1 7/8" diameter gear assemblies layered inside the cardboard boxes (Photo 18). While the barrel was estimated at weighing some 700 pounds, approximately 500 pounds of that weight was estimated to be concrete added to insure the barrel would sink when placed into the lake. Several parts were collected by OHM and placed in sample bottles, decontaminated, and displayed to the press which had gathered to observe the event.

69. The second barrel was opened later that evening at 2145 hours (see Photos 19 & 20). Contents resembled that of the first barrel, and on closer inspection, it was discovered that the parts contained in the first barrel were sub-assemblies of the parts found in the second barrel. Boxes contained in the second barrel were marked in the following manner (see Photo 21) :

Confidential
MH Part No. 550012
25 ea
Scrap Assemblies
For Destruction Only
Confidential

70. Careful monitoring of air and radiologic parameters was done prior, during and at the conclusion of all opening operations. All tests proved negative.

71. Samples of the water which surrounded the barrels in the overpack drum from 6-27 November were collected prior to opening. Part samples and concrete materials recovered from each drum were also collected for analysis. Both the COE and MPCA ran independent tests to verify whether the content of the recovered barrels could be considered hazardous.

X. LABORATORY ANALYSIS

72. The results of laboratory tests are included in Appendix D. They were received from Pace Laboratories on 4 January 1991. Leachate tests performed on the parts indicate that the barrel contents would not be classified as a hazardous waste under the Resource and Conservation Recovery Act (RCRA). Independent MPCA tests were also done on recovered parts and water samples. They confirm the PACE laboratory results. The recovered barrels were repacked into the overpack protective containers and remain in storage at the Duluth Area Vessel Yard.

XI. OBSERVATIONS

73. The findings of this project support historical records and

affidavits collected in 1976 from personnel working at the Twin Cities Army Ammunition Plant where the material was manufactured. The barrels were reported to have 8-10" of concrete poured into the base, loaded to within 6" of the top with scrap assemblies, and capped with a concrete top. Recovered barrels had concrete poured top and bottom with boxes of "scrap assemblies" packed between them. The packing boxes had identifiable markings which confirm the material as once having having a confidential classification (declassified 1974). The Minneapolis-Honeywell (M-H) noted in the part number has been confirmed with Honeywell (the defense contractor producing the part) as the 1959 designation for a M-H manufactured part.

74. Upon completion of laboratory testing which showed the contents as being safe to handle, barrel contents were inspected for identifiable marks which might indicate which assembly they were intended for. Missing springs, gears and other manufacturing errors were easily spotted upon close inspection. Some parts were marked reject, or inert, but most contained no markings (see Photo 22).

75. Two packing slips were apparently contained within the boxes when the barrels were opened. These slips were partially destroyed in the opening and repacking process used by the crew. Careful hand searching of the debris resulted in the recovery of 20-30 small pieces of packing slips apparently packed with the scrap assemblies found in the second barrel. An attempt was made to restructure the form by carefully fitting the recovered pieces together. It reads:

(INSPEC?)TION SLIP

Part No. _____

Packed By _____ Date _____

Inspected By _____ Date _____

Sealed By _____ Date _____

Gov't Insp _____ Date _____

Shipment No. _____

81-3837-07

76. Unidentifiable, incomplete signatures were recovered for three blanks, and the part number identified matched that on the exterior cover of the boxes, 550012. The most important discovery on the slip is an partial date written laterally across the date blanks by a single inspector. The date appears to be 8/--/62 with the 8 appearing on both slips. This would correspond with the date of the last disposals (#6 & #7) done in September 1962.

77. This discovery is important as it identifies the both the date and location of a particular disposal. Historical records indicate that disposals #6 & #7 were to be done in no less than 300 feet of water. If search efforts had been targeted to find this specific disposal area, search efforts would have centered in an area around Knife Island in much deeper water, one to three miles off shore. Discovery of the disposal in shallower water (170 ft.), 6 miles closer to Duluth than indicated casts a reasonable doubt over using the historical record as the basis for designating areas to search for more disposal sites.

78. The weight of the parts contained in the barrels which were opened has been preliminary estimated at 80-100 pounds per barrel. This would confirm a hypothesis of why concrete was placed in the barrels. A 55 gallon drum displaces 460 lbs. of water when submerged. If a barrel weighed less than 460 lbs. it would have floated. To insure proper disposal, concrete was added to each drum to achieve a final disposal weight greater than 500 pounds. Early 1959 barrel disposals were reported to have floated on the surface when placed in the lake. Holes were reportedly placed into the barrels with fire axes or shot full of holes by the Army guard accompanying the disposal to aid in their sinking. Successive disposals were reported to included concrete as a ballast material as verified by this finding.

79. The suggested date also verifies this site as being one of the last disposals, therefore, condition of the barrels at this site is probably better than any other disposal. The concrete on the interior of the barrels did an excellent job of protecting the interior lining of the barrel from corrosion. Exceptions to that are small perforations near the top or bottom of the barrel where air may have been trapped. Small holes were common in these areas. About 75% of original barrel gage remained on most areas of the barrel. Barrels sunk without concrete probably contained more air and had no inner protection from corrosion.

80. From the condition of the recovered barrels it is unlikely that barrels disposed of with or without concrete would be recovered totally intact. Corrosion holes which would allow any liquid content to migrate were common in the two recovered barrels (see Photo 23). The concrete interior of the recovered barrels seemed to provide most of the structural integrity. Over 300 barrels dumped in 1959 were reported not to have had concrete ballast. Currents circulating about the barrels were observed after disturbing sediments in the area with a ROV. These currents were observed to have carried off much of the sediments under each barrel until only a small pedestal remained. These pattern can be seen in the video collected by the EPA ROV.

81. As reported earlier, sonar readings taken in the area did identify one site which might be corroded barrels in 155 ft. of water. Twenty circles resembling individual debris piles were noted in a linear path, but were not confirmed with a video tow camera as a possible barrel disposal site. The sonar readings gathered at the site indicated that these circles were very low anomalies measuring 6 to 8 inches high. As the focus of the search was for intact barrels which would rise 2 to 4 feet above the bottom, the site was graded as a low-medium level target and not verified. It is possible that the

circles are former barrels and scrap parts which have disintegrated into the observed pattern. A heavy trawler mark across this area supports the theory that a heavy object was once netted here. The area also closely matches that reported as a historical dumpsite. If additional search is authorized this area should be rechecked using an ROV and some type of remote collection equipment to retrieve samples from these circular patterns.

XII. PART IDENTIFICATION

82. A sample of the recovered part(s) were forwarded to three separate entities for possible identification. Picatinny Arsenal (original designer of M-32 & M-40 grenades), Rock Island Arsenal AMCCOM (contracting authority for contract at TCAAP in 1959) and Alliant Techsystems (Honeywell). Initially the request was to identify whether this part was from a M-32 or M-40 grenade; however, the type of part recovered was too large for this munition. After some study, both Picatinny Arsenal and retired personnel TCAAP identified it as a part from a BLU-3 or BLU-4 anti-personnel grenade produced after the M-32 & M-40 (see Figure 18 & 19). Personnel from AMCCOM in Rock Island have verified this munition as having been produced at TCAAP under the subject contract.

83. Some of the safety devices (33%) were noted to have a red or green dot in the center. These were identified by Alliant Techsystems as a M55 detonator which was designed to trigger a larger explosive lead cup in the munition design. No lead cups were recovered in this project. Several sample parts recovered during this project were passed to Alliant for further testing of the detonators. Three attempts were made to trigger the detonators with no success (see Figure 20). The detonators have deteriorated with 25 years of submersion and are considered "safe".

XIII. CONCLUSIONS

84. In October 1990, an effort to locate and identify potential classified scrap disposal sites was undertaken by the U.S. Army Corps of Engineers, St. Paul District as authorized by DERP FUDS Project No. E05MNO25501. During this effort:

- a. 25 Sq. miles of Lake Superior lakebottom was remotely sensed using side scan sonar, tow cameras and ROV's.
- b. One of the seven reported disposal sites containing approximately 105 barrels was positively located. The study also located two potential sites which were not confirmed.
- c. Remote inspection of 25 barrels was completed by EPA and contractor ROV's and tow camera's. NAREL completed a radiologic survey on 23 barrels at the confirmed site.
- d. Recovery of two random barrels was successfully completed by remote device in 170' of water. Barrels relocated into 30 & 60 feet of water were successfully recovered by St. Paul District divers.

- e. The recovered barrels were opened and samples collected safely.
- f. Testing and analysis completed on the recovered material showed no exceedence of current water health standards.
- g. Materials were examined and identified as safety devices for a BLU-3 BLU-4 anti-personnel grenade manufactured at TCAAP in 1962. This closely aligns with affidavits prepared in 1976 by former Honeywell employees who participated in barrel disposal operations in 1959-61. The material was found to be carefully boxed and marked as confidential scrap assemblies from a Minneapolis-Honeywell facility.
- h. Developed COE/MPCA/EPA Lake Superior team.

85. The project also located a tug scuttled in 1928 and approximately 90 other targets which remain unconfirmed in the search area.

86. The project was completed with no injury to any participants. Over a thousand man-hours of surface and subsurface operations were involved in the recovery project. The barrels, although having been difficult to locate, recover and analyze, were handled carefully and professionally through each phase of the operation. Members of the search team are pictured in Photo 25.

XIV. PUBLIC RELATIONS PLANNING

87. As the barrel sites had long been a matter of speculation in the region, a considerable amount of media coverage was anticipated. In 1977 the media was invited to accompany the COE out on the lake aboard the Tug Superior to observe attempts to find and identify the barrels. The vessel size permitted the project to take approximately 30 reporters and other observers onto the lake operation. The 1990 effort as contracted would be accomplished by much smaller vessels spending long hours combing the lake with sonar. It was therefore decided to restrict the media from the vessels and handle all media relations from a temporary public affairs center located in the Duluth Area Office.

88. Mr. Ken Gardner and Ms. Joan Guilfoyle developed a press center for the Corps of Engineers out of the Duluth Area Office and strove to answer all informational requests through a series of daily releases held at the Duluth Area Canal Park Museum (see Photo 24). See Appendix F for a summary of the Public Relations Plan for this event.

89. Television, Radio and newspaper coverage of this event was fair in reporting the events of the search. Sample newspaper stories of the search effort are included in Appendix E. Recorded television news reports pertaining to the project are available for review at the St. Paul District Office.

XV. PROJECT COST

90. The search, recovery, testing and analysis phases of this project

was completed at a cost of \$91,000.

XVI. POINTS-OF-CONTACT

91. This report was prepared by the Army Corps of Engineers, St. Paul District, Engineering Division, Engineering Management Branch. Mr. Robert Dempsey, was the Project Engineer. Points-of-Contact (POC) who provided input for this report are:

Mr. Robert Dempsey	CENCS-ED-M	Engineer Manager	(612) 220-0443
Mr. Richard Beatty	CENCS-PD-ER	Environmental Eng.	220-0273
Mr. Ken Gardner	CENCS-PA	Public Affairs	220-0201
Mr. Ron Swenson	MPCA	Site Assessment	297-1793
Mr. Robert Cross	MPCA		
Mr. Mark Semler	NAREL		(205) 270-3400
Mr. Brad Benning	EPA Region 5	Emergency Response	(312) 353-7613
Dr. Dave Charters	EPA Emerg. Response		(201) 321-6748
Mr. Al Kliene	CENCE-DU		(218) 720-5264
Mr. Mike Stitch	Hazard Control	President	(612) 341-3411
Ms. Jan Finnigan	AMCCOM Wash D.C.	Public Affairs	(202) 274-8010
Mr. Don Dau	AMCCOM R.Island	Armament	(309) 782-7513
Mr. Bob Ronshiem	Picatinny Arsenal	Museum	(201) 724-3222
Coast Guard Duluth			(218) 720-5412
Mr. Jim Lynch	Nuclear Regulatory Commission		(780) 790-5500

92. Divers from the St. Paul District involved with the barrel recovery effort were:

Mr. Ron Fetting
Mr. Bob Sikkila
Mr. Ed Strand
Mr. Tom Hemstreet

93. A copy of this report will be sent to each of the above points-of-contact. An additional copy will be sent to the Public libraries in Duluth and Minneapolis, Minnesota.

FIGURES

LEGAL - COMMUNITY
FOLDER

Mr. Barnett/gcb/351

ORDEC-DM

29 September 1959

SUBJECT: Use of Equipment in Duluth Minnesota
Minneapolis-Honeywell Regulator Company
Contract No. DA-11-022-ORD-3019

THRU: Division Engineer
U. S. Army Engineering Division
North Central Division
536 South Clark Street
Chicago 5, Illinois

TO: U. S. Army Engineering District St. Paul
1217 U. S. Post Office and Custom House
180 East Kellogg Blvd.
St. Paul 1, Minnesota

1. It is requested that the services of the Lake Superior Office at Duluth, Minnesota, be made available for the disposal of classified scrap material under subject and allied contracts. Mr. Knolton of your organization has been contacted and indicates the equipment is available and has performed this type of service for other Department of Defense Agencies.

2. The Contractor will bear the cost of the use of the equipment. It will also furnish transportation and guard service for material from Minneapolis to Lake Superior. It is estimated that the amount of scrap material will weigh approximately 13,000 pounds, including preparation for disposal.

3. Request a copy of your action be made available to this office at the earliest possible date.

FOR THE COMMANDER:

*9-30-59 Hand carried to 2nd. Eng
approval, original letter & approval
from Capt. D. W. ... to St. Paul. HZ*

Copies Furnished:
Central File (DOC)

Figure 1 - 1959 Disposal Assistance request
from Division to St. Paul District.

DOCUMENTARY

JOS. E. WALKER
Assistant

Lake Superior Classified Scrap Disposal
DERP FUDS Project No. E05MN025501

Figure 1



CPT Hager/sj/793-1785
DEPARTMENT OF THE ARMY Materiel Readiness
HEADQUARTERS, UNITED STATES ARMY ARMAMENT COMMAND
ROCK ISLAND, ILLINOIS 61201

REPLY TO
ATTENTION OF:

DRSAR-ISL

23 MAR 1977

SUBJECT: Dumping of Classified Scrap into Lake Superior

District Engineer
US Army Engineer District, ST PAUL
1135 USPO and Custom House
St. Paul, MN 55101

1. The inclosed letter (Incl 1) implies the Corps of Engineers has had prior experience in related waste disposal operations for other agencies. Our search, thus far, has revealed that both Mr. Walker and Mr. Knotton (authors of the statement) are deceased.

2. Request your comments on the validity of implications contained in inclosed letter. Comments are considered necessary because of the possible impact on the programmed retrieval action.

FOR THE COMMANDER:

THOMAS J. WASH
Chief, Environmental Quality Office

1 Incl
as

Figure 2 - 1977 attempt to contact authors
of 1959 disposal authorization.

Lake Superior Classified Scrap Disposal
DERP FUDS Project No. E05MNO25501
Figure 2

2 NOV 1976

Dumped barrels plot thickens

Minnesota and Michigan officials, acting on the unsubstantiated story of a retired tug-boat skipper, want the federal government to find out exactly what was contained in more than 1,400 sealed barrels the Army dumped secretly into Lake Superior 14 years ago.

Although they have no hard evidence, state officials are following up a rumor that the barrels, in 100 to 300 feet of water near the Duluth shoreline, might contain radioactive waste materials.

During the winter of 1968, a fisherman picked up six barrels, believed to be some of the waste containers, about a mile offshore from the Duluth pumping station.

Both Honeywell Inc., Minneapolis, the manufacturer of the dumped material, and the U.S. Army Corps of Engineers, who supervised the dumping of the material, say it is scrap metal, nontoxic, noncontaminating and nonradioactive.

But spokespersons for Honeywell Inc., and the Corps admitted their records only go so far in identifying the dumped material.

James Braatz, public affairs spokesperson for the Corps said that they don't know who decided to dump. Orders came through channels in Washington.

He said the shipment of material arrived with military police in charge and already packed in concrete. It was then taken out on the Corps' barges to be dumped in the lake.

Braatz said that the U.S. Army has told the Corps that the material is shell fragments. The process of casting the shell so that it would explode into uniform particles was secret, therefore, the

scrap from the manufacturing process was classified.

In 1968, a fisherman, Stanley Sivertson, Duluth, picked up several of the barrels while trawling in about 25 fathoms, or 150 feet of water.

Sivertson said he dumped all the barrels back into the water, but that one of his crew had looked inside a barrel and had said the contents looked like buckshot or bits of metal which had been melted and mixed with concrete.

The dumping was brought to the attention of Michigan state officials by Marilyn Burton of Sault Ste. Marie, who asked Department of Natural Resources Director Howard Tanner during a Marquette meeting if he had heard a story that the Army dumped radioactive material into Lake Superior.

Danford E. Anderson, now in his early 70s and retired in the Soo, was the skipper of a Duluth-based tug on May 24, 1961. Army records show a secret shipment of 180 barrels was delivered to Anderson for dumping.

Anderson's wife, Gertrude, was at the dock with her husband. She said they were told by "someone" that the barrels "contained stuff from the atomic plant on the St. Paul River."

Minnesota pollution control officials said there were no nuclear facilities in the state at that time. They added they have checked out Anderson's story and have all but dismissed it.

But John Pegors, regional director of the PCA said he wants the Corps to pick up some of the barrels and check the contents. He agrees with Michigan offi-

cials that to put the matter to rest once and for all, the samples should be tested to determine their makeup.

Braatz said the material was put into containers of wood, paper, and metal. Concrete was added for ballast.

"That would indicate the material was not radioactive—that it was packed in wood and paper," Braatz said.

But James Pruchan, environmental specialist for the Michigan DNR said that radiation from alpha-emitting waste such as plutonium, would be stopped by wood, paper or concrete.

He added that putting radioactive waste materials into concrete and dumping them into water was a common method of disposal in the early sixties.

Michigan officials say they will press their investigation, and may demand the federal government dredge up one or more of the sunken barrels so the contents can be examined and analyzed.

Pegors said there are three dumping sites, including one in about 300 feet of water off Knife River. The others are at the 100 and 200 foot contour, he said.

"Samples should be taken from each of the sites," Pegors said.

Col. Forrest Gay, head of the Engineers office in St. Paul, said the Pentagon told him it would not object to that, since the scrap metal has been declassified. But, he added, there is no money in his budget to salvage the barrels.

The state offices think that since the Corps dumped the material, without notifying the state, the Corps should dredge the samples and cover the cost.

Figure 3 - 2 Nov 1976 Duluth Herald article in which wife of Tug Captain involved with the disposal is quoted as having been told of "Stuff from atomic plant" was in barrels.

DEPARTMENT OF THE ARMY
St. Paul District, Corps of Engineers
Lake Superior Area
Canal Park
Duluth, Minnesota 55802

DULUTH-NEWS TRIBUNE

DULUTH, MINN.

21 AUG 1976

Pentagon explanation of dumping disputed

The military waste dumped into Lake Superior between 1959 and 1962 consists of ordinary steel and aluminum, a Pentagon spokesperson said Friday.

But, the official explanation did not satisfy John Pegors, director of the Duluth office, Minnesota Pollution Control Agency.

The metal scrap was left over from production of experimental artillery warheads, the Pentagon spokesperson said, and had been scored or machined for fragmentation in a unique, secret pattern. It was dumped in the lake to keep it secret.

"The only thing that is down there in those barrels is medium carbon steel and maybe some aluminum shavings," he said.

Between October, 1959, and September, 1962, six loads of the scrap, to-

talling more than 350 tons, were shipped to Duluth from Honeywell, Inc., Minneapolis. The sealed steel drums came under Military Police guard, were loaded aboard Corps of Engineers barges, taken out onto the lake and dumped.

Corps records of that period refer to the material as "classified" and the Pentagon representative said that, at the time, the fragmentation pattern was "very secret." But the warheads have since been used in Vietnam and have been declassified.

While the work was going on at Honeywell, he said, the only way to dispose of the secret scrap was either melting or water dumping.

A blast furnace was not available at the time, according to the spokesperson.

After 1962, a corps officer revealed

earlier this month, the scrap was delivered to U.S. Steel Corp.'s Duluth works to be fed into the plant's furnaces.

The spokesperson said he had been unable to locate records of the project but learned the details from an engineer who had worked on it.

Pegors earlier Friday had said he wants the material retrieved and analyzed.

"The question I have," Pegors said, "is why they went to such extremes for noncontaminant material?"

On hearing the military's explanation later, he asked, "Wasn't U.S. Steel in operation in 1962?"

(It was—Ed.)

"This was the cheapest way to dispose of (the barrels)," the Pentagon spokesperson had said.

Figure 4 - 21 Aug 1976 Duluth-News Tribune
article explaining content of barrels.

Lake Superior Classified Scrap Disposal
DERP FUDS Project No. E05MNO25501

Figure 4

DEPARTMENT OF THE ARMY
St. Paul District, Corps of Engineers
Lake Superior Area
Canal Park
Duluth, Minnesota 55802

DULUTH NEWS-TRIBUNE

DULUTH, MINN.

11 DEC 1976

No radioactive leaching of barrels found

Geiger counter tests indicate there is apparently no radioactive material in the 1,400 barrels of classified defense waste dumped into Lake Superior between 1959 and 1961.

A report Friday from the Environmental Research Laboratory, Duluth, said there was no radioactive leaching in the area sampled last week by the U.S. Army Corps of Engineers.

Technicians are still working on water samples taken from near the area where several barrels were found last Saturday. David Yount, deputy director of the laboratory, said, and results will be completed next week.

The geiger counter tests are not conclusive, Yount said, but it is unlikely radioactive material exists since records show several barrels were opened in the dumping to make them sink more quickly.

If there had been, he pointed out, leaching would be occurring now and would have been detected.

The laboratory will send test results to the corps and will recommend that one or more barrels be hauled to the surface for further testing.

Figure 5 - 11 Dec 1976 Duluth-News Tribune article stating that several barrels were found. No location given.

DEC 4, 1976

LAKE SUPERIOR

BARREL PUMP

LOCATION SITE

BASE LINE ON OLD

Hwy # 61

K. BARBER

R. LUNDEN

Figure 6, Page 1 - Dec. 1976 Survey Notes from Magnetometer search by COE & Dr. Johnson U of M. Barrels found near #1 McQuade Rd Site in 1990.

②

#1
 EAST - 315° - 50
 WEST 109° - 00

#2
 EAST 305 - 33
 WEST 92° - 15

#3
 EAST 300° - 29
 WEST 86° - 50

91° - 15
 305 - 22
 107 - 15

Figure 6, Page 2 - Dec. 1976 Survey Notes from Magnetometer search by COE & Dr. Johnson U of M.

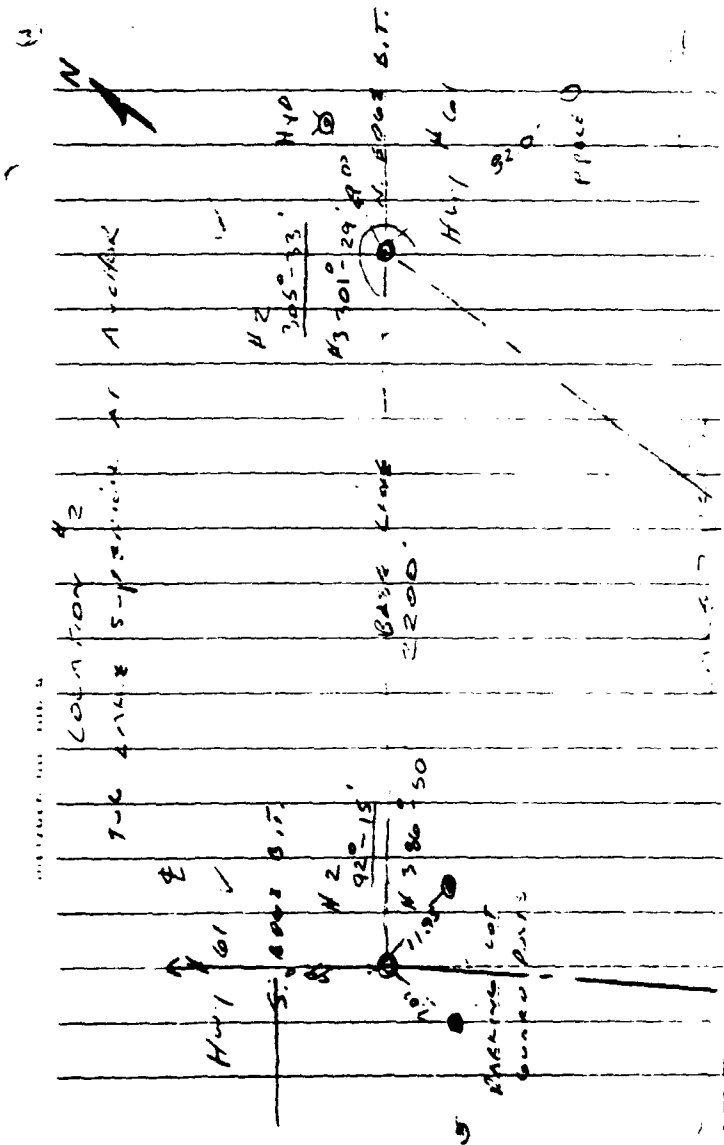


Figure 6, Page 3 - Dec. 1976 Survey Notes from Magnetometer search by COE & Dr. Johnson U of M.

Buoys # 2 LAKE SUPERIOR
 AT ANCHOR
 EAST 306-31
 WEST 93-16
 FROM MID POINT
 TO WEST POINT
 101-00
 3 FT FIX
 LAKE SUPERIOR
 EAST 305-19
 WEST 92-32
 (SWING TO 306-13 AT WEST)

Figure 6, Page 4 - Dec. 1976 Survey Notes from Magnetometer search by COE & Dr. Johnson U of M.

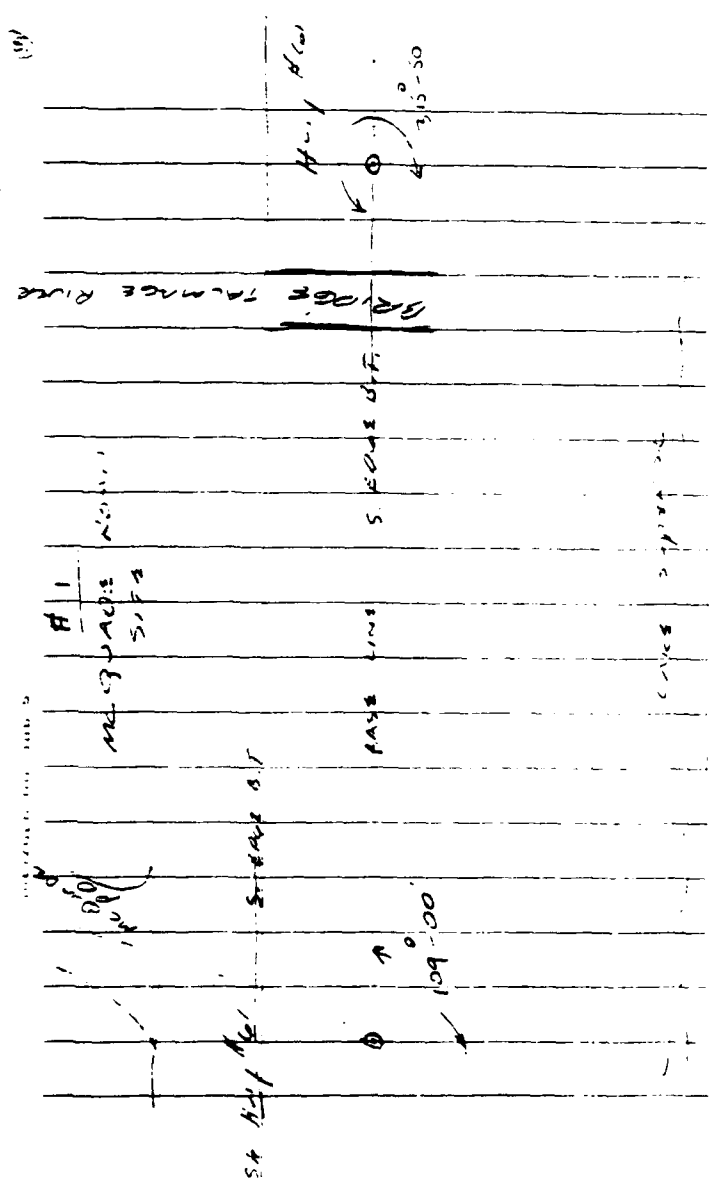


Figure 6, Page 5 - Dec. 1976 Survey Notes from Magnetometer search by COE & Dr. Johnson U of M.

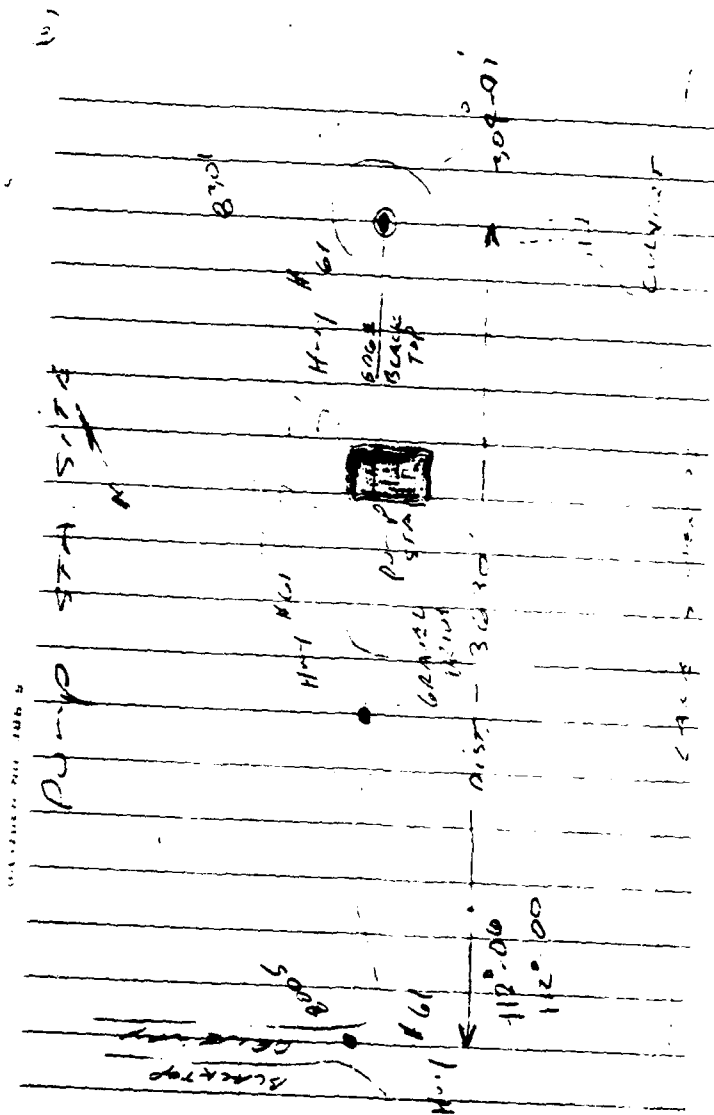


Figure 6, Page 6 - Dec. 1976 Survey Notes from Magnetometer search by COE & Dr. Johnson U of M.

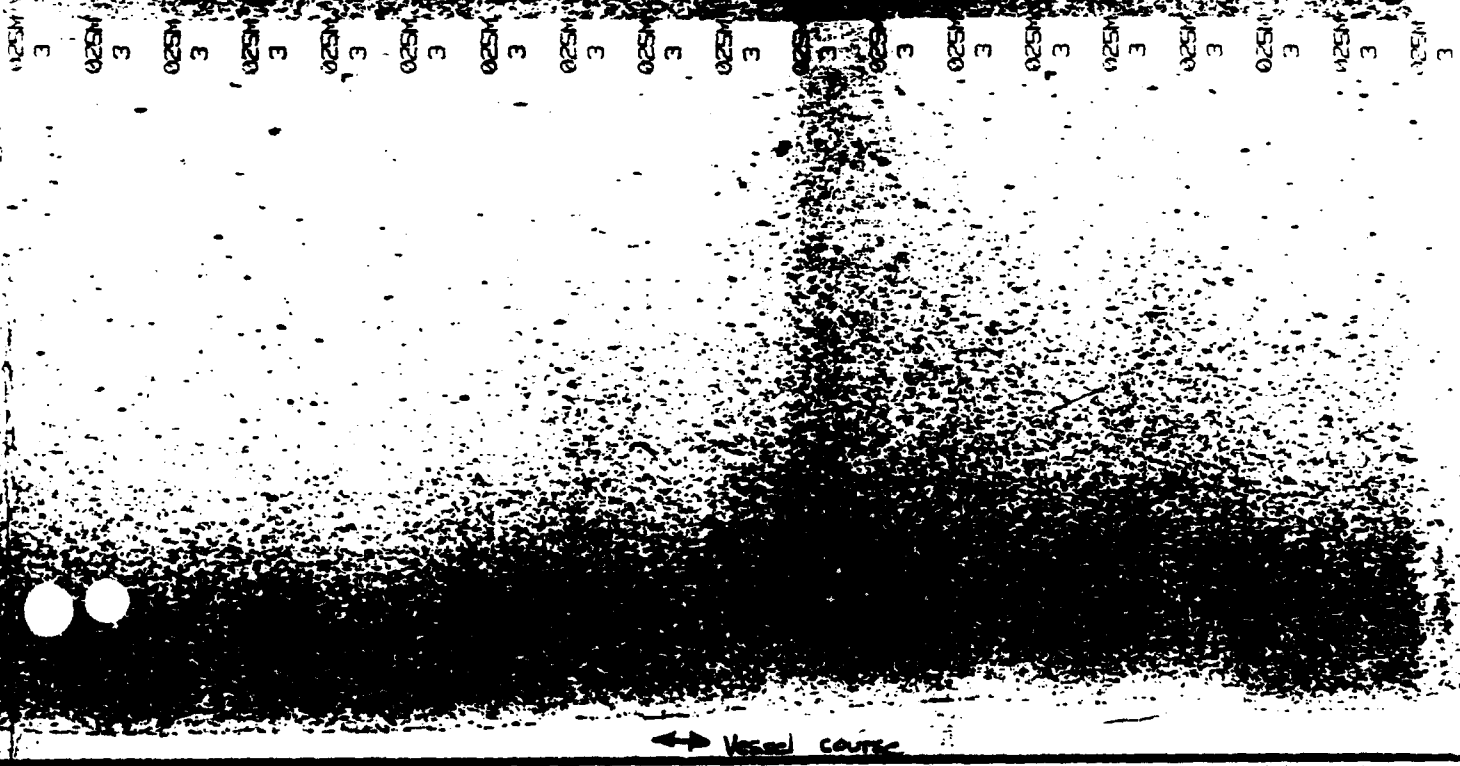
10/6/90 JTB

↑ Perfect

Figure 7 - Side Scan graph of practice barrel dropped by Contractor to calibrate equipment

1 1120 4 1130 9 1140 9 1150 9 1160 9 1170 9 1180 9 1190 9 1200 9 1210 9 1220 9 1230 9 1240 9 1250 9 1260 9 1270 9 1280 9 1290 9 1300 9 1310 9 1320 9 1330 9 1340 9 1350 9 1360 9 1370 9 1380 9 1390 9 1400 9 1410 9 1420 9 1430 9 1440 9 1450 9 1460 9 1470 9 1480 9 1490 9 1500 9 1510 9 1520 9 1530 9 1540 9 1550 9 1560 9 1570 9 1580 9 1590 9 1600 9 1610 9 1620 9 1630 9 1640 9 1650 9 1660 9 1670 9 1680 9 1690 9 1700 9 1710 9 1720 9 1730 9 1740 9 1750 9 1760 9 1770 9 1780 9 1790 9 1800 9 1810 9 1820 9 1830 9 1840 9 1850 9 1860 9 1870 9 1880 9 1890 9 1900 9 1910 9 1920 9 1930 9 1940 9 1950 9 1960 9 1970 9 1980 9 1990 9 2000 9

11/17/88



16-18' LOG HIT 3252.4' RE 810

Figure 8 - Sidescan graph of object later confirmed by ROV to be submerged log.

Lake Superior Classified Scrap Disposal
DERP FUDS Project No. E05MN025501

Figure 8

141272 10/15/87

Lake Superior Classified Scrap Disposal
DERP FUDS Project No. E05MN025501

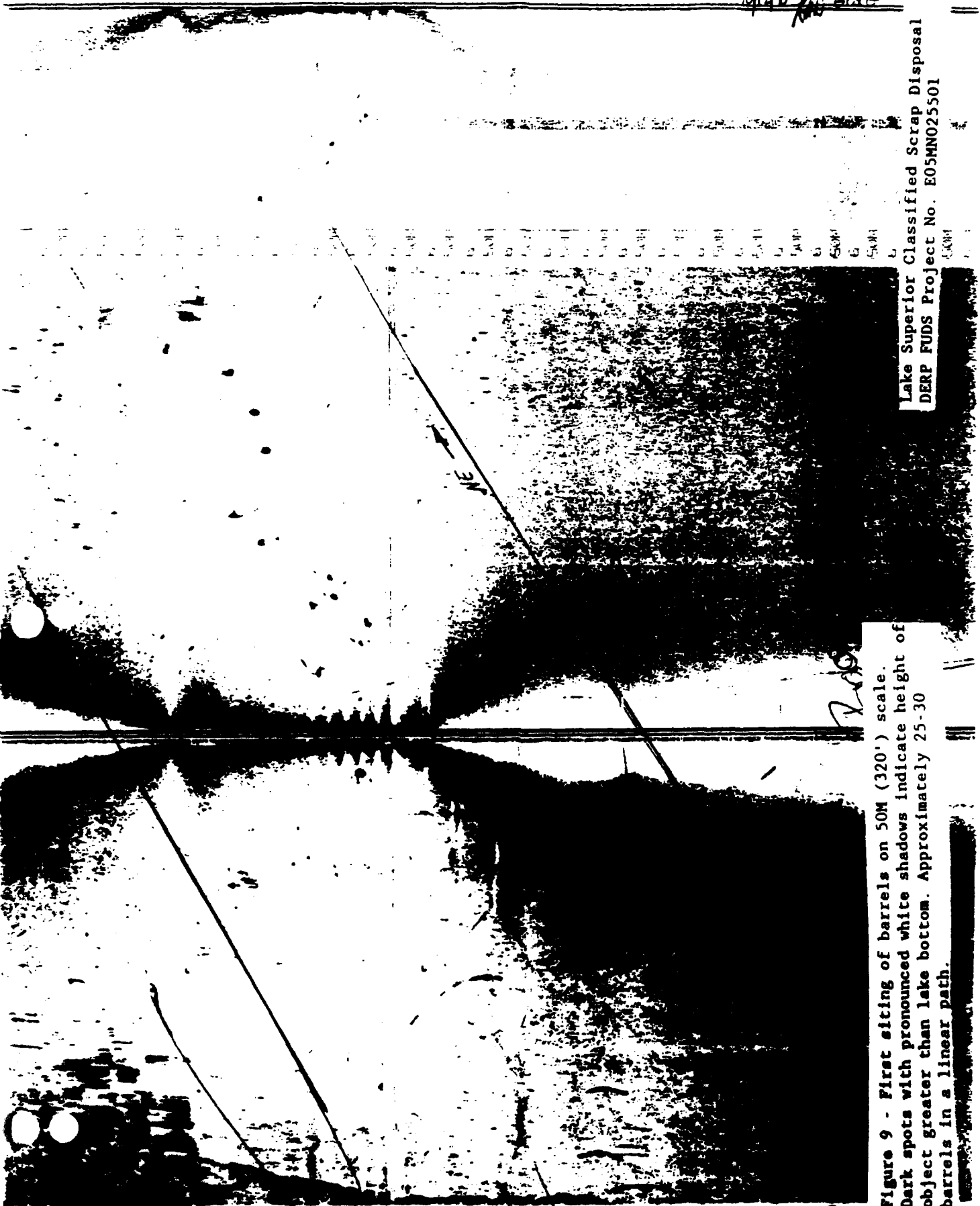


Figure 9 - First siting of barrels on 50M (320') scale.
 Dark spots with pronounced white shadows indicate height of
 object greater than lake bottom. Approximately 25-30
 barrels in a linear path.

Figure 9

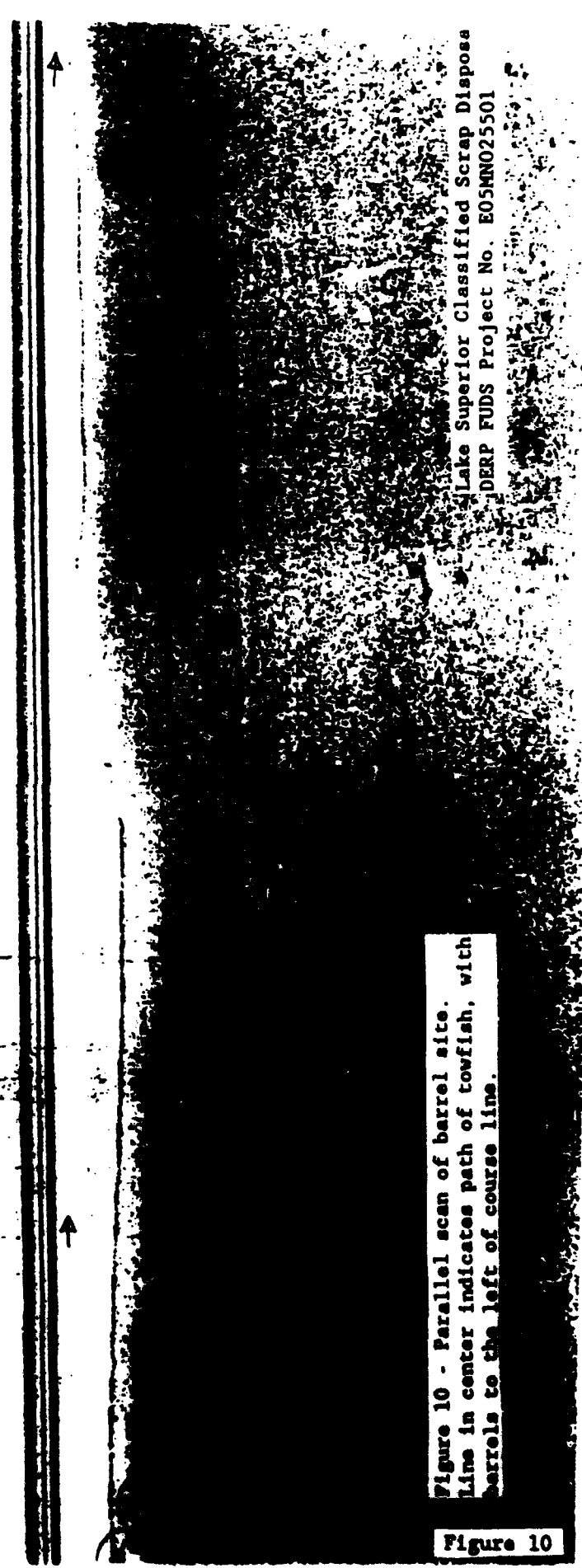


Figure 10 - Parallel scan of barrel site.
Line in center indicates path of towfish, with
barrels to the left of course line.

Figure 10

Lake Superior Classified Scrap Dispose
DERP FUDS Project No. E05MN025501

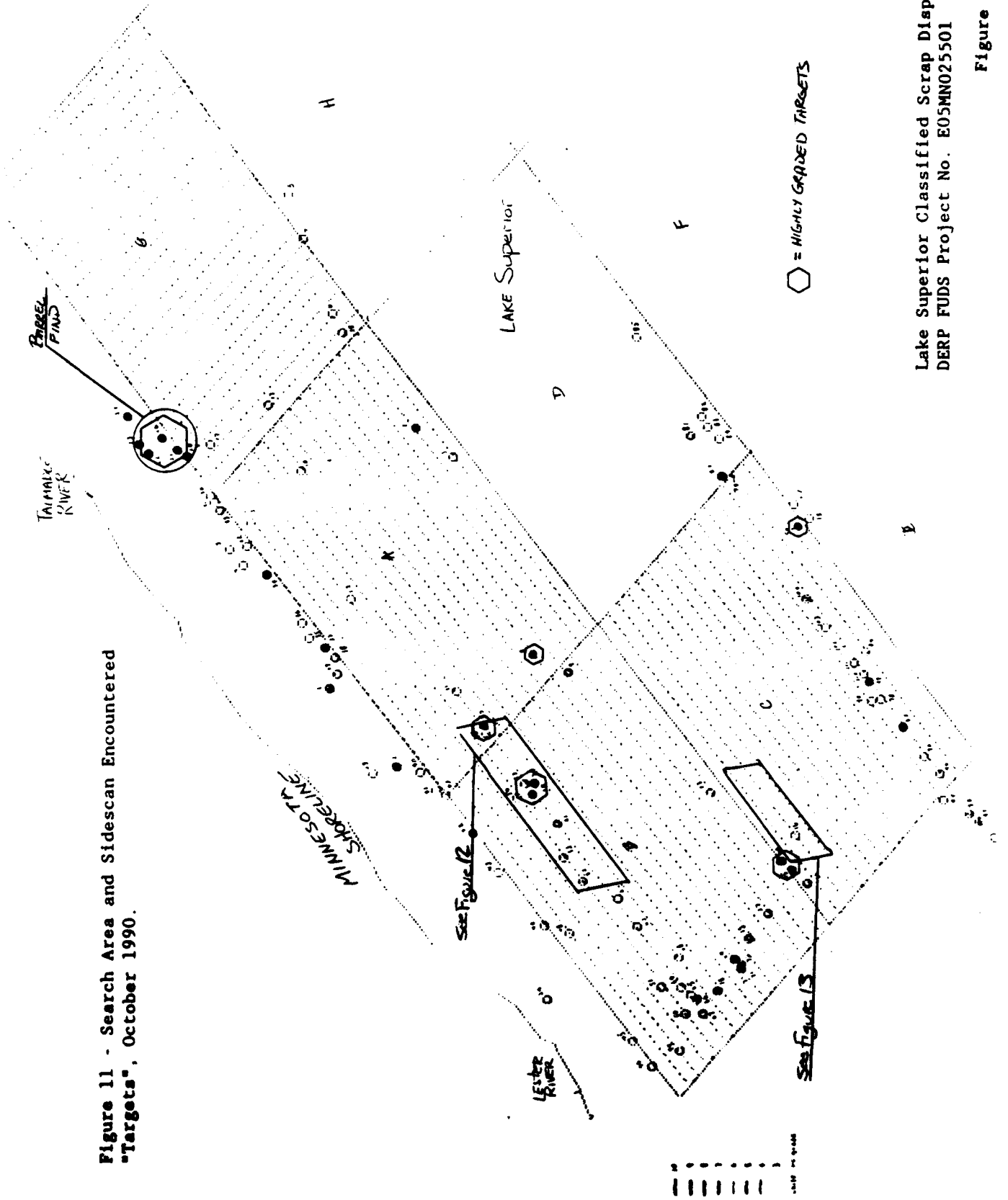


Figure 11 - Search Area and Sidescan Encountered "Targets", October 1990.

Lake Superior Classified Scrap Disposal
 DERP FUDS Project No. E05MN025501

Figure 11

Klinec Side Scan
600.B 10/10/90

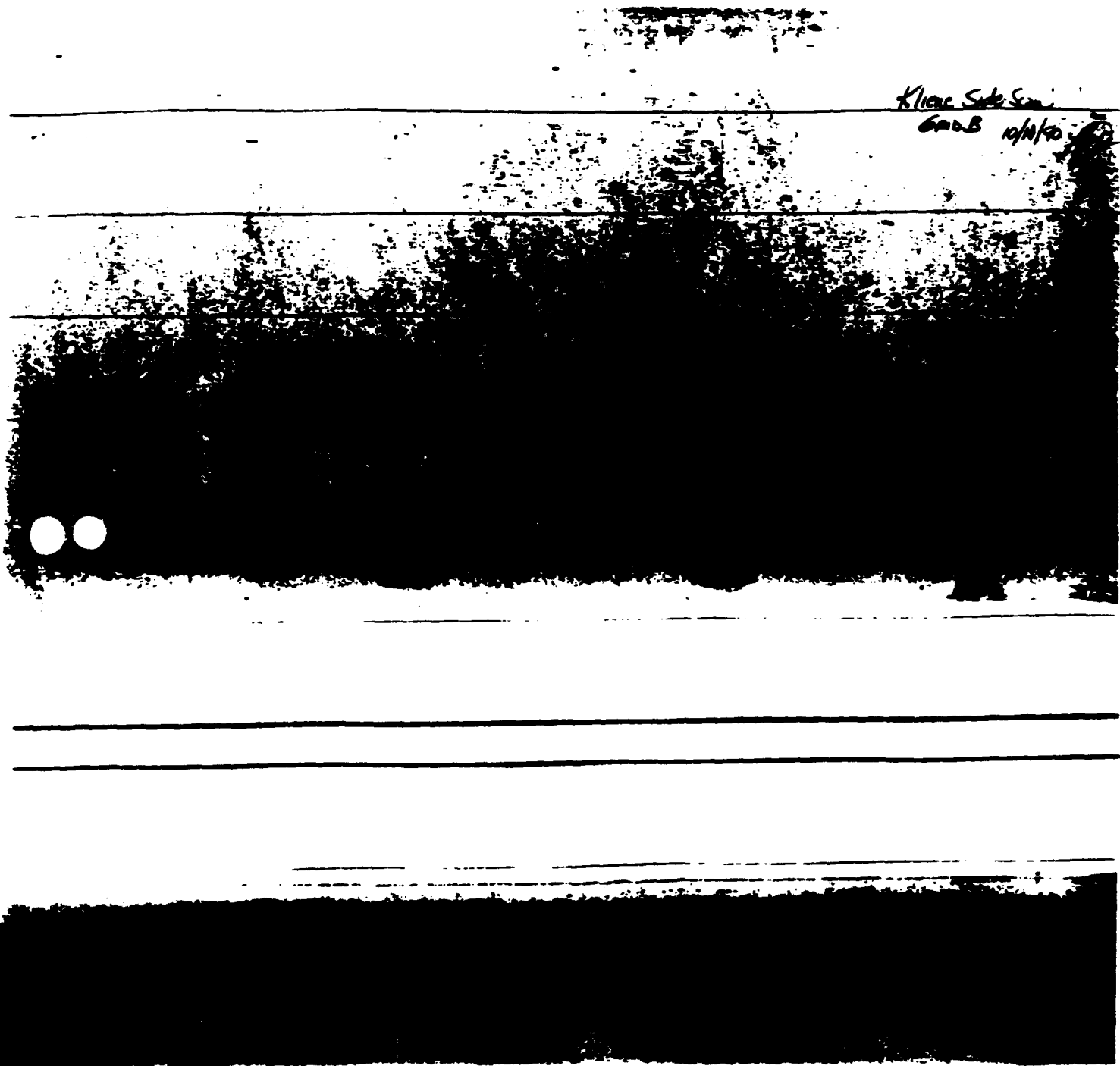


Fig. 12 - Lake Bottom Irregularities
Small 3-5 ft. circles at regular intervals in Grid A

GrA C3 10/11/90

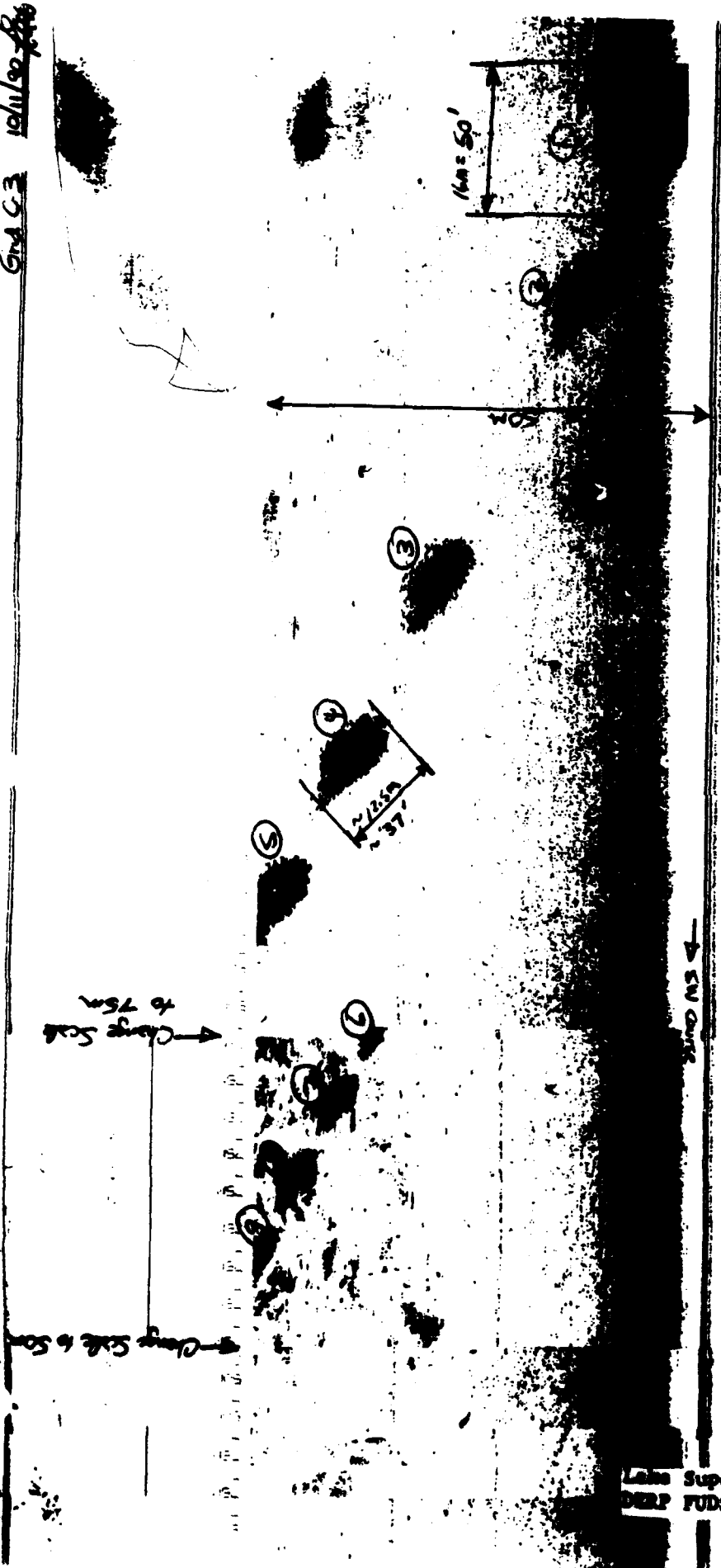
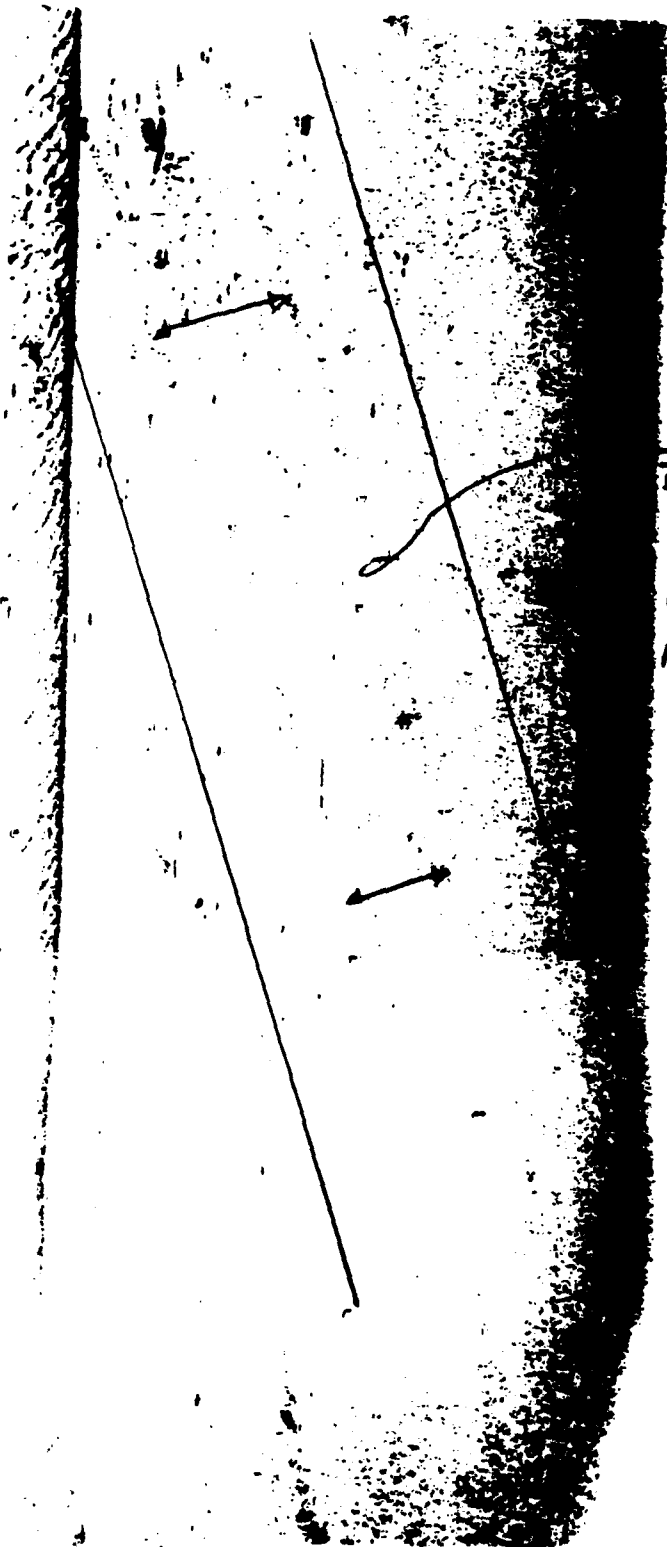


Figure 13 - Lake Bottom Irregularities
① - Large 30 ft. circles

Lake Superior Classified Scrap Disposal
DERP FUDS Project No. E05MNO25501



Drag
Marks
Net
or
Anchor?

Figure 14 - Trawler Drag Marks. Parallel net weights which kept fishing net on the bottom left miles of observable troughs which may have been thought to be "barrel tracks" in 1977.

Lake Superior Classified Scrap Disposal
DERP FUDS Project No. E038W025501

Figure 14

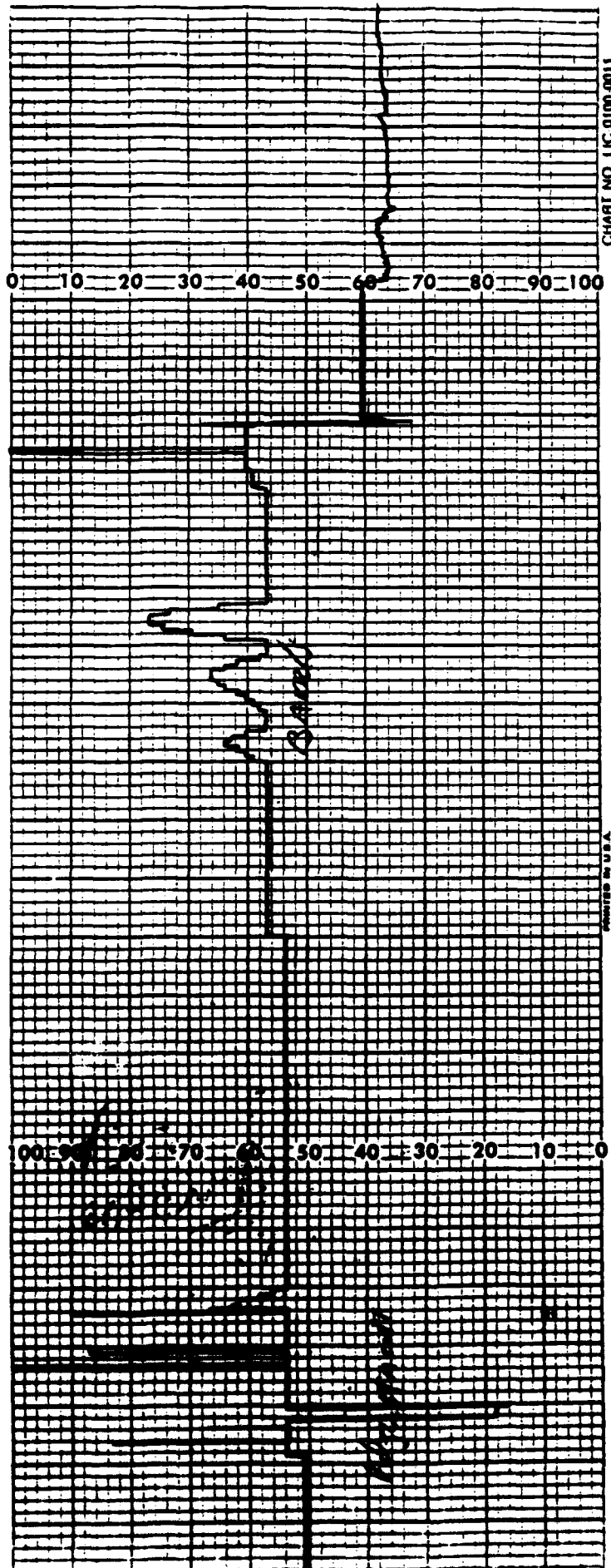
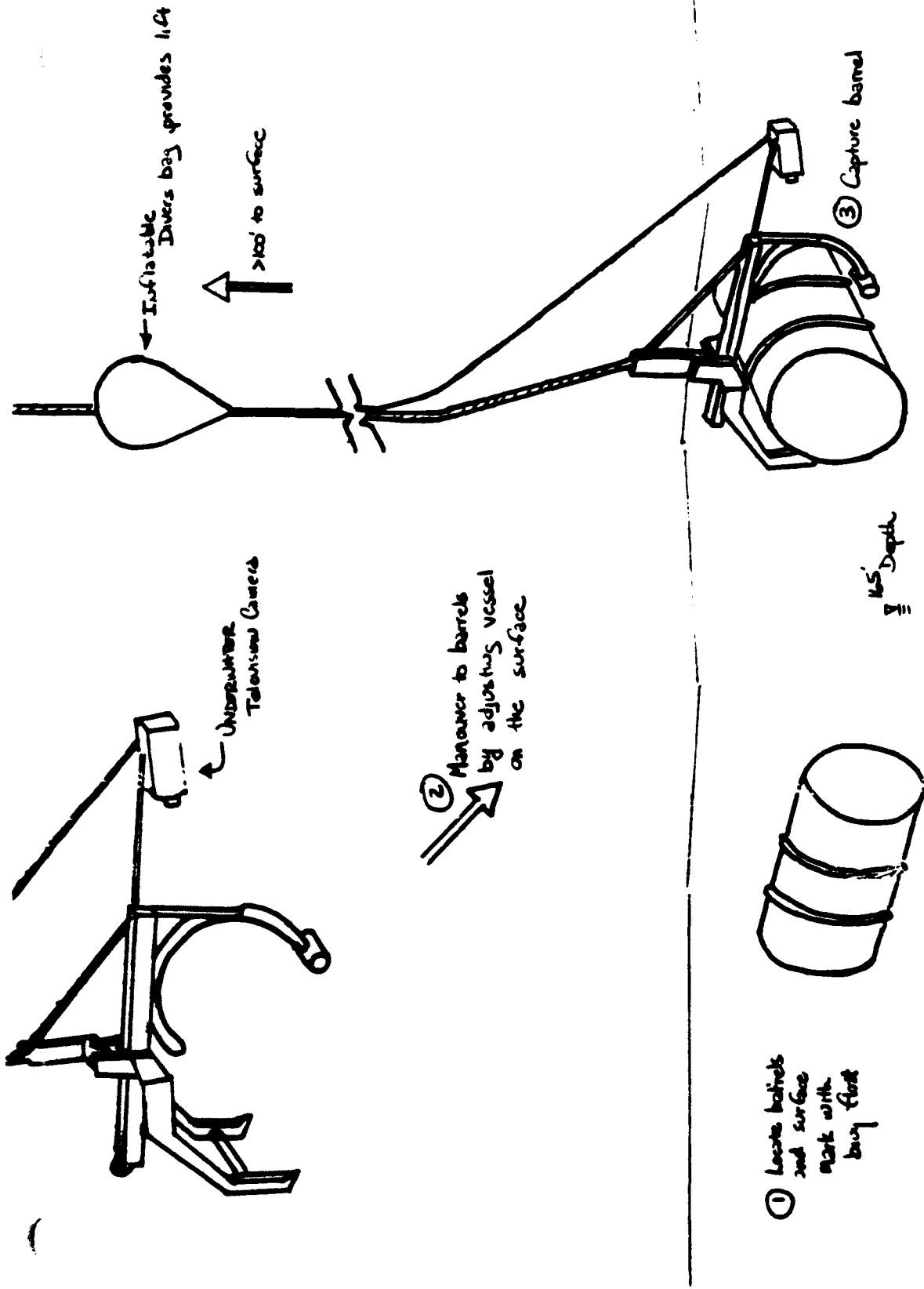


Figure 15 - Magnetometer survey results over known barrel site.



① Locate barrels and surface mark with buoy float

Figure 16 - Clamping device used to remotely capture two barrels located in 170' of water.

Memorandum



DATE Sept. 16, 1960
 TO Tom Long
 FROM Irwin Dahlheimer
 SUBJECT Die Cast Confidential Scrap

COPIES TO: Capt. Dean W. Marnik

	Empty Wt.	Net Wt.
1 Large Crate	90#	615#
1 Large Crate	105#	802#
1 Large Crate	105#	1,711#
6 Small Crates	185#	1,991#
12 Small Crates	240#	1,980#
1 Paper Barrel	38#	300#
1 Steel Barrel	42#	326#
1 Steel Barrel	42#	265#
1 Steel Barrel	42#	273#
1 Steel Barrel	42#	240#
1 Steel Barrel	42#	601#
1 Steel Barrel	42#	1,550#
1 Steel Barrel	42#	500#
1 Steel Barrel	42#	510#
1 Steel Barrel	42#	1,650#
1 Steel Barrel	42#	1,700#
1 Steel Barrel	42#	1,900#
1 Steel Barrel	42#	1,850#
1 Steel Barrel	42#	1,600#
1 Steel Barrel	42#	1,920#
1 Steel Barrel	42#	3,110#
1 Steel Barrel	42#	1,670#
1 Steel Barrel	42#	660#
1 Steel Barrel	42#	316#
1 Steel Barrel	42#	500#
1 Steel Barrel	42#	500#
1 Steel Barrel	42#	355#
1 Steel Barrel	42#	1,800#
1 Steel Barrel	42#	1,720#
1 Steel Barrel	42#	382#
1 Steel Barrel	42#	398#
1 Steel Barrel	42#	757#
1 Steel Barrel	42#	625#
1 Steel Barrel	42#	1,850#
1 Steel Barrel	42#	1,120#
	1,790#	18,950#

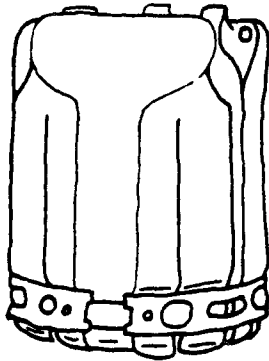
*W. J. Marnik at Ings. Hargreaves
me 3 46 22*

Figure 17 - Historical Shipping log 1960. Barrel Empty and loaded weights displayed.

Die Cast - Confidential Scrap

	Tare Wt.	Net. Wt.
1 Steel Barrel	42#	478#
1 Steel Barrel	42#	592#
1 Steel Barrel	42#	429#
1 Steel Barrel	42#	260#
1 Steel Barrel	42#	356#
1 Steel Barrel	42#	344#
1 Steel Barrel	42#	278#
1 Steel Barrel	42#	373#
1 Steel Barrel	42#	342#
1 Steel Barrel	42#	319#
1 Steel Barrel	42#	277#
1 Steel Barrel	42#	515#
1 Steel Barrel	42#	363#
1 Steel Barrel	42#	420#
1 Steel Barrel	42#	408#
1 Steel Barrel	42#	408#
1 Paper Barrel	38#	250#
1 Steel Tub	148#	856#
1 Steel Tub	148#	872#
1 Steel Tub	148#	800#
1 Steel Tub	148#	1112#
1 Steel Tub	148#	916#
1 Steel Tub	148#	1206#
1 Steel Tub	148#	940#
	<hr/>	<hr/>
	1746#	13114#
TOTAL	3728#	31973#

This is the total as of Sept. 16th and we continue to accumulate approximately 200# per day.



A. Vanes closed



B. Vanes Open

Figure 18 - BLU-3 Anti-Personnel Grenade.
Timing and safety device located in top section of
assembly. Photo from: Anti-Personnel Weapons,
Stockholm International Peace Research Institute, 1978

Lake Superior Classified Scrap Disposal
DERP FUDS Project No. E05MN025501

Alliant Techsystems Inc. Telephone 612 939-2000
 Twin Cities Arsenal
 New Brighton, Minnesota 55112

11 March 1991

Mr. Bob Dempsey
 U. S. Army Corp Of Engineers
 St. Paul District
 U. S. Post Office and Custom House
 St. Paul, MN 55101

Dear Bob:

I showed some of our senior Marketing staff the parts from Lake Superior and they have identified them as the Safety and Arming assemblies from the BLU-3 and BLU-4 grenades made by Honeywell in the early 1960's. The programs were classified. I am still trying to locate any paperwork that may exist on the programs but it does not appear that I will find any.

I have enclosed a copy of our laboratory report regarding the attempts to function the detonators in these parts. The conclusion of the report is that the detonators are not explosively sensitive. However, since only a few detonators were tested, I would still advise the use of caution when handling the parts with detonators. After being under water for thirty years, the detonators are likely to vary in their explosive sensitivity, and the samples that were tested may not be the least sensitive of those recovered. The parts with detonators can be identified by the green or red dot in the center of the part. One side of the dot will be green and the other red. Again, please handle these parts with care.

I have also included copies of the correspondence between the Nuclear Regulatory Commission and Honeywell regarding the allegation that the barrels contained radioactive material. The bottom line here is that the NRC has closed the matter. If you have any questions, please call me.

Again, if I can be of further assistance, please contact me.

Sincerely,

ALLIANT TECHSYSTEMS, INC.

James R. Persoon

James R. Persoon, PhD
 Corporate Director, Environmental Management

cc:C. Meier
 A. Davidson
 S. Eich
 T. Montag

Figure 19 - Alliant Techsystems identification of recovered parts.
 See Figure 20 for results of detonation tests.

Lake Superior Classified Scrap Disposal
 DERP FUDS Project No. E05MN025501

Marine Systems
 Precision Armament Systems
 Ordnance Systems
 Information Storage Systems

F:\MM\JRP\0311LKSUP

DSG/NB103

PRODUCT EVALUATION

Date: 8 MARCH 1991

Subj: EXPLOSIVE SENSITIVITY

To: J. PERSOON

On 3/8/91, I conducted an explosive sensitivity per instructions given below. The detonators tested from the Lake Superior material, were not explosivly sensitive.

DROP TEST

Place detonator with red side up.

Mount firing pin and drop a weight to equal 3/4 inch ounce on firing pin.

A seven gram weight was dropped on the firing pin from a height of 3 inches.

Result-No function

Repeat procedure above, but increase drop weight to equal 4 to 5 inch ounce.

A 3/4 ounce weight was dropped on firing pin from a height of six inches, which equals 4.5 inch ounces.

Result-No function.

Attempt to detonate explosivly using M100 detonator as an iniator.

An M100 detonator was functioned electrically so that the output end of the M100 detonator would impact the red side of the Lake Superior detonator.

Result-Lake Superior detonator did not function.

Figure 20 - Detonation testing of recovered scrap assemblies.

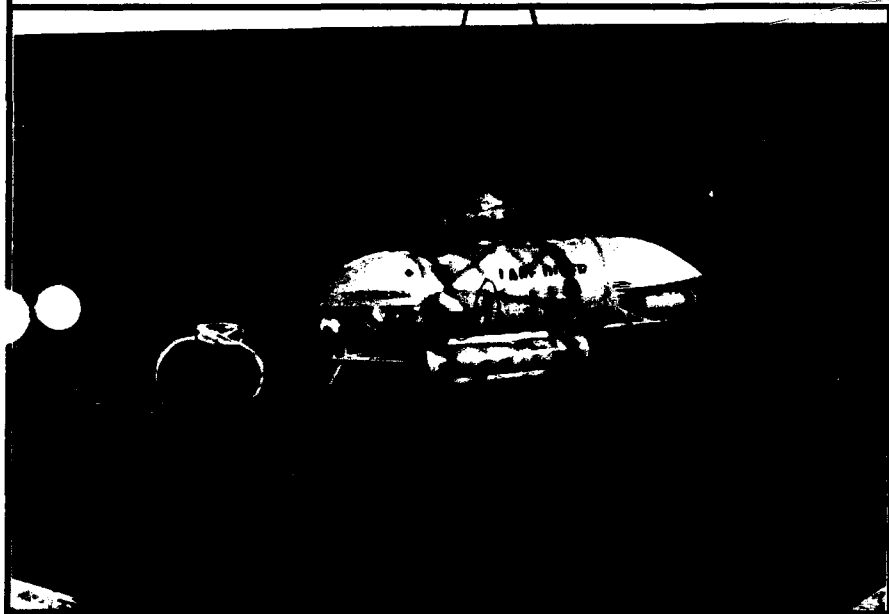
**Lake Superior Classified Scrap Disposal
DERP FUDS Project No. E05MNO25501**

PHOTOGRAPHS

**PHOTO #1 - Survey Boat -
"David Boyd" Operated by
Duluth Area Office of the
Detroit District COE.**



**PHOTO # 2 - Two Man sub-
mersible "Lake Diver" Based
in Elvira, New York.**



**PHOTO # 3 - Tug "Lake
Superior" and Crane Barge
"Markus". Operated by
Duluth Area Office of the
Detroit District.**

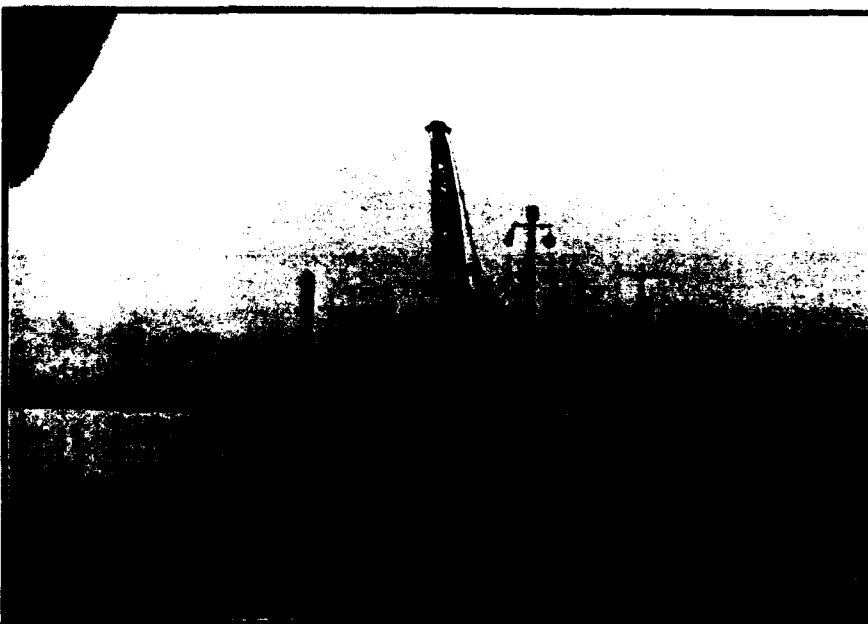


PHOTO #4 - "Northern Comfort" Served as confirmation vessel carrying magnetometer, tow cameras and diving equipment.



PHOTO #5 - Side Scan chart recorder. Sonar fish transmits echo imaging data from cable (shown in rear) to recorder for display.

PHOTO #6 - Side Scan sonar "towfish".



PHOTO # 7 - Side Scan readout of confirmed barrel site. When the course and location of the vessel nearly matched the barrel group, range of the side scan was halved. A noticeable improvement in image then occurred on the right side of the readout. Approximately 65 - 70 "targets" clearly graphed.

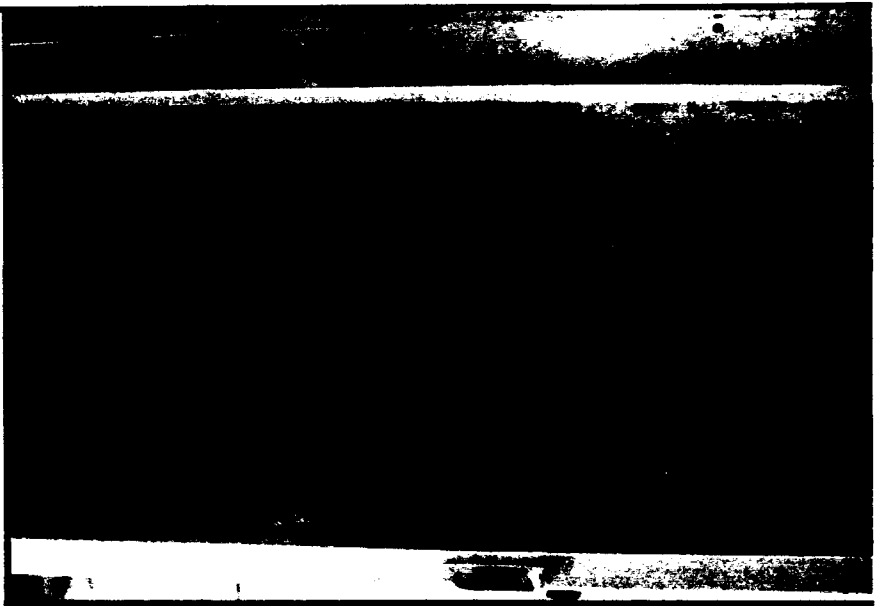


PHOTO # 8 - Rust streaks noted on towfish tail.



PHOTO # 9 - Protective overpack salvage drums. Recovered barrels were placed in these containers before being raised to the surface for recovery.

PHOTO # 10 - EPA Remotely Operated Vehicle (ROV). Television Camera in clear hemisphere, revolving sonar unit mounted below camera.

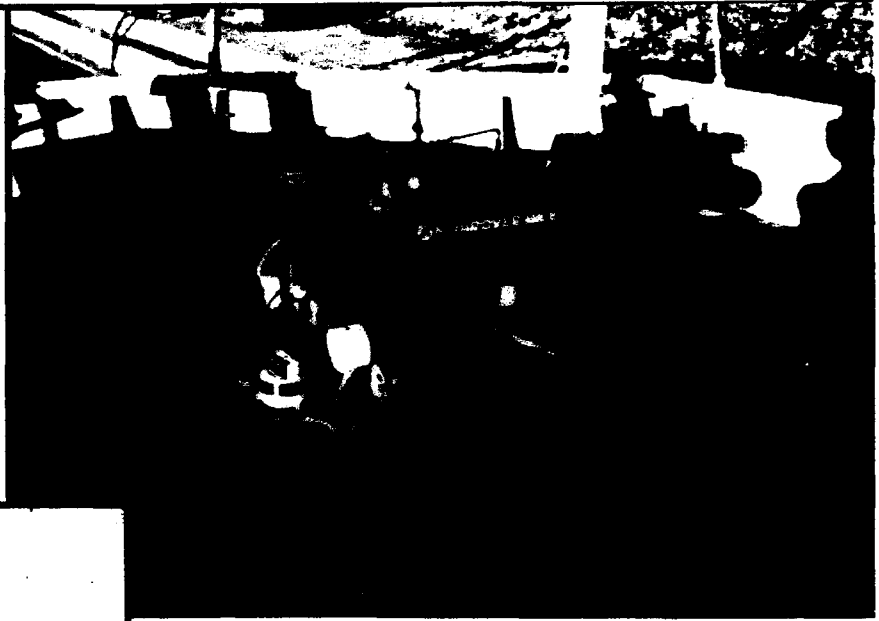


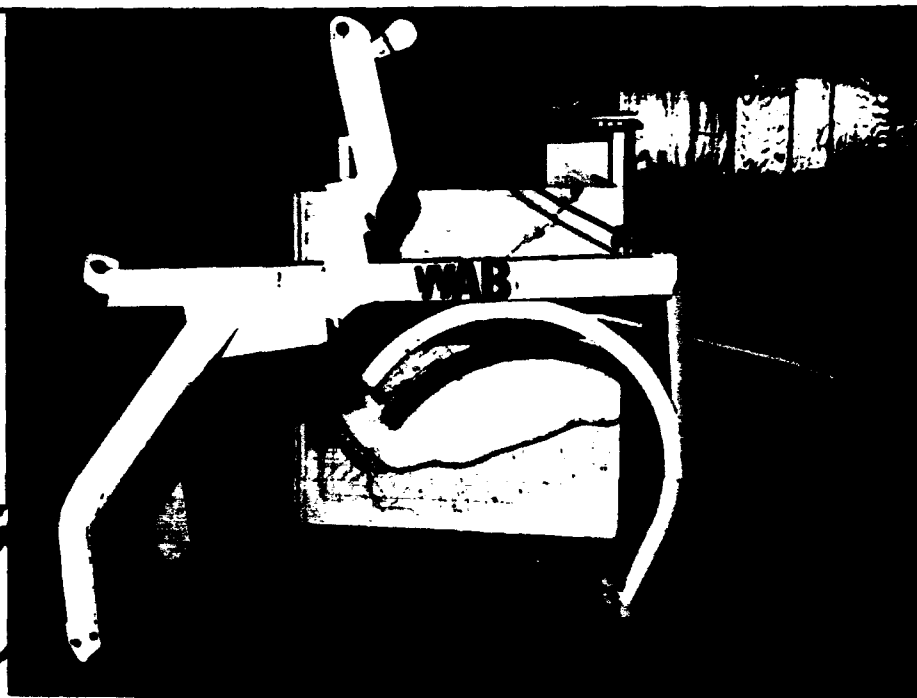
PHOTO # 11 - Gamma probe and ROV test launch in harbor.



PHOTO # 12 - Television monitor of ROV inspecting barrel concrete end at 170 feet depth.



**PHOTO # 13 - Remote
rel clamp. Three
point grab adjusted by
hand from the surface
while monitoring posi-
tion on Video camera
(not shown).**



**PHOTO # 14 - St. Paul Dis-
trict diver entering water to
overpack barrel in 35' of
water.**



**PHOTO # 15 - Crane aboard
CB "Markus" lifting first barrel
from Lake Superior in
overpack barrel. Concrete
of barrel can be ob-
served.**

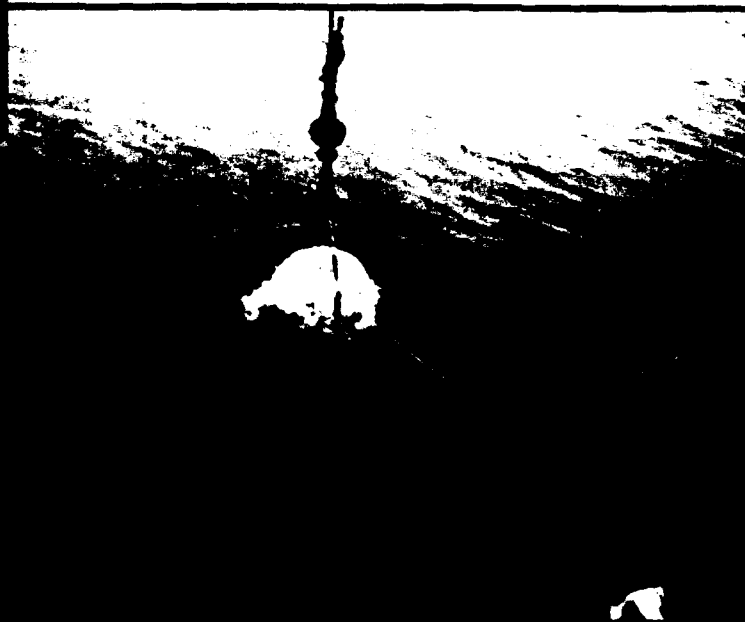


PHOTO #16 - MPCA official Robert Cross removing tamper seal from overpack for opening.



PHOTO # 17 - View from Backhoe window of first barrel opened by OHM Corp. Box firmly embedded in concrete can be seen at right side of debris. Large concrete end sections support affidavits prepared in 1976 which stated that concrete was poured in both the bottom and top of each barrel for additional ballast.



PHOTO # 18 - Tissue packed gear mechanisms packed in first barrel opened. Missing gears and loose springs can be easily observed.





PHOTO # 19 - Material from second barrel being packed for testing and inspection. Note protective suits worn for safety. Large concrete end section again visible at rear of debris pile.



PHOTO # 20 - Close-up of recovered scrap. Concrete grout mixture poured in barrel has preserved scrap and cardboard boxes from disintegration. Boxes were intact inside concrete which was crushed by backhoe for inspection.

PHOTO #21 - Recovered box with Minneapolis-Honeywell (MH) marking. Note Content: Scrap Assemblies and Confidential classification markings. Material has since been declassified.

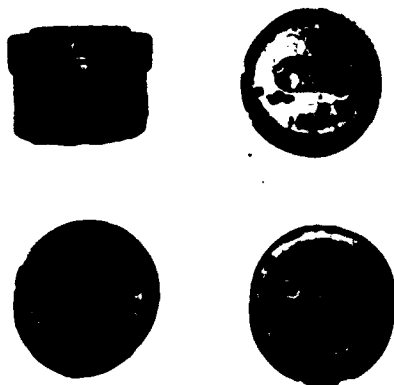
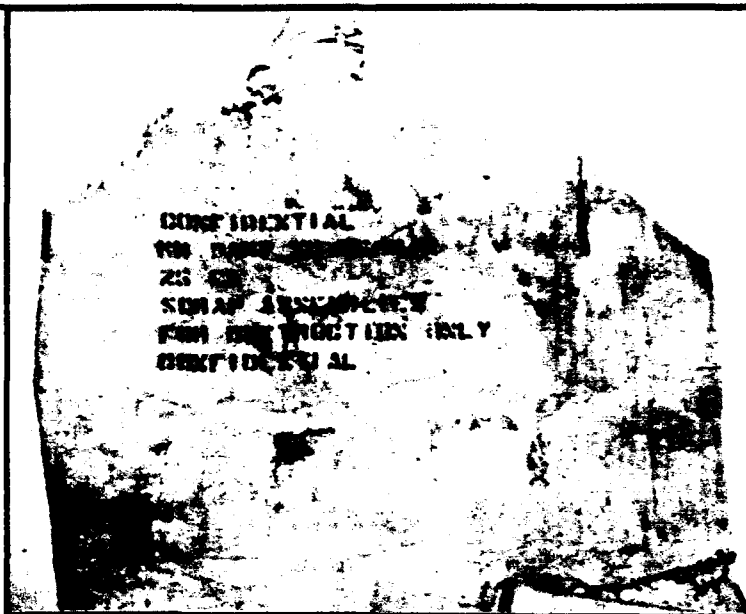


PHOTO # 22 - Recovered parts from Barrel #2. Gear assemblies in Photo #18 can be seen in upper right base of recovered parts from second barrel. Word "INERT" is also stamped in this part.

PHOTO # 23 -Interior section of barrel sawn off Barrel #2. Corrosion holes typical of both recovered barrels are in lower right corner.



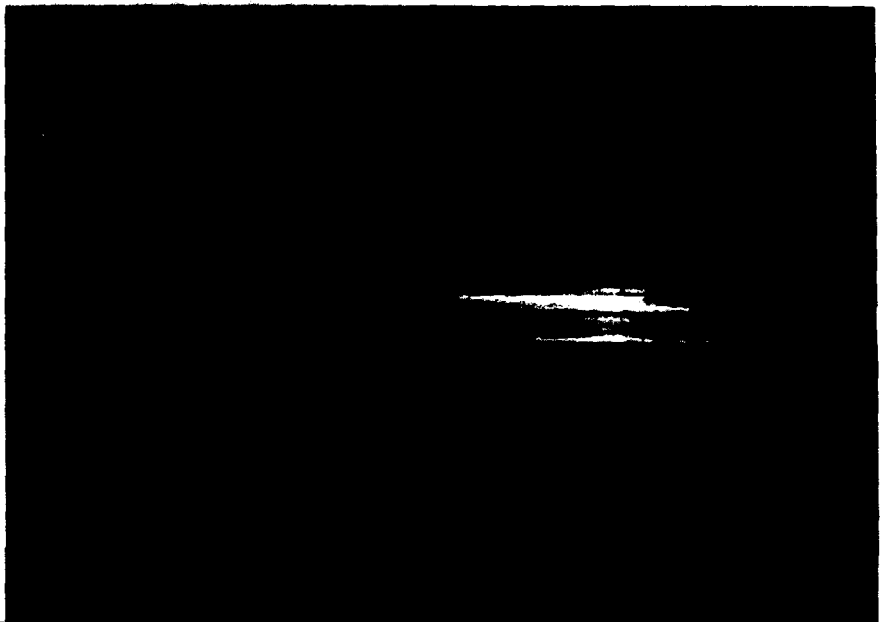
PHOTO #24 - Mr. Ken Gardner preparing for daily press briefing in Duluth Area Museum.



PHOTO # 25 - Participants in barrel locating efforts between October 10 - 16, 1990.



PHOTO # 26 - Lake Superior sunrise at Duluth Harbor canal, October 12, 1990. Calm water conditions were encountered for the entire effort.



APPENDIX A

FINAL REPORT
ON
CLASSIFIED SCRAP IN LAKE SUPERIOR

8 July 1977

HQ, US ARMY ARMAMENT MATERIEL READINESS COMMAND
ROCK ISLAND, ILLINOIS 61201

DICAR-ISC-A

SUBJECT: Final Report on Classified Scrap in Lake Superior

Lake Superior Area Office
St. Paul District Engineer
Canal Park
Duluth, Minnesota 55802

1. Inclosed is a copy of the final report on the investigation into the matter of the dumping of classified metal scrap into Lake Superior. The report is the Army's position on the subject and has been authorized for public release.

2. A limited number of copies can be produced at this headquarters for interested parties; however, to cover reproduction costs, a \$15 charge (in advance) is required for each additional copy. Copies of the report have been provided to the Duluth and Minneapolis Public Libraries.

FOR THE COMMANDER:

1 Incl
15 (quint)

JAMES J. WEISS
LTC, GS
Dir, Instl and Svc Dir

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20. ABSTRACT (Continue on reverse side if necessary and identify by block number) Report contains the results and data on the investigation of dumping of classified waste into Lake Superior. Investigation was the result of inquiries based on the secretive nature of dumping of classified grenade scrap during 1959-1962 timeframe.		

Final Report on Classified Scrap in Lake Superior

BACKGROUND

During the 1959-62 timeframe, the US Army dumped some 1,437 barrels into Lake Superior. Recent rumors that the contents of the 55 gallon barrels were radioactive have caused much public concern. News media coverage (Appendix A) and citizen inquiries have resulted in Governmental requests (Appendix B) to prove that the dumped material is not harmful. The St. Paul District Corps of Engineers has tried to assure all interested parties that the material dumped was scrap metal from classified munitions production. Concern is such that hard evidence on the barrel content is needed. The action to resolve the issue was given to HQ, ARRCOM. CPT James R. Hager, DRSAR-ISC, was appointed the investigating officer.

Twin Cities Army Ammunition Plant (TCAAP), formerly Twin Cities Ordnance Plant, is under the jurisdiction of HQ, ARRCOM. TCAAP is a Government-owned, contractor-operated military industrial installation located approximately 13 miles north of Minneapolis - St. Paul, Minnesota. The prime contractor at the plant is Federal Cartridge Corporation with Honeywell, Inc. (Minneapolis Honeywell Regulator Company during the timeframe under study) as a tenant activity. Honeywell has occupied Buildings 103 and 502 on the installation since the 1950's. Their mission, then and now, in Building 103 is the assembly of fuzes and the fabrication of ferrous and non-ferrous metal parts with turning, stamping and casting operations accomplished in Building 502.

INVESTIGATIVE METHODOLOGY

The procedure for determining the content of the barrels was to obtain copies of the manufacturing contracts and specifications and to obtain sworn statements from knowledgeable personnel. The Records Retention Center in St. Louis, MO was visited and contract documents obtained. Technical specifications of the material dumped were obtained from various Army organizations. Sworn affidavits were obtained from as many persons as possible who had firsthand knowledge or had participated in the disposal action.

INVESTIGATIVE FINDINGS

The investigative findings are in Appendix C. Item C-1, dated 25 Aug 59, contains a list of special purpose equipment used in Building 502. None of this special equipment is for handling or processing radioactive material. Additionally, the statements (C-2 and C-3 respectively) of Mr. Al Ruby, a Honeywell employee who helped pour the concrete caps on the barrels, and MAJ Milton Rothman, the Army's contract administrator, testify that the material was not handled in any special manner as would be required with radioactive material. Furthermore, Mr. Larry Eiler,

Honeywell's Public Relations Director, stated that Honeywell was not working with any radioactive material on any project during the time-frame involved. In support of all of this evidence, the water sample analysis, C-6, taken on 4 Dec 76 from the lake surface in the vicinity of a suspected dump site shows no difference between water samples taken near the bottom of the lake and at a surface point up-current. In fact, there was no detectable difference in general water quality among the sample points.

The material that was dumped into Lake Superior was metal scrap produced under Contract DA-11-022-ORD-3019 and associated contracts. The items produced under this contract, dated 15 Dec 59, are listed in C-8. Manufacture of the top and base section assembly for the M32 Grenade and the succeeding family of grenades - notably the M40 - produced the majority of the scrap. The M40 Grenade differed from the M32 in diameter only and its metallic composition was identical (verified in C-9). The metallic specifications for the M40 are listed as aluminum and steel (C-10 through C-12).

Mr. John G. Heren (C-13) states that the scrap was disposed of by dumping in Lake Superior because there were no smelting facilities cleared to handle classified material and that the volume of scrap produced was too large to store and safeguard. Appendices C-15 through C-23, dated Sep and Oct 59, show that alternate methods of disposal were being sought. These records also verify that the scrap was produced under Contract 3019 in Building 502 and that dumping was necessary due to the large accumulation of scrap material and the delay in arriving at another disposal method. The alternate method of disposal finally adopted was melting the scrap in the US Steel Corporation furnaces in Duluth. This was verified by Mr. Dennis Nylén of that corporation.

The documents inclosed clearly show that, except for no more than six barrels, the material dumped into Lake Superior was classified aluminum and steel scrap. This residue from grenade production is non-nuclear, non-toxic, and non-hazardous. The material was dumped into Lake Superior because that was the most economical and secure disposal method available at the time. The six barrels that were not loaded in Building 502 came from the Honeywell Hopkins Plant and contain, to the best recollection of those interviewed, fiberglass tape impregnated with lithium chloride, potassium chloride, barium chromate, calcium chromate, and zirconium. This material was the scrap from a thermal battery used on a time fuze. No reason has been found for their inclusion in the Lake Superior dumps. However, the composition of the salt mix impregnated on the tapes was classified. While the data collected on the six barrels is not conclusive, there is no reason to believe they contained anything other than what has been testified. These barrels had holes in them to insure their sinking and have had constant exposure to the water since 1959. In order to evaluate the potential impact on water quality of these barrels, a worst case situation was presented to the US Army Environmental Hygiene Agency.

Their evaluation is at C-24, which concludes that this disposal action will have a negligible effect on Lake Superior.

RECOVERY ACTIONS

With the melting of winter ice on Lake Superior, HQ, ARRCOM initiated action to exhume a barrel for content analysis. On 21 May 77, Patrol Squadron VP 4046, an antisubmarine unit located at NAS Glenview, Illinois, flew over Lake Superior. Using sophisticated detection equipment, the patrol was unable to verify barrel location.

On 7 Jun 77, the 86th Engineer Detachment (Diving) set up diving equipment aboard the "Coleman", US Army Corps' derrick boat. The "Coleman" anchored at the suspected dump site and diving apparatus was checked out. An underwater television camera was used to scan the dump site 130 feet below. No visual contact was made within the area scanned from the perimeter of the "Coleman". Photographs of the diving team and apparatus are in Appendix D.

On 8 Jun 77, the "Coleman" again set anchor over the suspected dump site. The underwater camera was used to scan the bottom. The diving crew made six dives during the day. Divers were in water ranging from 120 to 133 feet. An underwater SONAR device was used by the divers without success. Divers observed marks or "tracks" in the 3-inch thick silt which possibly could be attributed to barrels that were pushed by lake currents into deeper water.

On 9 Jun 77, the "Coleman" anchored west of the previous search area. The search routine was repeated without success. When it became apparent that barrels might not be in the immediate search area, COL Gay, St. Paul District Engineer, arranged for Dr. Thomas Johnson, an expert in underwater detection from the University of Minnesota, to bring his equipment from Minneapolis. Dr. Johnson had located the suspected site several months earlier.

On 10 Jun 77, the tugboat, "Duluth", carried Dr. Johnson to the suspected dump site. Using his equipment, Dr. Johnson attempted to relocate barrels in the vicinity of his previous find. The area that provided the strongest indication of barrels below on Dr. Johnson's equipment was searched via the underwater camera with negative results. Search operations of this nature continued until rough water caused the search equipment to give faulty results. By that time, it was apparent that the suspected dump area was void of barrels. Because no other suspected barrel dump site was known and search costs were \$4000 per day, not including Government personnel salaries, further search efforts were called off at 1500 hours.

MEDIA COORDINATION

A public affairs desk was established at Duluth by Mr. Peter Copeland, Chief of ARRCOM Public Affairs Office, to coordinate with the news media.

All information pertaining to the recovery effort was handled through this centralized office. As a result of earlier press releases (Appendix E, E-1 and E-2), the following media representatives were on hand to observe the operation:

- (1) Pioneer Press, St. Paul, MN
- (2) Duluth Herald News Tribune
- (3) Associated Press, St. Paul
- (4) United Press International, MN
- (5) WCCD-TV (ABC affiliate), St. Paul
- (6) KMSP-TV (CBS affiliate), MN
- (7) KSTP-TV (NBC affiliate), St. Paul
- (8) KDAC-TV, Duluth
- (9) KDAC-AM/FM, Duluth
- (10) WDID-TV, Duluth
- (11) KBJR-TV, Duluth

On 8 Jun 77, the first day of diving, the press boarded the tugboat "Lake Superior" and were briefed on the search operation by COL William Green, Chief of Staff, HQ, ARRCOM. Photographs are provided in Appendix F. The press observed the diving attempts and talked to crew members for approximately four hours before returning to Duluth to file their stories. This was repeated the following day as the area of search was moved from the original marker buoy. Mr. Copeland remained in Duluth to handle press inquiries while maintaining close radio contact with COL Green.

On the third day, 10 Jun 77, the press did not depart with the search team, but waited at Duluth. The media was advised of the arrival of Dr. Johnson. A press release (Appendix G, G-1) was prepared to cover the possible termination of the search effort. It was given to media in attendance upon COL Green's return to the OCE Duluth Area Office at 1600 hours. COL Green held a press conference based upon the release and a question and answer session followed.

Media publications received during the search effort are contained in Appendix G (G-2 through G-9). Additionally, three articles (G-10 through G-12) appeared after the search was terminated. Copies of additional news items will be forwarded as appropriate.

CONCLUSIONS

1. Suspected dump site does not contain barrels.
2. No barrel dump site locations are known at this time.
3. To continue search operations without a starting point would be counterproductive, especially at \$4000 per day.

4. Contents of the barrels have never had a significant toxic effect of any nature -- chemical, physical, or radiological -- upon the water and biological life of Lake Superior.

5. Contents of the barrels have conclusively been established and are/were of no environmental consequence.

6. Press relations during the search operation were excellent, and the media was kept fully informed of all search details.

7. Reporting of events in printed and electronic media were fair and accurate.

8. The efforts made to resolve the barrel controversy outweigh the adverse public reaction generated when the matter was initially brought to light.

RECOMMENDATIONS

1. Discontinue the barrel search.
2. Provide copies of this report to interested parties.
3. Place this report in the Army's permanent records.

Lake Superior's mystery barrels

For the past nine years, minnows, brook trout, and other species of fish swimming in Lake Superior around Duluth, Minn., have shown erratic spawning patterns, unusual sensitivities to copper, respiratory difficulties, and other abnormalities. Several hundred feet below the fish, more than 1,400 concrete-sealed metal barrels containing waste from a classified project at Honeywell Inc. have been quietly rusting away ever since the Army Corps of Engineers dumped them there between 1959 and 1962.

Although a Honeywell spokesman swears that the barrels contain nothing more than "scrap metal, which is low-carbon steel cast into a zinc alloy," Minnesota officials fear a more sinister connection between the barrels' contents and the fish's plight.

The issue reached a head a few weeks ago when Donald I. Mount, director of the Environmental Protection Agency's research laboratory in Duluth, released the results of tests on water samples taken from the lake in December. Although he admitted that the tests do not disprove Honeywell's contention, he also emphasized that they "don't prove that the barrels don't contain radioactive material, just that radioactive material is not leaking out of them in sufficient amounts to be measured."

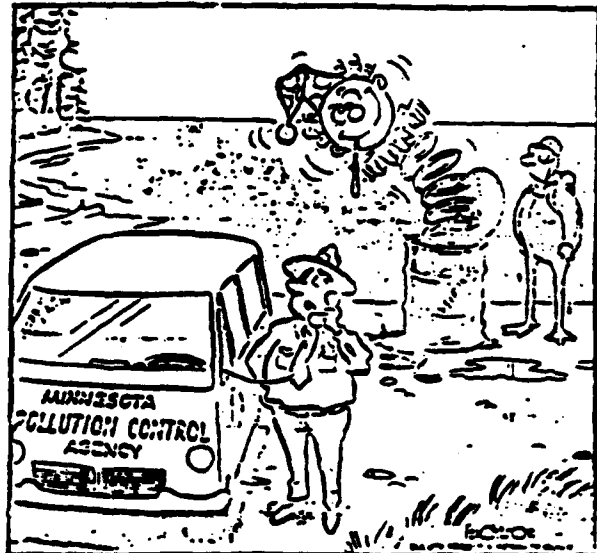
Lost records. The Minnesota Pollution Control Agency wants more proof of harmlessness—specifically, the original contract for the project, which would contain the metallurgical specifications. "If the Corps doesn't locate the contract during the winter," says Louis J. Breimhurst, the PCA's water quality director, "we may ask them to raise a barrel, or a few barrels in the spring."

Both producing the contract and raising the barrels may be easier said than done. The Honeywell project involved work on artillery shell casings and antipersonnel fragmentation devices, but because it was classified, the

Company and the Army, says James E. Braatz, public affairs chief for the Corps' St. Paul district, says the Army's copy might have been lost in a St. Louis warehouse fire in 1972.

Without the contract, no one can prove that the barrels all contain the same substances. "To be absolutely sure, all the barrels would have to be raised and opened," warns J. David Yount, deputy director of the EPA lab. "The cost of raising all the barrels would be astronomical, and I'm not even sure that it's technically or humanly possible," counters Braatz, who adds that the cost of raising even one or two drums would be \$50,000.

A 'dumb' move. Braatz is convinced that the issue is being overblown—two Duluth newspapers and the *St. Paul Dispatch* ran sizable stories on the situation last month—but neither he nor anyone at Honeywell can explain why



"Hello . . . Honeywell? . . . Ver-ry funny!"

the Corps would dump scrap metal in the first place. After 1962, scrap from the project was melted down in a Duluth steel mill, and Braatz says that he does not know why it was not all disposed of that way. "It was dumb to put the barrels in Lake Superior," he admits.

The EPA's Mount agrees that the public may be reacting too strongly to the issue. "I think it's the secrecy of the whole affair that's caused public concern," he says. Mount notes that his laboratory analyzed water samples for several potentially harmful metals, for organic pollutants, and for radioactivity, yet turned up nothing. Still, even he is not content to leave the barrels—and the Corps—in peace. While the Corps searches for its documents, he says, "we're going to keep a close watch on the water, and we'll immediately check water samples when we see any changes."

PCA calls for analysis of dumped waste barrels

Barrels dumped into Lake Superior between 1919 and 1937 containing classified military wastes should be retrieved for analysis, John Peters of the Duluth office of the state Pollution Control Agency (PCA) said today.

Six shipments of classified waste were dumped into the lake by the U.S. Army Corps of Engineers between October 1939 and September 1952, government sources at Duluth believe.

They indicated the waste was produced by Honeywell, Inc., and was said to be scrap metal, non-toxic, non-contaminant and non-radioactive.

Peters said that if the analysis of the materials shows it is harmless, the PCA will write off the incident. "The question I have is why they went to such extremes for non-contaminant material," he said.

The 30 tons of material were brought to Duluth under military police escort and stored, according to Corps re-

ports, into Lake Superior at depths of 100, 200 and 300 feet.

In 1969, a Duluth fisherman, Stanley Sivertson, picked up several of the large barrels while trawling in depths of about 150 feet about one mile northeast of the Lakehead pumping station.

He said the barrels, which weighed almost a ton each, created a hazard aboard ship in the swelling lake and were dumped back into the lake. But one was opened by a crewman who said the contents looked like buckshot or bits of metal which had been melted and mixed with concrete. Sivertson said

In a story in today's edition, the Chgo. Quineman Jim in Waukegan, Wis., quotes a Honeywell representative as

saying the barrels "absolutely did not contain radioactive or hazardous materials."

This is apparently confirmed by a spokesman for the National Security Branch, Energy Research and Development Administration (ERDA), who said Honeywell has never had a contract for nuclear arms. ERDA is the government agency responsible for such records. Spokesmen for the Minneapolis-based firm have been quoted as saying the drums contained scrap metal left over from production of experimental artillery warheads.

Honeywell spokesmen were quoted as saying that the once-classified project is now declassified.

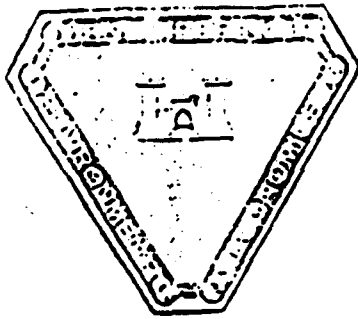
Honeywell and the Department of Army have been asked by the Duluth Herald and News-Tribune to provide more specific information on the contents of the barrels and the reason they were disposed of such manner.

The barrels were lined with concrete for ballast, said Lt. Col. Norman Hantz, acting engineer for the Corps' St. Paul district, in a letter earlier this month to the Save Lake Superior Association.

He said the contents were "iron ammunition barrels, iron of a classified maturity nature, and of non-toxic, non-contaminant material." After 1972, the material was delivered to U.S. Steel Corp's Duluth Works to be melted in blast furnaces.

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NOV 2 1976

Officials ask check on wastes dumped into lake

By THE ASSOCIATED PRESS

Michigan officials, acting on the unsubstantiated story of a retired tug-boat skipper, want the federal government to find out exactly what was contained in more than 1,400 sealed barrels the Army dumped secretly into Lake Superior 14 years ago.

Although they have no hard evidence, state officials are following up a rumor that the barrels, in 100 to 300 feet of water near the Duluth shoreline, might contain radioactive waste materials.

The Army Corps of Engineers said Monday the barrels hold classified, nonradioactive scrap metal, produced during the manufacture of secret weapons used in Viet Nam. The corps admits there were 1,437 containers dumped between 1959 and 1962.

The dumping was brought to state attention by Marilyn Burton of Sault Ste. Marie, who asked Department of Natural Resources Director Howard Tanner during a Marquette meeting if he had heard a story that the Army dumped radioactive material into Lake Superior.

Danford E. Anderson, now in his early 70s and retired in the Soo, was the skipper of a Duluth-based tug on May 21, 1961. Army records show a secret shipment of 150 barrels was

Anderson's wife, Gertrude, was at the dock with her husband. She said they were told by "someone" that the barrels "contained stuff from the atomic plant near St. Paul."

Minnesota pollution control officials said there were no nuclear facilities in the state at that time. They added they have checked out Anderson's story and have all but dismissed it.

The Andersons have been telling friends about the strange night-time operation for years, but it was only when Mrs. Burton brought it up to Tanner that the state got wind of it.

Preliminary DNR investigation turned up another witness to the dumpings, 59-year-old Leonard Yeo of Laurium in the Upper Peninsula.

Yeo said he remembered participating in the dumping operation and being disturbed by its secrecy. He told the Detroit Free Press he had no reason to believe the barrels contained nuclear waste.

Michigan officials say they will press their investigation, and may demand the federal government dredge up one or more of the sunken barrels so the contents can be examined and analyzed.

Col. Forrest Gay, head of the Engineers office in St. Paul, said the Pentagon told him it would not object to that, since the scrap metal has been declassified. But, he added, there is no money in his budget to

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THE DAILY MINING GAZETTE

HOUGHTON, MICHIGAN

21 AUG 1976

Military scrap dumped in lake said no threat

DULUTH, Minn. (AP) — Military scrap dumped into Lake Superior between 1965 and 1967 consisted of ordinary metal, a Pentagon spokesman says.

"The only thing that is down there in those barrels is medium carbon steel and maybe some aluminum shavings," the spokesman said Friday.

The waste was left over from production of experimental artillery warheads, he said, and had been machined for fragmentation in a unique, secret pattern. It was dumped in the lake to keep it secret.

Between October 1969 and September 1967, six loads of scrap totaling more than 350 tons were shipped to Duluth from Honeywell Inc., Minneapolis, in sealed steel drums which were loaded aboard Corps of Engineers barges, taken onto the lake and dumped.

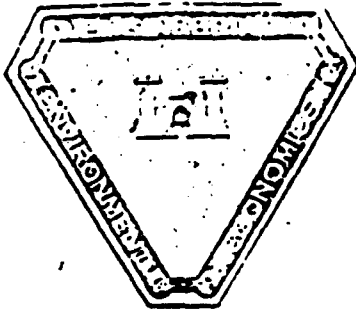
Corps records refer to the material as "classified." The Pentagon representative said that, at the time, the fragmentation pattern was "very secret" but the warheads have since been used in Vietnam and have been declassified.

The Pentagon explanation did not satisfy John Pegors, director of the Duluth office, Minnesota Pollution Control Agency (MPCA).

Pegors has called for the material to be retrieved and analyzed.

"The question I have," Pegors said, "is why they went to such extremes for non-combat material."

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The Pioneer, Bemidji, Minnesota

Tuesday, November 2, 1976

Officials try to find out what was dumped in Lake Superior

By The Associated Press

Michigan officials, acting on the unsubstantiated story of a retired tug-boat skipper, want the federal government to find out exactly what was contained in more than 1,400 sealed barrels the Army dumped secretly into Lake Superior 14 years ago.

Although they have no hard evidence, state officials are following up a rumor that the barrels, in 100 to 300 feet of water near the Duluth shoreline, might contain radioactive waste materials.

The Army Corps of Engineers said Monday the barrels hold classified, nonradioactive scrap metal, produced during the manufacture of secret weapons used in Viet Nam. The corps admits there were 1,437 containers dumped between 1959 and 1963.

The dumping was brought to state attention by Marilyn Burton of Sault Ste. Marie, who asked Department of Natural

Resources Director Howard Tanner during a Marquette meeting if he had heard a story that the Army dumped radioactive material into Lake Superior.

Danford E. Anderson, now in his early 70s and retired in the Soo, was the skipper of a Duluth-based tug on May 24, 1961. Army records show a secret shipment of 160 barrels was delivered to Anderson for dumping.

Anderson's wife, Gertrude, was at the dock with her husband. She said they were told by "someone" that the barrels "contained stuff from the atomic plant on the St. Paul River."

Minnesota pollution control officials said there were no nuclear facilities in the state at that time. They added they have checked out Anderson's story and have all but dismissed it.

The Andersons have been telling friends about the strange night-time operation for years, but it was only when

Mrs. Burton brought it up to Tanner the state got wind of it.

Preliminary DNR investigation turned up another witness to the dumpings, year-old Leonard Yeo of Laurium in Upper Peninsula.

Yeo said he remembered participating in the dumping operation and he was disturbed by its secrecy. He told Detroit Free Press he had no reason to believe the barrels contained nuclear waste.

Michigan officials say they will press their investigation, and may demand federal government dredge up one more of the sunken barrels so contents can be examined and analyzed.

Col. Forrest Gay, head of Engineers office in St. Paul, Minn., said the Pentagon told him it would not object to that, since the scrap metal has been declassified. But, he added, there is no money in his budget to salvage the barrels.

AS

Editorial/Opinion

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A barrel in hand

One of those barrels has to come up.

The barrels, of course, are those that supposedly contain some 800,000 pounds of military waste, dumped into Lake Superior between 1959 and 1962 by the U.S. Army Corps of Engineers, on behalf of Honeywell, Inc., of Minneapolis.

The barrels—1,400 of them—lie in 100 to 300 feet of water about one mile out into the lake from Duluth. Some of these barrels became entangled in the nets of commercial fishermen in 1963, but the presence of the barrels in the lake didn't come to public light until this past summer.

In August, the Army Corps and Honeywell explained that the barrels contained harmless scrap metal left over from munitions testing. The scraps were said to be nonradioactive, non-explosive, and nonchemical.

These assurances, however, have not been sufficient to remove the concern of Dr. Donald Mount, director of the National Environmental Research Laboratory (formerly called the National Water Quality Laboratory) in Duluth. In a letter to Peter Gove, executive director of the Minnesota Pollution Control Agency, Dr. Mount said he is suspicious about the Honeywell waste because of

changes in the spawning habits and other behavior patterns of his laboratory animals.

To ascertain beyond doubt what those barrels contain, Dr. Mount has suggested that his lab and the PCA "lift one or more of them out and do some analytical work to find out what was in them so that we have a better idea of what to expect should one break."

The Army Corps and Honeywell can continue to give assurances that these barrels contain only harmless metal scraps. But to paraphrase an old wisdom about a bird in the hand, a barrel in hand might be worth two in the lake.

The pot of public speculation can boil on forever, and without definite, first-hand examination of the contents of some of the barrels, everytime we get an outbreak of flu around here, or 10 people in a room sneeze, will be guessed that whatever illness has befallen this community has come from those mysterious, sunken barrels.

Why not raise one or two to settle the matter? Consider that Honeywell has had its rent of the lake bottom for most 20 years as a dump—certainly it wouldn't be unfair to ask Honeywell to pay for raising these one or two barrels.

remains of small bomb

By DON BOXMUEVER
Staff Writer

Those celebrated barrels on the bottom of Lake Superior contain the remains of a weapon known to the U.S. Army as a "bomblet."

A bomblet, according to the sworn testimony of a retired ordnance officer, is a small bomb.

Filled with small shot or ball bearings, the weapon was a "cluster bomb unit" designed for anti-personnel and antimaterial use.

The testimony is contained in the three-page affidavit of Milton M. Rothman, who served more than 20 years in the Army Ordnance Corps before his retirement in 1936.

THE TESTIMONY was released by the U.S. Army Corps of Engi-

neers in an apparent effort to satisfy public curiosity over the contents of 1,400 drums dumped into Lake Superior near Duluth between 1939 and 1952.

There had been speculation from as far away as Michigan that the drums contained radioactive, toxic or explosive material, and the corps, which carried out the dumping program under contract, has said it would fetch a barrel or two from the lake bottom if it had to in order to end the controversy.

It appears now that none of the barrels will be surfaced this winter because the U.S. Environmental Protection Agency's (EPA) water quality lab at Duluth is sat-

See Bomb, Page 22

Bomb

Continued from Page 21

ified the drums are not contaminating the water.

ANALYSIS OF WATER samples taken from the vicinity of the drums earlier this month shows the water is no different in quality from samples taken in another part of the lake.

While it does not now contemplate fishing a drum or two out of the lake, the corps said it will continue to search for records showing the precise nature of the ordnance waste.

Rothman, meanwhile, described the operation — now declassified — that produced the mysterious waste.

"Production of the bomblets involved the use of steel," he recalled, and the steel bomblets were filled with little steel balls. Any balls left over were taken out on a gunnery range and destroyed with explosives to render them shapeless, he said in his affidavit.

THEY THEN WERE PACKED in drums, sealed with concrete, taken to Duluth under close security and dumped by the corps into the lake in an apparent effort to elude foreign agents who might like to know what the contents of a bomblet looked like.

At no point in the operation were there any precautions taken by any personnel against radioactive

contamination, Rothman said. After completion of the dumping project, he had lunch at the Duluth Air National Guard base and returned to his duty station at the Twin Cities arsenal for debriefing.

For his part in the bomblet mission, Rothman indicated, he was awarded an oak leaf cluster for his Army Commendation Medal.

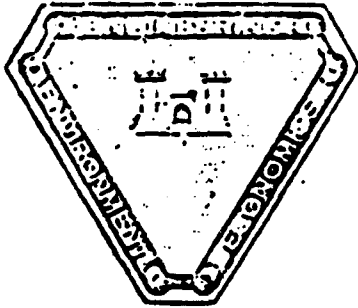
Hennepin jury to probe shooting

The fatal shooting of a teen-age youth at the scene of a robbery by a Minneapolis park policeman will be investigated by a Hennepin County grand jury.

County Atty. Gary Flakne said Thursday the jury will probe the shooting of Kenneth W. Lambert, 17, a week ago. It occurred near the Nicollet Tennis Center in south Minneapolis, which authorities said had been robbed moments earlier by two persons.

Darrell J. Stock, 29, was charged with robbing the center with Lambert.

Park policeman James Dale said he shot Lambert after he thought one of the fleeing persons shot at him. But the first shot actually was fired by another park policeman, police said they learned afterward.



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St. Paul Pioneer Press

St. Paul, Minnesota

Trucker doubts cargo radioactive

By DON DOMMEYER
Staff Writer

The recollections of a veteran truck driver may help clear up the mystery surrounding 600,000 pounds of military waste dumped in Lake Superior between 1959 and 1962.

Don Cahow, of 4622 104th Ave. NE, Blaine, said Wednesday he doesn't agree with speculation that the material, contained in 55-gallon steel drums, might be radioactive.

"From the way the drums were handled and from the way we hauled it," Cahow said, "it just couldn't have been radioactive."

The state of Michigan and an environmental group, the Northern Environmental Council (NOREC), want state and federal agencies to completely investigate recently published suggestions that some of the 1,400 drums contained radioactive waste from a nuclear power plant.

The drums were dumped in 100

to 300 feet of water near Duluth by the U.S. Army Corps of Engineers under contract to Honeywell, Inc. Both the corps and Honeywell have maintained that the drums contained then-classified scrap metal left over from testing ordnance at the Twin Cities Arms plant at Arden Hills.

Cahow, a 25-year employe of Briggs Transportation Co., said he was told the drums contained metal "stampings," and were topped off with a layer of concrete to seal the load.

"The drivers didn't touch the drums," he said. "They (Honeywell employes) loaded our trailers with forklifts. I could tell the drums were very heavy, though."

Cahow said he made "quite a few" runs from the Twin Cities to Duluth during that period and usually in convoys of three and four trucks.

The drums would be offloaded at Duluth, placed on a corps barge and taken about a mile offshore for dumping.

Cahow said he could not recall seeing any military guards at either end of the line, but the trips and dumping operations were always observed by one or two men in civilian clothing he thought were Honeywell people.

He said no precautions, such as wearing protective clothing, or monitoring the loads for radioactivity, were ever taken, leading him now to believe the drums did not contain anything hazardous.

"Besides," he added, "we are required by the Interstate Commerce Commission (ICC) to signify radioactive loads with placards front, back and sides. We never used any placards on those loads."

Cahow said he continued to haul the Honeywell drums to Duluth after the intake dumping was stopped in 1962 because it was "an easy run and good money."

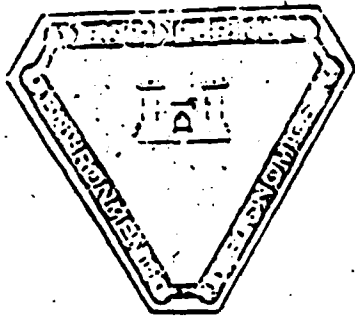
After 1962, the drums were taken to the U.S. Steel plant at Duluth and melted down.

It has been suggested that the drum caches be located and a representative sample of drums hauled to the surface to be analyzed to conclusively determine if they are radioactive.

But Mimeterota Pollution Control Agency (PCA) Director Peter Gove said this week there does not appear to be any solid evidence that the drums contain radioactive material. He said he cannot at the present time recommend spending money to retrieve any of the drums.

St. Paul Pioneer Press
Thurs., Nov. 11, '76

Local and Regional



DEPARTMENT OF THE ARMY
St. Paul District, Corps of Engineers
1135 U. S. Post Office and Custom House
St. Paul, Minnesota 55101

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NOV 2 1976

Army's dump in Superior probed

¹³⁸ By The Associated Press
Michigan officials, acting on the unsubstantiated story of a retired tugboat skipper, want the federal government to find out exactly what was contained in more than 1,400 sealed barrels the Army dumped secretly into Lake Superior 14 years ago.

Although they have no hard evidence, state officials are following up a rumor that the barrels, in 100 to 300 feet of water near the Duluth shoreline, might contain radioactive waste materials.

The Army Corps of Engineers said Monday the barrels hold classified, nonradioactive scrap metal, produced during the manufacture of secret weapons used in Viet Nam. The corps admits there were 1,437 containers dumped between 1959 and 1962.

The dumping was brought to state attention by Marilyn Burton of Sault Ste. Marie, who asked Department of Natural Resources Director Howard Tanner during a Marquette meeting if he had heard a story that the Army dumped radioactive material into Lake Superior.

Danford E. Anderson, now in his early 70s and retired in the Soo, was the skipper of a Duluth-based tug on May 24, 1961. Army records show a secret shipment of 160 barrels was delivered to Anderson for dumping.

Anderson's wife, Gertrude, was at the dock with her husband. She said they were told by "someone" that the barrels "contained stuff from the atomic plant on the St. Paul River."

Minnesota pollution control officials said there were no nuclear facilities in the state at that time. They added they have checked out Anderson's story and have all but dismissed it.

The Andersons have been telling friends about the strange night-time operation for years, but it was only when Mrs. Burton brought it up to Tanner that the state got wind of it.

Preliminary DNR investigation turned up another witness to the dumpings, 50-year-old Leonard Yeo of Laurium in the Upper Peninsula.

Yeo said he remembered participating in the dumping operation and being disturbed by its secrecy.

Michigan officials say they will press their investigation, and may demand the federal government dredge up one or more of the sunken barrels so the contents can be examined and analyzed.

Col. Forrest Gay, head of the Engineers office in St. Paul, Minn., said the Pentagon told him it would not object to that, since the scrap metal has been declassified. But, he added, there is no money in his budget to salvage the barrels.



DEPARTMENT OF THE ARMY
St. Paul District, Corps of Engineers
1135 U. S. Post Office and Custom House
St. Paul, Minnesota 55101



The Dispatch

St. Paul, Minnesota

Fri., Nov. 5, 1970

Secret dumping raises questions

Ridder News Service

DULUTH — Minnesota and Michigan officials, acting on the unsubstantiated story of a retired tugboat skipper, want the federal government to find out exactly what was contained in more than 1,000 sealed barrels the Army secretly dumped into Lake Superior 14 years ago.

Although state officials have no hard evidence, they are following up a rumor that the barrels, in 100 to 300 feet of water near the Duluth shoreline, might contain radioactive waste materials.

DURING the winter of 1963, a fisherman picked up six barrels, believed to be some of the waste containers, about a mile offshore from the Duluth water pumping station.

Both Honeywell Inc., Minneapolis, the manufacturer of the dumped material, and the U.S. Army Corps of Engineers who supervised the dumping of the material, say it is scrap metal, nontoxic, noncontaminating and nonradioactive.

But Honeywell and the corps admitted their records only go so far in identifying the dumped material.

James Brantz, speaking for the corps, said the orders to dump came from Washington, D.C.

He said the shipment of material arrived with Army Military Police in charge and already packed in concrete. The barrels were taken out of the corps' barges to be dumped in the lake.

BRANTZ SAID that the U.S. Army has told the corps that the material is shell fragments. The process of casting the shell so that it would explode into uniform particles was secret; therefore, the scrap from the manufacturing process was classified, he said.

In 1963, a fisherman, Stanley Sivertson, of Duluth, picked up several of the barrels while trawling in about 25 fathoms (150 feet) of water.

Sivertson said he dumped all the barrels back into the water. One of his crew men, however, had looked inside a barrel and had said the contents looked like buckshot or bits of metal which had been melted and mixed with concrete.

The dumping was brought to the attention of Michigan officials by Marilyn Burton of Sault Ste. Marie, who asked Michigan Natural Resources Director Howard Tanner during a Marquette, Mich., meeting whether he had heard the Army dumped the radioactive material.

DANFORD E. Anderson, now in his early 70s and retired, was skipper of a Duluth-based tug on May 24, 1951. Army records show that a secret shipment of 100 barrels was delivered to Anderson for dumping.

Anderson's wife, Gertrude was at the dock with her husband. She said recently they were told by "someone" that the barrels "contained stuff from the atomic plant on the St. Paul river."

Minnesota Pollution Control Agency officials said there were no nuclear facilities in the state at that time. They added they have checked out Anderson's story and have all but dismissed it.

But John Pegors, regional PCA director, said he wants the Corps to retrieve some of the barrels and check their contents.

BRANTZ said the material was put into containers of wood, paper, and metal. Concrete was added for ballast.

"That would indicate the material was not radioactive — that it was packed in wood and paper," Brantz said.

But James Pruehan, environment specialist for the Michigan DNR said that radiation from Alpha-emitting waste such as plutonium, would be stopped by wood, paper or concrete.

He added that putting radioactive waste materials into concrete and dumping them into water was a common method of disposal in the early 1960s.

STATE OF MICHIGAN



*noted
21* *DD info*

NATURAL RESOURCES COMMISSION

JOHNSON
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DEPARTMENT OF NATURAL RESOURCES

STEVENS T. MASON BUILDING, LANSING, MICHIGAN 48928
HOWARD A. TANNER, Director

December 22, 1976

COPIES from NC

Mr. James L. Liverman
Assistant Administrator for
Environment and Safety
U.S. Energy Research and
Development Administration
Washington, D. C. 20545

Dear Mr. Liverman:

Thank you for your letter of December 7, 1976 explaining the results to date of your investigation concerning the contents of the barrels which were dumped into Lake Superior by the Army Corps of Engineers. I realize that your agency has spent considerable time and effort in reviewing your records concerning nuclear waste material which could be contained in the barrels; and that the EPA and Corps of Engineers have conducted water sampling which showed no radioactivity or elevated water quality parameters in the vicinity of the 20 barrels that were located.

However, it is still our position that to provide a completely satisfactory answer to the public, representative barrels must be removed from each of the dump locations and be opened for analysis. I realize that your agency is only peripherally involved, however, our position is that the Federal Government dumped the barrels in the waters of the Great Lakes without the states' knowledge or approval and we feel that it is their responsibility to assure the citizens of these states that the barrels do in fact contain inert materials.

By copy of this letter, I am notifying Governor Milliken, Congressman Ruppe, the Corps of Engineers and other states which border on Lake Superior that our position has remained unchanged and urge them to support efforts to obtain conclusive information on the contents of these barrels.

Sincerely,

Howard A. Tanner
Director

cc: Governor Milliken, Cong. Ruppe, Gen. Moore,
Mr. Alexander, Mr. Goye, Mr. Gebken



B1

Save Lake Superior Association



TO PREVENT THE POLLUTION OF LAKE SUPERIOR

Dan Rau
117 N. 2nd Ave., E.
Duluth, Minnesota
55805

2nd August, 1976

Col. Max W. Noah
1135 U.S. Post Office and Customs House
St. Paul, Minnesota 55101

Dear Colonel Noah:

I have been trying to determine the contents and origin of some 55 gallon drums which were dumped into Lake Superior near Duluth and some of which were subsequently caught in 1968 by a fishing boat in a trawl net, brought to the surface and dumped again in shallower water. I have talked to the person who handled those drums. He described them as weighing about 700 - 800 lbs., having sand in them, and being nearly rusted through in places. He said there were no marks evident on the barrels, except numbers which meant nothing to him. On two separate occasions, this boat picked up drums of this description, once two drums, and the second time four drums, both times about 1 1/2 miles east (up current) of the intake for the Duluth City water pumping system, which is about two miles northeast of the Lester River.

I have talked twice to Court Mueller of your Duluth office and he has given me a (barely legible) copy of a letter to Rep. Phillip K. Zappe dated 12th June, 1975 signed by you, and said that he has no more information on any drum dumping, except possibly the tug logs. Knife River, where the drums described in that letter were supposedly dumped is 12 miles east of where the above drums were recovered, and the recovered drums were picked up in about 25 fathoms (150 feet) whereas the drums in your letter were supposedly dropped into 350 feet of water.

I am not satisfied that the drums described in your letter are the ones which were picked up in the trawl of the HIAWATHA in the winter of 1968. Since you obviously have some records of dumping which are apparently not available in Duluth, would you please go through those records to see if there was any other, possibly earlier, dumping closer to the pumping station which might reasonably account for the drums recovered by the HIAWATHA. Needless to say, any harmful material in that area would have a high chance of being taken in by the Duluth city water intake because of the prevailing current northeast to southwest along the North Shore.

With many thanks for your attention. Sincerely,

Dan Rau
Dan Rau, Vice President

B 2

NCSPA

Inquiry Regarding Disposal of Waste
Material in Lake Superior by Corps

Memo for Record

Chief, Public Affairs Office 10 Nov-76

1. Public Affairs Office received a telephone call in the morning of 2 November from Kirk Schaffitz, a reporter for the Detroit Free Press. Schaffitz wanted information on steel drums dumped in Lake Superior between 1959 and 1961 by the Corps and which rumor alleged contained nuclear material or radioactive wastes. His basic question was whether the Corps would consider raising one or more of the barrels so that the contents could be analyzed. The call was transferred to District Engineer who told Schaffitz that material dumped -- produced by Minneapolis Honeywell Regulator Company for Chicago Ordnance District -- was several hundred containers, mostly 55-gallon drums, which contained classified metal scrap shown on Corps records to be non-toxic, non-radioactive and non-explosive. DE said he would check further on exact number of containers dumped, how many dumps and locations. Schaffitz said that story had resulted from statements of Mrs. Joseph R. Burton at meeting of Michigan DNR. Mrs. Burton, Schaffitz said, declared at the meeting that the wife of a former Corps tugboat captain, Edward Anderson, told her that her husband in 1961 had participated in a dump in Lake Superior of steel drums that were said to contain radioactive wastes from the Twin Cities. Schaffitz further stated that a letter from Michigan DNR Commissioner Howard Tanner to the U.S. Energy Research Development Administration (USERDA) requested a Federal investigation. DE phoned Col. James Miller in Office of Ass't Sec Army Victor Vessey and was told Corps had no authority to exhume barrels.
2. DE received telephone call 2 November from Jonathan Kane, Special Assistant to Michigan Governor Milliken, asking for information on alleged dumping of materials. DE responded with information from District records, assuring Kane that the dumped material was innocuous. The exchange discussed the possibility of retrieving some of the containers to have them examined. DE pointed out that he had no authority or money to conduct such an operation.
3. DE called reporter Schaffitz back afternoon of 2 Nov and informed him that about 1400 containers had been dumped in six operations at two locations -- mouth of Lester River, at about 100-foot depth, and mouth of Knife River, about 300-foot depth. DE again reiterated that material was not radioactive or toxic, and we could not initiate recovery and examination.
4. PA Office 2 Nov contacted Mrs. Gertrude Anderson, wife of Danford, at her home in Sault Ste. Marie. We were informed by her that her husband had suffered a stroke in recent years and she must talk for him. She stated that while she had never made any statement that the Corps had dumped radioactive waste in Lake Superior during her husband's period of employment, that at the time of one of the dumps, in 1960, she had witnessed the loading of the barrels on her husband's vessel and that it was rumored then that the contain-

10 Nov 76

ers "must have contained radioactive wastes because of the heavy military escort that accompanied them." Mrs. Anderson also made reference to "radioactive stories" in local newspaper.

5. PAO called E.J. Sundstrom, reporter for Sault Ste. Marie Evening News, and asked him about stories referred to by Mrs. Anderson. Sundstrom told us that Mrs. Anderson had attempted to get him to run such a story three years previous but after talking to her he gave it little credence and did not follow through because he considered her unreliable.

6. Also on 2 Nov, DE spoke by phone with Mrs. Burton, discussing dumping and allegations of radioactive wastes, informing her that Corps records and circumstances clearly prove that dumped material was harmless.

7. 3 Nov PAO received call from Steve Gadler, member Citizen's Committee of Minnesota Pollution Control Agency, asking details of barrel dumping. He stated dumping was bad judgement even if barrels did not contain radioactive waste. Queries were also received from WCCO-TV which sent camera crew and reporter to interview DDE in the afternoon. Treatment in local news hour was balanced and indicated strong unlikelihood that materials dumped 15 years before were in any way dangerous.

8. Emergency Operations Office received telephone query from official of USERDA asking for background on dumping. He was briefed on the background of the story and seemed satisfied.

9. Queries from media, State officials and citizens continue to be received by Office of DE and PAO once or twice daily.


JAMES E. BRAATZ
Chief, Public Affairs Office

BY



State of Wisconsin \ DEPARTMENT OF NATURAL RESOURCES

Anthony S. Earl
Secretary

January 18, 1977

BOX 450
MADISON, WISCONSIN 53701

IN REPLY REFER TO: 1600

Colonel Forrest T. Gay, III, District Engineer
St. Paul District, Corps of Engineers
1135 U.S. Post Office and Custom House
St. Paul, Minnesota 55101

Dear Colonel Gay:

On December 14, 1976, representatives of the Department of Natural Resources met with officials from the Corps of Engineers, Environmental Protection Agency and the Minnesota Pollution Control Agency to discuss the most recent findings concerning the contents of 1,437 fifty-five gallon barrels of scrap metal that were dumped by the Corps of Engineers in the Minnesota waters of Lake Superior near Duluth. Although investigations to date indicate that the contents of these barrels have not significantly affected water quality in Lake Superior, there appears to be some doubt on the exact content of all the barrels.

Consequently, I would urge you to continue your investigations until conclusive information is obtained on the contents of the barrels. It is the Department's position that the Corps should secure the Honeywell defense contract in addition to recovering a representative sample of the barrels for inspection of the contents. This information should then be made available to the public.

Thank you for your efforts in resolving this sensitive matter.

Sincerely,

Anthony S. Earl
Secretary

cc: Executive Director - Minnesota Pollution Control Agency
Howard Tanner - Michigan DNR
Dr. Donald Mount - EPA

65



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

ENVIRONMENTAL RESEARCH LABORATORY - DULUTH
6201 CONGDON BOULEVARD
DULUTH, MINNESOTA 55804

November 11, 1976

Y 1126

Mr. Peter Gove, Executive Director
Minnesota Pollution Control Agency
1935 West County Road B2
Roseville, Minnesota 55113

Dear Mr. Gove:

During the past few weeks, there have been articles in the local news media regarding waste material from Honeywell Corporation which the Army had dumped in Lake Superior some years ago. Coincidentally with this publicity, we have noticed again a change in the water characteristics coming into our lake water intake at the laboratory, such that some of our animals have stopped spawning and other behavioral abnormalities seem to have cropped up. We have noted instances of this nature from time to time in past years, as well. Naturally, I couldn't help but wonder if there is any connection between these two since it has been some time since the drums have been put into the lake, and undoubtedly some of them may have rusted through by this time.

Furthermore, as you are well aware I am sure, the content of some of the organic hydrocarbons in the lake are higher than common sense would seem to suggest they ought to be and this, too, has made me suspicious about some identified source of materials other than fall-out and rain-out from air transport.

The purpose of my memorandum is to suggest that we attempt to learn more about what was in those barrels and if need be, that we lift one or more of them out and do some analytical work to find out what is in them so that we have a better idea of what to expect should one break.

I have talked to an individual who assisted with the dumping operation and information from that person indicates that there was perhaps a hundred tons of the material dumped in the lake. Judging from the security which surrounded the dump, it seems reasonable to suspect that it was pretty bad stuff that was contained in the drums. For our own interests, we would like to look into this further and solicit your help in doing so.

Very truly yours,

Donald I. Mount
Donald I. Mount, Ph.D.
Director



MINN. POLLUTION
CONTROL AGENCY

B6

LEONARD B. (MR. JOHN D.) SULLIVAN, 110, CHAIRMAN

THOMAS L. AMLEY, OHIO
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 THOMAS H. FORBES, ILLINOIS
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 PAUL S. SARBAPALLI, MICHIGAN
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CHIEF CLERK
 FRANCES J. COUGHLIN
 CHIEF CLERK
 FRANCES STILL
 MINORITY COUNSEL
 EDWARD H. SHAFER

U.S. House of Representatives
 Committee on
 Merchant Marine and Fisheries
 Room 1334, Longworth House Office Building
 Washington, D.C. 20515

November 5, 1976

Colonel Forrest T. Gay III
 District Engineer, St. Paul
 U.S. Army Corps of Engineers
 1210 U.S. Post Office and
 Customhouse
 St. Paul, Minnesota 55101

Dear Colonel Gay:

A situation has just been brought to my attention that appears to represent an incredible lack of good judgment on the part of the Corps, especially since it is the Corps that has primary responsibility for the administration and enforcement of the Refuse Act of 1899. I refer to the reported and acknowledged dumping by the Corps of some 1,437 containers of waste material into Lake Superior in the vicinity of the Knife River between the years 1959 and 1962.

I understand that the State of Michigan has asked for a probe of this affair which was reported to have been conducted in a rather clandestine manner.

Duluth area residents, whose water intakes lie in the vicinity of the Lester River, and, indeed, all residents in the Lake Superior basin are deserving of a full disclosure, of proof that nothing inimical to their health or welfare was or is present, and of a recovery and alternate disposal effort if adequate assurances are not forthcoming.

May I please have the benefit of your advice.

Sincerely,
Philip Ruppe
 Philip E. Ruppe
 Ranking Minority Member

PER/jbw

cc: Brig. Gen. Robert L. Moore
 North Central Division Engineer

B7

DISPOSITION FORM

FILE NO.

SUBJECT

TO AOIC
TCAIOFROM John G. Heren, R10
Mpls-Honeywell Reg. Co.
Twin Cities Arsenal Bldg. 502
New Brighton, Minn.

DATE 25 August 1959 COMMENT NO. 1

J. Heren/ds

1. The following list of facilities and special processes to be utilized by Minneapolis-Honeywell Regulator Co. at Twin Cities Arsenal Building 502 on Contract DA-11-022-ORD-3019 facilities Contract DA-11-022-ORD-2095.

- (a) Chemical Analytical Laboratory.
This laboratory will be utilized to ascertain that materials manufactured here or purchased outside comply with the applicable specifications per the Ordnance Drawing or Engineering Parts List. This laboratory will perform the control function on chemical processes utilized at this plant.
- (b) Meter Direct Reading Spectograph.
This special test machine is used to analyse metal alloys manufactured at this plant to ascertain that they meet specifications per Ordnance Drawing or Engineering Parts list. The information derived by analysis on metal slug curves as a control for their casting operations.
- (c) Phillips X-Ray Refraction and Fluorescence.
Utilized in analysis of material as to structure and composition. This analysis is used as a basis of certification of material produced.
- (d) Radiographic X-Ray (100KV-100A)
This equipment will be used to check weldments and castings in case of doubtful material as to porosity or inclusions. Minneapolis-Honeywell Regulator Co. are also contemplating attempting to evaluate visual standards for these type of defects.
- (e) Aluminum Alloy Heat Treatment Ovens.
This equipment is to be used by Minneapolis-Honeywell Reg. Co. for the treatment of items produced on Contract DA-11-022-ORD-3019
- (f) Metal Finish (Zinc Plate; Chemical Films for Aluminum Alloys; Dichromate; Chemical Clearing of Materials.)

2. All the above equipment is to be utilized by Minneapolis-Honeywell Reg. Co. to supply certification as required by PA-FDs-1112; 669; but also as required by specifications as noted on Ordnance Drawings and Engineering Parts lists for Contract DA-11-022-ORD-3019. This memo is to acquaint all concerned with new equipment being used and to ascertain if any approvals or certifications of processes will be required. This equipment is all located at Twin Cities Arsenal; Building 502; New Brighton, Minnesota and is not equipment found at other Minneapolis-Honeywell Regulator Co. facilities.

C-1



SWORN STATEMENT

For use of this form, see AR 190-30; the proponent agency is Office of The Provost Marshal General.

LOCATION Honeywell Inc.	DATE 3/7/77	TIME 2:00 pm	FILE NUMBER --
LAST NAME, FIRST NAME, MIDDLE NAME Ruby, Allan LeRoy	SOCIAL SECURITY NUMBER. 472-18-7521		GRADE/STATUS --
ORGANIZATION OR ADDRESS Honeywell Inc., Avionics Div., 1625 Zarthan Ave, St. Louis Park, MN			

WANT TO MAKE THE FOLLOWING STATEMENT UNDER OATH

During the 1959 thru 1961 time frame, considerable scrap material of a classified nature was accumulated by Honeywell at Building 502 at the Twin City Arsenal. Some small quantity was from the Hopkins facility, the majority being metals from product produced at Building 502. This was security classified material awaiting disposition authorizing instructions from the Chicago Ordnance District. Far and away the majority of scrap was steel and aluminum mixed into concrete. The material was scrap from hemisphere manufacture of a configuration similar to the photograph shown me by Captain Hager during our discussions on 2/25/77. I can recall two and possibly three occurrences in which I was involved in witnessing the disposition of classified scrap. I know that some and very possibly all of this material was supplied to the Corps of Engineers for disposition within Lake Superior. The preparation by putting material into fifty-five gallon drums did not correspond to the final submersion dates as a number of filled drums were stored at Building 502 and only part of them were placed on trucks at a time.

The material placed in the drums was all non-toxic and handled without requirements for any special cautions or special safety instructions. Material involved was:

- . Ceramic
- . Magnesium
- . Brass
- . Concrete
- . Steel
- . Aluminum
- . Impregnated Paper/Fiber-glass Tape

Due to the lapsed time and absence of records, the foregoing statements are my best recall at this point in time.

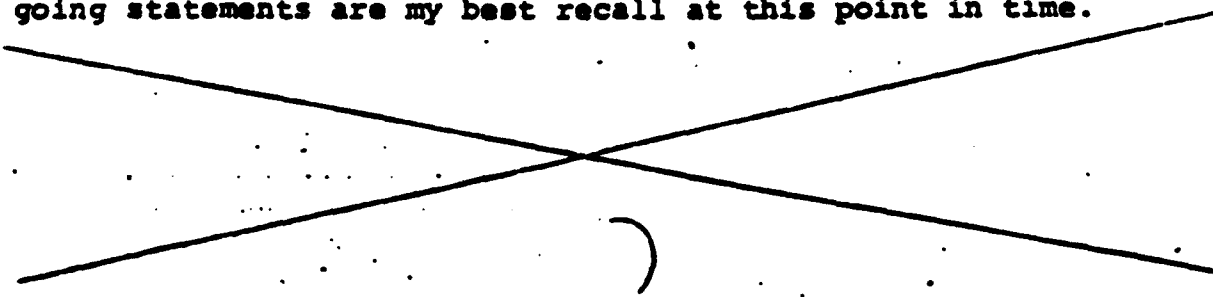


EXHIBIT C-2	INITIALS OF PERSON MAKING STATEMENT LRL	PAGE 1 OF 1 PAGES
----------------	--	-------------------

ADDITIONAL PAGES MUST CONTAIN THE HEADING "STATEMENT OF _____ TAKEN AT _____ DATED _____ CONTINUED" THE BOTTOM OF EACH ADDITIONAL PAGE MUST BEAR THE INITIALS OF THE PERSON MAKING THE STATEMENT. BE INITIALED AS "PAGE _____ OF _____ PAGES." WHEN ADDITIONAL PAGES ARE UTILIZED, THE BACK OF PAGE 1 WILL BE LINED OUT, AND THE STATEMENT WILL BE CONCLUDED ON THE REVERSE SIDE OF ANOTHER COPY OF THIS FORM.

DA FORM 2323

SUPERSEDES DA FORM 2020, 1 JAN 60, WHICH WILL BE USED.

APPIDAVIT OF MILTON M. ROTISMAN

I, MILTON M. ROTISMAN, being first duly sworn on oath, deposes and says:

I served in the United States Army from March 1943 until my retirement in November 1966. I was commissioned as an officer in June 1945. I served as an officer in the Army Ordnance Corps from December 1945 to November 1966.

From August 1962 to January 1964, I served as a contracting officer's representative at the Twin Cities Army Ammunition Plant, New Brighton, Minnesota. My office was located at the plant. This office was a subsidiary of the Chicago Ordnance District, Chicago, Illinois.

My duty as a contracting officer's representative was to insure that Honeywell Incorporated complied with the terms and conditions of its contracts with the United States. I administered other contracts with Honeywell and with other contractors. I was responsible for insuring that the material used in the manufacturing met the contract specifications, that the products met the statistical quality control standards and on a limited basis I negotiated with the contractors and approved changes within the contracts.

Two of the Honeywell contracts, I administered, were for the production of small bomblets, one anti-personnel and one anti-materiel. These bomblets were known as cluster bomb units. The contract was classified as confidential. It was not classified as top secret. The project was classified because the bomblets were new and the configuration and manufacturing techniques were new.

During my term at Twin Cities Army Ammunition Plant, I was in the plant on the production line, on a daily basis. I had to wear safety glasses while I was in the plant. At no time did I ever see anything that would indicate there was any radioactive material in the plant.

The production of the bomblets involved the use of steel. One of the bomblets had steel ball bearings in the bomb casing itself. I know of no special treatments involved. I know of no radioactive material in the two Honeywell buildings. I did not see a radiometer or Geiger counter or any other radioactive measuring device and I did not have to wear a monitoring badge.

The production of the cluster bomb units resulted in disposable steel scrap. Upon my arrival in August of 1962, there was scrap accumulated. It was disposed of in September 1962. The scrap was transported to Camp McCoy and destroyed on a range with C-4 explosive. We then examined the scrap to see that no particles of identifiable size remained.

In the later part of September or in early October 1962, a load of fifty-five gallon drums, filled with the steel scrap were taken to the Corps of Engineers dock in Duluth and loaded on a boat. I understood these drums were to be dumped in Lake Superior.

The scrap was transported by Honeywell in trucks to Camp McCoy, Duluth and Camp Ripley. The trucks at all times were under guard by Honeywell. In late October 1962, or early November, another load of scrap was taken to Camp Ripley and destroyed. I accompanied this load and witnessed the destruction.

The scrap which went to Lake Superior, was loaded in the fifty-five gallon drums until the drums were about three fourths full. The top one fourth was filled with concrete. The drums were three and one half to four feet tall. Each drum was then sealed with a cap. From the production line accumulation, the scrap went directly into the drums. The drums were setting at designated places on the production line. At no time during the handling or transporting of the scrap did I see anyone wearing special protective clothing or equipment. I never had to wear special clothing or equipment.

The scrap taken to Duluth was loaded on the trucks, under guard, and was accompanied by me and Major Dean in a car. We had a car in front and behind the truck with guards, so there is no chance that any other material could have been placed in the truck. There was nothing unusual about the trip. We had about fifty barrels in one truck. The conveyer took the scrap straight to the dock in Duluth. The barrels were placed on the boat's deck so they could be pushed or rolled into the lake. The boat personnel had no special clothing. The boat had no special equipment on it.

C-4

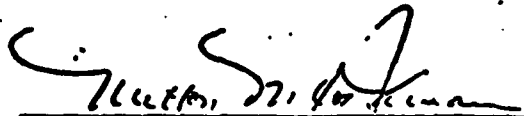
The trip took place in the morning. I ate lunch at the Air National Guard Base in Duluth, after the delivery.

This was the only scrap shipment to Duluth that I ever witnessed. I would have known about any and all shipments to Duluth, during my tour of duty.

When I arrived at Twin Cities Arsenal, I received a security briefing and when I left I was debriefed. I was given no warnings, nor was I cautioned about special handling procedures or health hazards.


I was honorably retired from the U.S. Army in November 1966. I was given an oak leaf cluster for my Army Commendation Medal.

Further affiant sayeth not.


MILTON M. NOTISIAN

Subscribed and sworn to before me this 10th

day of December, 1976.


Notary Public, Minnesota County, Minnesota

My Commission expires December 20, 1981



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

ENVIRONMENTAL RESEARCH LABORATORY - DULUTH
639 CONGDON BOULEVARD
DULUTH, MINNESOTA 55804

C O P Y

Summary of Water Analyses
Pertinent to the Barrels in Lake Superior

Samples of water were taken near the bottom among the barrels and at a point some 100 or more feet "upstream" from the barrels. At the time of sampling on December 4, 1976, the current velocity was about 0.1 FPS. The current direction was such that we expect water discharged from the harbor to have been moving through the area being sampled.

Rigid precautions were taken to avoid contamination of the samples by containers and sampling equipment. A minute quantity of oil from the new winch cable used to lower the sampler, was noted on the lake surface. Precautions were taken to avoid contamination from this source.

The plan of data evaluation was to compare the concentration of metals, organics and radioactivity in the samples collected from among the barrels to the concentrations in water samples taken upstream. Any higher concentration in water from among the barrels would suggest contamination from the barrels or their contents.

An analysis for eleven metals revealed no detectable differences between the two groups of three samples each. All concentrations were within the range of values observed in the western tip of Lake Superior.

A GC-MS analyses for a variety of organic chemicals again revealed no detectable differences. The PCB concentration in both sample locations was a few trillion higher than open lake values. These elevated values

C-6

MORE...

may have been the result of 1) oil contaminants from the cable, 2) a small amount of sediment in the samples or 3) increased amounts from harbor water.

Checks for beta and gamma emitting radionuclides showed no difference between sampling points. The analytical methods used did not include a major sample concentration step so detection limits could be lowered to some extent. The methods used are considered adequate for purposes of these analyses.

ERL-D concludes that water quality around the barrels is good. We find no detectable contributions from them by the elements and chemicals we are able to measure routinely. No information has been found to confirm or deny that the barrels contain steel, aluminum, and zinc, and any solution that might be taking place is not detectable by our methods even though the methods we employed have significantly greater sensitivity than those normally used in routine laboratories.

Memorandum



Nov 29 1950
 Div-542
 1/1/51

FOR ALL INTERNAL COMPANY CORRESPONDENCE

December 14, 1950

DATE: December 14, 1950
 TO: *G. W. Lilliestrop - 805
 FROM: L. J. Quale - 847
 SUBJECT: SUBSIDIARY RELEASE (NO. 2)
 CONTRACT 600-2028

COMES TO:
 J. Barrett - 803
 G. Hanson - 840
 T. Miller - 815
 R. Anderson - 816
 J. Prokes - 816
 J. Tucci - 816
 *L. Felley - 816
 *A. Ruby - 820
 W. Mannik - 820
 *E. Kitchell - 854
 *D. Sakuma - 850
 *H. Maschka - 850
 *W. Michelmann - 831
 G. Goldberg - 810
 F. Robinson - 831
 S. Petrillo - 831
 *L. Rogers - D.C.
 D. MacLennan - M.S.
 G. Keale - 847
 *R. Quale - 847
 J. Emson - 850
 *Ord Files - 247

SPECIAL INVESTIGATION REQUIRED
 REFER TO PORTUGAL NATIONALS
 INVESTIGATION OF ~~REDACTED~~ 12-15-50

Classified copies of the contract

REFERENCE: Original release of May 27, Serial 20005
 Supp. No. 1 July 23, Serial 20023

It has authorized to proceed with the fabrication of the following:

I Delete Item 1 in my release of July 23 and substitute the following:

ITEM NO.	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	AMOUNT
1	Head, M3, 762M Rocket M3, MPTS, including loading of Fuses, Lens: Detonator, M55; Detonator Lock Cup; Fuse, Rocket, Mechanical Timer, M41 and Crate Packing.	670	Each	\$3,234.94	\$5,517,409.00

~~CONFIDENTIAL INFORMATION~~
~~CONFIDENTIAL INFORMATION~~

SUB ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	AMOUNT
(a)	Head, M3, 762M Rocket M3, MPTS	670	1	\$1,620.33	\$1,092,521.10
(b)	Fuse, Grenade, M212	2,072,980	3,094	4 069.60	2,726,619.60
(c)	Top Section Assembly for Grenade M22, OGD. No. 8790433	2,072,980	3,094	1,150.47	770,814.90
(d)	Base Section Assembly for Grenade M22 OGD. No. 8790404	2,072,980	3,094	1,150.47	770,614

COPY.

C-8

DECLASSIFIED OCT 74 PER AUTHORITY MSG
 ANBAR-88 291507Z Oct 74 SUBJ: AMCR 380-3
 SECURITY ICM.

DISPOSITION FORM

For use of this form, see AR 340-15, the proponent agency is TAGCEN.

REFERENCE OR OFFICE SYMBOL

SUBJECT

DRCPM-SA-LS-RI

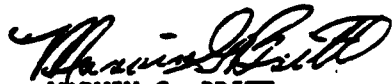
M40 and M32 Grenades

TO DRSAR-ISC
CPT Hager

FROM DRCPM-SA-LS-RI

DATE 14 April 1977 CMT 1
Mr. Britt/jh/6841/6572

1. Reference is made to Lake Superior disposal.
2. The only difference between the two subject grenades was the diameter. When assembled, the metal and make-up of the grenades were the same.



MARVIN G. BRITT
Industrial Program Specialist
DRCPM-SA-LS-RI

C-9.

40190020

FORM 1 APR 54 1181

NOTE - When Government drawings, specifications, or other data are used for any purpose other than in connection with a definitely related Government procurement operation, the United States Government thereby incurs no responsibility nor any obligation whatsoever: it is the fact that the Government may have furnished, furnished, or in any way used all the said drawings, specifications, or other data is not to be regarded by implication or otherwise as in any manner bestowing the holder of any other patent or invention, or conveying any rights or preference to manufacture, use, or sell any patented invention that may in any way be related thereto.

PHYSICAL PROPERTIES	DO NOT DO	APPLY PART NO. AS SPECIFIED	REVISIONS			
			SYM	DESCRIPTION	DATE	APPROVAL
YP		APPLICATION	A	EO-OAC-SP-102	2-26-58	<i>[Signature]</i>
TS		NEET A: 5V	B	EOPA 9131	12-1-61	<i>[Signature]</i>
ELS		USFO ON				
RA						
BM						
RM						

BALL

.095 ± .005 SPHERICAL DIA

(B)

NOTES:-

- 1 - SPEC MIL-A-2550 APPLIES.
- (B) 2 - MATERIAL:- WIRE, STEEL, STEEL NO. 1010, 1015 OR 1020, FINISH NO.1, TEMPER HARD, PRACTICE A OR B, SPEC QQ-W-461 (NOTE 4), OR WIRE, STEEL, GROUP II, STEEL NO. 1013, FINISH I, TYPE 3, SPEC QQ-W-409 (NOTE 5)
- 3 - WEIGHT OF 600 BALLS, 34.5 ± 1.5 GRAMS.
- (A) 4 - APPROVED SOURCE:- MINNEAPOLIS - HONEYWELL REGULATOR CO, HOPKINS, MINN. HAMMERMILLED, FLASHED. (NOTE 6)
- 5 - APPROVED SOURCE:- HARTFORD STEEL BALL CO, HARTFORD, CONN. EITHER DOUBLE - FLASHED OR; HEADED, FLASHED AND UNGROUND (NOTE 6).
- 6 - ALL SOURCES MUST SUPPLY AN ITEM EQUIVALENT TO THE MANUFACTURER'S ITEM INDICATED. ORDNANCE CORPS APPROVAL REQUIRED.

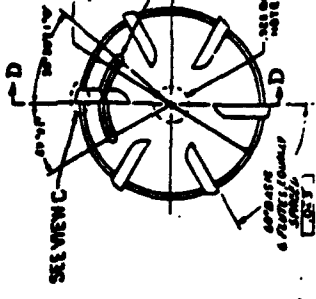
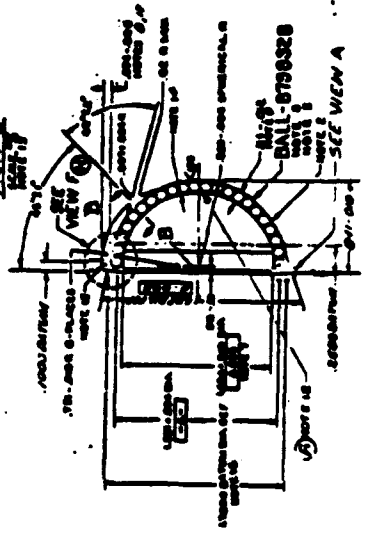
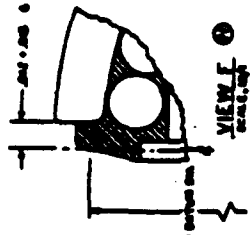
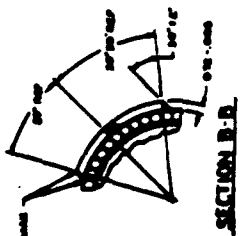
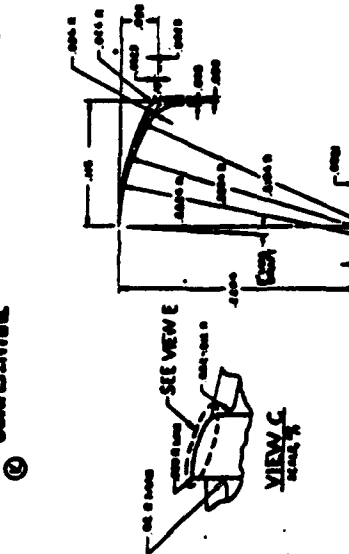
ORDNANCE PART NO. 8793328

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ON FRACTIONS DECIMALS ANGLES	ORIGINAL DATE OF DRAWING: SEPT 27 1957	BALL	PICATINNY ARSENAL		
	MATERIAL SEE NOTE 2		ORDNANCE CORPS DEPT. OF THE ARMY		
HEAT TREATMENT	APPROVED BY ORDER OF THE CHIEF OF ORDNANCE <i>[Signature]</i> ORDN CORPS		SCALE	ORDN CORPS A	8798328
FINAL PROTECTIVE FINISH	APPROVED BY ORDER OF THE CHIEF OF ORDNANCE <i>[Signature]</i> ORDN CORPS		UNIT WT	SHEET	OF

C-10

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1. This drawing is a technical drawing of a mechanical assembly. It consists of several views: SECTION B-B, VIEW C, SECTION D-D, VIEW A, VIEW E, and VIEW G. The drawing is a technical drawing of a mechanical assembly. It consists of several views: SECTION B-B, VIEW C, SECTION D-D, VIEW A, VIEW E, and VIEW G. The drawing is a technical drawing of a mechanical assembly. It consists of several views: SECTION B-B, VIEW C, SECTION D-D, VIEW A, VIEW E, and VIEW G.

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SWORN STATEMENT

For use of this form, see AR 190-30; the proponent agency is Office of The Provost Marshal General.

STATION DCASPRO Plant Office Hopkins	DATE 2-25-77	TIME 1030	FILE NUMBER
LAST NAME, FIRST NAME, MIDDLE NAME HEREN, JOHN GERHARDT	SOCIAL SECURITY NUMBER. 476-18-9268		GRADE/STATUS GS-12/Supvtr
ORGANIZATION OR ADDRESS DCASPRO Honeywell Quality Assurance Rep 600 2nd Street NW, Hopkins, MN 55343			

I John G. Heren WANT TO MAKE THE FOLLOWING STATEMENT UNDER OATH concerning the contents of the steel barrels sunk in Lake Superior. The basics are (1) classified material was being manufactured at Honeywell locations (2) due to problems no classified smelting facility was available (3) safeguarding and storage of this volume of scrap material from mass production was not feasible. It was determined that sinking the material to a great depth in Lake Superior was the most economical and secure method of disposal. The Army Material Command arranged for the material as generated to be placed in 55 gal. steel drums with concrete poured in the base, classified material to within approximately 5 inches of top and a layer of concrete on top. Holes were punched in the side to allow water to enter. (Originally this was not done and some barrels floated due to their displacement being greater than the weight.) These barrels were stored until a quantity sufficient to justify the use of a Corp of Engineer's barge and tow by the Coast Guard. They were then transported by semi-truck under guard to Duluth or Superior, loaded on the barge and then to a point selected by the tow Captain for dumping. This was witnessed by various employees of the Chicago Procurement District or Chicago Ordnance District. The material as generated consisted of two types of metal parts. One type was an embossed strip steel that was formed into hemispheres. Both the flat embossed strip cut into pieces and hemispheres with connecting parts would be in some barrels. The second type was a die cast aluminum with steel shot in a matrix; this could be hemispheres, broken pieces of hemispheres or ingot consisting of shot and aluminum matrix. In addition, small quantities of expended test items were placed in a few barrels. I was a Supervisor of Government Quality Assurance personnel during this period and the course of my duties took me thru these areas each day and I personally saw the content of 75% to 80% of the barrels as they were being filled. In addition, all the barrels filled at the Bldg 502 Honeywell facility were reviewed by one of our personnel prior to final cementing. Further if memory can be relied upon, I believe, that there were a few barrels (no more than 6) of material from Hopkins Honeywell included in one shipment, these contained thermal battery parts and materials. To the best of my knowledge and memory this was the content of all barrels filled at the Honeywell facility and shipped to Lake Superior for disposal. The items being manufactured at the Bldg 502 Honeywell facility at that time were the upper and lower shell for the T57(M43) munition and upper and lower hemispheres for the AM4 and M40 grenades.

C-13

NONE	INITIALS OF PERSON MAKING STATEMENT <i>John G. Heren</i>	PAGE 1 OF 1 PAGES
------	---	-------------------

ADDITIONAL PAGES MUST CONTAIN THE HEADING "STATEMENT OF _____ TAKEN AT _____ DATED _____ CONTINUED." THE BOTTOM OF EACH ADDITIONAL PAGE MUST BEAR THE INITIALS OF THE PERSON MAKING THE STATEMENT AND BE INITIALED AS "PAGE _____ OF _____ PAGES." WHEN ADDITIONAL PAGES ARE UTILIZED, THE BACK OF PAGES MUST BE LINED OUT, AND THE STATEMENT WILL BE CONCLUDED ON THE REVERSE SIDE OF ANOTHER COPY OF THIS FORM.

AFFIDAVIT

I John A. Horan HAVE READ OR HAVE HAD READ TO ME THIS STATEMENT WHICH BEGINS ON PAGE 1 AND ENDS ON PAGE 1. I FULLY UNDERSTAND THE CONTENTS OF THE ENTIRE STATEMENT MADE BY ME. THE STATEMENT IS TRUE. I HAVE INITIALED ALL CORRECTIONS AND HAVE INITIALED THE BOTTOM OF EACH PAGE CONTAINING THE STATEMENT. I HAVE MADE THIS STATEMENT FREELY WITHOUT HOPE OF BENEFIT OR REWARD, WITHOUT THREAT OF PUNISHMENT, AND WITHOUT COERCION, UNLAWFUL INFLUENCE, OR UNLAWFUL INDUCEMENT

John A. Horan
(Signature of Person Making Statement)

WITNESSES:

Robert DeLoach
James H. Jones

Subscribed and sworn to before me, a person authorized by law to administer oaths, this 2nd day of March, 1972 at Hopkins, Hennepin County, Minnesota

ORGANIZATION OR ADDRESS
DCAS/KO honeywell, 600 2nd Street NW
Hopkins, MN 55343

Cornin Jacobson
(Signature of Person Administering Oath)
Commission Expires 05/9, 1982

CORNIN JACOBSON

(Typed Name of Person Administering Oath)

Notary Public

(Authority To Administer Oaths)

ORGANIZATION OR ADDRESS

INITIALS OF PERSON MAKING STATEMENT

JAH

MEMORANDUM



FOR ALL INTERNAL COMPANY CORRESPONDENCE

DATE September 17, 1959 COPIES TO: D. Schram
T. Long
W. Kervik
TO H. Paschke
FROM B. Brooks
SUBJECT Tumbling Scrap Hemispheres and
Runners to Salvage Raw Material

The scrap has been tumbled using (4) different conditions of the load in the barrel or mixture of rock to scrap. It has been determined that the best conditions would be about 60% rock - 40% scrap and about one-third of a barrel full of material. This mixture should be tumbled in water for about 8 hours to remove 60% of the raw material.

To handle the amount of scrap produced on the line would require (2) tumbling barrels as large as the DB-400 Alcoa barrels now in use in the ball group. The barrels would have to be built special to stand the action of the 6" to 8" stones. A barrel with doors with 1/8" diameter holes may work better to remove the raw material as it is broken free. If the small pieces are left in the barrel, they act as a cushion to prevent further breakage of material.

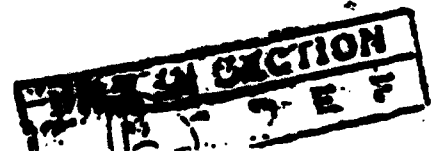
The (2) barrels would have to be run steady for at least 6 weeks, 3 shifts to tumble the scrap available. After this scrap is all used up, it would require 16 hours a day to handle the scrap created each day.

Williams Patent Crusher and Pulverizer Company Inc. can supply a #156 hammermill for \$1299.00, less motor and installation. This hammermill should handle this job and break up all the scrap each day in about 2 hours. The scrap that is available could all be salvaged in 2 weeks and with the present shortage of raw material this would be to everyone's advantage.

As a comparison, it would require about 50 hours to break up a 1000 pounds of scrap with the tumbling barrel and about 3 hours with the Williams' hammermill. The balance of the operations would be about the same for the salvage of the raw material. This does not mean the operator would have to be at the tumbling barrel for the full 50 hours, but the labor would be at least 9 hours/H lbs. using the tumbling barrels.

It is estimated that the hammermill would be a cleaner operation than the tumbling barrels and would require 1/4 of the floor space required for the tumbling barrels.

C-15



The small amount of raw material salvaged to date points out that it is possible to salvage this material and return it to useable raw material. The dimension will be changed .0005 to .001, but the material will still be well within spec.

It is recommended that a Williams' hammermill is purchased or rented as soon as possible and this salvage program is worked out, both to salvage the raw material and to clean up the die cast area.

BB:fx

(2/4)

C-16

DISPOSITION FORM

SECURITY CLASSIFICATION (if any)

SEP 28 1959

FILE NO.

ORDEC-X

SUBJECT

Disposal of Scrap Material
Contract DA-11-022-ORD-3019TO Commanding Officer Chicago Ordnance District FROM Special Representative of Commanding Officer DATE 22 Sept 1959 COMMENT NO. 1
Capt Dean/oj

1. The enclosed Memorandum, which was prepared by Minneapolis Honeywell Regulator Company, reflects the results of experimental work carried on as a result of District recommendations relative to the above subject. The results of this experiment indicate that the recovery of salvage raw material as a result of tumbling would result in considerable equipment to be acquired as well as the necessity for accruing considerable cost from direct labor.

2. Present plans call for the disposal of accumulated scrap at Bldg. 502 by dumping in Lake Superior with the assistance of the U. S. Army Corps of Engineers. This action has become necessary due to the large accumulation of scrap material and the delay in arriving at the feasibility of this suggested method of disposal.

3. It is requested that the enclosed Memorandum be reviewed by appropriate persons and that expeditious action be taken to resolve the system for disposal of this material which must be used in the future.

P R Dean

P. R. DEAN
Capt, Ord Corps

1 Incl
NER Memo dtd 9/17/59

CC - Major Vansant
A. M. Sunder
Herma Barnett
W. M. Livingston

C-17

**LEGAL - COMMUNITY
FOLDER**

Mr. Barnett/gcb/351

ORDEC-EM

29 September 1959

SUBJECT: Use of Equipment in Duluth Minnesota
Minneapolis-Honeywell Regulator Company
Contract No. DA-11-022-ORD-3019

THRU: Division Engineer
U. S. Army Engineering Division
North Central Division
536 South Clark Street
Chicago 5, Illinois

TO: U. S. Army Engineering District St. Paul
1217 U. S. Post Office and Custom House
180 East Kellogg Blvd.
St. Paul 1, Minnesota

1. It is requested that the services of the Lake Superior Office at Duluth, Minnesota, be made available for the disposal of classified scrap material under subject and allied contracts. Mr. Knolton of your organization has been contacted and indicates the equipment is available and has performed this type of service for other Department of Defense Agencies.

2. The Contractor will bear the cost of the use of the equipment. It will also furnish transportation and guard service for material from Minneapolis to Lake Superior. It is estimated that the amount of scrap material will weigh approximately 13,000 pounds, including preparation for disposal.

3. Request a copy of your action be made available to this office at the earliest possible date.

FOR THE COMMANDER:

*9-30-59 Hand carried to Div. Eng
+ approved. Original letter + approved
from Capt. Dean's hand carry to St. Paul, Minn.*

Copies Furnished:
Central File (30C)
Capt. Dean (Twin Cities Insp)

C-18

DOCUMENTARY
JOS. E. WALKER
Assistant

Division Engineer
U. S. Army Engineering Division
North Central Division
536 S. Clark Street,
Chicago, Illinois.

Ha 7-7523

1. Request utilization of existing available equipment in Deluth, Minn. for the disposal of classified scrap material under classified contract.
2. The contractor will bear the cost of the use of the equipment. Mr. Knolton, Lake Superior Officer has been contacted and indicates the equipment is available, and that he has done this type of work before. The contractor will furnish transportation and guard service for material from Minneapolis to Lake Superior. This letter should be written and hand carried to the Chicago Office of the Division Engineer, and after it is approved, sent direct to me in Minneapolis. I will then hand-carry the information to the St. Paul Engineer Office and then to the Lake Superior Office.

Si. pcc

CAPTAIN DEAN

Edw. J. Knolton - Deluth Minn.
Ra 2-1451

Flanagan X626

Dist Eng

~~Cong of Eng~~

U.S. Army Eng Dist
St. Paul.

1217 U.S. Post off + Custom House

180 E Kellogg Blvd

St. Paul 1 Minn

Order of Mr Knauth

ORDEC-X

SUBJECT: Disposal of Scrap Material, Contract DA-11-022-
ORD-3019

THRU: Commanding Officer,
Chicago Ordnance District

FROM: Maj. C. V. Vanzant DATE: 1 Oct. 195
COMMENT #2

TO: Capt. P. R. Dean,
Special Representative of
Commanding Officer

Major Vanzant/ar

1. Arrangements have been made to expedite the disposal of accumulated scrap as reflected in Comment #1 above. Details of these arrangements were discussed during Capt. Dean's visit of 29 and 30 September.

2. With reference to the Memorandum submitted by M. H. R. proposing an additional method of segregating scrap material, it is requested that the following additional information be obtained from the contractor for presentation to this office.

- a. Confirmation that the process recommended has been sufficiently explored to produce the results desired.
- b. Preparation of an estimate of costs for the reprocessing of the metal recovered that will be reused.
- c. The costs of a motor for the hammermill and the expense for installation will also be required.

3. Screening of Government sources for the availability of a hammermill of the same or like model has been initiated.

4. In the meantime, it may be the desire of M. H. R. to prepare a purchase order with complete justification for the needs of this equipment with cost estimates as enumerated above for future presentation.

J. E. Walker
J. E. WALKER

DISPOSITION FORM

SECURITY CLASSIFICATION (U/CONF)

FILE NO.

CRREC-1

SUBJECT

Use of Army Engineer Equipment in Duluth, Minn.
for the Disposal of Classified Scrap

TO Commanding Officer

FROM Special Representative

DATE 7 Oct 1959

COMMENT NO. 1

ATTN: Mr. Barnett

of Commanding Officer

Capt. Dean/oj

1. Reference is made to letter dated 29 September 1959, subject as above, which was sent through the Division Engineer in Chicago to the Engineering District in St. Paul. Mr. L. A. Hauser, Jr., Chief of the Operations Office in St. Paul, concurred in the basic letter and on 6 October 1959, a trip was made to the District Engineer's Office in Duluth to further investigate the necessary procedures.

2. It was found that adequate material handling equipment as well as vessels were available for this operation, and a minimum amount of material handling would be necessary due to proximity of docks and type of vessels to be used. Contact was made with Mr. Yang and Mr. Nowlton, who were most cooperative in their actions. The scrap material which we disposed of by this method is presently being prepared for movement by Minneapolis Honeywell. The present plans are to utilize commercial van-type vehicles between Minneapolis and Duluth. Security arrangements have been coordinated with the Commanding Officer of the M.P. Detachment at Fort Snelling, Major Stapleton, and necessary guards will be made available for the shipment en route as well as the time interval prior to sinking. It is assumed that the disposal will be accomplished within the next two weeks.


P. R. DEAN

Capt, Ord Corps

cc - Major Tarrant
Mr. WalkerFILE IN SECTION
A (B / C D E F

R-52

30 FEB 1950

ORDNANCE OPS

(to be in Official Record)

FILE NO.

CONVERSATION RECORD

STENOGRAPHER

TELEPHONE

VISIT

IN

OUT

TO

FROM

NAME: PRESENT LOCATIONS UNIT

DATE: 10/26/59

WITH: MR. F. DILLON

SECTION: 2ND 2 Div.

REPRESENTING: T. C. A. I. U.

BRANCH: MINNEAPOLIS BRANCH

ADDRESS: 1006 W. LAKE ST.

CONTRACT: 3019

CITY: MINNEAPOLIS, MINN.

ITEM:

TELEPHONE: FE 9-3612

EXTENSION: 293-294

SUBJECT:

OTHERS PARTICIPATING:

PRELIMINARY NOTES

CONVERSATION IN BRIEF

1. CLEARANCE FOR JOHN WINKIE IN MAIL TODAY

CAPT DEAN WILL DEAN DULUTH. HE WILL IF POSSIBLE, WITNESS DUMPING OF SCRAP

2. NOT NECESSARY THAT SAID ACCOMPANY CLASSIFIED SCRAP TO DULUTH, MINN.

FROM CORPS OF ENG BARGE IF WEATHER WILL NOT PERMIT. IMMEDIATE

CONVOY IS UNDER MILITARY CONTROL THROUGHOUT JOURNEY. SUGGEST SOME CERTIFICATION BE OBTAINED SHOWING THAT AMOUNT OF SCRAP PICKED UP WAS ACTUALLY DUMPED.

BARGE MOVEMENT, STATEMENT WILL BE SECURED FROM CORPS OF ENGS. PERSONNEL

DATE	10/26/59
FILE NO.	3019
CONTRACT NO.	
REPORT BY	J. A. J. [Signature]
REVIEWED BY	[Signature]

EXHIBIT DOCUMENTARY

FOR DISCUSSION BY FILE

C-72

SIGNATURE: [Signature]



DEPARTMENT OF THE ARMY Mr. Eichhorn/rhc/584-3816
U. S. ARMY ENVIRONMENTAL HYGIENE AGENCY
ABERDEEN PROVING GROUND, MARYLAND 21010

HSE-EW-A

80 JUN 1977

SUBJECT: Environmental Hazards of Waste Disposal in Lake Superior

Commander
USA Armament Materiel Readiness Command
ATTN: Environmental Quality Office
Rock Island, Illinois 61201

1. References.

- a. FONECON, 17 June 1977, between MAJ Daniel Wilking, your Headquarters, and Dr. Donald Emig, this Agency.
- b. FONECON, 28 June 1977, among MAJ Wilking, Dr. J. T. Wyatt, and Mr. Henry C. Eichhorn, this Agency.

2. Reference 1a requested this Agency to evaluate, on a worst case basis, the potential environmental hazard due to chemical toxicity of disposal in Lake Superior, during the period, 1957-62, of six sealed 55-gallon drums containing potential toxicants (lithium chloride, barium and calcium chromate, calcium chloride, and zirconium metal). The following simplifying assumptions were proposed by your Headquarters.

- a. Instantaneous dissolution and diffusion of contents of the drums.
- b. A mixing zone 1 mile in diameter 100 feet deep.
- c. Each drum filled by about 50 percent with each toxicant.

3. Reference 1b requested a separate evaluation of environmental hazard due to chemical toxicity of some 1440 drums (55 gallons) of steel and aluminum parts, consisting of six dumps at the same site during the period, 1957-62. Some efforts have been made to retrieve the drums which, to this date, have been unsuccessful. Findings of this Agency will be a basis for decision as to whether further retrieval attempts will be made.

C-24

HSE-EW-A

SUBJECT: Environmental Hazards of Waste Disposal in Lake Superior


4. Based upon technical considerations summarized in the table appended as an inclosure to this letter, it is our considered judgment that the dump referred to in reference 1a, should the sealed drums open, represents negligible environmental hazard with the exception of chromium, due to barium and calcium chromate, which represents low hazard as a result of propensity of chromium to bioaccumulate in biota of the food chain leading to man. However, we feel that the simplifying assumptions, together with the criterion chosen, have been sufficiently conservative as to cause the probability of the event of bioaccumulation of chromium to be exceedingly small.

5. In our opinion, the environmental hazard due to chemical toxicity of aluminum and steel parts is also negligible. This opinion is based on the exceedingly small solubility of steel and aluminum. Because of this tiny dissolution rate and the vast volume of Lake Superior, we are certain that the dissipative capacity of the Lake far exceeds the dissolution rate of the metals, and that the chemical background of the Lake and of the mixing zone specified will never be exceeded due to this small addition.

6. This Agency recommends that no further attempt be made to retrieve the drums referred.

FOR THE COMMANDER:

1 Incl
as


JOHN P. PIERCY, P.E.
COL, MSC
Director, Environmental Quality

MEMORANDUM FOR RECORD:

SUBJECT: Classified Scrap in Lake Superior

1. From the historical records available, which are limited due to required record destruction and the sinking of one tugboat and the burning of another, both with logbooks, the following is the dump dates and depths of the six known dumps of barrels into Lake Superior:

- a. Dump No 1 o/a 27 Oct 59 in not less than 100 ft of water.
- b. Dump No 2 o/a 25 Sep 60 in not less than 100 ft of water.
- c. Dump No 3 o/a 15 Jun 61 in not less than 100 ft of water.
- d. Dump No 4 o/a 14 Oct 61 in not less than 200 ft of water.
- e. Dump No 5 o/a 26 May 62 in not less than 300 ft of water.
- f. Dump No 6 o/a 26 Sep 62 in not less than 300 ft of water.

~~In addition to water depth, the dumping instructions specified~~
dumping to be done not less than 3 miles from shore.

2. Actual dump sites are not known except for the one which was located with the help of a commercial fisherman who unintentionally caught some barrels in his fishing net and with a sonar device that gives a bottom profile of an area of the lake. The St. Paul District Engineer's Office stated that without a starting point, such as given by the fisherman, the remaining dump sites would be nearly impossible to locate.

James R. Hager
JAMES R. HAGER
CPT, CE
Civil Engineer

ESTIMATED HAZARD DUE TO CHEMICAL TOXICITY IN A CIRCULAR MIXING ZONE (ONE MILE IN DIAMETER BY 100 FEET DEEP)

Chemical Species	Maximum Estimated Dump (pounds)	Maximum Concentration Expected (milligrams per liter)	Criteria for Safe Concentration	Estimated Safe Concentration (milligrams per liter)	Bioconcentration Factor (milligrams / liter)	Estimated Environmental Hazard
Barium	3305	0.02		0.5	8.0	Negligible
Calcium	1277	0.01		75.0	1	Negligible
Bromine	1285	0.01		0.05	0.003	low
Uranium	1002	0.01		5.0	2.0	Negligible
Ironium	6120	0.05		0.14	0.25	Negligible

* Coded as follows:

- A "Water Quality Criteria, 1972." Nat Acad Sci., Nat Acad Engr., Wash DC (1973).
- B Hibbard, P.L., "The significance of mineral matter in water," Amer Water Works Assoc 21, 884 (1934).
- C Based upon the product of a conservative median tolerance limit for fathead minnow (14 milligrams per liter) times a conservative application factor of 0.01 [see National Technical Advisory Committee to the Secretary of the Interior, Water Quality Criteria, US Environmental Protection Agency (1972)].
- D World Health Organization, International Drinking Water Standards, Geneva (1958).
- E Noncritical; see following reference:
- F Wood, J.M., "Biological cycles for toxic elements in the environment." Science 163, 1049-1052 (1974).
- G No data.
- H Swanson, G.H., 1974, "The chemical toxicity of elements," Battelle Pacific Northwest Laboratories. Document No. 2284-1015 (1974).

**US ARMY ARMAMENT MATERIEL READINESS COMMAND
PUBLIC AFFAIRS OFFICE ROCK ISLAND, IL 61201
(309) 794-5838, 5421, 6144
AUTOVON 793-**

NEWS RELEASE

DATE: 29 April 1977

NO: 96-77 PSC

ARMY TO RAISE SCRAP FROM LAKE BOTTOM

HQ, US ARMY ARMAMENT MATERIEL READINESS COMMAND (ARRCOM), ROCK ISLAND, ILLINOIS,
29 April 1977 ----Several barrels of formerly classified scrap material
dumped by the Army in Lake Superior nearly 20 years ago will be raised from the
lake bottom to ascertain their exact contents, Army officials announced here today.

The material, dumped during the late 1950's and early Sixties, has recently
evoked concern from a number of Government officials and environmentalist groups
as to whether the scrap was affecting the lake's water quality.

~~Excavation of several barrels will be undertaken as soon as weather conditions~~
and plans are finalized, the Army announced. A detailed analysis of the scrap,
made up of such metals as zinc, steel and aluminum, will be done by the
Environmental Research Laboratory in Duluth.

Although water samples, taken in December 1976 by the EPA, Duluth, around
one of the known dump sites, indicated good water quality, Army officials
acknowledge that environmentalists and other interested parties will continue
to speculate on the barrel contents until the analysis of the material is made
public.

Some 1400 barrels were disposed of in the lake during 1959 through 1962. The
residual scrap material was left over from production lines of Honeywell, Inc.,
the Minneapolis electronics firm which had an Army contract to produce
fragmentation grenades.

- E N D -

E-1

**US ARMY ARMAMENT MATERIEL READINESS COMMAND
PUBLIC AFFAIRS OFFICE ROCK ISLAND, IL 61201
(309) 794-5838, 5421, 6144
AUTOVON 793-**

NEWS RELEASE

DATE: 16 May 77

NO: 113-77

PSC

ARMY DIVERS TO RAISE WAR SCRAP

HQ, US ARMY ARMAMENT MATERIEL READINESS COMMAND (ARRCOM), ROCK ISLAND, ILLINOIS, May 16, 1977 ---- An Army diving team will raise one or more barrels of formerly classified scrap materiel from Lake Superior during the second week in June, an Army spokesman said here today. Colonel William T. Green, Chief of Staff of the US Army Armament Materiel Readiness Command, announced that divers from the 86th Engineer Detachment (Diving) from Fort Belvoir, Virginia, will be in charge of the recovery operation. The dive will be subject to weather conditions, said Colonel Green.

Some 1400 barrels of scrap were dumped in the Lake during the late 1950's and early Sixties. The scrap was left over from the production lines of the Minneapolis-Knevet Regulator Company which was under Army contract to produce fragmentation grenades. The process of casting the shell so as to explode into uniform particles was secret; the scrap from the manufacturing process was classified. It was later de-classified during the Vietnam War.

A fully equipped derrick boat with decompression chamber and other diving apparatus will act as mother ship for the salvage operation. Army divers hope to locate one of the suspected dump sites in some 120 feet of water near the Knife River estuary.

According to Army sources, once the site is located, divers will bring one or more barrels to the surface. Representatives from the Environmental Research Laboratory, Duluth, will be on hand to observe and later analyze the content of such metals as zinc, steel and aluminum.

- M O R E -

E-2

N.R. 113-77
Page 2

Army officials acknowledge that environmentalist groups have been concerned over the barrel contents. Said Green, "Ever since the barrels became a subject of discussion, rumors have been flying that they contain some form of toxic or radioactive substance. We want to lay those rumors to rest."

Although water samples taken by the EPA last December discount any water impurities, public speculation has continued.

- E N D -

Headquarters, US Army Armament Materiel
Readiness Command, Rock Island, Illinois

NEWS RELEASE

DATE: 10 June 1977

Dateline: Duluth, Minnesota, 10 June 1977 - - A three day search by Army divers failed to locate and recover barrels of formerly classified scrap materials from Lake Superior, an Army spokesman said here today.

Some 1400 barrels, sunk in depths ranging from 120 to 500 feet of water nearly twenty years ago, contained left-over metal scraps from the production lines of the Minneapolis Regulator Company which was under Army contract to produce metal parts for controlled fragmentation munitions.

These munitions were classified during the late 'fifties' and early 'sixties', and later de-classified during the Vietnam War. The Army diving team from the 86th Engineer Detachment (Diving) from Fort Belvoir, Virginia, made approximately 12 dives and spent more than 6 hours on the

lake bottom searching a suspected dump site one and half miles off the North shore of the Lake, some 10 miles from Duluth.

Working with underwater detection gear, including TV cameras and Sonar equipment they searched for the elusive barrels. The Army crew were joined in their quest by Doctor Thomas Johnson of the University of Minnesota, one of the country's leading experts on underwater detection.

Colonel William T. Green, Chief-of-Staff for the U.S. Army Armament Materiel Readiness Command, Rock Island, Ill., stated that while he was disappointed that a sample barrel could not be opened to convince skeptics of the (barrel) contents, sufficient evidence does exist from old records and eye-witness accounts that the contents are as the Army has said all along.

He emphasized that no evidence exists that the barrels are contaminating the

Lake or hazardous to public health. "But, I'm also mindful of those who have express concern over this particular issue. However, it does not change — the documented evidence we uncovered during an exhaustive investigation, that these containers are filled with other than metals of zinc, steel and aluminum encased in cement. They are neither toxic nor radioactive", he said. "It's been a tough decision to call-off the operation but, we've given it our very best try. It's expensive and to continue would be a waste of the taxpayer's money", he concluded.

#

DEPARTMENT OF THE ARMY
St. Paul District Corps of Engineers
Lake Superior Area
Canal Park
Duluth, Minnesota 55802

THE ST. PAUL JOURNAL

MINNEAPOLIS, MINN.,

9 JUNE 1977

Metal Waste Barrel Search Continues

DULUTH, Minn. (UPI) — U.S. Army Corps of Engineers divers were back in Lake Superior today attempting to locate barrels dumped into the lake in the late 1950s.

Six divers searched the shallowest of four known spots where the barrels were dumped Wednesday, but failed to come up with anything.

The barrels, containing waste metal fragments and grenades produced by Honeywell for the military, have been the subject of a controversy over whether they are polluting the lake.

Water samples taken from the area around the barrels last fall showed no difference from water in other parts of the lake, but officials of the Minnesota, Wisconsin and Michigan Departments of Natural Resources demanded further testing.

The 1,637 barrels were dumped along the North Shore near the Knife River between 1959 and 1962. At the time the contents were classified as secret, but they have since been declassified.

DEPARTMENT OF THE ARMY
St. Paul District, Corps of Engineers
Lake Superior Area
Canal Park
Duluth, Minnesota 55802

THE DULUTH HERALD

DULUTH, MINN.

9 JUNE 1977

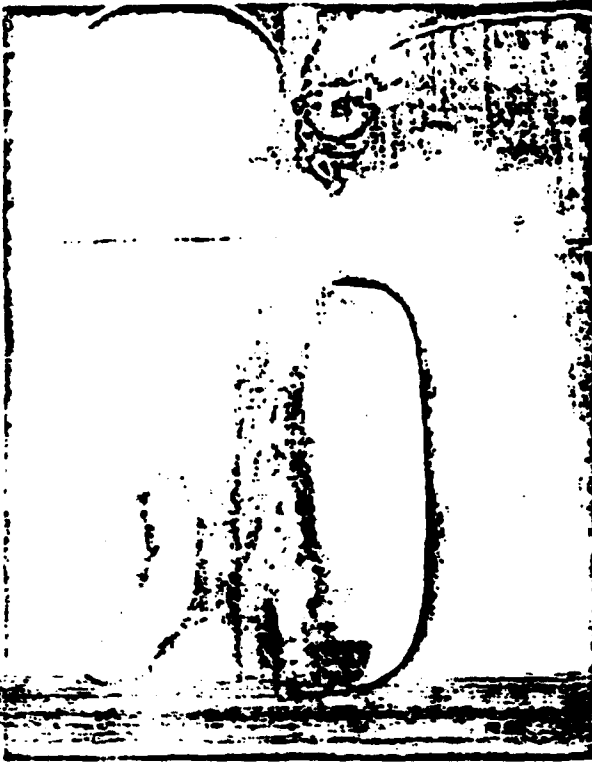


TRACKING BARRELS—Divers were back in Lake Superior today searching for 1,400 barrels sunk in the mid 1930s and early 1940s by the U.S. Army. The divers scoured the bottom in 200 feet of water Wednesday about 10 miles east of the Duluth ship canal, but found only tracks possibly left by 20-gallon steel drums as they moved with underwater currents. The Corps of Engineers plans to lift four of the drums and examine the contents. A Corps official expects the operation will confirm rumors indicating the drums "contain absolutely nothing but empty metal."

DULUTH NEWS-TRIBUNE

DULUTH, MINN.

9 JUNE 1977



Staff photo by Jerry McLeister
Bottom of Lake Superior, as seen through a television monitor aboard recovery vessel. The dark streak toward the bottom of the screen is believed to be a "barrel track."

Divers see 'tracks' but . . . no barrels

By RICHARD L. POMEROY
Of the News-Tribune staff

Divers Wednesday were tracing barrels along the Lake Superior bottom in 140 feet of water.

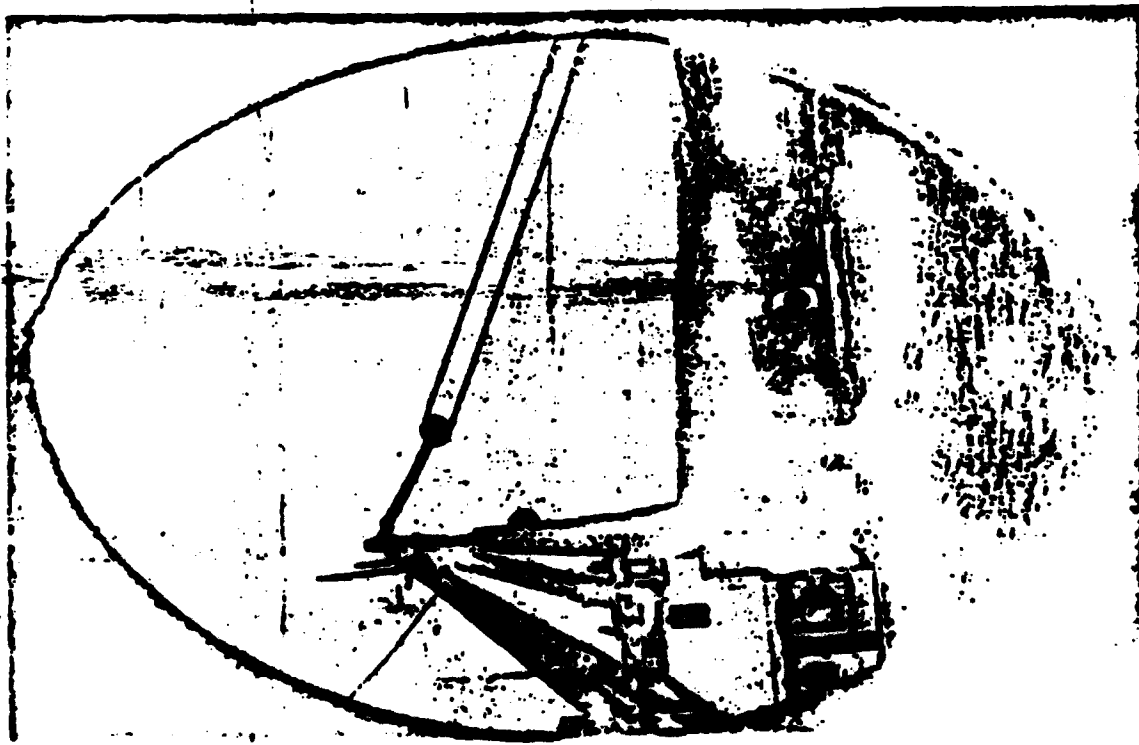
That's right -- barrel tracks.

At least, that's what the divers believe they saw. That's what they reported when they came to the surface without sighting any of the 1,400 mysterious barrels sunk in the lake during the mid 1930s and early 1950s.

The U.S. Army and the U.S. Army Corps of Engineers struck out Wednesday in the underwater search for the barrels, supposedly containing scrap metal which during that period was classified as "secret."

The hunt will continue today. Involved is a team of six divers from the army's

Continued on Page 11A, Column 1



Staff photo by Jerry McLeister
Aboard a big frames diving platform action on Lake Superior the Army attempts to recover barrels it dumped in the lake more than 40 years ago.

No barrels sighted

From Page One

86th Engineer Detachment at Ft. Belvoir, Va., with Col. William T. Green, chief of staff, U.S. Army Materiel Readiness Command, Rock Island, Ill., as project officer.

If none of the barrels is located and raised for inspection, "we'll have a tough decision to make" on whether to continue the search, the project officers said as the first day produced no results.

Well, no tangible results. Divers reported seeing marks on the lake bottom, marks they suggested could have been made in the thin layer of silt by the barrels (actually 55-gallon steel drums) if they rolled with underwater currents.

The marks are the "rip marks" that have been made by the barrels. The type used in the disposal of the material. Sgt. Herbert Buchite, the chief diver said.

Divers have been following one of the tracks "because at this stage it's the only thing we have going for us," he added.

The tracks were seen by divers on the lake bottom and by television monitor-watches aboard the corps' derrick barge (on-man on the surface, about 10 miles east of the Duluth ship canal and more than one-half mile off the coast there.

Locations of the barrels were found by use of sonar last fall and marked on charts. Returning now, the searchers anchored the barge at the most westerly location, but have had difficulty finding any of the barrels.

As the search started Wednesday, Green was confident the divers would locate at least four barrels. He told news media representatives he was certain the operation would confirm search which indicates the "drums contain ab-

solutely nothing but scrap metal."

The barrels are being recovered, he said, "because some people just won't believe that", and examination of the contents will "set the rumors (about toxic substances or radioactive material) to rest."

The materials and the process used in making the small antipersonnel fragmentation bombs no longer is classified as "secret," he said.

The army tried several methods of disposing of the scrap metal, including use of explosives at Camp Ripley, Green said. That failed, and the disposal was made in the lake until a plan was devised to melt the scrap at U.S. Steel's

Duluth Works in 1962. The lake dumping ended then.

Divers and television cameras today will continue the search, with the underwater cameras being used at intervals between the 40-minute diving periods.

Water clarity in the area is surprisingly good, media representatives observing the attempted recovery operation noted.

On the deck of the derrick barge they watched television monitors as the camera scanned the lake bottom without use of artificial light.

Divers reported visibility at depths 125 to 140 feet in that area is from 10 to 15 feet.



A U.S. Army Corps of Engineers diver leaps from the deck of a vessel being used in an attempt to recover one of about 1,400 barrels of waste dumped into Lake Superior years ago.

DEPARTMENT OF THE ARMY
St. Paul District Corps of Engineers
Lake Superior Area
Canal Park
Duluth, Minnesota 55802

DULUTH NEWS-TRIBUNE

DULUTH, MINN.

10 JUNE 1977

Barrels playing hard to get yet



1977 photo by Charles Curtis
Sgt. John Huesbarn assists Sgt. Joe Conde with diving gear as they prepare for one more attempt to raise barrels sunk by the Army years ago.

The search was almost 13 hours long Thursday but still not one of the approximately 1,400 barrels at the bottom of Lake Superior has been sighted.

For the second day, the U.S. Army Corps of Engineers hunted for the barrels with divers. The barrels are supposed to contain scrap metal classified as "secret" during the mid 1940s and early 1950s when they were dumped into the lake.

At 6 a.m. today the same divers will be on the job—but with different equipment guiding their work.

Dr. Thomas Johnson, University of Minnesota, is back in Duluth to use the same sonographic equipment with which located some barrels last fall.

Courtland Mueller, Lake Superior District corps chief, said he hopes it will be a short and successful day. The equipment was installed on a Coast Guard tug late Thursday and is ready to go, he said.

The barrels are thought to be about 10 to 12 miles up the shore from the Duluth-Superior harbor and in 140 feet of water about one mile offshore.

The barrels are being sought, said Col. William T. Green, chief of staff, U.S. Army Materiel Readiness Command, Rock Island, Ill., to confirm research that they contain nothing but scrap metal.

DEPARTMENT OF THE ARMY
St. Paul District, Corps of Engineers
Lake Superior Area
Canal Park
Duluth, Minnesota 55802

THE DULUTH HERALD

DULUTH, MINN.

10 JUNE 1977

Barrel hunt nearly over

The three-day underwater search for the elusive barrels in Lake Superior may be nearly over.

The communication came about 11 a.m. today from U.S. Army and U.S. Army Corps of Engineers personnel aboard a derrick barge 30 miles northeast of the Duluth ship canal and about one-half mile off the North Shore.

Sophisticated sonographic equipment apparently has pinpointed the location of the barrels, dumped in the lake during the late 1940s and early 1950s. They supposedly contain unexploded ordnance, including from production of small arms and personnel carriers.

Divers Wednesday and Thursday were unable to locate the disposal areas, charted last fall by Dr. Thomas Johnson of the University of Minnesota. He returned to the scene today with the same equipment, and a spokesperson for the government's recovery team said the barrels may have been located in about 180 feet of water.

The army launched the recovery attempt to quell rumors that the barrels may have contained some toxic or radioactive substances which may be harmful to public health.

DEPARTMENT OF THE ARMY
St. Paul District Corps of Engineers
Lake Superior Center
Duluth, Minn.

DULUTH NEWS-TRIBUNE

DULUTH

10 JUNE 1977



Sgt. Joe Condo looks for the bottom of Lake Superior in Thursday's episode of the Corps of Engineers barrel

haul, while Sgt. Al Hunt handles the diver's line. See story, other picture on Page 2A.

Search called off

Unable to find sunken barrels

DULUTH, Minn. (AP) - Between 14 and 20 barrels out of 1,400 dumped into Lake Superior by Armed Forces personnel almost 20 years ago have disappeared for the second time.

The barrels, which some had warned might contain toxic or radioactive elements, were located on the lake bottom last December by investigators from the U.S. Army Corps of Engineers.

But Friday, a Corps spokesman said a three-day effort to relocate the barrels and bring them to the surface has been unsuccessful, and the Corps has

dangerous substances. However, government officials said the barrels contained scraps from research on new mortar weapons, consisting of zinc, steel and aluminum in a cement casing.

Between 14 and 20 of the barrels were located in 150 feet of water last December, about 10 miles from Duluth and about one and one-half miles from the Minnesota shoreline. Corps engineers took water samples from the barrel field which was analyzed for possible contaminants.

The results from those tests showed that water in the area was different from other waters in Lake Superior.

Blantz said a team of Army divers and civilian experts spent three days attempting to locate the barrels. The search used a variety of sophisticated instruments, including sonar and metal detectors.

Blantz said the order to halt the search was given by Col William Green, chief of staff of the U.S. Army Ammunition Material Readiness Command (AARCOM) in Rock Island, Ill.

He said the decision to halt the project was based on cost and on the belief that the barrels probably could not be found.

that didn't bury themselves in silt have worked their way down into deeper water," said Jim Blantz, a spokesman for the Corps office in St. Paul.

He blamed the prospects of finding the missing barrels to "looking for Moby Dick or Bigfoot. The chances of finding them are very, very slight."

The barrels, dumped into Lake Superior near Duluth between 1959 and 1961, were said to contain secret weapons material generated by Honeywell Inc., Minneapolis.

The search for the barrels had been prompted after environmental groups warned that the barrels might contain dan-

DEPARTMENT OF THE ARMY
St. Paul District Corps of Engineers
Lake Superior Area
Canal Park
Duluth, Minnesota 55802

DULUTH NEWS-TRIBUNE

DULUTH, MINN.

11 JUNE 1977

A search not like shooting fish in barrel

BY RICHARD POMEROY
Of the News-Tribune staff
After three days of underwater
searching for some of the 1,400 barrels

of scrap material sunk in Lake Superior
more than 15 years ago, the score Fri-
day was:

• Lake Superior U.S. Army 0.

The U.S. Army Corps of Engineers
gave up Friday after failing to locate
any of the barrels in 125 to 140 feet of
water about 10 miles east of Duluth and
one-half mile off the north shore.

Army divers, aided by sophisticated
sonographic equipment from a barge
on the surface, could not find the barrels
(actually steel drums) in the areas the
electronic gear detected them last fall.

The operation in November pinpoint-
ed the apparent location of some of the
barrels and water quality tests were
made because of concerns expressed by
environmentalists about possible conta-
mination of the drinking water sup-
ply. The tests indicated nothing unusual
about the water quality.

Those expressions led to the just-
ended attempts to recover some of the
barrels for examination of the contents
to put to rest rumors that the material
may have been toxic or radioactive. The
Army had said the material was metal
left from the production of small anti-
personal bombs and at the time of the
disposal the composition of the mili-
tary hardware was classified as "se-
cret."

A spokesman for the government's
recovery team said the efforts were
complicated by four-foot waves which
made it difficult to effectively scan the
lake bottom with the electronic equip-
ment, including television cameras.

DEPARTMENT OF THE ARMY
St. Paul District, Corps of Engineers
Lake Superior Area
Canal Park
Duluth, Minnesota 55802

DULUTH NEWS-TRIBUNE

DULUTH, MINN.

19 JUNE 1977

SLSA raps Corps 'excuses' for not finding sunken barrels

The Associated Press

The Save Lake Superior Association (SLSA) says it does not accept the U.S. Army Corps of Engineers' "excuses" for not being able to locate any of some 1,400 barrels dumped into Lake Superior nearly 20 years ago.

The corps announced June 10 that it had called off the effort after three days of searching. The barrels were dumped between 1959 and 1971 by Honeywell, Inc., Minneapolis. Honeywell said the barrels contained secret weapons mate-

About 14 of the barrels were located in 150 feet of water last December about 10 miles from Duluth. However, a corps spokesman said the barrels apparently had shifted into deeper water since then and could not be located again for removal.

Divers reported seeing marks on the lake bottom which might have been tracks made by ridges on the barrels. However, they found no barrels.

The Save Lake Superior Association complained in a statement Saturday that the corps had been unable to follow through on the "promise we all knew to

corps resume the search until the matter is settled by testing material from one or more of the barrels.

The search was made after environmental groups said the barrels might contain toxic or radioactive substances. Government officials said the barrels contained scraps from research on new mortar weapons, consisting of steel and aluminum in a cement ing.

"Perhaps in the special services of the Army they will find someone who qualifies as a barrel tracer," said the statement approved by the association board and the group's president, Karen Carlson of Duluth.

The association said it now seriously questions whether the alleged testing of water taken last year from near the barrels could have been valid. Those tests showed that water to be indistinguishable from Lake Superior water taken anywhere else.

"We do not accept the corps' excuse," the statement said. "Numerous 750-pound barrels cannot be assumed to have drifted off to parts unknown since last year. If they are not there now, they weren't there then."

The association demanded that the

DEPARTMENT OF THE ARMY
St. Paul District, Corps of Engineers
Lake Superior Area
Canal Park
Duluth, Minnesota 55802

1 BARREL - 15

DULUTH HERALD

DULUTH, MINN.

20 JUNE 1977

EDITORIAL

Those elusive barrels

After spending three days and \$12,000 of the public's money searching for barrels on the bottom of Lake Superior, the U.S. Army Corps of Engineers on June 10 called off its search.

This past Saturday, the Save Lake Superior Association said it could not accept the Corps' "excuses" for not being able to locate any of the barrels. The association demanded that the Corps continue its search.

That request seems ill-advised. For the moment, the best strategy would seem to be to drop the search.

The barrels in question, an estimated 1,400, were put in the lake between 1950 and 1971. According to Honeywell, Inc., Minneapolis, the barrels were filled with then-classified materials used for making armaments. More specifically, Honeywell said the barrels contained scraps of zinc, steel and aluminum poured into the barrels in a mixture of cement.

Presence of the barrels first became public information after a commercial fisherman brought some of the barrels to the surface with his nets. After a concern was expressed that the barrels might contain chemically-toxic materials, the Corps agreed to try to find some of the barrels to examine the contents.

Three days of searching in waters 10 to 12 miles up the North Shore from Duluth, however, proved futile. Barrels once thought to be in a specific, known location had apparently been moved into deeper waters by lake currents, Corps spokesmen explained.

It would always seem worthwhile to examine some of those barrels if any could be found. But there is no sense of urgency in the present situation to demand that the Corps continue to search the lake bottom now until it finds some barrels.

They have been in the lake for more than 25 years. If they were to hold any toxic materials, it would seem they would have done so by now. Also, when the controversy first began, a Corps spokesman explained that the barrels often floated on the surface when dumped, and had to be shot full of holes with rifles before they would sink. If they contained radioactive or toxic materials, that practice would have been forbidden.

If another fisherman catches a barrel in his nets, the Corps should have a look. Or if more sophisticated equipment could be found to make location of the barrels easier, another search would be warranted. But under present circumstances, further searching isn't justified.

HEARING CONTINUES HERE

Lakes Water Quality Report Hit, Praise

By MIKE PAYTON
Telegram Staff Writer

A three-volume, \$14 million study commissioned in 1972 to deal with water quality in Lakes Superior and Huron came under fire and also was applauded Monday night in the opening session of a two-day hearing here by the International Joint Commission.

The purpose of the local session, which continued Tuesday at the Holiday Inn, is to gain public input on the report so that the IJC can make recommendations to the U.S. and Canadian governments on protecting the water quality, according to Henry P. Smith III, chairman of the American section of the IJC who moderated the session.

Dr. Gary Glass, of the Duluth Environmental Research Laboratory, who assisted in the preparation of the lengthy report, was the first witness and also first to take it to task.

Glass said the \$14 million investment may not have paid the expected returns because of the variety of views presented by the 89 contributing authors.

Falls Short

Glass said the report falls short in its attempts to provide detailed information on pollutants in both lakes and does not

provide baseline information for water quality.

He suggested that more data is needed on methods of determining the amounts of pollutants in fish and in water and the relationship between the two.

According to Glass, the guidelines are different for determining the amounts of parts per million of toxic pollutants in fish and the amount by parts per trillion of pollutants in water.

Responsibility of data lines in different projects illustrated in the report is difficult because of the vagueness of that data.

Barrels

He, like another witness after him, urged the IJC to use the clues its international status carries to find out more about the nature of some 1,400 barrels dumped in Lake Superior off Duluth several years ago.

These barrels are said to contain munitions scrap and were the target of an unsuccessful search here by the U.S. Army Corps of Engineers within the past several days.

Glass intimated that the two governments have a reluctance to dig deep enough into the situation of the barrels and

other members.

Com's sector argued them.

other members.

Glass also urged the IJC to make available to the general public some of the supporting data which led the Upper Lakes Reference Group, which authored the study at the IJC's direction, to submit some 42 recommendations on protection of the two lakes.

Technology

He said the technology is available for the reference group to provide more detailed data on pollutants in their lakes and their effect on water and aquatic life.

Dr. William Swenson, assistant professor of biology at the University of Wisconsin-Superior, added color to the hearings when he charged that the report does not adequately address the effects of introducing exotic fish species into Lake Superior.

Swenson said that smelt, which were intentionally introduced into the Great Lakes, are responsible for the collapse of

(Turn to IJC, Page 4)

(Continued from Page 1)

the nine-million-pound per-year herring catch in Western Lake Superior because adult smelt feed off herring larvae.

"Unstable"

Terming the smelt population as "unstable," Swenson also noted that pink salmon released into the lake could be as big a problem as the sea lamprey they are supposed to control.

He said the problem is sensitive because it is political in nature and Smith agreed, noting that sport fishing for salmon in Lake Michigan has moved ahead of commercial fishing in prominence.

Swenson urges that fisheries responsible to both governments should be under stricter controls as to the introduction of new species before any such actions are taken.

He said the policy of "let's try it and see how it works" should be reversed to detailed studies of the possible effects of new species before they are turned loose in the largest of the Great Lakes.

Swenson said exotic species "are one pollutant which magnifies itself. It does not degrade and is uncontrollable."

"A Whole Page?"

The problem of exotic species is addressed on a page of the report. Swenson asked humorously, "A whole page?"

He said that the biological system of the lake is going to be upset with almost any introduction of non-native fish.

"The International Joint Commission could apply a little pressure on agencies of both governments who may be experimenting a little more than they should."

Dr. Alden Lind, of the Save Lake Superior Association, said there is a "manifest ambivalence" in the report regarding suggested tolerance levels for lake pollution, but also was high in his praise of the document.

Lind, a noted regional environmentalist, suggested that the IJC implement monitoring of new pollutants on their probable effects before they become a part of the lakes system.

"We should address the question of how much we know about how bad things are rather than merely recognizing that things are bad and shouldn't be allowed to get any worse," Lind stated.

He said, "We should do some quizzing of various agencies as to what has already been dumped into the lake." Lind said in a reference to the quantity of the barrels dumped off of the Duluth shore several years ago.

Lind concurred with the reference group's recommendations that Reserve Mining Company's discharge of 67,000 tons of taconite tailings into Lake Superior each day be halted immediately.

The group also suggested that drinking water standards be established for asbestos contained in those tailings.

Back to the Lake

Lind said Reserve's solution to the dumping problem, an on-land disposal site, leaves several questions unanswered, one of which is how to control the airborne emission of asbestos fibers back into the lake when the on-land disposal site is used.

He also urged stricter controls over the types of cargoes being carried on ships plying the Great Lakes so that proper countermeasures can be implemented when a vessel sinks.

Dr. Albert Dickas of the Center for Lake Superior Environmental Studies at the University of Wisconsin-Superior, wanted to know why the problem of shoreline erosion was not adequately addressed in the report.

Complexity

Tim Flinn, who heads the surveillance and control division of District Five for the Environmental Protection Agency, said there is a difficulty in determining which erosion is caused by nature and which by man and that the complexity of that situation calls for more study time than was allowed.

The IJC is an international agency charged with the responsibility of recommending protection measures for all U.S.-Canadian boundary areas to both governments.

Smith explained that the testimony presented here and in subsequent hearings at Thunder Bay, Ontario and Houghton, Ont., this week, and in Canada next month, will be reviewed extensively before the final IJC recommendations are compiled.

Representing the Canadian section of the head table were Professor Maxwell Cohen, chairman of the Canadian group, and Bernard Beupre, Richelieu, Quebec.

Victor Smith, Illinois, is the other American on the panel. Keith Henry, a Vancouver, British Columbia engineer, is the other Canadian on the IJC and is not in attendance.

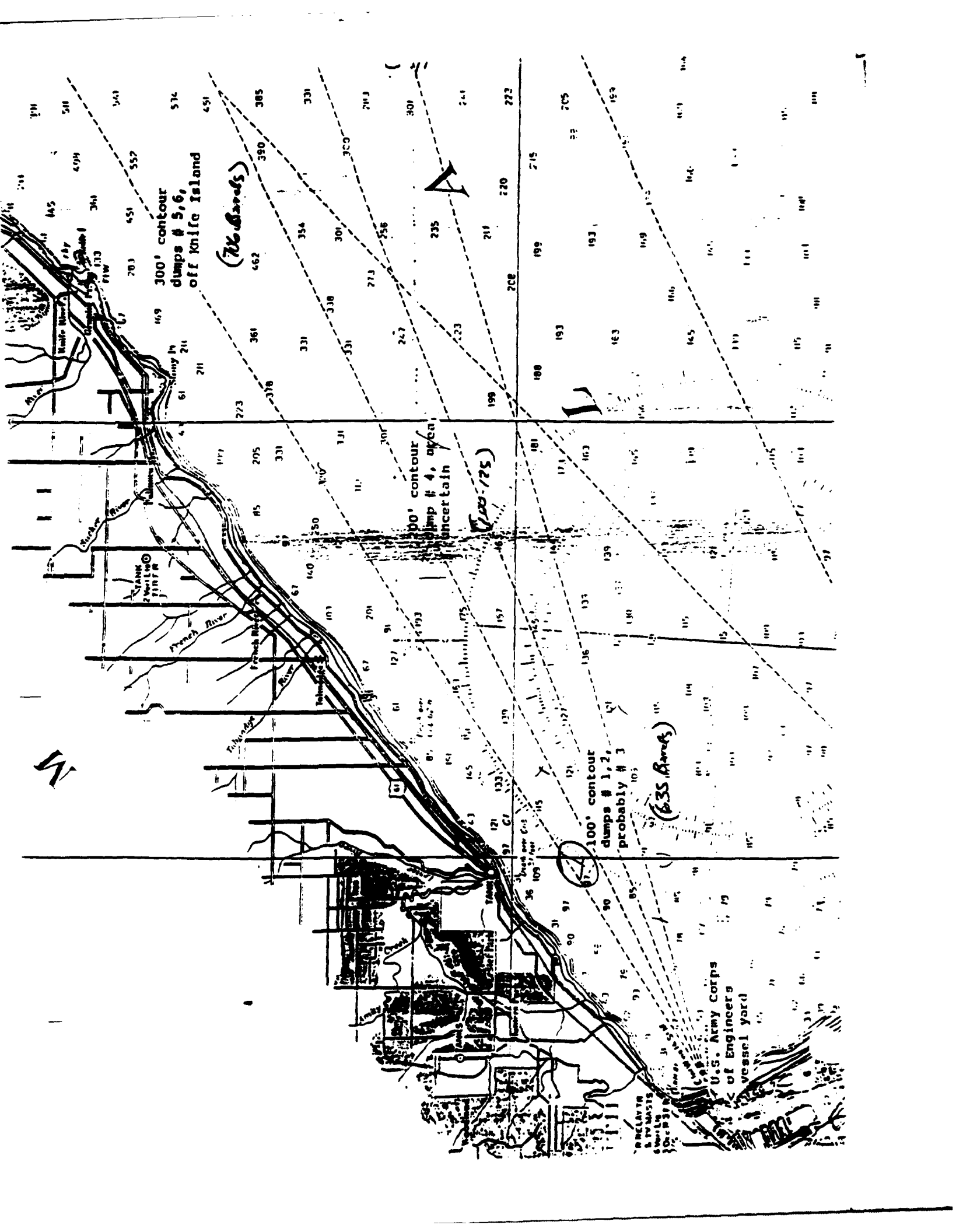
The responsibility to undertake the reference group's study and hold the public hearings was conferred on the IJC in a bi-national water quality agreement signed by the U.S. and Canada in 1972.

June 23, 1985

LAKE SUPERIOR BARREL DUMPS

NO.	DATE	DEPTH	AREA	BARRELS NO.	WEIGHT (lbs.)
1	Oct. 26, 1959	100'	3 miles out from Lester River	380	190,000
2	Oct. 11, 1960	100'	Approximately same as #1	75	50,000
3	June 15, 1961	100'	Unclear, maybe same as #1, 2.	180	90,000
4	Oct. 14, 1961	200'		100-125	50,000
5	June 26, 1962	300'	off Knife Island	206	200,000
	sept. 25, 26, 1962	300'	18 miles from Corps vessel yard, in vicinity of Knife River.	500	250 - 300,000

ENCL 2



DRSAR-1SE

20 APR 1977

ATTACHMENT "C"

MEMORANDUM FOR RECORD:

SUBJECT: Classified Scrap in Lake Superior

1. From the historical records available, which are limited due to required record destruction and the sinking of one tugboat and the burning of another, both with logbooks, the following is the dump dates and depths of the six known dumps of barrels into Lake Superior:

- a. Dump No 1 o/a 27 Oct 59 in not less than 100 ft of water.
- b. Dump No 2 o/a 25 Sep 60 in not less than 100 ft of water.
- c. Dump No 3 o/a 15 Jun 61 in not less than 100 ft of water.
- d. Dump No 4 o/a 14 Oct 61 in not less than 200 ft of water.
- e. Dump No 5 o/a 26 May 62 in not less than 300 ft of water.
- f. Dump No 6 o/a 26 Sep 62 in not less than 300 ft of water.

In addition to water depth, the dumping instructions specified dumping to be done not less than 3 miles from shore.

2. Actual dump sites are not known except for the one which was located with the help of a commercial fisherman who unintentionally caught some barrels in his fishing net and with a sonar device that gives a bottom profile of an area of the lake. The St. Paul District Engineer's Office stated that without a starting point, such as given by the fisherman, the remaining dump sites would be nearly impossible to locate.


JAMES R. HAGER
CPT, CE
Civil Engineer

C-25

JH
DAILY REPORT OF OPERATIONS

Tug Lake Superior Crew 9
 Location Duluth-Superior
 Date 8 JUNE 1961
 Wind Strong NE
 Weather partly cloudy

Character of work: unloading Coleman

TRIPS, TOWING AND RUNNING LIGHT

FROM-		TO-		PLANT AND MATERIALS IN TOW			MILES RUN	
Locality	Time of Departure	Locality	Time of Arrival	Name of Plant	MATERIALS		Towing	Light
					Kind	Tons		
<u>Superior</u>	<u>6:00AM</u>	<u>Vessel Yard</u>	<u>6:00PM</u>	<u>Coleman, 759</u>			<u>11</u>	<u>2</u>

DISTRIBUTION OF TIME	H.	M.	Probable operations tomorrow:
Running with tow	2	00	
Running without tow		40	
Making up tow			
Breaking up and delivering tow			
Making lockages			
Taking on fuel and supplies for tug			
Delays—weather, current, etc.			Communications received:
Washing tug boilers			
Minor operating repairs to tug			
Sundays and holidays			
Laytime of shift	12	00	Remarks: <u>To finish for Coleman to work on breakwater, towed to Vessel Yard.</u>
Waiting on plant—painting, cleaning, etc.	9	20	<u>Deck crew 4 hours unloading Army Ordnance barrels onto scow #10</u>
Tug standing by—crew on pier repairs			
Total time	24	00	
Lost Time not Chargeable to Work			
Repairs (4 consecutive hours or more)			
Cancellation of work			
Total lost time			
Grand total	24	00	

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cc 11/12 June 61

APR 61 1961

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DAILY REPORT OF OPERATIONS

Tug Lake Superior Crew 9
 Location Duluth Superior
 Date 9 June 1961
 Wind Light NE
 Weather Clear

Character of work: Tending Coleman

TRIPS, TOWING AND RUNNING LIGHT

FROM-		TO-		PLANT AND MATERIALS IN TOW			MILES RUN	
Locality	Time of Departure	Locality	Time of Arrival	Name of Plant	MATERIALS		Towing	Light
					Kind	Tonn		
Vessel Yard	6:00AM	Vessel Yard	6:00PM	Coleman, 759 #10			3 1/2	16

DISTRIBUTION OF TIME	H.	M.	Probable operations tomorrow:
Running with tow	6	00	
Running without tow	2	20	
Making up tow			
Breaking up and delivering tow			
Making lockages			
Taking on fuel and supplies for tug			
Delays—weather, current, etc.			Communications received:
Washing tug boilers			
Minor operating repairs to tug			
Sundays and holidays			
Laytime of shift	12	00	Remarks: Towed scow load of Army
Waiting on plant—painting, cleaning, etc.	3	40	Ordinance waste to dump.
Tug standing by—crew on pig repairs			
Total time	21	00	
Lost Time not Chargeable to Work			
Repairs (8 consecutive hours or more)			
Continuation of work			
Total lost time			
Grand total	24	00	

S. H. [Signature]
 Master

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OPR 02000

cc [unclear] 24 June 61

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DAILY REPORT OF OPERATIONS

Tug Lake Superior Crew 11
 Location Duluth Superior, Lake Superior.
 Date 25 May 1962
 Wind Lt. to Fresh Westerly
 Weather PARTLY cloudy.

Character of work: Towing EK-8380 loaded with ARMY Ordnance scrap to dump off Knife Island & return to Duluth, towing #16 from Two Harbors to Duluth, Tending Coleman in PM.

TRIPS, TOWING AND RUNNING LIGHT

FROM-		TO-		PLANT AND MATERIALS IN TOW			MILES RUN	
Locality	Time of Departure	Locality	Time of Arrival	Name of Plant	MATERIALS		Towing	Light
					Kind	Tonn		
Vessel Yard	5:00AM	Vessel Yard	5:00PM	Coleman, EK-8380 & #16			64	9

DISTRIBUTION OF TIME		H.	M.	Probable operations tomorrow:
Running with tow		8	30	
Running without tow		1	10	
Making up tow			30	
Breaking up and delivering tow			50	
Making lockages				
Taking on fuel and supplies for tug				
Delays—weather, current, sea				Communications received:
Washing tug boilers				
Minor operating repairs to tug				
Sundays and holidays				
Laytime off shift		12	00	Remarks: Left V.X. with 8380 at 6:00AM, dumped ARMY Ordnance material off Knife Island at 8:30AM and continued on with 8380 to Two Harbors where #16 was added to the tow and both tows were towed to Duluth. Relieved tug "Duluth" tending Coleman in PM.
Waiting on plant—painting, cleaning, etc		1	00	
Tug standing by—crew on pier repairs				
Total time		24	00	
Lost Time not Chargeable to Work				
Repairs (6 consecutive hours or more)				
Cessation of work				
Total time				
Grand total		24	00	

P. G. Jordan

Master

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DAILY REPORT OF OPERATIONS

Tug YARQUETTE Crew 9
 Location Duluth-Superior Harbor
 Date 28 September 1962
 Wind Light Westerly
 Weather Partly Cloudy

Character of work: Tending Derrickboat Coleman and
Dumping Restricted Material

TRIPS, TOWING AND RUNNING LIGHT

FROM-		TO-		PLANT AND MATERIALS IN TOW		MILES RUN	
Locality	Time of Departure	Locality	Time of Arrival	Name of Plant	Materials Kind Tons	Towing	Light
Superior	6:30AM	Superior	11:00P	Derrickboat Coleman		42	14

DISTRIBUTION OF TIME	H.	M.	Probable operations tomorrow:
Running with tow	8	06	
Running without tow	2	40	
Making up tow		15	
Breaking up and delivering tow		15	
Making lockages			
Taking on fuel and supplies for tug			
Delays—weather, current, etc. <u>Traffic</u>		30	Communications received:
Washing tug boilers			
Minor operating repairs to tug			
Sundays and holidays			
Laytime of shift	8	30	Remarks:
Waiting on plant—painting, cleaning, etc.	5	45	<u>Crew Helped to Load and Dump Restricted</u>
Tug standing by—crew on pier repairs			<u>Material</u>
Total time	24	00	
Lost Time not Chargeable to Work			
Repairs (8 consecutive hours or more)			
Cessation of work			
Total lost time			
Grand total	24	00	

K.P. 2/20

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DAILY REPORT OF OPERATIONS

VESSEL NAME: WISCONSIN Crew: 5
 Location: Superior Harbor
 Date: 26 September 1982
 Direction: Fresh Northerly
 Weather: Cloudy

Character of work: Tending Derrickboat Coleran and
Dumping of Restricted Material

TRIPS, TOWING AND RUNNING LIGHT

FROM-		TO-		PLANT AND MATERIALS IN TOW			MILES RUN	
Vessel	Time of Departure	Locality	Time of Arrival	Name of Plant	Materials		Towing	Light
					Kind	Tonnage		
Superior	5:30AM	Superior	8:30PM	Derrickboat Coleran			39	21

DISTRIBUTION OF TIME	H.	M.
Working with tow	7	40
Working without tow	3	15
Working up tow		20
Working up and delivering tow		35
Working lockages		
Working on fuel and supplies for tug		
Working weather, current, sea		
Working tug boilers		
Working repairs to tug		
Working days		
Working off shift	9	00
Working on plant—painting, cleaning, etc	3	10
Working loading by—crew on pier repairs		
Total time	24	00
Net Time not Chargeable to Work		
Working (6 consecutive hours or more)		
Working on work		
Total lost time		
Grand total	24	00

Probable operations tomorrow: _____
 Communications received: _____
 Remarks: Crew failed to load and dump one final
load of Restricted Material.

D. J. [Signature]
 Master

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- 1 - Minnesota Pollution Control Agency
1935 West County Road B2
Roseville, Minnesota 55113
- 5 - Lake Superior Area Office
St Paul District Engineer
Canal Park
Duluth, Minnesota 55802
- 1 - Mr. Larry L. Eiler (MN17-3687)
Manager of Public Relations
Honeywell, Inc.
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Minneapolis, Minnesota 55413
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WASH DC 20314

APPENDIX B

HAZARD CONTROL, INC.

**CONTRACTORS FINAL REPORT:
Underwater search of Lake Superior's classified
barrel disposal site, Duluth, Minnesota.**

**This report submitted as required by: Mike Stich
President
Hazard Control, Inc.**

December 10, 1990

St. Paul Army Corps of Engineers
1421 USPO & Customs House
St. Paul, Mn 55108-9808
Attn: Bob Dempsey
Reg: PO# DACW3790M1118

**CONTRACTORS FINAL REPORT:
Underwater search of Lake Superior's classified
barrel disposal site, Duluth, Minnesota.**

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"B" - Loran Coordinates of area searched	9
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CONTRACTORS FINAL REPORT
Underwater Search of Lake Superior's Classified
barrel disposal site, Duluth, Minnesota.

October 25, 1990

St. Paul Army Corps of Engineers
1421 USPO & Customs House
St. Paul, Mn 55108-9808
Attn: Bob Dempsey
Reg: PO# DACW3790M1118

CONTRACTORS FINAL REPORT:
Underwater search of Lake Superior's classified
barrel disposal site, Duluth, Minnesota.

INTRODUCTION

The aim of this report is to summarize all actions and events which led to the completion of Hazard Control's contract with the Army Corps of Engineers, (St. Paul), regarding the search for the barrels in Lake Superior. This can be accomplished most effectively by a chronological detailing of the days and events as they happened.

I've enclosed the "contractor's work schedule" (attachment "F") as part of this final report. The final report will refer frequently to the numbered boat crews and lettered search areas, so it is highly recommended to familiarize yourself with attachment "F" before reading further.

Chronology of Contract

October 5, 1990 - Contractor meets with contracting officer (Bob Dempsey) at the Duluth Army Corps of Engineers office. Also present were Dick Beatty, Joan Guilfoyle, Al Kline and two other local corps workers (Randy and Norm). I submitted my contractors schedule to the CO and we discussed the facilities, personnel, boats, working hours, safety, public and press relations. It was decided that the Duluth Corps facility would serve as our base of operations. The four survey vessels to be docked behind one another on the Eastern pier. The work day would run approximately 12 hours (weather permitting) with all four vessels, in order to maximize coverage of search areas. All contact with the press and public would be channelled through Bob Dempsey or Joan Guilfoyle. A 'press day' would be held on Sunday Oct. 14 from 9:00am till 11:00am. No press to be allowed on survey vessels for safety reasons. It was further agreed that we would officially begin our search Oct. 11, at 7:00am, allowing one day (Oct. 10) for practice and electronics tuning.

October 9th - Contractors equipment delivered to the Duluth Corps facility. Vessel #1 prepared for the operation with EG&G side scan and winch. The rest of the equipment stored in the corps warehouse building.

CONTRACTORS FINAL REPORT
Underwater Search of Lake Superior's Classified
barrel disposal site, Duluth, Minnesota.

October 10th - Practice day began with the arrival of the other vessels, #2, 3 and 4. The rest of the equipment was then installed on the boats and a meeting held with all crew members. During the meeting the search plan was laid out and quadrants assigned to the three boats (1, 2, 3), outfitted with side scan sonar, boat #4 to be the verification vessel. Each captain was given a chart of his assigned quadrant, with one of two options for searching it. They were ordered to strictly follow the Loran courses mapped out for them, with no stopping or slowing. They would then call boat #4 for any strong target verification, if needed. In addition, the captains were advised to bring all sonar readings, areas mapped and any target records to the meeting room, each evening, after the daily search effort, to analyze the findings and prepare for the next days effort. For the practice session, we assigned 3 practice quadrants directly Southwest of the main search area (which basically expanded our search area along the already existing Loran lines #45812 and #45860, Southwesterly to Loran line #32590). Boat #4 departed first and dropped 3 empty 55 gallon drums in the practice zone at a depth of 105 feet. Boats 1, 2 and 3 made runs by the submerged barrels with their sonar activated. After they became accustomed to how the drums appeared on their sonar graphs, they then proceeded to searching the practice zones. Boat #4 with it's verification equipment (magnetometer and underwater video equipment) also made several passes by the practice drums and then aided the other vessels in searching the practice zones. At approximately 6:00pm all boats were called into port, due to rough seas. A meeting was held to review findings, procedures and to prepare for the following day. Craig Scott and Chuck Haber arrived with a Klein side scan sonar and it was installed on boat 3 in place of a Westmar side scan. All crew members were advised to be at the corps facility by 7:00am the following day.

October 11th - Upon completion of the 7:00am briefing of the crews, vessel #1 proceeded to search quadrant A, vessel #2 quadrant C and vessel #3 quadrant B. Vessel #4 trailed vessel #1 and awaited calls for verification of any targets (grade 6 or higher) from any of the 3 sonar equipped vessels. Boat #3 proceeded to search approximately the Northwestern half of quadrant B, boat #2 searched the middle 2/5 of quadrant C and boat #1 the Northwestern half of quadrant A. All boats were searching in a Southwest to Northeast (and vice-versa) direction, along predesignated Loran lines 500 feet apart. The sonar were set at ranges of 2-300 feet either side of the vessels. In addition to quadrant A, boat #1 expanded it's search area Northwesterly 1/2 mile to Loran line 45808, so as to include an area that our pre-bid investigation had shown to reveal some sonar targets worthy of further passes with the sophisticated EG&G sonar. At 10:40am, boat #4 received a call from boat #1 to verify 2 cylindrical target that their sonar had detected at Loran coordinate 32571.15/45810.10. Boat #4 lowered the R.O.V. (remote operated vehicle) at this location and video taped two large logs and nothing further. Boat #1 also detected another target at Loran #32572.18/45809.91 which was verified as a large rock by boat #4's video tow camera. Boat #3 called boat #4 for

CONTRACTORS FINAL REPORT
Underwater Search of Lake Superior's Classified
barrel disposal site, Duluth, Minnesota.

verification of 2 different target sightings, but only uneven topography of lake bottom in these areas were noted. All boats returned to the dock at 8:00pm. A meeting with all crews immediately followed, where sonar readings, videos and other findings were discussed and reviewed.

October 12th - Boats #1, 3, 4 departed at 7:30am. Boat #2 departed at 9:30am. Boat #1 proceeded to search the balance of quadrant A, boat #2 an additional 2/5 of quadrant C and boat #3 the balance of quadrant B. At approximately 10:00am boat #1 called boat #4 to verify 3 barrel like targets at Loran #32575.2/45623.0. After 14 passes with the magnetometer, boat #4 was unable to detect any metallic object and discontinued this particular verification effort. A short time later boat #1 called again and they had detected 9 large "blotches" on the lake bottom. These "blotches" were 20-30 foot in diameter, about 50 feet from each other, and in a Linear pattern. The "blotches" are located in the area of Loran #32584.5/45830. Boat #3 also detected similar "blotches" at Loran #32585.7/45824.9 verification by boat #4's section scan sonar and video cameras revealed these "blotches" to be groups of small rocks that apparently were dropped in piles by passing surface ships. At approximately 2:00pm boat #3 called boat #4 to verify a large target they had detected at Loran #32576.01/45821.34. Boat #4 lowered the R.O.V. and verified the target as a small shipwreck. With the help of Pat Labodie, of the Duluth Museum, a positive identification of the vessel was possible. It was revealed to be the A.C. Adams, a 65 foot tug boat, built in 1881, sunk in 1929 in 112 feet of water. Pat felt that it was of little historical significance and there appeared to be nothing of value left on the ship. The wreck is fairly intact and will probably be open to amateur scuba divers. All vessels returned to the dock at 8:30pm. A meeting was held and sonar, video and all findings were studied and reviewed.

October 13th - Boats #1, 3, 4 departed at 7:00am. Boat 2 departed at 10:00am to begin searching the Northwest section of quadrant E. Boat #1 proceeded to search the Southwest section of quadrant G and boat #3 searched the balance of quadrant C. Boat #4 proceeded to verify various targets the other boats had detected the day before. Rocks and tree parts were the only things revealed by boat #4's verification equipment during the morning hours. At 11:43am boat #1 called boat #4 and stated they had targets of grade level 10 (positive sighting of barrels). Boat #4 arrived and lowered it's tow camera to a depth of 180 feet. After several passes with the tow camera, visual recorded confirmation of the barrels was accomplished. There were 65 barrels counted in depths ranging from 194 feet to 151 feet. The line of barrels began at Loran #32563.7/45812.0 (194 feet) and continued 2200 feet along a northerly "S" shaped curve towards shore, Loran #32562.8/45809.1 (151 feet). The longitude/latitude coordinate of the middle of the line of barrels is 46 52'46"/91 54'75". The barrels lie approximately 1 mile off shore from the mouth of the Talmadge River, directly in front of Lakeview Castle Resort/Hotel.

CONTRACTORS FINAL REPORT
Underwater Search of Lake Superior's Classified
barrel disposal site, Duluth, Minnesota.

After several passes with the underwater tow camera, all boats were called into port about 2:30pm to review findings, due to wavy conditions on the lake. Upon arrival, all crew members were called in for a de-briefing and the video of the barrels was studied. The barrels appeared to be in excellent condition (some surface rust), concrete on one end and metal on the other. After the briefing the crews were released for the day and ordered to report to the dock at 7:00am, to prepare for press day. This same evening the submarine Hazard Control hired, arrived from Lake Seneca, New York.

October 14th - All crews arrived on the dock at 7:00am for 'press' day. All video, side scan, magnetometer and other electronic equipment was unloaded off the survey boats and placed on the dock. This equipment was displayed, so the press could see it and ask questions about it. At this time, our second submarine from Duluth arrived, and together with the other one from New York, they too, displayed their capabilities for the press in the corps dock Lagoon area. The press event lasted 3 hours. At noon boats 1, 2, 3, 4 departed the corps dock and began finishing their mapping and survey work. Boat #1 finished surveying the Southwest 2/5 of section G and also mapped an area directly NE of where the barrels were discovered. This area was approximately 3/4 of a mile from the North shore, 1/2 mile wide and extended NE about 4 miles. Boats 2 and 3 finished surveying the Western half of section E and also re-surveyed some missed areas in the practice zone. Boat #4 searched a half mile area directly Southwest of the practice zone. All survey and mapping work ended at 7:00pm this day and the boats returned to the dock shortly thereafter.

October 15th - At 7:00am a brief meeting was held at the corps facility and plans for recovery of 1-2 barrels were formulated. The Duluth submarine developed a leak and was unable to assist in any recovery efforts. The New York sub was loaded on the corps Markus crane barge along with all recovery, haz.mat., and hard hat dive equipment. The corps provided the Lake Superior tug to pull the Markus out to the barrel dumping site. Boat #3 accompanied so as provided surface support and would tender the submarine during recovery efforts. We arrived at the dumping site at 12:30pm. The sub was lowered over the side of the barge by the crane and began it's initial dive at 1:00pm. The sub located 5 barrels and attempted to place it's clamping device over one of them. The device was triggered prematurely and the sub had to be hauled back onto the barge to reset the clamp. During the second attempt, the sub became entangled in it's buoy line and had to abort the dive. At 5:30pm the sub made it's 3rd and final dive of the day. As the sub approached a barrel, the geiger counter in the sub, began to register minute levels of radiation. The pilot aborted the dive and returned to the surface to report these readings. Other readings with another geiger counter were taken on the sub, the buoy line, the tug's anchor and anything else that was in the water, and the results were negative. The tug, barge and boat #3 returned to dock at approximately 8:30pm. A brief

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meeting was held and plans were made for final recovery efforts to take place on tuesday the 16th.

October 16th - The Lake Superior tug, Markus crane barge and boat #4 departed the corps dock at 8:00am, arriving at the dump site at 9:00am. the purpose of the first submarine dive was to verify any radioactive readings. The corps' project manager (Bob Dempsey) accompanied the sub pilot with a second geiger counter. Together they were submerged in the barrel area for nearly one hour and received no indications of radioactivity. The barrel clamp was reinstalled on the sub and a second dive got underway at 1:00pm. After 1 hour the sub surfaced and reported that his batteries (for his lights) had failed and that he was unable to locate a barrel during the dive. While the sub's batteries were being recharged, boat #4 proceeded to locate a barrel with it's underwater camera. A barrel was located, marked with a buoy and underwater flashing strobe. At 5:30pm, with batteries fully charged, the sub made it's final attempt to recover a barrel. it followed the buoy line down to the barrel and placed it's clamping device on the barrel. Upon releasing the clamp on the barrel, the sub returned to barge. Boat #4 then kept tension on the clamp retrieval line, until the tug was able to maneuver along side and grasp the line. Upon applying more tension with the tug's winch, the clamp disengaged itself from the barrel. Unfortunately, the day had expired and any more recovery attempts were impossible. We concluded that the clamp wasn't precisely placed on the barrel correctly or was too weak to handle the weight of the barrel. All boats returned to the dock at 9:45pm. All equipment was then unloaded and all crews were dismissed. Hazard Control's contract with the corps was, for the most part, complete.

October 25th - During a phone conversation with the project manager (Bob Dempsey) it was made clear, that Hazard Control had developed a barrel clamping device, capable of retrieving the barrels remotely from the surface. The project manager stated that he was interested in the clamp and would have to get approval from his superiors. he also indicated that he would like Hazard Control to take magnetometer readings over the barrels. The conversation concluded with the project manager stating that we would be permitted to run the magnetometer over the barrels the following Tuesday (Oct. 30th) since he would also be there with EPA officials to conduct radioactivity readings and video more barrels with an R.O.V. He said "If there is a problem with you using the barrel clamping device, I'll call you back", end of conversation. No call back was ever acknowledged by Hazard Control people.

October 30th - Hazard Control crew (boat 4), EPA officials and corps officials meet on corps dock at 7:00am. Boat 4 departs for dump site at 7:30am. Lake conditions at this time were conducive for experimentation with the barrel clamping device. By 8:30am a barrel had been located (by underwater camera) and buoyed. The camera was attached to the barrel clamping device and the whole apparatus was

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lowered down the barrel buoy line. Within one hour, the device was maneuvered over the barrel and secured remotely from the surface. The device (with the barrel) was then slowly raised and brought to 27 feet of water near the shoreline and then the barrel was gently released after it was attached with a buoy line. During the whole process (approx. 2 hours), the barrel and the clamping device are constantly being monitored VIA the attached underwater camera, so as to detect any stress, deformation, deterioration, etc., of the barrel, but none is noted. At noon, boat 1 arrived and was informed of the successful experimentation with the clamping device. The project manager states he would like to witness a second experiment with the clamping device after the EPA crew do their work with the R.O.V. At 4:00pm the project manager comes aboard boat 4 and assists Hazard Control in the second experiment with the clamping device. The process was repeated, with the same results. The second barrel was left near the shoreline in 52 feet of water with an attached buoy line. Boat 4 returns to the corps' dock at 9:30pm.

October 31st - Boat 4 returns to the barrel dump site and finishes it's proton magnetometer readings during the morning hours. By noon, all Hazard Control equipment has been removed from the corps' dock facility. The Hazard Control contract with the Army Corps, had been completed.

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SUMMARY

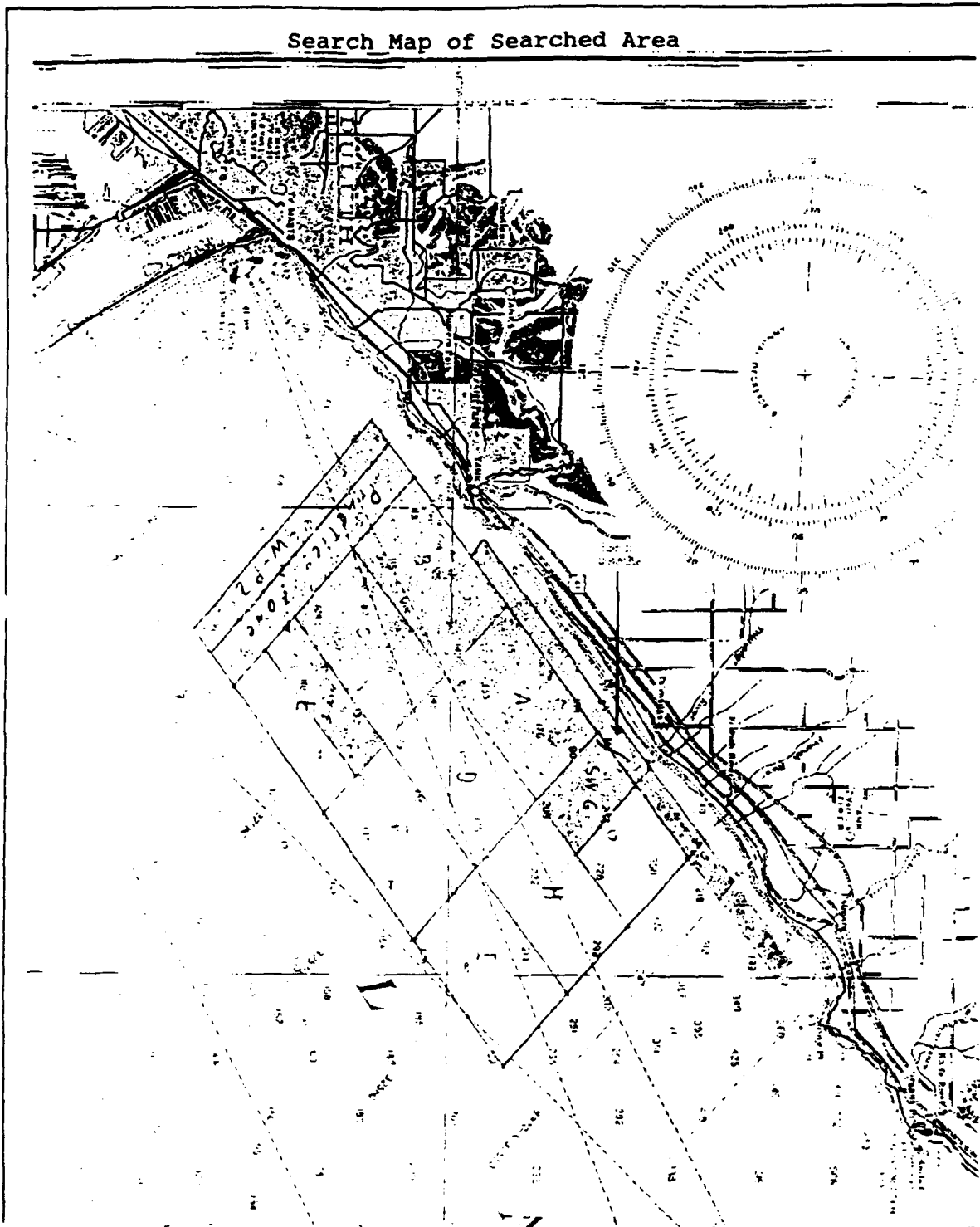
Hazard Control has met all it's obligations and goals as set forth in the attached 'scope of work'. We thoroughly surveyed (searched) approximately 24 square miles of the lake bottom. A total of 88 man hours was spent by 3 surface ships equipped with side scan sonar and 8 more hours with a magnetometer, by a fourth ship, which summarizes the underwater metal detection effort. (The magnetometer was found to have limited effectiveness in this area of Lake Superior). Thirty-six hours were spent by underwater video cameras, a remote operated vehicle, and a submarine, completing the underwater inspection portion of this contract.

As a result of the detection effort, one barrel dump site consisting of 105 barrels was located. With the aid of the submarine and underwater cameras visual confirmation of the barrels was accomplished. By using a camera mounted, remote operated, barrel grabbing device, two barrels were safely relocated near the shoreline, enabling the Army Corps to easily remove them from the lake. The entire contract was successfully completed with out any incident or violation of any Federal, State or local laws, and without any incident of injury or damage to persons or property.

This report submitted as required by: Mike Stich
President
Hazard Control, Inc.

MS/amm

CONTRACTORS FINAL REPORT
Underwater Search of Lake Superior's Classified
barrel disposal site, Duluth, Minnesota.



Attachment "A"

CONTRACTORS FINAL REPORT
 Underwater Search of Lake Superior's Classified
 barrel disposal site, Duluth, Minnesota.

Attachment "B"
 Loran Coordinates of Areas Searched

Area	Four Corner Coordinates		Area-square miles
=====			
A	32576.0/45812.0	32565.0/45812.0	
	32565.0/45828.0	32576.0/45828.0	4.05
B	32587.0/45812.0	32587.0/45828.0	
	32576.0/45828.0	32576.0/45812.0	4.05
C	32576.0/45828.0	32576.0/45844.0	
	32587.0/45844.0	32587.0/45828.0	4.05
SW-G	32565.0/45812.0	32565.0/45818.0	
	32560.0/45812.0	32560.0/45818.0	1.65
NW-E	32587.0/45844.0	32576.0/45844.0	
	32587.0/45852.0	32576.0/45852.0	2.02
PRACTICE ONE	32587.0/45812.0	32590.0/45812.0	
	32587.0/45860.0	32590.0/45860.0	3.15
SW-P.Z.	32590.0/45812.0	32592.5/45812.0	
	32592.5/45860.0	32590.0/45860.0	2.25
NW-B.A.G.	32580.0/45812.0	32580.0/45808.0	
	32543.0/45808.0	32543.0/45812.0	2.975
	TOTAL SQUARE MILES=		24.195

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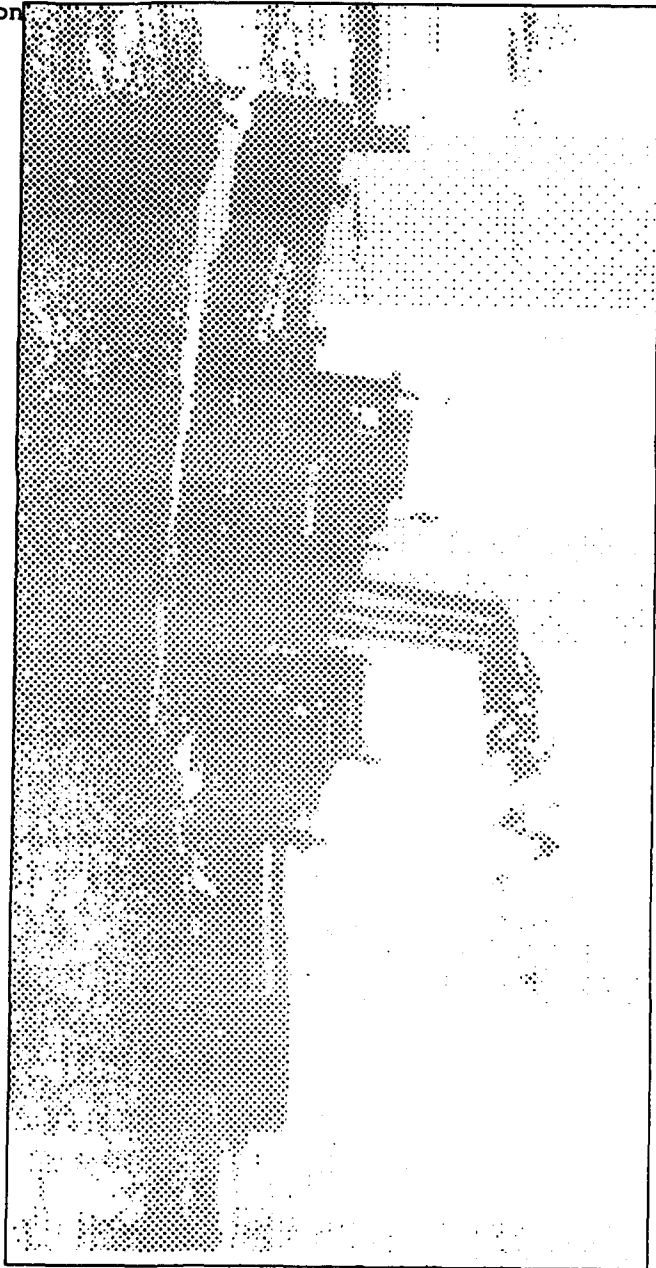
ATTACHMENT "C
Boats, Crew, and Equipment

BOAT	CREW	(CORPS)	EQUIPMENT
#1-"Boyd"	Roger Chapman Terry Aldrich Ken Engelbrecht Ken Knutson	Bob Dempsey Ken & Randy	EG&G Side Scan Sonar w/1500ft. of armored cable and winch
#2 "Madeline Goodrush"	Jerry Buchanan Peter Buchanan Rick Stauber Walter Pluid		King-sonic side scan sonar, underwater video camera
#3-"Heyboy"	Ken Merryman Ray Julian Steve Petschel Craig Scott Chuck Haber		Klein side scan sonar 2-Westmar Side scan sonar, underwater video camera
#4-"Northern Comfort"	Dan Gates Ken Anderson Mike Stich John Stich		Proton II magnetometer R.O.V., underwater tow camera
#5- "Lakediver"	Harold Maynard Mike		K-350 submarine, Mechanical arm, lights Communications.
#6 (Sub #2)	Scott Patterson		K-250 submarine (scratched from service) Mechanical problems

Inc 2

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Attachment "D" Description
of A.C. Adams



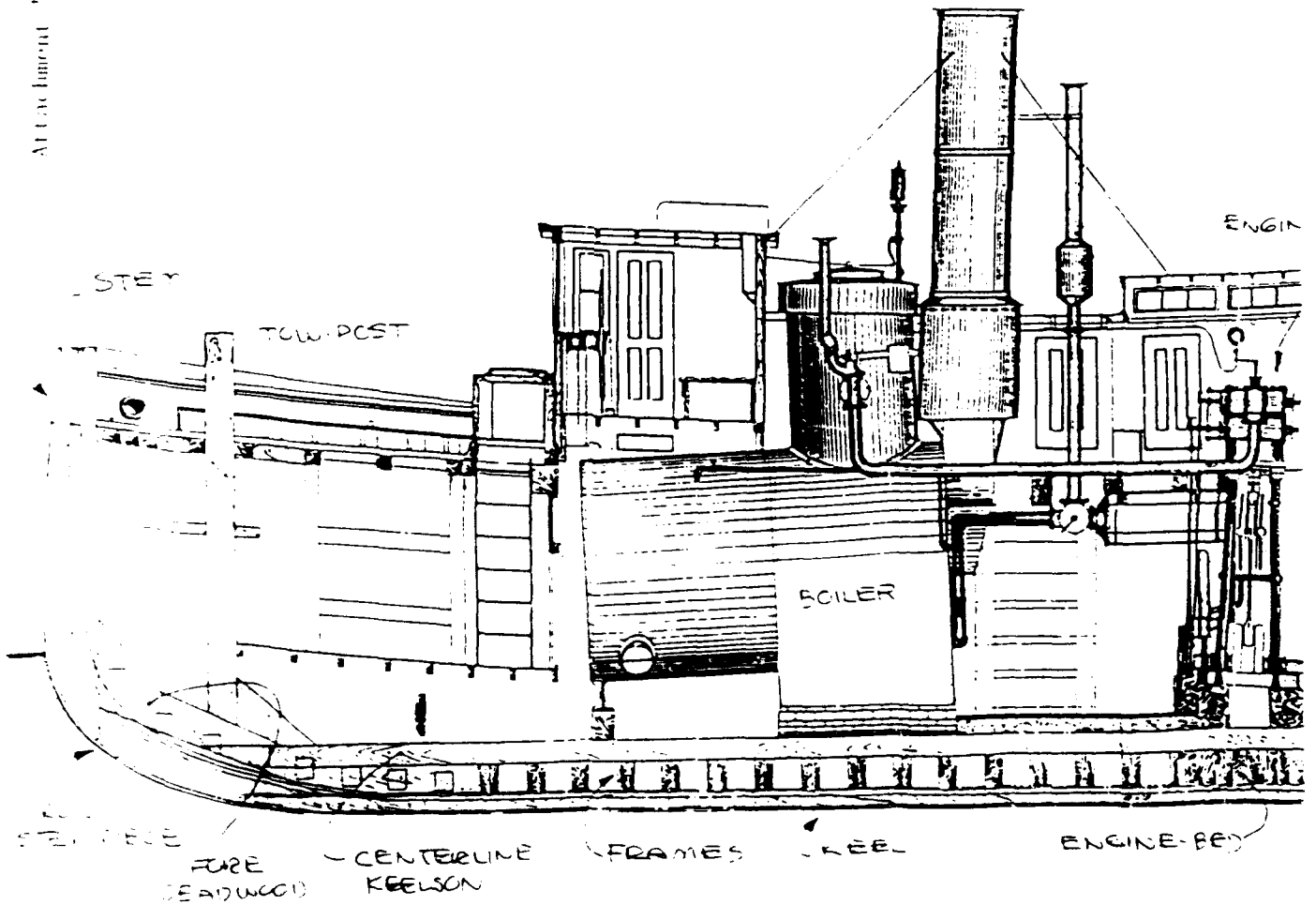
Attachment "D"

Inboard Profile drawing of typical steam tug,
 shows arrangement of structural features like
 those seen in St. Joseph wreck. Plan represents
 tug JULIAN V. O'BRIAN, built in 1888 at Buffalo,
 New York (Institute for Great Lakes Research)

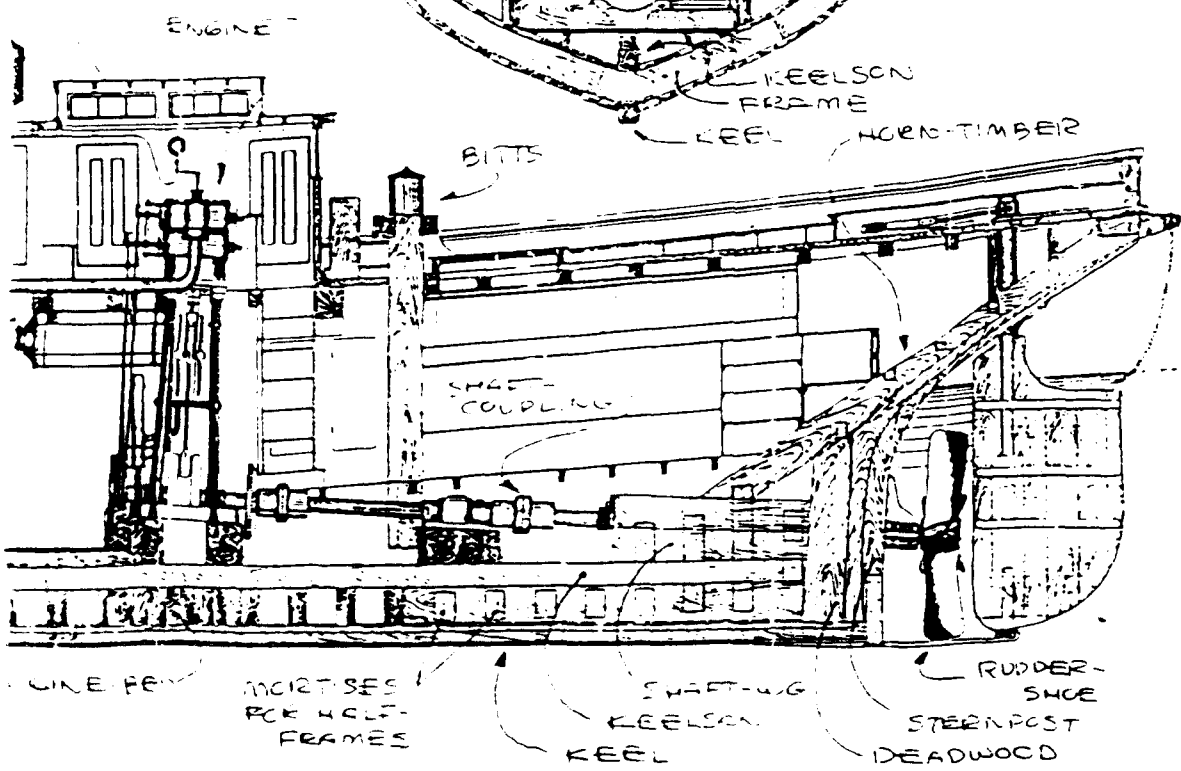
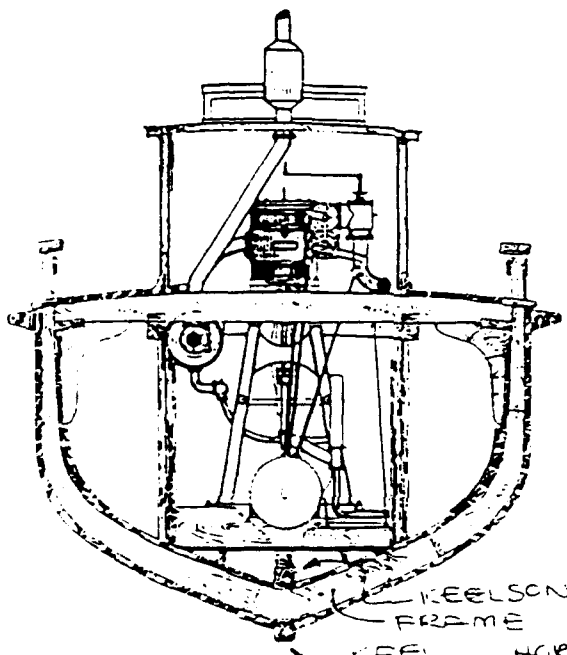
*A.C. ADAMS
 WAS IDENTICAL*

Scale 0 2 4 6 8

Attachment "D" Cont'd



C. ADAMS
AS IDENTICAL



ENGINE

KEELSON
FRAME

BITTS

KEEL HORN-TIMBER

SHAFT
COUPLING

LINE PIVOT

MORTISES
FOR HALF-
FRAMES

SHAFTING
KEELSON
KEEL

RUDDER-
SHOE
STERNPOST
DEADWOOD

Attachment
"E"

STATE OF NEW YORK)

)ss:

AFFIDAVIT

COUNTY OF CHEMUNG)

HAROLD W. MAYNARD, being duly sworn, deposes and says:

That on the fifth dive of the day on October 16, 1990, when a barrel had been found with the underwater camera and buoy placed on it, I dove down again with the Geiger counter on and set at its lowest level. I found a barrel on the edge of a bank, at one hundred and sixty-five (165) feet. I placed my barrel lifting device on the barrel and locked it in place. I then returned to the surface, having been down about 30 or 40 minutes.

The small boat was dispatched to up slack on the line, then the big tug was brought over to hoist the barrel. At that time, I was on the stern of the tug, and I observed that they were going to try to lift the barrel with a capstan on the tug. I personally don't like this as it put tension sideways on the line, plus the tug was moving when they took tension, it was all at once. In my estimation, this snapped the line and barrel lifting device too sharply, causing the device to either rip from the barrel or crush the barrel as it had been under water for thirty (30) years and could have been weak. The barrels must be brought up with slow, steady pressure in the future to stop this from happening. Of course, this is only my personal opinion.

At no time during this dive did the Geiger counter go off.

Harold W. Maynard
Harold W. Maynard

Sworn to before me this
27 day of October, 1990.

Barrara A. Quinn

BARRARA A. QUINN Notary Public
New York State Notary Commission

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October 5, 1990

St. Paul Army Corps of Engineers
1421 USPO & Custom House
St. Paul, Mn 55101-9808
Attn: Bob Dempsey
PO# DACW3790M1118

Attachment "F"
Contractor's Work Schedule
for

Underwater search for Lake Superior classified barrel disposal site
Duluth, Minnesota

General: Hazard Control intends to use the Duluth Army Corps of Engineers' office and dock area, as it's base of operations. Crew briefings, docking of search vessels, equipment storage, and other support will be headquartered at this location. We will have four surface vessels and at least one (possibly two) submarines.

I. Vessels, equipment and crew:

Vessel #1: will be the Boyd, a 45' launch provided by the Duluth Army Corps of Engineers. This will be the flag ship of search fleet and captained by a corps provided pilot. Roger Chapman (of International Marine Systems, Millwaukee, Wisc.) who is Hazard Control's 'Director of Marine Operations', will be stationed on this vessel. He will also operate EG&G side scan sonar from this boat. In addition, Terry Aldrich (Hazard Control's General Manager) will be on board for technical support. Terry is also an expert in hazardous materials, certified medic and fireman. A tow camera may also be provided to observe the bottom of the lake and video tape as necessary.

Vessel #2 will be the "Madeline Goodrush", a 33' twin engine (V-8's), piloted by Jerry Buchanan. Jerry is an experienced Lake Superior shipwreck discoverer and is highly skilled in water related electronics. He will have Rick Stauber as his crew member. Rick is a certified and very experienced scuba diver and also quite familiar with underwater electronics. The vessel will be equipped with a 'king-sonic' side scan sonar in addition to other various electronic equipment.

Vessel #3 will be the "Hey Boy". a 31 footer, piloted by Ken Merryman. Ken is a Lake Superior charter captain, shipwreck searcher, scuba diver and is highly skilled in water related electronics. Mike Toch (of International Marine, Milwaukee) will be operating a Westmar side scan sonar from this vessel. In addition, Ray Julian (Master diver and electronic whiz) will be Ken's 1st mate. Also, on board will be Wes Deibler of Hazard Control for additional technical support. Ken

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will also have an underwater tow camera for viewing and recording the lake bottom.

Vessel #4 will be the "Northern Comfort" a 27 footer, piloted by Dan Gates. Dan is a Lake Superior charter captain, shipwreck searcher, scuba diver and skilled in underwater electronics. Mike Stich (President of Hazard Control and the Corps' Contractor) will be operating a Proton II magnetometer from this vessel. Ken Anderson (of Twin City based search and rescue outfit) will be operating a Westmar section scan sonar. Also, on board will be John Stich, experienced with the magnetometer and for technical support. This boat will also have an R.O.V. (remote operated vehicle) for viewing and recording the lake bottom.

All surface boats will have Loran, for linear navigation, electronic and/or graph depth finders and be linked by radio communications.

Vessel #5 will be the "lake Diver" a K-350 model submarine, piloted by Harold Maynard of Wellsburg, New York. Harold has made more than 500 dives with his sub, and over 100 of these to depths greater than 300 feet. His vessel is equipped with directional sonar, hydro-phones, mechanical arm, four 500,000 candle power lights and has video and still photo capability.

I. Search Procedure:

Vessels number 1, 2, and 3 will be the designated search vessels. Each vessel will be assigned to search one quadrant of the target area. The target area (see attached map) has been divided into 9 quadrants, lettered from A through I (with A being most likely, and I the least). Each vessel will follow assigned Loran TD lines in straight and parallel search patterns. These lines are 500 feet apart, which will allow a 50 foot overlap based on an effective range of 300 feet either side of the vessel, using side scan sonar. As the vessels detect probable targets, the sonar operator will grade the target, on a level of 1-10, with 10 being a barrel (for sure) and then descending numerical grading with 1 being least likely. At the same time a target is sighted and graded, the pilot or support crew will log the exact location on Loran. The vessel will keep proceeding on it's designated search pattern with no slowing down or stopping. The Loran reading of the target will then be transmitted by radio to boat #4, which will (by using section scan sonar and magnetometer) verify if the target is metal. if indeed the target is metal, then again the Loran reading is taken, recorded and the target re-graded by boat #4 as being very likely target (barrel). This procedure will continue until all 9 quadrants are searched, time runs out, or weather interferes.

III. Verification:

after the entire target area is searched by surface vessels, the

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verification (visual sighting of targets) process will begin. Vessel #5 will be brought to the highest graded targets and attempt to make visual contact with the target. Other surface vessels equipped with underwater video capability will attempt to verify lesser graded targets. Should a barrel actually be sighted, a marking buoy will be dropped on the exact location and additional attempts to locate other barrels in the area will continue. Upon completion of the verification process, the last part of the contract will begin.

IV. Recovery:

Should several barrels be sighted, video and still photo's of the barrel will be taken and studied to try to determine it's contents. If they prove to be inconclusive, then vessel #5 will attempt to take samples from barrels that have rusted through and place them into sample containers, which will be lowered from the surface. These containers will be DOT approved hazardous containment drums and will be sealed just under the surface of the water, so as not to expose the contents to air. If a rusted or deteriorated barrel cannot be found, than an intact barrel will be located. A barrel device will be lowered over the barrel from the surface and maneuvered into position by vessel #5's mechanical arm. The barrel will be slowly raised until it is approximately 10 feet from the surface and then brought to shallow water where it will be contained in a 95 gallon over-pack DOT approved drum and sealed beneath the surface of the water. The drum will then be turned over to the Corps of Engineers for further disposition.

V. Chronology of events and dated work schedule:

October 5, 1990 Contractors work schedule, plan and procedure to take place at Duluth Army Corps of Engineers office.

October 9, 1990 Contractors equipment to be delivered to base of operations, corps office Duluth approx. 3-4:00pm.

October 10, 1990 Surface vessels #1-4, crews, and balance of equipment to arrive at base of operations. Equipment installed, practice runs made, meeting with crew and corps approx. 9:00am.

October 11, 1990 7:00am search officially begins and scheduled to run 12 hours. Meeting and review findings afterwards.

October 12, 1990 7:00am search continues and runs 12 hours. Meeting and review findings afterwards.

October 13, 1990 Search continues, 7:00am and runs 12 hours. Meeting and review findings afterwards.

October 14, 1990 Submarine arrives 7:00am, press invited at 9:00am. Demonstration for 2 hours. Then verifications and search for

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additional 8 hours. Meeting and review findings afterwards.

October 15, 1990 7:00am verification, search, recovery (depends on findings) run 12 hours. Meeting and review findings afterwards.

October 16, 1990 7:00am verification and recovery-should conclude run 12 hours. Meeting and review afterwards.

October 17, 1990 Site investigations concluded. Review all findings.

VI. Summary:

Hazard Control's intention is to locate and possibly recover at least one, if not 2 barrels. not only will Hazard Control meet the requirements of this contract, we will exceed it to the extent that all parties concerned, including the residents of Duluth, are satisfied with the effort put forth. Hazard Control intends to search at least 32 square miles of the bottom of Lake Superior. With 3 surface searching vessels, a minimum of 100 hours will be spent, electronically searching for targets. The equipment provided far exceeds the requirement of this contract. Further more, we intend to have a second submersible available for verification, recovery and safety reasons, but as of this writing, that has not been confirmed. the only problem that we could encounter is weather. Should that interfere with completing this contract Hazard Control will extend it's time in Duluth, as long as we financially are able to.

Report completed by Mike Stich, President of Hazard Control, Inc.

*Also attached: 1. Map of designated search area
 2. Safety plan

MS/amm

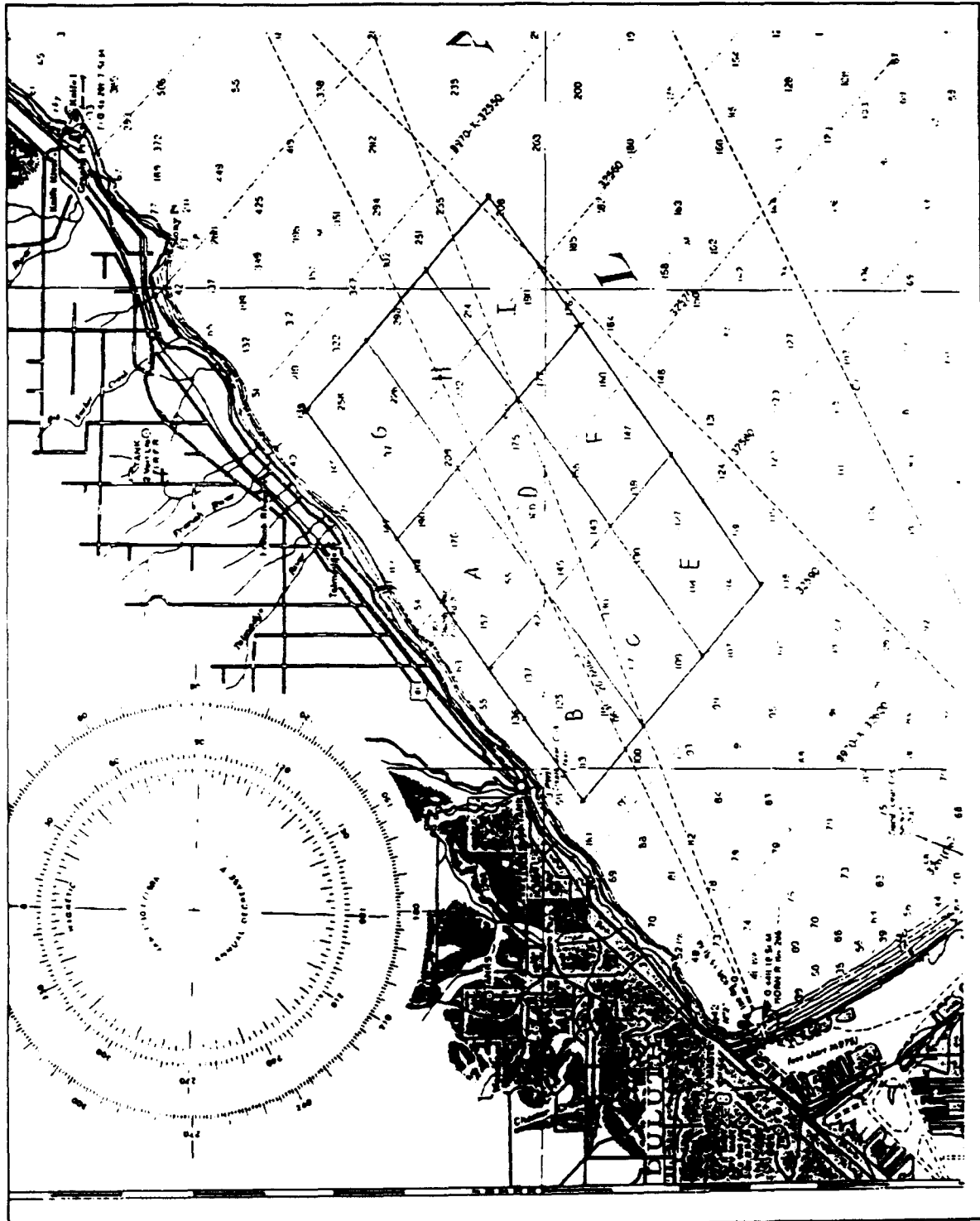
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SAFETY PLAN

Hazard Control's business is safety and as such we have taken the following precautions for this contract, even though no diving is anticipated:

1. Certified and experienced divers with equipment on each vessel.
2. Medical supplies and oxygen on each vessel.
3. Certified medic and 3 licensed hard hat professional divers with equipment as part of crew.
4. Hazardous materials handling equipment and protective clothing on each vessel.
5. Personnel experienced in CPR/1st Aid on each vessel.
6. A second submarine available to support the other.
7. Constant radio contact with all vessels.
8. The following phone numbers distributed to each vessel captain:
Emergency 911
 - A. Dan (divers Alert Network) emergency 919-684-811
Mpls. 612-588-2731
 - B. Nearest hyperbaric chamber-Mpls. 612-347-3131
*Notified of operation
 - C. Hospitals-Duluth, St. Mary's 218-726-4357
St. Luke's 218-726-5616
Mpls. Hennepin Co. Medical Center 612-347-3131
Methodist 612-932-5353
 - D. Coast Guard, Duluth 218-720-5412
 - E. Helicopter, Traverse City Mich. Coast Guard
616-992-8214. *Notified of operation
 - F. Coast Guard, Soo St. Marie 909-635-3231
*Notified of operation, also given coordinates of
search area, they will broadcast warnings during
operational period to keep other craft clear of
our vessels.

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Map at Designated Search Area

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barrel disposal site, Duluth, Minnesota.

Search Lines for Section A

SW to NE Search Plan
Line Spacing - 500 feet
Line Length - 13750 feet

	S1	S2	S1	S2
Line #1	32576.0	45812.0	32565.0	45812.0
Line #2	32576.0	45813.0	32565.0	45813.0
Line #3	32576.0	45814.0	32565.0	45814.0
Line #4	32576.0	45815.0	32565.0	45815.0
Line #5	32576.0	45816.0	32565.0	45816.0
Line #6	32576.0	45817.0	32565.0	45817.0
Line #7	32576.0	45818.0	32565.0	45818.0
Line #8	32576.0	45819.0	32565.0	45819.0
Line #9	32576.0	45820.0	32565.0	45820.0
Line #10	32576.0	45821.0	32565.0	45821.0
Line #11	32576.0	45822.0	32565.0	45822.0
Line #12	32576.0	45823.0	32565.0	45823.0
Line #13	32576.0	45824.0	32565.0	45824.0
Line #14	32576.0	45825.0	32565.0	45825.0
Line #15	32576.0	45826.0	32565.0	45826.0
Line #16	32576.0	45827.0	32565.0	45827.0

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Underwater Search of Lake Superior's Classified
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Search Lines for Section B

SW to NE Search Plan
Line Spacing - 500 feet
Line Length - 13750 feet

	S1	S2	S1	S2
Line #1	32587.0	45812.0	32576.0	45812.0
Line #2	32587.0	45813.0	32576.0	45813.0
Line #3	32587.0	45814.0	32576.0	45814.0
Line #4	32587.0	45815.0	32576.0	45815.0
Line #5	32587.0	45816.0	32576.0	45816.0
Line #6	32587.0	45817.0	32576.0	45817.0
Line #7	32587.0	45818.0	32576.0	45818.0
Line #8	32587.0	45819.0	32576.0	45819.0
Line #9	32587.0	45820.0	32576.0	45820.0
Line #10	32587.0	45821.0	32576.0	45821.0
Line #11	32587.0	45822.0	32576.0	45822.0
Line #12	32587.0	45823.0	32576.0	45823.0
Line #13	32587.0	45824.0	32576.0	45824.0
Line #14	32587.0	45825.0	32576.0	45825.0
Line #15	32587.0	45826.0	32576.0	45826.0
Line #16	32587.0	45827.0	32576.0	45827.0

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Search Lines for Section C

SW to NE Search Plan
Line Spacing - 500 feet
Line Length - 13750 feet

	S1	S2	S1	S2
Line #1	32587.0	45828.0	32576.0	45828.0
Line #2	32587.0	45829.0	32576.0	45829.0
Line #3	32587.0	45830.0	32576.0	45830.0
Line #4	32587.0	45831.0	32576.0	45831.0
Line #5	32587.0	45832.0	32576.0	45832.0
Line #6	32587.0	45833.0	32576.0	45833.0
Line #7	32587.0	45834.0	32576.0	45834.0
Line #8	32587.0	45835.0	32576.0	45835.0
Line #9	32587.0	45836.0	32576.0	45836.0
Line #10	32587.0	45837.0	32576.0	45837.0
Line #11	32587.0	45838.0	32576.0	45838.0
Line #12	32587.0	45839.0	32576.0	45839.0
Line #13	32587.0	45840.0	32576.0	45840.0
Line #14	32587.0	45841.0	32576.0	45841.0
Line #15	32587.0	45842.0	32576.0	45842.0
Line #16	32587.0	45843.0	32576.0	45843.0

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Search Lines for Section D

SW to NE Search Plan
Line Spacing - 500 feet
Line Length - 13750 feet

	S1	S2	S1	S2
Line #1	32576.0	45828.0	32565.0	45828.0
Line #2	32576.0	45829.0	32565.0	45829.0
Line #3	32576.0	45830.0	32565.0	45830.0
Line #4	32576.0	45831.0	32565.0	45831.0
Line #5	32576.0	45832.0	32565.0	45832.0
Line #6	32576.0	45833.0	32565.0	45833.0
Line #7	32576.0	45834.0	32565.0	45834.0
Line #8	32576.0	45835.0	32565.0	45835.0
Line #9	32576.0	45836.0	32565.0	45836.0
Line #10	32576.0	45837.0	32565.0	45837.0
Line #11	32576.0	45838.0	32565.0	45838.0
Line #12	32576.0	45839.0	32565.0	45839.0
Line #13	32576.0	45840.0	32565.0	45840.0
Line #14	32576.0	45841.0	32565.0	45841.0
Line #15	32576.0	45842.0	32565.0	45842.0
Line #16	32576.0	45843.0	32565.0	45843.0

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Search Lines for Section E

SW to NE Search Plan
Line Spacing - 500 feet
Line Length - 13750 feet

	S1	S2	S1	S2
Line #1	32587.0	45844.0	32576.0	45844.0
Line #2	32587.0	45845.0	32576.0	45845.0
Line #3	32587.0	45846.0	32576.0	45846.0
Line #4	32587.0	45847.0	32576.0	45847.0
Line #5	32587.0	45848.0	32576.0	45848.0
Line #6	32587.0	45849.0	32576.0	45849.0
Line #7	32587.0	45850.0	32576.0	45850.0
Line #8	32587.0	45851.0	32576.0	45851.0
Line #9	32587.0	45852.0	32576.0	45852.0
Line #10	32587.0	45853.0	32576.0	45853.0
Line #11	32587.0	45854.0	32576.0	45854.0
Line #12	32587.0	45855.0	32576.0	45855.0
Line #13	32587.0	45856.0	32576.0	45856.0
Line #14	32587.0	45857.0	32576.0	45857.0
Line #15	32587.0	45858.0	32576.0	45858.0
Line #16	32587.0	45859.0	32576.0	45859.0

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Search Lines for Section F

SW to NE Search Plan
Line Spacing - 500 feet
Line Length - 13750 feet

	S1	S2	S1	S2
Line #1	32576.0	45844.0	32565.0	45844.0
Line #2	32576.0	45845.0	32565.0	45845.0
Line #3	32576.0	45846.0	32565.0	45846.0
Line #4	32576.0	45847.0	32565.0	45847.0
Line #5	32576.0	45848.0	32565.0	45848.0
Line #6	32576.0	45849.0	32565.0	45849.0
Line #7	32576.0	45850.0	32565.0	45850.0
Line #8	32576.0	45851.0	32565.0	45851.0
Line #9	32576.0	45852.0	32565.0	45852.0
Line #10	32576.0	45853.0	32565.0	45853.0
Line #11	32576.0	45854.0	32565.0	45854.0
Line #12	32576.0	45855.0	32565.0	45855.0
Line #13	32576.0	45856.0	32565.0	45856.0
Line #14	32576.0	45857.0	32565.0	45857.0
Line #15	32576.0	45858.0	32565.0	45858.0
Line #16	32576.0	45859.0	32565.0	45859.0

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Search Lines for Section G

SW to NE Search Plan
Line Spacing - 500 feet
Line Length - 13750 feet

	S1	S2	S1	S2
Line #1	32565.0	45812.0	32554.0	45812.0
Line #2	32565.0	45813.0	32554.0	45813.0
Line #3	32565.0	45814.0	32554.0	45814.0
Line #4	32565.0	45815.0	32554.0	45815.0
Line #5	32565.0	45816.0	32554.0	45816.0
Line #6	32565.0	45817.0	32554.0	45817.0
Line #7	32565.0	45818.0	32554.0	45818.0
Line #8	32565.0	45819.0	32554.0	45819.0
Line #9	32565.0	45820.0	32554.0	45820.0
Line #10	32565.0	45821.0	32554.0	45821.0
Line #11	32565.0	45822.0	32554.0	45822.0
Line #12	32565.0	45823.0	32554.0	45823.0
Line #13	32565.0	45824.0	32554.0	45824.0
Line #14	32565.0	45825.0	32554.0	45825.0
Line #15	32565.0	45826.0	32554.0	45826.0
Line #16	32565.0	45827.0	32554.0	45827.0

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Search Lines for Section H

SW to NE Search Plan
Line Spacing - 500 feet
Line Length - 13750 feet

	S1	S2	S1	S2
Line #1	32565.0	45828.0	32554.0	45828.0
Line #2	32565.0	45829.0	32554.0	45829.0
Line #3	32565.0	45830.0	32554.0	45830.0
Line #4	32565.0	45831.0	32554.0	45831.0
Line #5	32565.0	45832.0	32554.0	45832.0
Line #6	32565.0	45833.0	32554.0	45833.0
Line #7	32565.0	45834.0	32554.0	45834.0
Line #8	32565.0	45835.0	32554.0	45835.0
Line #9	32565.0	45836.0	32554.0	45836.0
Line #10	32565.0	45837.0	32554.0	45837.0
Line #11	32565.0	45838.0	32554.0	45838.0
Line #12	32565.0	45839.0	32554.0	45839.0
Line #13	32565.0	45840.0	32554.0	45840.0
Line #14	32565.0	45841.0	32554.0	45841.0
Line #15	32565.0	45842.0	32554.0	45842.0
Line #16	32565.0	45843.0	32554.0	45843.0

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Search Lines for Section I

SW to NE Plan
Line Spacing - 500 feet
Line Length - 13750 feet

	S1	S2	S1	S2
Line #1	32565.0	45844.0	32554.0	45844.0
Line #2	32565.0	45845.0	32554.0	45845.0
Line #3	32565.0	45846.0	32554.0	45846.0
Line #4	32565.0	45847.0	32554.0	45847.0
Line #5	32565.0	45848.0	32554.0	45848.0
Line #6	32565.0	45849.0	32554.0	45849.0
Line #7	32565.0	45850.0	32554.0	45850.0
Line #8	32565.0	45851.0	32554.0	45851.0
Line #9	32565.0	45852.0	32554.0	45852.0
Line #10	32565.0	45853.0	32554.0	45853.0
Line #11	32565.0	45854.0	32554.0	45854.0
Line #12	32565.0	45855.0	32554.0	45855.0
Line #13	32565.0	45856.0	32554.0	45856.0
Line #14	32565.0	45857.0	32554.0	45857.0
Line #15	32565.0	45858.0	32554.0	45858.0
Line #16	32565.0	45859.0	32554.0	45859.0

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Search Lines for Section A

NW to SE Search Plan
Line Spacing - 500 feet
Line Length - 8240 feet

	S1	S2	S1	S2
Line #1	32575.8	45812.0	32575.8	45828.0
Line #2	32575.4	45812.0	32575.4	45828.0
Line #3	32575.0	45812.0	32575.0	45828.0
Line #4	32574.6	45812.0	32574.6	45828.0
Line #5	32574.2	45812.0	32574.2	45828.0
Line #6	32573.8	45812.0	32573.8	45828.0
Line #7	32573.4	45812.0	32573.4	45828.0
Line #8	32573.0	45812.0	32573.0	45828.0
Line #9	32572.6	45812.0	32572.6	45828.0
Line #10	32572.2	45812.0	32572.2	45828.0
Line #11	32571.8	45812.0	32571.8	45828.0
Line #12	32571.4	45812.0	32571.4	45828.0
Line #13	32571.0	45812.0	32571.0	45828.0
Line #14	32570.6	45812.0	32570.6	45828.0
Line #15	32570.2	45812.0	32570.2	45828.0
Line #16	32569.8	45812.0	32569.8	45828.0
Line #17	32569.4	45812.0	32569.4	45828.0
Line #18	32569.0	45812.0	32569.0	45828.0
Line #19	32568.6	45812.0	32568.6	45828.0
Line #20	32568.2	45812.0	32568.2	45828.0
Line #21	32567.8	45812.0	32567.8	45828.0
Line #22	32567.4	45812.0	32567.4	45828.0
Line #23	32567.0	45812.0	32567.0	45828.0
Line #24	32566.6	45812.0	32566.6	45828.0
Line #25	32566.2	45812.0	32566.2	45828.0
Line #26	32565.8	45812.0	32565.8	45828.0
Line #27	32565.4	45812.0	32565.4	45828.0
Line #28	32565.0	45812.0	32565.0	45828.0

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Search Lines for Section B

NW to SE Search Plan
 Line Spacing - 500 feet
 Line Length - 8240 feet

	S1	S2	S1	S2
Line #1	32587.0	45812.0	32587.0	45828.0
Line #2	32586.6	45812.0	32586.6	45828.0
Line #3	32586.2	45812.0	32586.2	45828.0
Line #4	32585.8	45812.0	32585.8	45828.0
Line #5	32585.4	45812.0	32585.4	45828.0
Line #6	32585.0	45812.0	32585.0	45828.0
Line #7	32584.6	45812.0	32584.6	45828.0
Line #8	32584.2	45812.0	32584.2	45828.0
Line #9	32583.8	45812.0	32583.8	45828.0
Line #10	32583.4	45812.0	32583.4	45828.0
Line #11	32583.0	45812.0	32583.0	45828.0
Line #12	32582.6	45812.0	32582.6	45828.0
Line #13	32582.2	45812.0	32582.2	45828.0
Line #14	32581.8	45812.0	32581.8	45828.0
Line #15	32581.4	45812.0	32581.4	45828.0
Line #16	32581.0	45812.0	32581.0	45828.0
Line #17	32580.6	45812.0	32580.6	45828.0
Line #18	32580.2	45812.0	32580.2	45828.0
Line #19	32579.8	45812.0	32579.8	45828.0
Line #20	32579.4	45812.0	32579.4	45828.0
Line #21	32579.0	45812.0	32579.0	45828.0
Line #22	32578.6	45812.0	32578.6	45828.0
Line #23	32578.2	45812.0	32578.2	45828.0
Line #24	32577.8	45812.0	32577.8	45828.0
Line #25	32577.4	45812.0	32577.4	45828.0
Line #26	32577.0	45812.0	32577.0	45828.0
Line #27	32576.6	45812.0	32576.6	45828.0
Line #28	32576.2	45812.0	32576.2	45828.0

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Search Lines for Section C

NW to SE Search Plan
 Line Spacing - 500 feet
 Line Length - 8240 feet

	S1	S2	S1	S2
Line #1	32587.0	45828.0	32587.0	45844.0
Line #2	32586.6	45828.0	32586.6	45844.0
Line #3	32586.2	45828.0	32586.2	45844.0
Line #4	32585.8	45828.0	32585.8	45844.0
Line #5	32585.4	45828.0	32585.4	45844.0
Line #6	32585.0	45828.0	32585.0	45844.0
Line #7	32584.6	45828.0	32584.6	45844.0
Line #8	32584.2	45828.0	32584.2	45844.0
Line #9	32583.8	45828.0	32583.8	45844.0
Line #10	32583.4	45828.0	32583.4	45844.0
Line #11	32583.0	45828.0	32583.0	45844.0
Line #12	32582.6	45828.0	32582.6	45844.0
Line #13	32582.2	45828.0	32582.2	45844.0
Line #14	32581.8	45828.0	32581.8	45844.0
Line #15	32581.4	45828.0	32581.4	45844.0
Line #16	32581.0	45828.0	32581.0	45844.0
Line #17	32580.6	45828.0	32580.6	45844.0
Line #18	32580.2	45828.0	32580.2	45844.0
Line #19	32579.8	45828.0	32579.8	45844.0
Line #20	32579.4	45828.0	32579.4	45844.0
Line #21	32579.0	45828.0	32579.0	45844.0
Line #22	32578.6	45828.0	32578.6	45844.0
Line #23	32578.2	45828.0	32578.2	45844.0
Line #24	32577.8	45828.0	32577.8	45844.0
Line #25	32577.4	45828.0	32577.4	45844.0
Line #26	32577.0	45828.0	32577.0	45844.0
Line #27	32576.6	45828.0	32576.6	45844.0
Line #28	32576.2	45828.0	32576.2	45844.0

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Search Lines for Section D

NW to SE Search Plan
 Line Spacing - 500 feet
 Line Length - 8240 feet

	S1	S2	S1	S2
Line #1	32575.8	45828.0	32575.8	45844.0
Line #2	32575.4	45828.0	32575.4	45844.0
Line #3	32575.0	45828.0	32575.0	45844.0
Line #4	32574.6	45828.0	32574.6	45844.0
Line #5	32574.2	45828.0	32574.2	45844.0
Line #6	32573.8	45828.0	32573.8	45844.0
Line #7	32573.4	45828.0	32573.4	45844.0
Line #8	32573.0	45828.0	32573.0	45844.0
Line #9	32572.6	45828.0	32572.6	45844.0
Line #10	32572.2	45828.0	32572.2	45844.0
Line #11	32571.8	45828.0	32571.8	45844.0
Line #12	32571.4	45828.0	32571.4	45844.0
Line #13	32571.0	45828.0	32571.0	45844.0
Line #14	32570.6	45828.0	32570.6	45844.0
Line #15	32570.2	45828.0	32570.2	45844.0
Line #16	32569.8	45828.0	32569.8	45844.0
Line #17	32569.4	45828.0	32569.4	45844.0
Line #18	32569.0	45828.0	32569.0	45844.0
Line #19	32568.6	45828.0	32568.6	45844.0
Line #20	32568.2	45828.0	32568.2	45844.0
Line #21	32567.8	45828.0	32567.8	45844.0
Line #22	32567.4	45828.0	32567.4	45844.0
Line #23	32567.0	45828.0	32567.0	45844.0
Line #24	32566.6	45828.0	32566.6	45844.0
Line #25	32566.2	45828.0	32566.2	45844.0
Line #26	32565.8	45828.0	32565.8	45844.0
Line #27	32565.4	45828.0	32565.4	45844.0
Line #28	32565.0	45828.0	32565.0	45844.0

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Search Lines for Section E

NW to SE Search Plan
 Line Spacing - 500 feet
 Line Length - 8240 feet

	S1	S2	S1	S2
Line #1	32587.0	45844.0	32587.0	45860.0
Line #2	32586.6	45844.0	32586.6	45860.0
Line #3	32586.2	45844.0	32586.2	45860.0
Line #4	32585.8	45844.0	32585.8	45860.0
Line #5	32585.4	45844.0	32585.4	45860.0
Line #6	32585.0	45844.0	32585.0	45860.0
Line #7	32584.6	45844.0	32584.6	45860.0
Line #8	32584.2	45844.0	32584.2	45860.0
Line #9	32583.8	45844.0	32583.8	45860.0
Line #10	32583.4	45844.0	32583.4	45860.0
Line #11	32583.0	45844.0	32583.0	45860.0
Line #12	32582.6	45844.0	32582.6	45860.0
Line #13.	32582.2	45844.0	32582.2	45860.0
Line #14	32581.8	45844.0	32581.8	45860.0
Line #15	32581.4	45844.0	32581.4	45860.0
Line #16	32581.0	45844.0	32581.0	45860.0
Line #17	32580.6	45844.0	32580.6	45860.0
Line #18	32580.2	45844.0	32580.2	45860.0
Line #19	32579.8	45844.0	32579.8	45860.0
Line #20	32579.4	45844.0	32579.4	45860.0
Line #21	32579.0	45844.0	32579.0	45860.0
Line #22	32578.6	45844.0	32578.6	45860.0
Line #23	32578.2	45844.0	32578.2	45860.0
Line #24	32577.8	45844.0	32577.8	45860.0
Line #25	32577.4	45844.0	32577.4	45860.0
Line #26	32577.0	45844.0	32577.0	45860.0
Line #27	32576.6	45844.0	32576.6	45860.0
Line #28	32576.2	45844.0	32576.2	45860.0

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Search Lines for Section F

NW to SE Search Plan
 Line Spacing - 500 feet
 Line Length - 8240 feet

	S1	S2	S1	S2
Line #1	32575.8	45844.0	32575.8	45860.0
Line #2	32575.4	45844.0	32575.4	45860.0
Line #3	32575.0	45844.0	32575.0	45860.0
Line #4	32574.6	45844.0	32574.6	45860.0
Line #5	32574.2	45844.0	32574.2	45860.0
Line #6	32573.8	45844.0	32573.8	45860.0
Line #7	32573.4	45844.0	32573.4	45860.0
Line #8	32573.0	45844.0	32573.0	45860.0
Line #9	32572.6	45844.0	32572.6	45860.0
Line #10	32572.2	45844.0	32572.2	45860.0
Line #11	32571.8	45844.0	32571.8	45860.0
Line #12	32571.4	45844.0	32571.4	45860.0
Line #13	32571.0	45844.0	32571.0	45860.0
Line #14	32570.6	45844.0	32570.6	45860.0
Line #15	32570.2	45844.0	32570.2	45860.0
Line #16	32569.8	45844.0	32569.8	45860.0
Line #17	32569.4	45844.0	32569.4	45860.0
Line #18	32569.0	45844.0	32569.0	45860.0
Line #19	32568.6	45844.0	32568.6	45860.0
Line #20	32568.2	45844.0	32568.2	45860.0
Line #21	32567.8	45844.0	32567.8	45860.0
Line #22	32567.4	45844.0	32567.4	45860.0
Line #23	32567.0	45844.0	32567.0	45860.0
Line #24	32566.6	45844.0	32566.6	45860.0
Line #25	32566.2	45844.0	32566.2	45860.0
Line #26	32565.8	45844.0	32565.8	45860.0
Line #27	32565.40	45844.0	32565.4	45860.0
Line #28	32565.0	45844.0	32565.0	45860.0

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Search Lines for Section G

NW to SE Search Plan
 Line Spacing - 500 feet
 Line Length - 8240 Feet

	S1	S2	S1	S2
Line #1	32564.6	45812.0	32564.6	45828.0
Line #2	32564.2	45812.0	32564.2	45828.0
Line #3	32563.8	45812.0	32563.8	45828.0
Line #4	32563.4	45812.0	32563.4	45828.0
Line #5	32563.0	45812.0	32563.0	45828.0
Line #6	32562.6	45812.0	32562.6	45828.0
Line #7	32562.2	45812.0	32562.2	45828.0
Line #8	32561.8	45812.0	32561.8	45828.0
Line #9	32561.4	45812.0	32561.4	45828.0
Line #10	32561.0	45812.0	32561.0	45828.0
Line #11	32560.6	45812.0	32560.6	45828.0
Line #12	32560.2	45812.0	32560.2	45828.0
Line #13	32559.8	45812.0	32559.8	45828.0
Line #14	32559.4	45812.0	32559.4	45828.0
Line #15	32559.0	45812.0	32559.0	45828.0
Line #16	32558.6	45812.0	32558.6	45828.0
Line #17	32558.2	45812.0	32558.2	45828.0
Line #18	32557.8	45812.0	32557.8	45828.0
Line #19	32557.4	45812.0	32557.4	45828.0
Line #20	32557.0	45812.0	32557.0	45828.0
Line #21	32556.6	45812.0	32556.6	45828.0
Line #22	32556.2	45812.0	32556.2	45828.0
Line #23	32555.8	45812.0	32555.8	45828.0
Line #24	32555.4	45812.0	32555.4	45828.0
Line #25	32555.0	45812.0	32555.0	45828.0
Line #26	32554.6	45812.0	32554.6	45828.0
Line #27	32554.2	45812.0	32554.2	45828.0
Line #28	32553.8	45812.0	32553.8	45828.0

CONTRACTORS FINAL REPORT
 Underwater Search of Lake Superior's Classified
 barrel disposal site, Duluth, Minnesota.

Search Lines for Section H

NW to SE Search Plan
 Line Spacing - 500 feet
 Line Length - 8240 feet

	S1	S2	S1	S2
Line #1	32564.6	45828.0	32564.6	45844.0
Line #2	32564.2	45828.0	32564.2	45844.0
Line #3	32563.8	45828.0	32563.8	45844.0
Line #4	32563.4	45828.0	32563.4	45844.0
Line #5	32563.0	45828.0	32563.0	45844.0
Line #6	32562.6	45828.0	32562.6	45844.0
Line #7	32562.2	45828.0	32562.2	45844.0
Line #8	32561.8	45828.0	32561.8	45844.0
Line #9	32561.4	45828.0	32561.4	45844.0
Line #10	32561.0	45828.0	32561.0	45844.0
Line #11	32560.6	45828.0	32560.6	45844.0
Line #12	32560.2	45828.0	32560.2	45844.0
Line #13	32559.8	45828.0	32559.8	45844.0
Line #14	32559.4	45828.0	32559.4	45844.0
Line #15	32559.0	45828.0	32559.0	45844.0
Line #16	32558.6	45828.0	32558.6	45844.0
Line #17	32558.2	45828.0	32558.2	45844.0
Line #18	32557.8	45828.0	32557.8	45844.0
Line #19	32557.4	45828.0	32557.4	45844.0
Line #20	32557.0	45828.0	32557.0	45844.0
Line #21	32556.6	45828.0	32556.6	45844.0
Line #22	32556.2	45828.0	32556.2	45844.0
Line #23	32555.8	45828.0	32555.8	45844.0
Line #24	32555.4	45828.0	32555.4	45844.0
Line #25	32555.0	45828.0	32555.0	45844.0
Line #26	32554.6	45828.0	32554.6	45844.0
Line #27	32554.2	45828.0	32554.2	45844.0
Line #28	32553.8	45828.0	32553.8	45844.0

CONTRACTORS FINAL REPORT
 Underwater Search of Lake Superior's Classified
 barrel disposal site, Duluth, Minnesota.

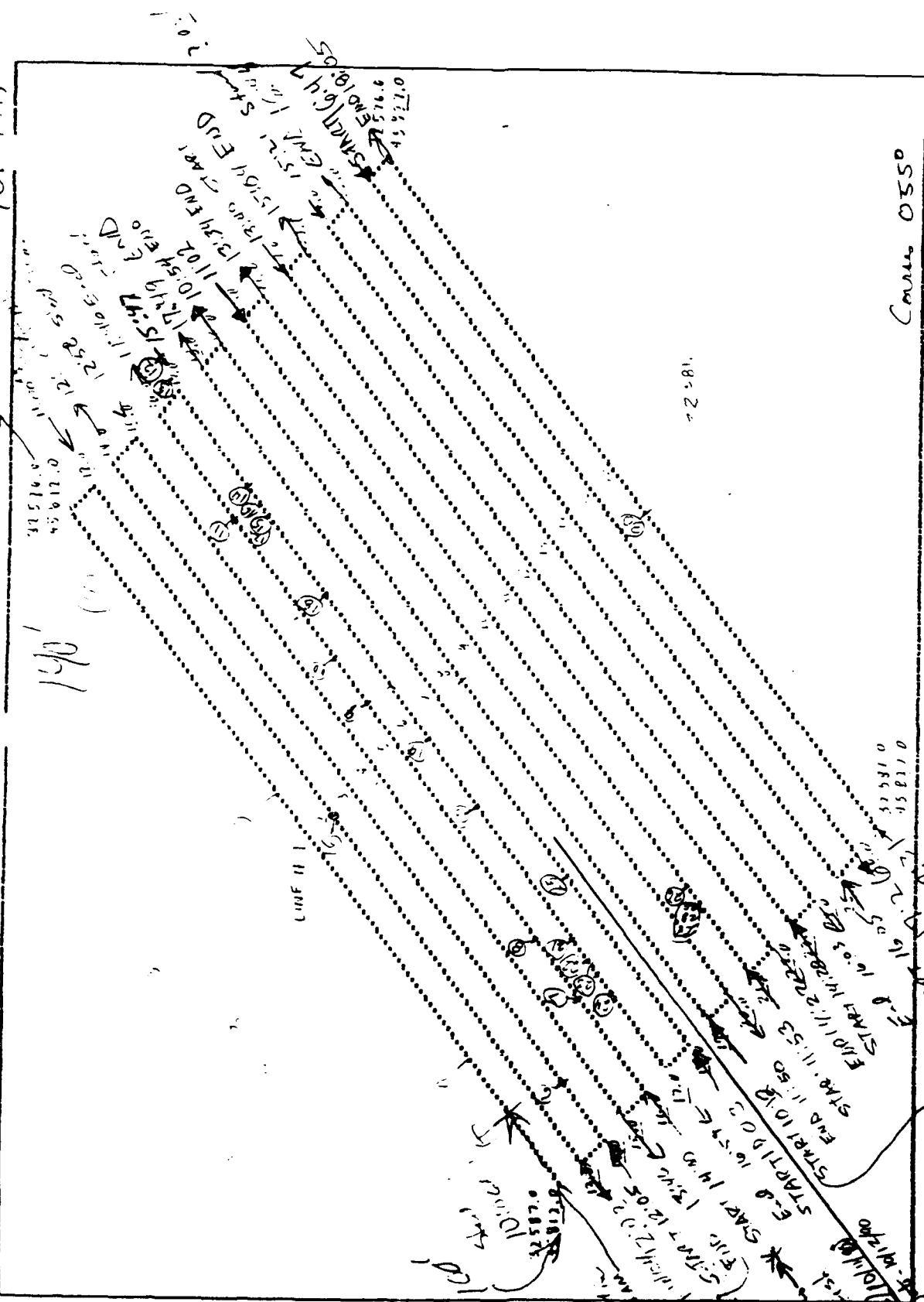
Search Lines For Section I

NW to SE Search Plan
 Line Spacing - 500 feet
 Line Length - 8240 feet

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Line #2	32564.2	45844.0	32564.2	45860.0
Line #3	32563.8	45844.0	32563.8	45860.0
Line #4	32563.4	45844.0	32563.4	45860.0
Line #5	32563.0	45844.0	32563.0	45860.0
Line #6	32562.6	45844.0	32562.6	45860.0
Line #7	32562.2	45844.0	32562.2	45860.0
Line #8	32561.8	45844.0	32561.8	45860.0
Line #9	32561.4	45844.0	32561.4	45860.0
Line #10	32560.4	45844.0	32561.0	45860.0
Line #11	32560.6	45844.0	32560.6	45860.0
Line #12	32560.2	45844.0	32560.2	45860.0
Line #13	32559.8	45844.0	32559.8	45860.0
Line #14	32559.4	45844.0	32559.4	45860.0
Line #15	32559.0	45844.0	32559.0	45860.0
Line #16	32558.6	45844.0	32558.6	45860.0
Line #17	32558.2	45844.0	32558.2	45860.0
Line #18	32557.8	45844.0	32557.8	45860.0
Line #19	32557.4	45844.0	32557.4	45860.0
Line #20	32557.0	45844.0	32557.0	45860.0
Line #21	32556.6	45844.0	32556.6	45860.0
Line #22	32556.2	45844.0	32556.2	45860.0
Line #23	32555.8	45844.0	32555.8	45860.0
Line #24	32555.4	45844.0	32555.4	45860.0
Line #25	32555.0	45844.0	32555.0	45860.0
Line #26	32554.6	45844.0	32554.6	45860.0
Line #27	32554.2	45844.0	32554.2	45860.0
Line #28	32553.8	45844.0	32553.8	45860.0

10/2/90
16 PAINT
45817.0
7/17/1826

10/11/90



Section II

Section I

500.0

500.0

Corner 0350
230°

2581

0.11810
0.15220

0.11810
0.15220

6

15

140

12.05
13.05
14.05
15.05
16.05
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24.05
25.05
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27.05
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30.05
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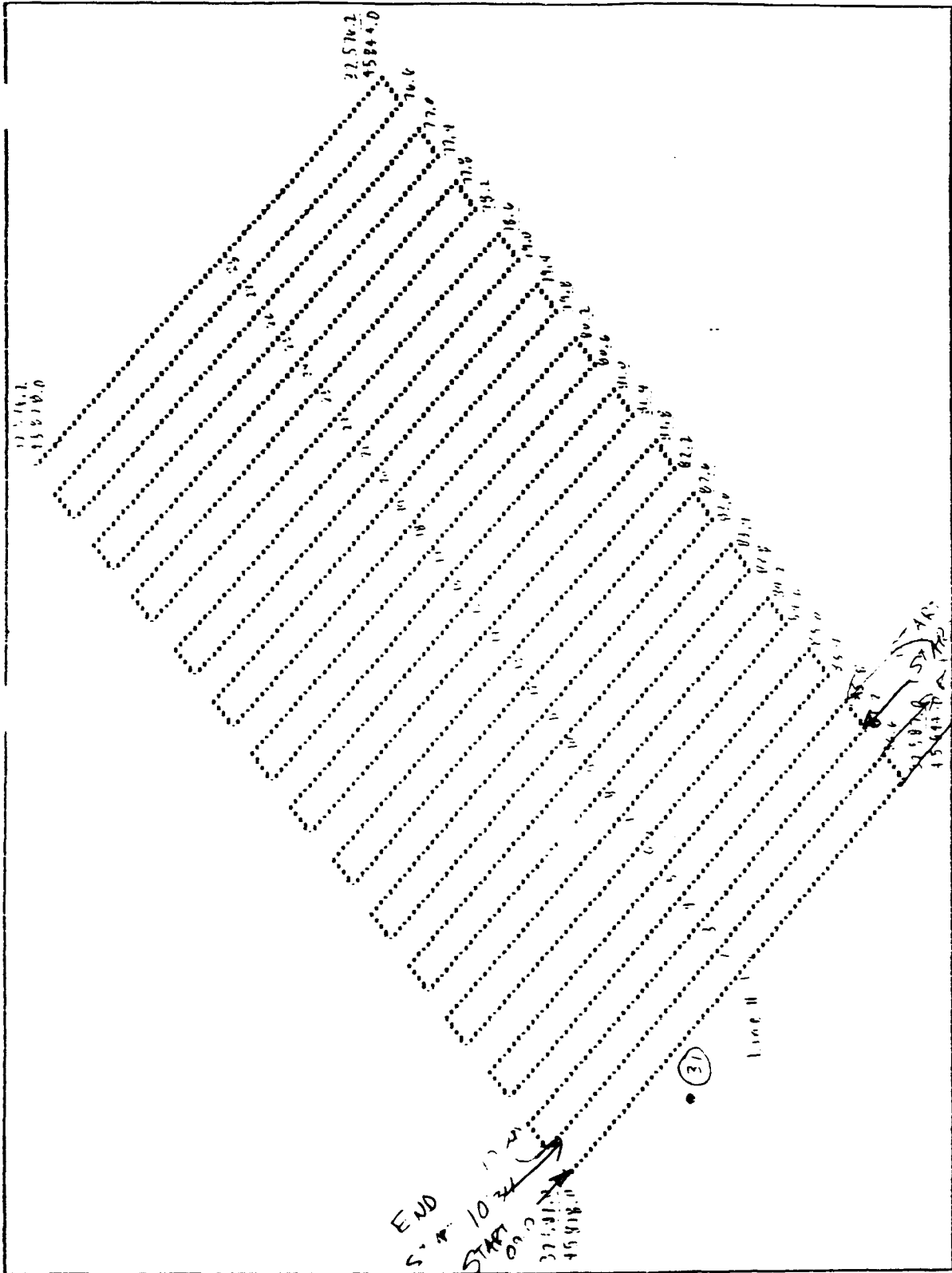
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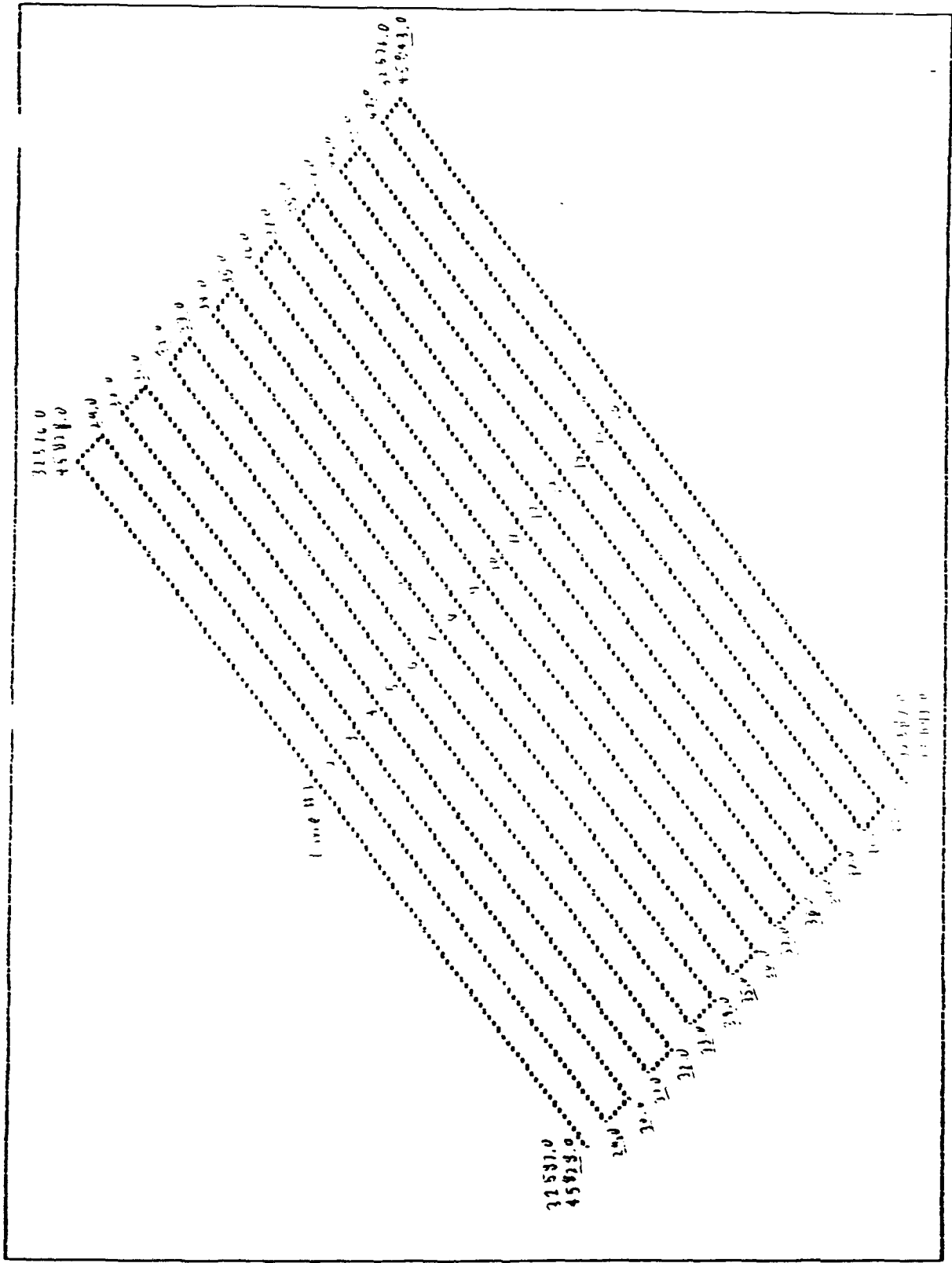
START END

11 11



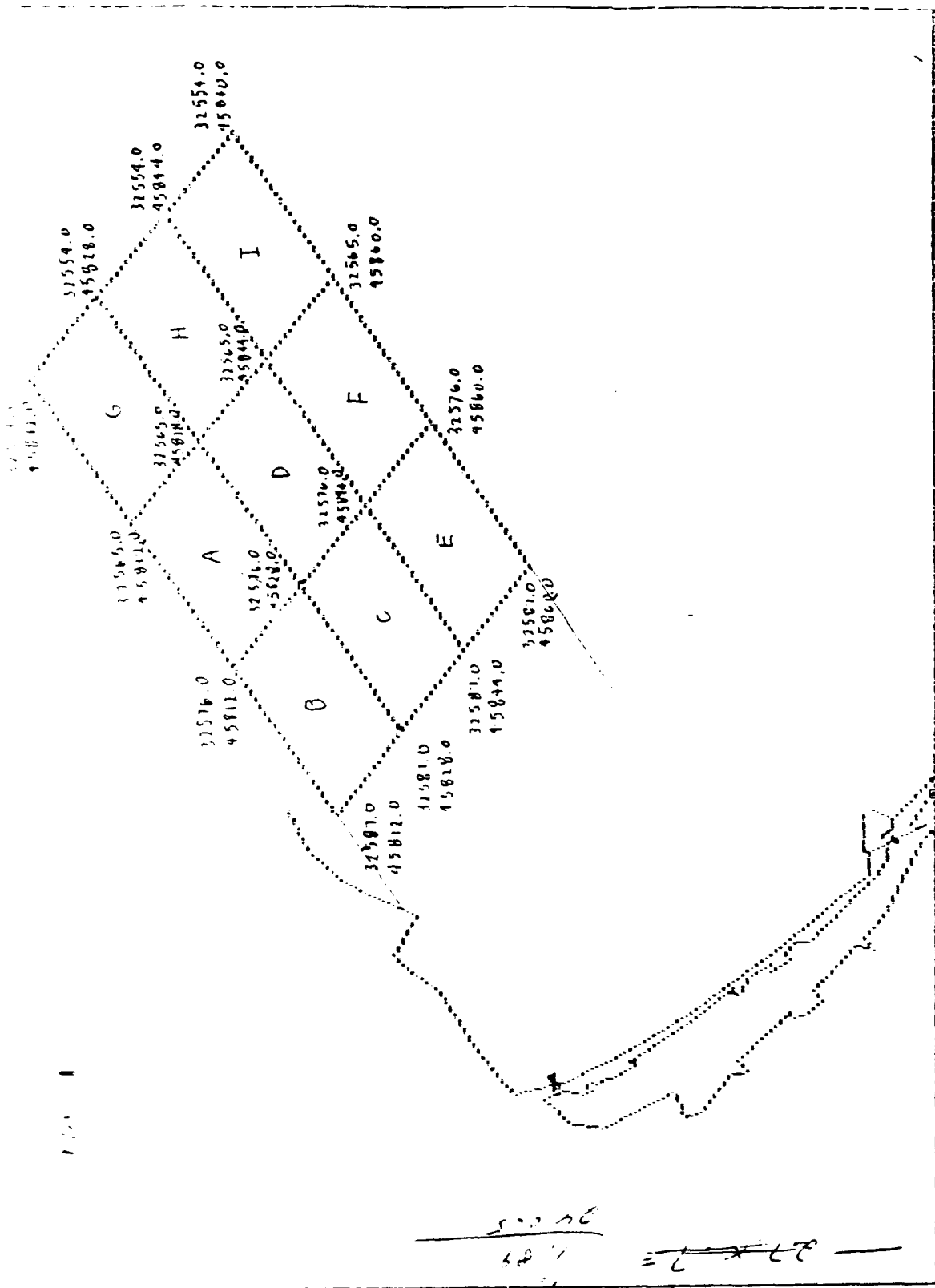
Section C
 NW to SE Search Plan

34576.0
45821.3



Section 1 - 10 to 11 - 10000 - 10000

10000



SW - RZ - 21 x 21 = 3.15
 P2 - 4.5 x 2.7 = 3.15
 NW - AC - 8.5 x .35 = 2.975
 SW - G - 4.1 x 1.5 = 1.65
 A - 4.5 x 2.7 = 4.05
 F - 4.5 x 2.7 = 4.05
 C - 1.7 x 2.7 = 4.59
 RZ - 2.7 x 2.7 = 7.29
 Total = 24.65



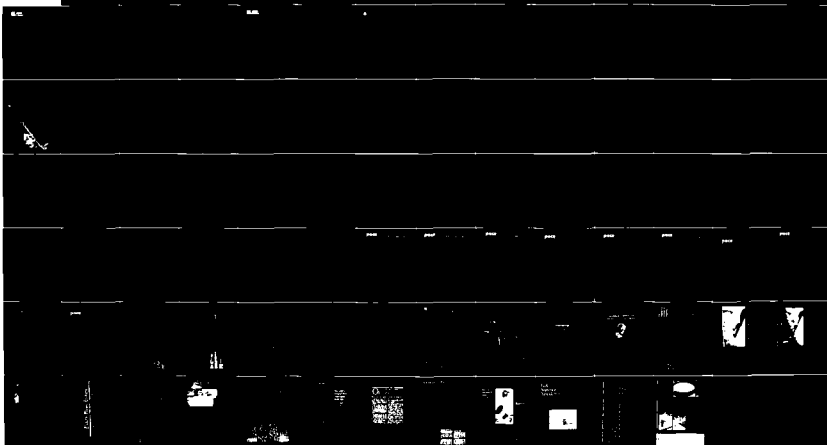
AD-A247 568

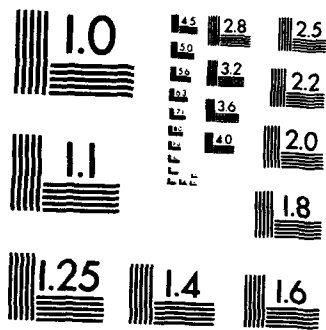
REPORT OF FINDINGS: LAKE SUPERIOR CLASSIFIED BARREL
DISPOSAL SITE DEFENSE. (U) CORPS OF ENGINEERS ST PAUL
MN ST PAUL DISTRICT AUG 91 XA-COE/SPD

3/Y

UNCLASSIFIED

NL





MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS
STANDARD REFERENCE MATERIAL 1010a
(ANSI and ISO TEST CHART No. 2)

Search Lines for Section A

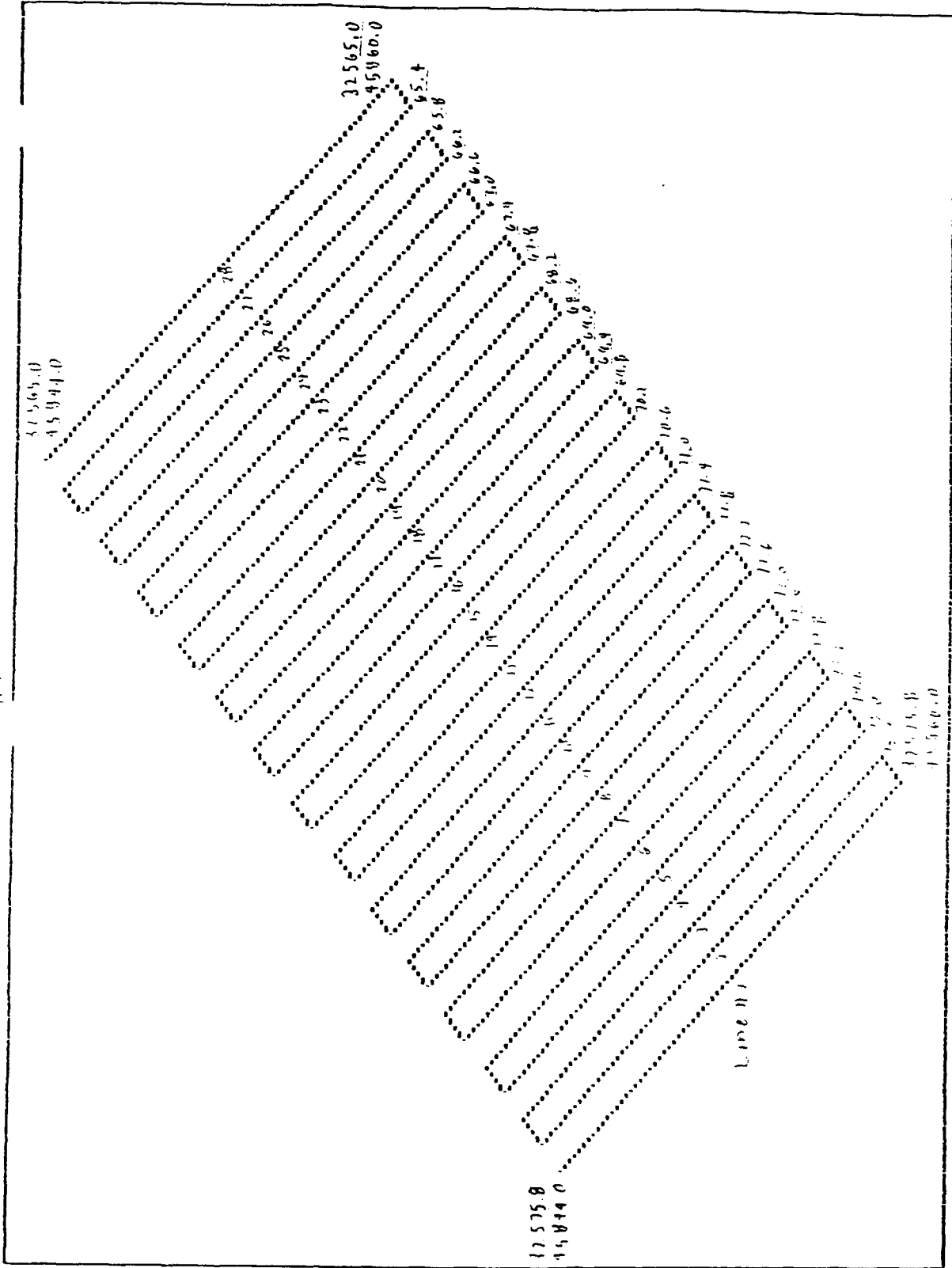
SW to NE Search Plan

Line Spacing - 500 feet

Line Length - 13750 feet

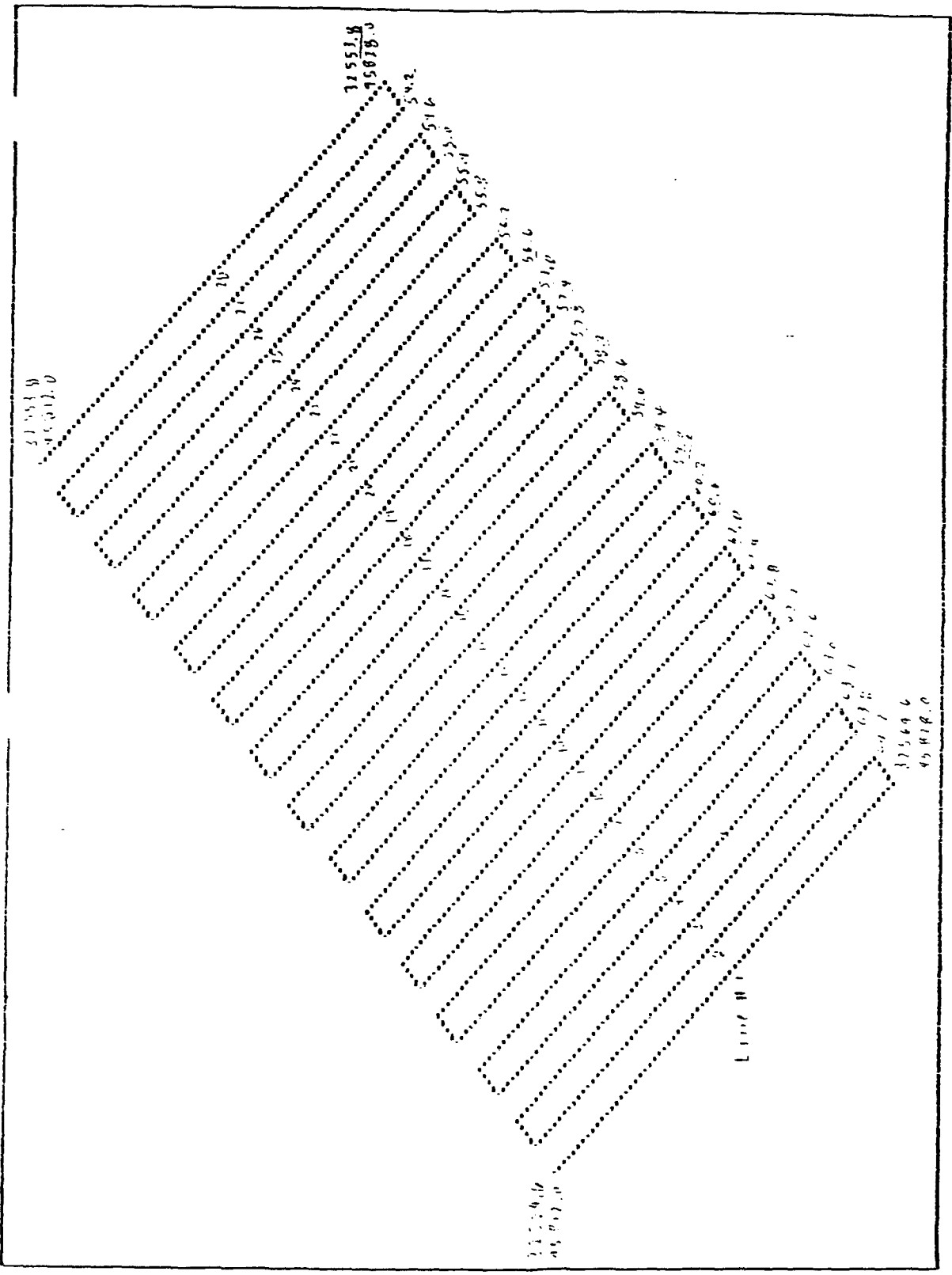
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Line # 1	32576.0	45812.0	32565.0	45812.0	
Line # 2	32576.0	45813.0	32565.0	45813.0	3136
Line # 3	32576.0	45814.0	32565.0	45814.0	3136
Line # 4	32576.0	45815.0	32565.0	45815.0	217
Line # 5	32576.0	45816.0	32565.0	45816.0	210
Line # 6	32576.0	45817.0	32565.0	45817.0	210
Line # 7	32576.0	45818.0	32565.0	45818.0	210
Line # 8	32576.0	45819.0	32565.0	45819.0	
Line # 9	32576.0	45820.0	32565.0	45820.0	210
Line # 10	32576.0	45821.0	32565.0	45821.0	
Line # 11	32576.0	45822.0	32565.0	45822.0	
Line # 12	32576.0	45823.0	32565.0	45823.0	
Line # 13	32576.0	45824.0	32565.0	45824.0	
Line # 14	32576.0	45825.0	32565.0	45825.0	
Line # 15	32576.0	45826.0	32565.0	45826.0	←
Line # 16	32576.0	45827.0	32565.0	45827.0	

11/11/11



Section F HW 10 51 Search Plan

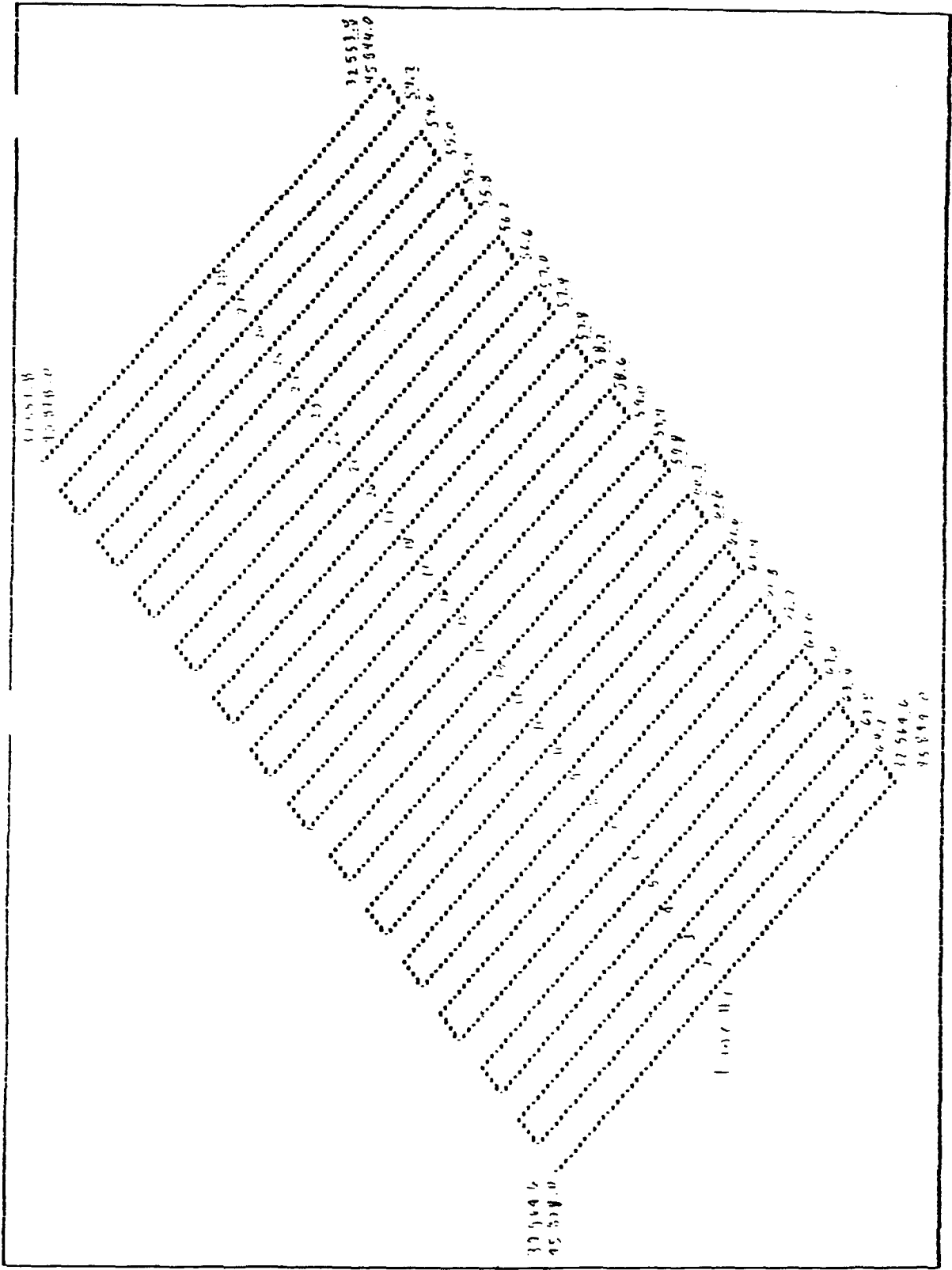
111



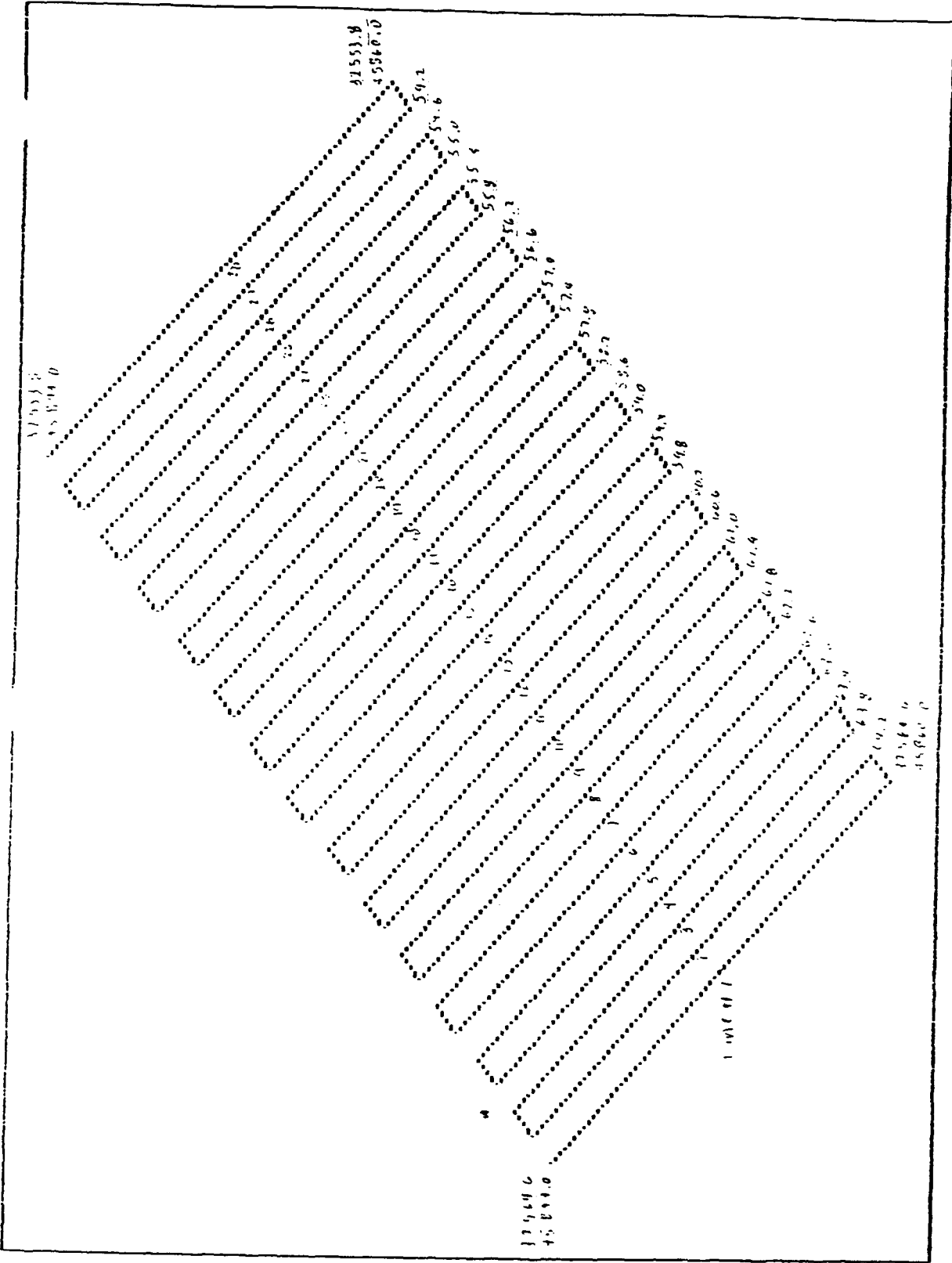
North to SE Search Plan

Section 6

1000 15

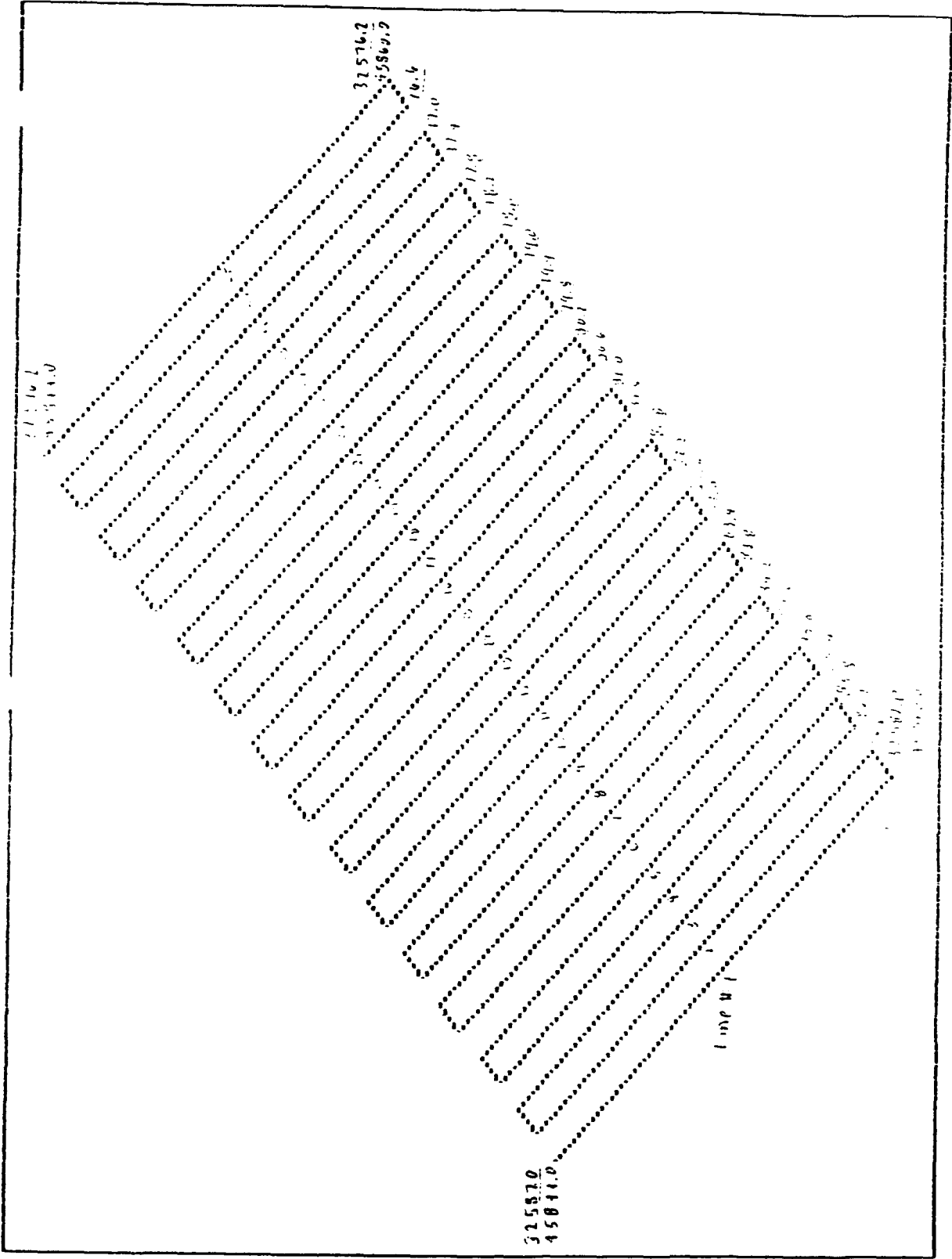


100000

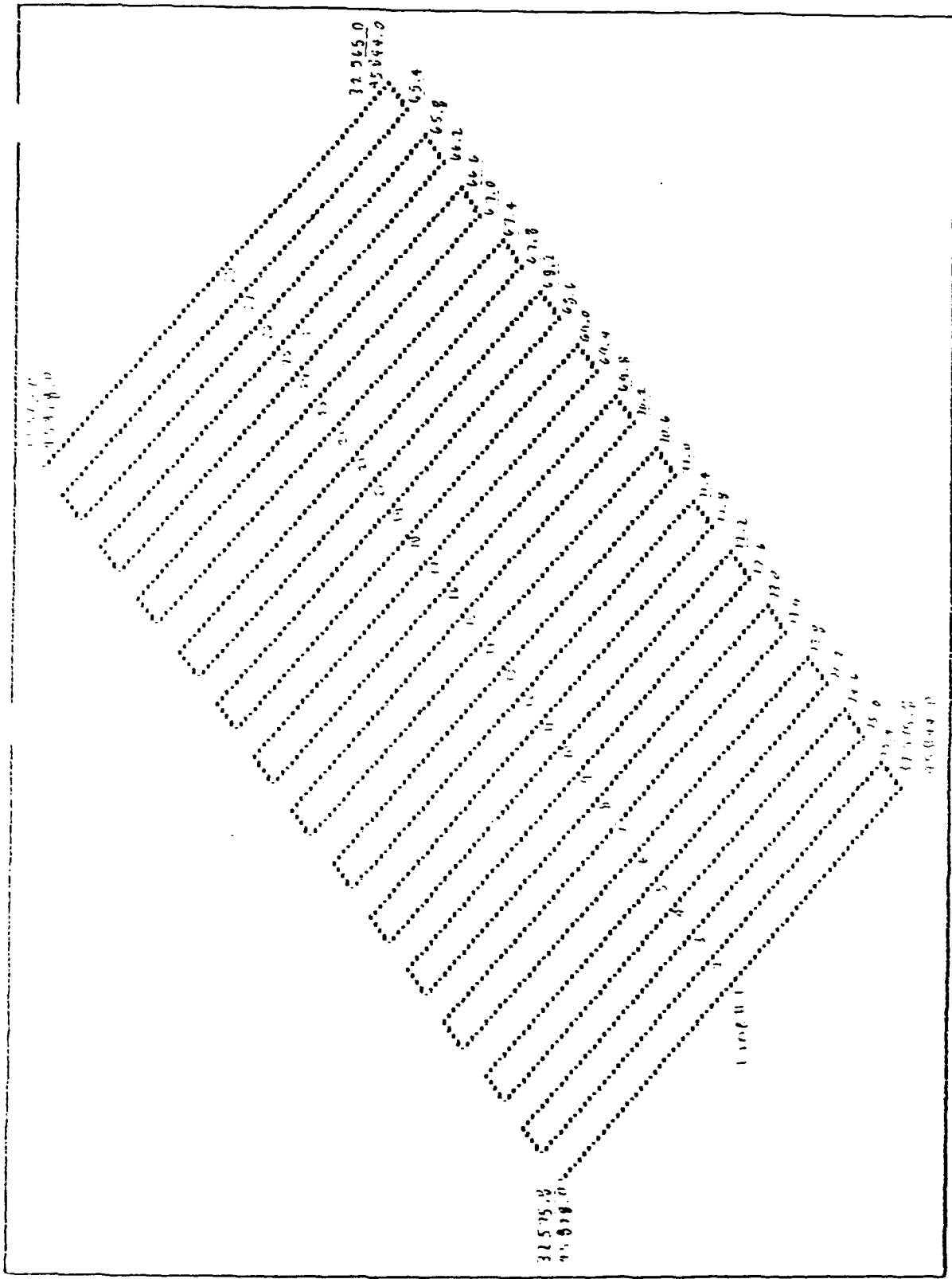


NW to SE Search Plan

Section 1

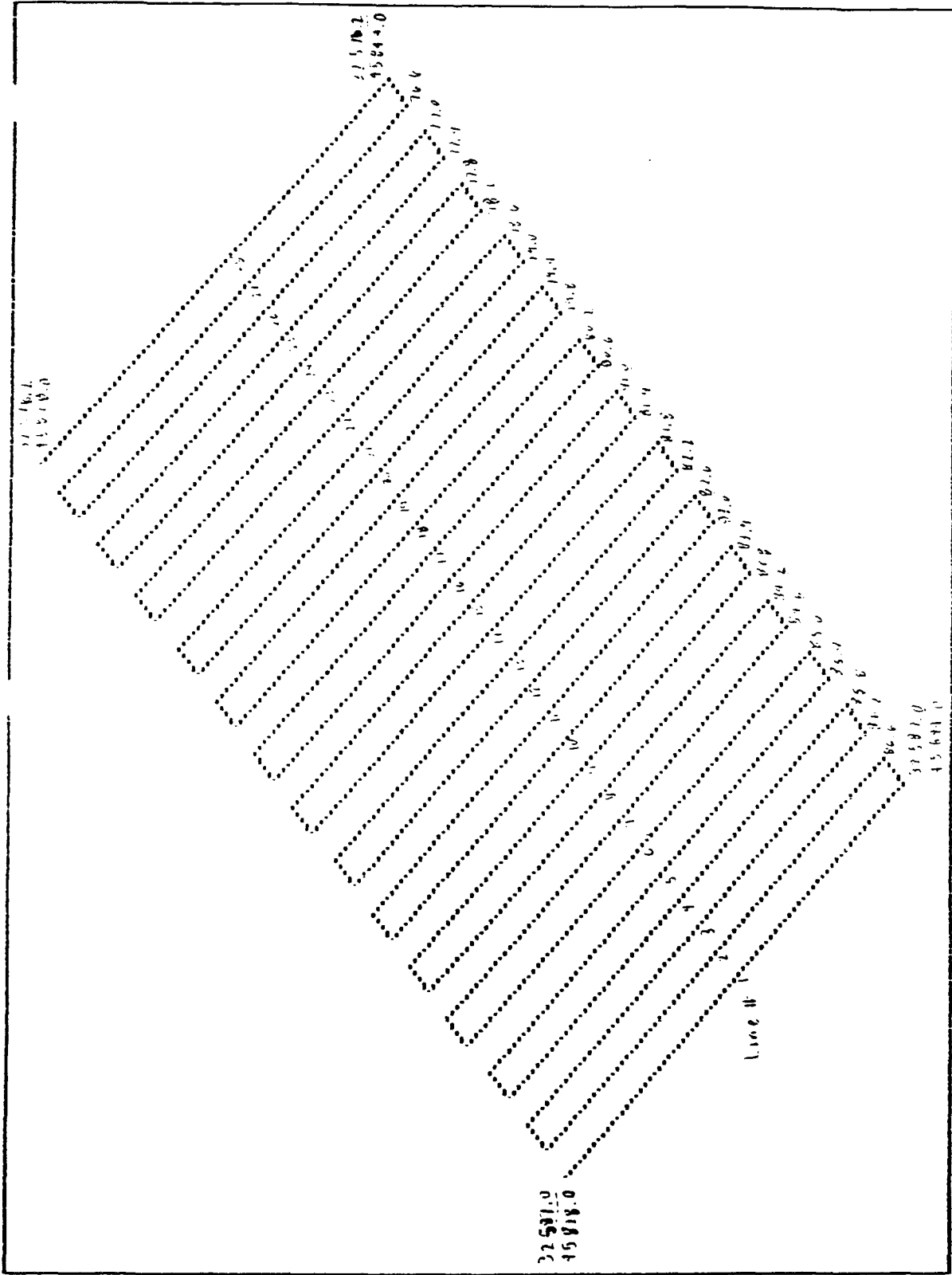


Section 1
 Camp Hill
 Section Map



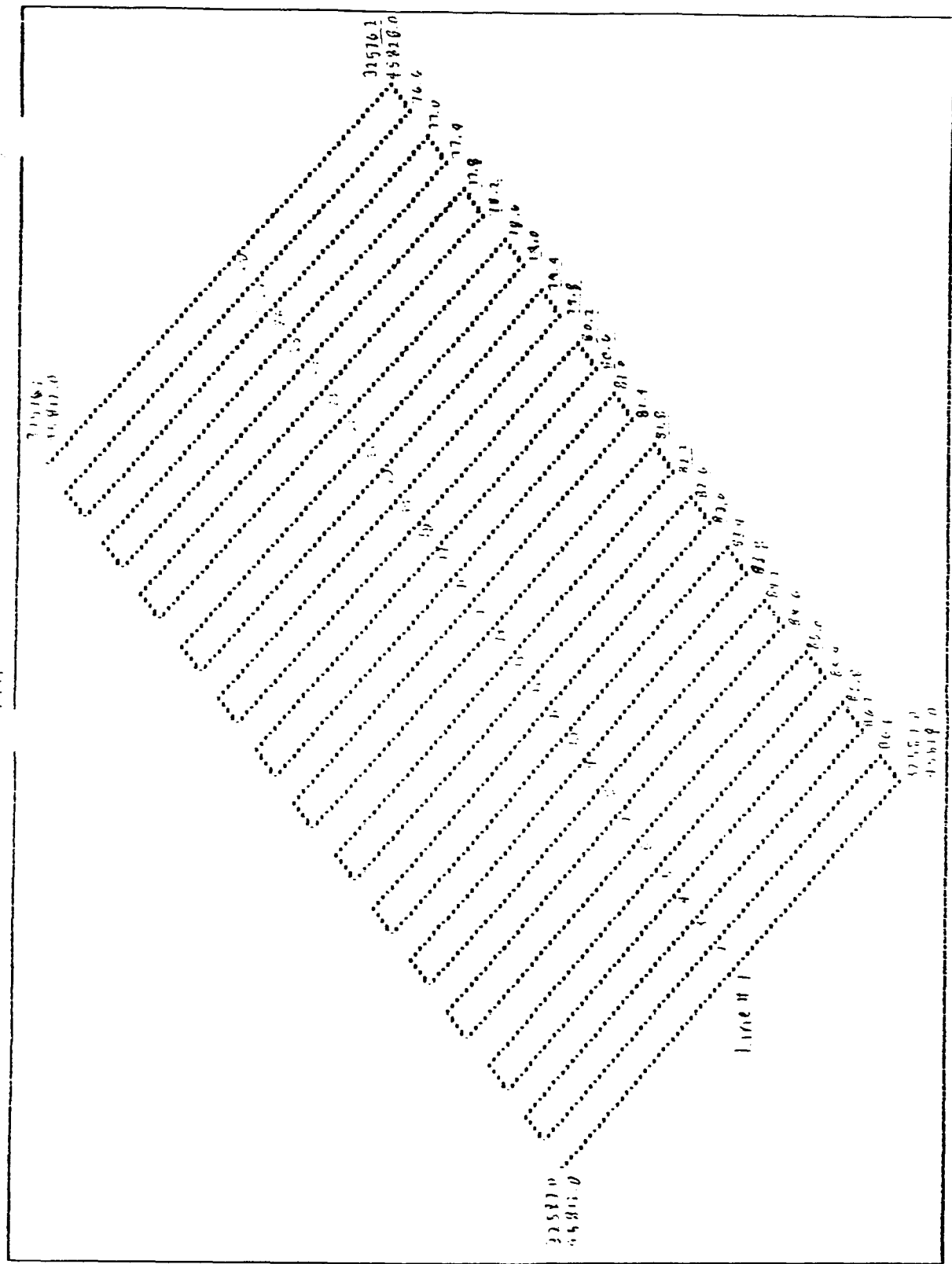
Section 10 City to St. George's Plan

11. 16

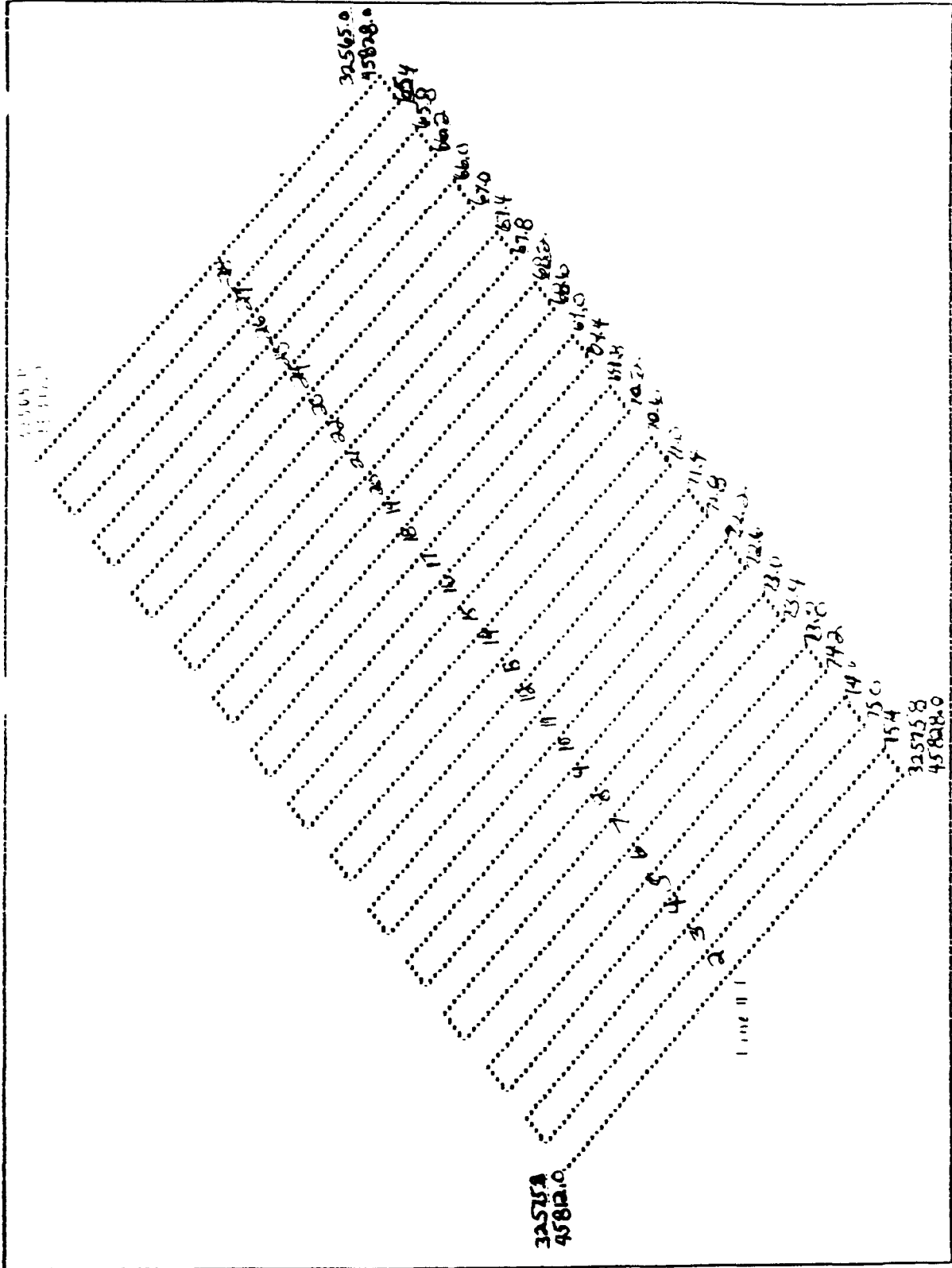


Section C

NW 1/4 Search Plan



Section B 100 ft. Search Plan



SECTION II

20:00:36

L L X Y

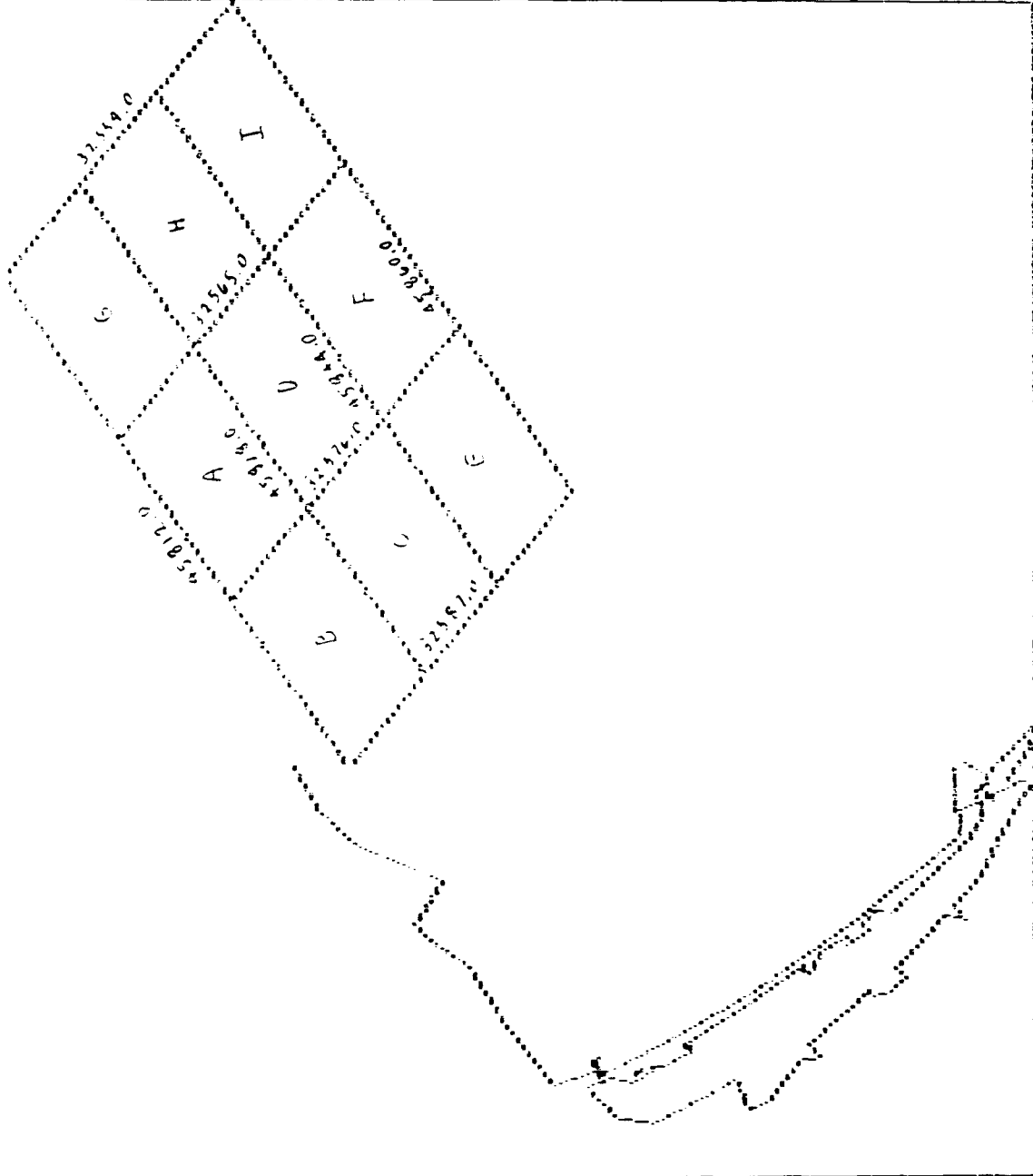
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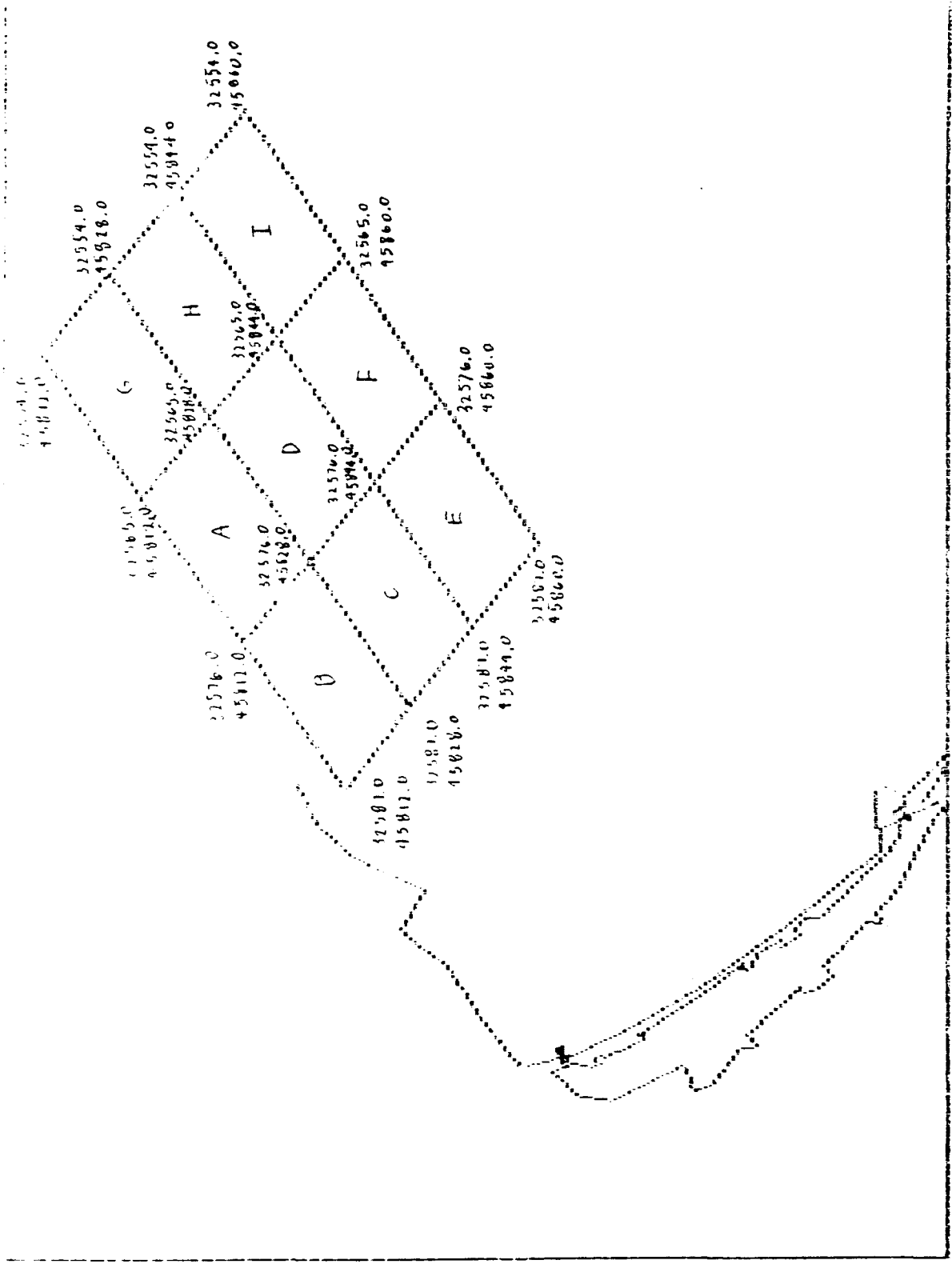
Log Off
Track Off

LrnFilter Off
LogFilter Off
InpFilter Off

TDGrid: 10
LLGrid: 10

Scal: 12000







FIRE & SAFETY SERVICE & SUPPLY

(612) 341-3411
510 NORTH 3RD STREET
MINNEAPOLIS, MN 55401

1. Project Name: _____
2. Project Number: _____
3. Project Location: _____
4. Project Start Date: _____
5. Project End Date: _____

Contractor's Work Schedule

Contractor will be on site for the Lake Superior Oil Disaster Barrel Disposal site
from _____ to _____.

Contractor's Work Schedule will be to use the Duluth Army Corps of Engineers' Project # _____ for the use of operations. Crew briefings, training of _____, _____, and other support will be headquartered at _____ and will be used to support the vessels and at least one _____ _____.

Contractor's Work Schedule will be to use the Duluth Army Corps of Engineers' Project # _____ for the use of operations. Crew briefings, training of _____, _____, and other support will be headquartered at _____ and will be used to support the vessels and at least one _____ _____.

Vessel #1 will be the "P. J. 1-1" tugboat owned by the Duluth Army Corps of Engineers. This will be the flag ship of search fleet and captained by a Corps certified pilot. Roger Chapman of International Marine Systems, Milwaukee, Wisconsin is Hazard Control's 'Director of Marine Operations', will be stationed on this vessel. He will also operate an EG and G side scan sonar from this boat. In addition, Terry Aldrich (Hazard Control's General Manager) will be on board for technical support. Terry is also an expert in hazardous materials, certified medic and fireman. A tow camera may also be provided to observe the bottom of the lake and video tape as necessary.

Vessel #2 will be the "Madeline Goodrush", a 33 foot twin engine (V-8's), piloted by Jerry Buchanan. Jerry is an experienced Lake Superior shipwreck discoverer and is highly skilled in water related electronics. He will have Rick Stauber as his crew member. Rick is a certified and very experienced scuba diver and also quite familiar with underwater electronics. The vessel will be equipped with a 'king-sonic' side scan sonar in addition to other various electronic equipment.

Vessel #3 will be the "Hey Boy", a 31 footer, piloted by Ken Merryman. Ken is a Lake Superior charter captain, shipwreck searcher, scuba diver and is highly skilled in water related electronics. Mike Toch (of International Marine, Milwaukee) will be operating a Westmar side scan sonar from this vessel. In addition, Ray Julian (Master diver and electronic whiz) will be Ken's 1st mate. Also, on board will be Wes Deibler of Hazard Control for additional technical support. Ken will also have an underwater tow camera for viewing and recording the lake bottom.

Vessel #4 will be the "Northern Comfort" a 27 footer, piloted by Dan Gates. Dan is a Lake Superior charter captain, shipwreck searcher, scuba diver and skilled in underwater electronics. Mike Stich (President of Hazard Control and the Corps' contractor) will be operating a Proton II magnetometer from this vessel. Ken Anderson (of a Twin City based search and rescue outfit) will be operating a Westmar section scan sonar. Also, on board will be John Stich, experienced with the magnetometer and for technical support. This boat will also have an R.O.V. (remote operated vehicle) for viewing and recording the lake bottom.

All surface boats will have Loran, for linear navigation, electronic and/or graph depth finders and be linked by radio communications.

Vessel #5 will be the "Lake Diver" a K-350 model submarine, piloted by Harold Maynard of Wellsburg, New York. Harold has made more than 500 dives with his sub. and over 100 of these to depths greater than 300 feet. His vessel is equipped with directional sonar, hydro-phones, mechanical arm, four 500,000 candle power lights and has video and still photo capability.

I. Search procedure:

Vessels number 1, 2, and 3 will be the designated search vessels. Each vessel will be assigned to search one quadrant of the target area. The target area (see attached map) has been divided into 9 quadrants, lettered from A through I with A being the most likely, and I the least. Each vessel will follow assigned linear search lines in straight and parallel search patterns. These lines are 500 feet apart. There will allow a 50 foot overlap based on an effective range of 300 feet of the vessel, using side scan sonars. As the vessels detect probable targets, the sonar operator will grade the target, on a level of 1-10, with 1 being a barrel (for sure) and then descending numerical gradings with 10 being least likely. At the same time a target is sighted and graded, the pilot or sonar operator will log the exact location on Loran. The vessel will keep proceeding in its designated search pattern with no slowing or stopping. The Loran reading of the target will then be transmitted by radio to boat #4, which will (using section scan sonar and magnetometer) verify if the target is metal. If indeed the target is metal, then again the Loran reading is taken, recorded and the target re-graded by boat #4 as being a very likely target (barrel). This procedure will continue until all 9 quadrants are searched, time runs out, or weather interferes.

II. Verification:

After the entire target area is searched by surface vessels, the verification (visual sighting of targets) process will begin. Vessel #5 will be brought to the most graded targets and attempt to make visual contact with the target. Other surface vessels equipped with underwater video capability will attempt to verify lesser graded targets. Should a barrel actually be sighted, a marking buoy will be dropped on the exact location and additional attempts to locate other barrels in the area will continue. Upon completion of the verification process, the last part of the contract will begin.

W. Recovery:

Should several barrels be sighted, video and still photo's of the barrel will be taken and studied to try to determine it's contents. If they prove to be inconclusive, then vessel #5 will attempt to take samples from barrels that have rusted through and place them into sample containers, which will be lowered from the surface. These containers will be DOT approved hazardous containment drums and will be sealed just under the surface of the water, so as not to expose the contents to air. If a rusted or deteriorated barrel cannot be found, then an intact barrel will be located. A barrel grabbing device will be lowered over the barrel from the surface and maneuvered into position by vessel #5's mechanical arm. The barrel will be slowly raised until it is approximately 10 feet from the surface and then brought to shallow water where it will be contained in a 95 gallon over pack DOT approved drum and sealed beneath the surface of the water. The drum will then be turned over to the Corps of Engineers for further disposition.

V. Chronology of events and dated work schedule:

October 5, 1990 - Contractors work schedule, plan and procedure to take place at Duluth Army Corps of Engineers office.

October 6, 1990 - Contractors equipment to be delivered to base of operations. Corps office Duluth approx. 3-4pm.

October 7, 1990 - Surface vessels #1-4, crews, and balance of equipment to arrive at base of operations. Equipment installed, practice runs made, meeting with crew and Corps approx. 9am.

October 8, 1990 - 7am search officially begins and scheduled to run 12 hours. Meeting and review findings afterwards.

October 9, 1990 - 7am search continues and runs 12 hours. Meeting and review findings afterwards.

October 10, 1990 - Search continues, 7am and runs 12 hours. Meeting and review findings afterwards.

October 11, 1990 - Submarine arrives 7am, press invited at 9am. Demonstration for 1 hour. Then verification and search for additional 8 hours. Meeting and review findings afterwards.

October 12, 1990 - 7am verification, search, recovery (depends on findings) run 12 hours. Meeting and review findings afterwards.


October 13, 1990 - 7am verification and recovery-should conclude run 12 hours. Meeting and review afterwards.

October 14, 1990 - Site investigations concluded. Review all findings.

Summary:

Hazard Control's intention is to locate and possibly recover at least one, if not 2 barrels. Not only will Hazard Control meet the requirements of this contract, we will exceed it to the extent that all parties concerned, including the residents of Duluth, are satisfied with the effort put forth. Hazard Control intends to search at least 32 square miles of the bottom of Lake Superior. With 3 surface searching vessels, a minimum of 100 hours will be spent, electronically searching for targets. The equipment provided far exceeds the requirement of this contract. Further more, we intend to have a second submersible available for verification, recovery and safety reasons, but as of this writing, that has not been confirmed. The only problem that we could encounter is weather. Should that interfere with completing this contract Hazard Control will extend it's time in Duluth, as long as we financially are able to.

Report completed by Mike Stich President of Hazard Control, Inc.



- Attached:
1. Map of designated search area
 2. Safety plan



(612) 341-3411
510 NORTH 3RD STREET
MINNEAPOLIS, MN 55401

FIRE & SAFETY SERVICE & SUPPLY

October 7, 1987

SAFETY PLAN

Hazard Control's business is safety and as such we have taken the following precautions for this contract, even though no diving is anticipated:

1. Certified and experienced divers with equipment on each vessel.
2. Medical supplies and oxygen on each vessel.
3. Certified medic and 3 licensed hard hat professional divers with all gear as part of crew.
4. Hazardous materials handling equipment and protective clothing on each vessel.
5. Personnel experienced in CPR/1st Aid on each vessel.
6. A second submarine available to support the other.
7. Constant radio contact with all vessels.
8. The following phone numbers distributed to each vessel captain: Emergency

- A. Dan (Divers Alert Network) emergency 919-684-8111 Mpls. 612-755-1777
- B. Nearest hyperbaric chamber Mpls. 612-347-3131 *Notified of operation
- C. Hospitals Duluth, St. Mary's 218-726-4357
St. Luke's 218-726-5616
Mpls., Hennepin Co. Medical Center 612-347-3131
Methodist 612-932-5353
- D. Coast Guard, Duluth 218-720-5412
- E. Helicopter, Traverse City Mich. Coast Guard 616-992-8214
*Notified of operation
- F. Coast Guard, Soo St. Marie 906-635-3231
*Notified of operation, also given coordinates of search area, they will broadcast warnings during operational period to keep other craft clear of our vessels.

APPENDIX C



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
OFFICE OF RADIATION PROGRAMS

National Air and Radiation Environmental Laboratory
1504 Avenue A. Montgomery, AL 36115-2601
(205) 270-3400 • FTS 228-3400

November 27, 1990

Mr. Bob Dempsey
U.S. Army Corps of Engineers
St. Paul District
1421 USPO & Customs House
St. Paul, MN 55101
Attn: CENCS-ED-M

Dear Mr. Dempsey;

Enclosed is the final report of our results from the survey of drums in Lake Superior. This survey was conducted during the week of Oct. 29 - Nov 2, 1990, under an Army IAG.

Because the underwater probe is insensitive to the presence of alpha and/or beta radiation, no conclusions concerning the presence or absence of radionuclides which are pure alpha or beta emitters can be made. I would, therefore, recommend that as you open any recovered drums, you have available an alpha survey meter and a G-M survey meter with a thin window that is sensitive to beta radiation. I would also suggest that you provide, or require the contractor to provide, full face, air purifying respirators and coveralls for all workers in the area as the concrete is removed. This will protect from the concrete dust which will be generated and allow for easy decontamination of workers should any radioactive or hazardous materials be present.

We appreciate the Army considering us to assist in the radiological monitoring of these drums, and hope that you will consider our services in any future efforts involving actual or potential radioactive wastes.

Should you have any questions concerning the work performed or results of the data analysis, please call me at (205) 270-3413.

Sincerely,

A handwritten signature in cursive script that reads "Mark O. Semler".

Mark O. Semler
Health Physicist

Enclosure

cc: David Kee, EPA/Region 5
Gary V. Gulezian, EPA/Region 5
Brad Benning, Region 5, OSWER
Richard J. Guimond (ANR-458)
Raymond A. Brandwein (ANR-458)
Stephanie DeScisciolo (ANR-458)

Introduction:

The National Air and Radiation Environmental Laboratory, NAREL, received a request from the U. S. Army Corps of Engineers, St. Paul District, St. Paul, MN, thru EPA's regional office in Chicago to provide assistance in the radiological assessment of a series of drums containing waste material dumped into Lake Superior. These drums, dumped in the late 1950's, were thought to contain only scrap materials left over from the manufacture of hand grenades. The contractor, Honeywell, did not have a radioactive materials license until 10 years after this dumping. However, there has been persistent concern expressed by the press and environmental groups over the years that the drums might contain radioactive wastes.

The Corps of Engineers previously had employed a manned submersible to assist in locating the drums and evaluating their condition. A Geiger-Mueller survey meter was used during this survey. During one approach to a series of drums, the operator reported "a continuous series of clicks" from the instrument and a reading of approximately 20-40 counts per minute on the 0.1x scale. This would correspond to an exposure rate of 0.1-0.2 mR/hr. During subsequent dives, this reading could not be duplicated.

Because of the uncertainty which arose in this previous survey, the NAREL was requested to provide assistance to the Corps thru an IAG during the week of Oct 29 - Nov 2, 1990. An EPA team consisting of Dr. David Charters, Environmental Response Team, Edison, NJ, Mr. Brad Benning, Emergency Response Team, Region V, Chicago, and Mr. Mark Semler, NAREL, Montgomery, AL, was assembled. Dr. Charters provided a remotely operated submersible; Mr. Semler brought an underwater gamma ray detection system and would be responsible for interpreting the data gathered, and Mr. Benning represented the EPA should the site have to be considered for inclusion on the National Priorities List or require emergency removal actions under CERCLA guidelines.

Description of Equipment:

The remotely operated vehicle (ROV) was a Benthos MiniRover, MK II and had both sonar and video camera readouts. A continuous recording of the video was made each day of the survey. The ROV was neutrally buoyant and could move forward and backward, up and down, and laterally using independently controlled thrusters. The video camera could be scanned up, down and sideways, independently of the motion of the ROV, and the side scanning sonar provided a 270° scan forward and to the sides.

The underwater gamma probe consists of a 4" by 4" sodium iodide detector, photomultiplier tube, and combination high voltage supply/preamplifier housed in an aluminum cylinder 8" in diameter and 23" long. It is rated for a working depth of 500 feet. A single, waterproof coaxial cable connects the probe to a

multichannel analyzer located at the surfac. This cable was negatively buoyant and restricted somewhat the freedom of movement of the ROV. The detector has an Am-241 alpha source implanted into it to allow correcting for gain shifts due to changes in ambient temperatures.

The probe was mounted atop the ROV along the centerline such that the face of the sodium iodide detector was approximately 6" from the front surface of the ROV, and the side was approximately 6" from either side of the ROV. The coaxial cable was tied to the ROV cable every 4-5 feet. The probe was balanced with external weights to float horizontally with slight positive buoyancy. Weights were then added to the ROV to achieve neutral buoyancy of the combined units.

A Canberra model CI-10 multichannel analyzer (MCA) was used to accumulate spectroscopic data from the gamma probe. It is a portable, battery operated instrument with a built-in signal amplifier and 8192 data storage channels. Data was stored on an external audio cassette tape deck and read out to a serial line printer. Data for each drum or background was stored in a 256 channel subgroup of the memory and subsequently moved to tape for evaluation at the NAREL.

The energy response of the system was calibrated using an external source of Co-60 with gamma energies of 1173 KeV and 1332 KeV. Peaks corresponding to these two energies were located into channels 117 and 133 of the MCA by adjusting the amplifier gain. When calibrated the Am-241 implant produced a peak in channel 184. During the course of the survey, the amplifier gain was adjusted periodically to maintain this peak in channel 184. This procedure yields an energy calibration of 10 KeV per data channel. Thus the energy of an unknown peak could be identified, i.e., a peak occurring in channel 66 would correspond to an energy of 660 KeV, characteristic of Cs-137.

The probe is capable of detecting only gamma radiation. Both alpha and beta radiations would be absorbed by the probe's housing, the concrete poured around each drum, and by the water separating the drum and the probe. Thus the data presented in this report is for the measurement of gamma radiation only. For the measurement of gamma radiation, however, the probe is extremely sensitive; in a well-shielded environment such as a lead shield or underwater, it can accurately measure gamma radiation levels that are a fraction of the naturally occurring background on land.

Sampling Procedure:

The drums had previously been located using a towed, side-scan sonar. They were arranged in a rough line stretching approximately North-South in 150-170 feet of water. The mid point of the line was marked by a buoy; a Corps contractor also had marked a position near a drum just shoreward of the midpoint marker. Figure 1 is a map of the area showing the approximate

locations of the drums.

The ROV and probe were lowered into the water from the stern of the boat and allowed to sink to the bottom. Drums were then located on the sonar scan and the ROV moved to them. The ROV was positioned approximately 6" from each drum, either along side or at the center of the end; then a 5 minute acquisition of data was made. The summation of counts in channels 2 thru 160 was continuously displayed on the MCA. At the end of the analysis, this summation was logged and the spectral data stored on cassette tape.

Background analyses were made in the same depth of water as the sampled drums. These counts were taken at the end of the day on Tuesday and Thursday at approximately 150 feet with the probe 10-20 meters from the line of drums. Backgrounds were also taken in shallower water for two drums which had been moved.

A summary of the drums sampled is presented in Table 1. The column labelled "Tag No" is an identifier stored with each spectrum on tape or printed out. These tag numbers were started at 1 on Tuesday, 21 on Wednesday, and 31 on Thursday. The columns "Date" and "Time" are the time and date of the start of each analysis; "ROV Time" is the elapsed time that the ROV controller has been running, and this value is recorded by the VCR along with the video signal from the ROV camera. A brief description of the location of the probe and the drum being sampled is also given.

During the sampling of drums on Thursday, three were noted to have a slightly higher summation of counts in channels 2-160. The analysis period for these three drums was extended to 10 minutes to accumulate more spectral data for later analysis. One final spectral sample was acquired on Thursday with the probe on the deck of the boat.

Each time the ROV was returned to the boat after being in the vicinity of drums, it and the cables were surveyed for possible radioactive contamination using a Ludlum Measurements Model 19 micro-R meter. This instrument, serial number 69362, had recently been calibrated by Ludlum using Cs-137. The background exposure rate on the boat over water measured 1.5-2 uR/hr. No contamination was found during these surveys.

Analysis of Data:

A printout of each spectrum is included as Appendix I. A discussion of the format is at the beginning of this appendix.

A preliminary analysis of the summation of counts in channels 2-160 indicated that the two measurements in 50 feet of water and the two in 30 feet of water were significantly different from those at 140-160 feet. Thus, these four measurements, tag numbers 23, 24, 31, and 32 were analyzed separately. Likewise the data for the

probe on the deck of the boat was excluded from the analysis of drum and background measurements.

The summation of data in channels 2-160 provides a measure of the total gamma activity measured by the probe. The energy spectrum was then subdivided into a series of smaller regions to look for indications of the presence of specific radionuclides. This data is given in Table 2. The energy regions selected are:

- | | |
|-----------|---|
| 2 - 14 | Primarily higher energy gammas which have lost some energy passing through an absorber such as concrete or water. |
| 15 - 35 | Primarily naturally occurring Ra-226 and Th-232 decay product gammas. |
| 36 - 54 | A non-specific region. |
| 55 - 70 | Cs-137 from fallout or man-made sources, and an important Ra-226 decay product gamma. |
| 71 - 94 | Decay product gammas from Th-232. |
| 95 - 109 | Gammas from a decay product of U-238. |
| 110 - 160 | Man-made radionuclides and naturally occurring K-40. |
| 160 - 200 | Am-241 implant peak and high energy gammas. |

The region 160-200 was analyzed to determine if any spectra had counts significantly above or below the mean. This would indicate a malfunction of the detector system or the presence of high energy gammas. Uranium-238 was specifically mentioned in one report as a suspected radioactive waste in the drums; the region 95-109 was selected to look specifically for U-238. If it were present, U-235 would also be present and be detected in the region 15-35, along with the decay products of Ra-226 and Th-232.

For each energy region the mean and standard deviation for the drums and backgrounds were calculated. Each drum was then tested for inclusion within the range of ± 2 standard deviations from the mean. The population of drums was also tested against the backgrounds as being equal.

Drum at 50 feet: Tag numbers 23 and 24 are the spectra and data for the drum which had been moved into 50 feet of water and a background measurement approximately 10 feet from the drum. There is no difference between the two groups of data for any of the energy regions analyzed.

Drum at 30 feet: Tag numbers 31 and 32 are the spectra and data for the drum which had been moved into 30 feet of water and a background measurement approximately 10 feet from the drum.

There is no difference between these two groups of data for any of the energy regions analyzed.

Drums at 150-170 feet: With the exception of drum #11, tag 10, no drums monitored had gamma levels significantly different from background in either the full energy region 2-160 or in any of the discrete energy regions. Drum #11 had slightly elevated gamma levels in the full energy region and the lower 4 discrete regions. There was insufficient data accumulated in the individual channels of the spectrum to make determination of the identity of any gamma emitting radionuclides. The increase in measured gamma activity for this drum was very small and was noticeable only because of the low ambient background present. It is probable that this increase would not have been detectable for measurements made on land where the background gamma activity is more than twice that at 150 feet underwater.

The exposure rate for drum #11 can be estimated using the data taken with the probe on the deck of the boat. The exposure rate on deck was 1.5-2 uR/hr as noted above. The summation of counts in the full energy region for the on deck spectrum, tag 42, is 16624, which corresponds to an exposure rate of 2 uR/hr. The mean of the summation of counts for the 3 background spectra and for drum #11 are 6289 and 7820, respectively. This indicates a background exposure rate at 150 feet of 0.8 uR/hr, and an increase over background at drum #11 of 0.2 uR/hr.

At the request of the Corps of Engineers, the following examples are provided to compare the increase over background of drum #11 with naturally occurring or man-made exposures.

- o The average exposure rate on land ranges from 7 - 15 uR/hr.²
- o The current annual exposure permissible at the fence line of a nuclear generating station is 5,000 uR. This would be approximately 1 uR/hr above background for a person living at the fence line, assuming an occupancy of 16 hours per day.³
- o The natural background from cosmic radiation increases by 0.11 uR/hr for every 100 feet above sea level.³
- o The estimated annual exposure from weapons testing fallout is 4000 uR, or 0.4 uR/hr.³
- o A typical chest x-ray exposure is 9000 uR.³

During the monitoring on Thursday, three drums, tags 33, 37, and 38, were noted to have slightly higher total counts in the full energy region. The analysis period for these three was extended to 10 minutes to accumulate more data. Analysis of these spectra at NAREL resulted in the conclusion that there is insufficient data present for radionuclide identification. It was further concluded that an analysis period of 2-4 hours per drum would be needed for such identification because of the extremely low levels of

radioactivity present. It should be pointed out that the exposure levels for these three drums does not differ significantly from background.

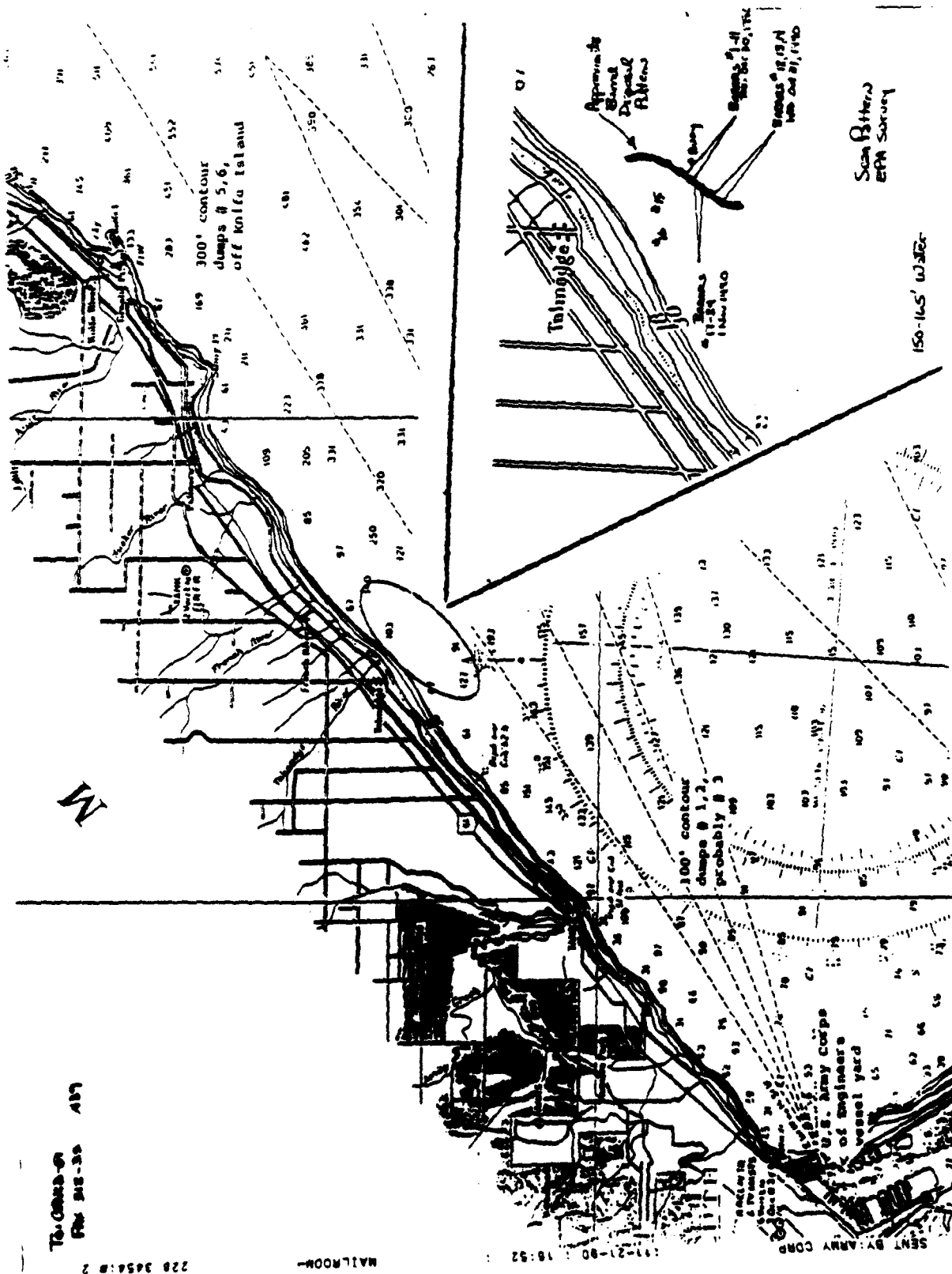
Conclusions:

The following conclusions can be made based on the results of the data analyses following the survey of drums.

- o The results of this survey are applicable to radionuclides emitting gamma radiation only; the probe will not detect alpha or beta radiation. Good radiation safety practices would dictate that monitoring for alpha, beta, and gamma radioactivity be performed if any of these drums are opened to evaluate their contents.
- o The two drums moved to shallower water were monitored and found not to have gamma exposure rates above background. These drums pose no radiological health hazard from external gamma radiation to people handling them or to people in their vicinity.
- o Of 24 total drums monitored, only one had an elevated gamma level, which was only marginally greater than background. As noted above, this increase is quite small and only detectable in a low background environment. Handling of this drum would pose no radiological health hazard from gamma radiation.
- o The increased gamma exposure rate, 500 - 1000 times greater than background, detected in a previous survey using a G-M instrument was not found in this survey.
- o Drums 33, 37, and 38 had marginally elevated gamma exposure rates within the variation of background. There were insufficient data for these drums, or drum 11, to allow an identification of any radionuclide. An analysis period of 2 to 4 hours would be required to determine what specific radionuclides, if any, were resulting in these marginally elevated exposure rates.

1. Personal conversation with Mr. Bob Dempsey, U.S. Army Corps of Engineers, St. Paul District.
2. Environmental Radiation Data, Report 59, July-September 1989; Environmental Protection Agency report EPA 520/5-90-003; 1990.
3. Peacetime Radiological Training for Firefighters, Paramedics, and Law Enforcement Personnel; Pacific Northwest Laboratory; August, 1987.

Figure 1. Area Map with Drum Site



T-0000-01
R-000-00 187

228 3654: 2

MAILROOM-

191-21-90 18:52

SENT BY: ARMY CORP

U.S. Army Corps
of Engineers
vessel yard

Scan Bitters
EPA Survey

Table 1. Summary of Drums Surveyed with the NAREL Underwater Probe.

Spectrum						
Tag No.	Count Length	Date	Time	ROV Time	Description of Sampling	
Tuesday, October 31, 1990						
Site ~100-150 south of marked drums						
1	5 Min	10-31	13:55	5:03:31	1st drum, ~1ft from rim on concrete end of drum	
2	"	"	14:53	6:01:57	2nd drum, ~1ft from concrete end	
3	"	"	15:12	6:19:05	3rd drum, ~1ft from concrete end	
4	"	"	15:25	6:33:18	4th drum, ~1ft from concrete end	
5	"	"	15:41	6:44:55	5th drum, ~1ft from concrete end	
Boat relocated, anchored between markers						
6	"	"	16:35	7:43:20	6th drum, Metal sides clear of growth, ~ 1ft from concrete	
7	"	"	16:50	7:57:37	7th drum, ~1ft from side near concrete	
8	"	"	17:00	8:07:07	8th drum, ~1ft from rim, metal cap end rather than concrete end	
9	"	"	17:17	8:25:00	9th, 10th drums together, ~1ft from concrete end of one, ~1ft from side of 2nd one	
10	"	"	17:31	8:38:30	11th drum, ~1ft from rim on concrete end, unsure of id in sonar scan	
11	"	"	17:39	8:46:10	11th drum, backed off ~ 2ft	
12	"	"	17:55	9:02:44	Background, 15-20 meters from drums	
13	"	"	18:02	-	Background, same position, readjusted amplifier gain	
Wednesday, November 1, 1990						
At a marked drum, continue with Tuesday work						
21	5 Min	11-1	10:52	1:59:30	12th, 13th drums together, ~1ft from point where 2 met, "706" inscribed in one	

				concrete cap, metal clean and "bluish"
22	"	"	11:17 2:25:00	14th drum, ~1ft from concrete end, drifting and had to stop and reposition

Could not hold anchor, pulled anchor to reset location.
When rov/probe put in water, blew a thruster fuse.
Retrieved and replaced fuse; then had to reseal a leak.
Finally moved to a drum moved into 50 ft of water.

23	5 Min	11-1	15:57 7:07:21	15th drum, ~2ft from side, 57 ft deep
24	"	"	16:05 7:53:20	Background, ~30 feet from drum 15

Thursday, November 2, 1990
Located drum in 30 feet of water

31	5 Min	11-2	09:45 0:51:30	16th drum, ~1ft from middle of drum
32	"	"	09:56 1:03:30	Background, ~20 feet from drum 16

Reposition to deeper water and continue searching for
drums in the "line." About 100 yards south of marked
drums, in 150 feet of water.

33	10 Min	11-2	10:34 1:41:30	17th drum, ~1ft from midside
34	5 Min	"	11:01 2:09:30	18th drum, ~1ft from concrete end, clean cap with gouge in middle
35	"	"	11:39 2:47:40	19th drum, ~1ft from concrete end
36	"	"	11:47 2:56:25	20th drum, ~1ft from metal end cap
37	10 Min	"	11:58 3:06:48	21st drum, ~1ft from concrete end, "765" inscribed in concrete
38	10 Min	"	12:17 3:26:20	22nd drum, ~1ft from side, clean metal sides and metal end
39	5 Min	"	12:39 3:49:20	23rd drum, ~1ft from side
40	"	"	12:50 3:58:10	24th drum, ~1ft from concrete end, buried ~3-4 inches in mud
41	"	"	12:59 4:09:50	Background, ~10 meters from drums
42	"	"	13:13 -	Background, Probe on deck

Table 2. Summary of Summation of Counts in selected energy windows

Drum No.	Tag No.	2-160	2-14	15-35	36-54	55-70	71-94	95-109	110-160	160-200
1	1	5909	1354	955	537	360	605	668	1430	32542
2	2	5753	1259	1019	517	366	569	607	1416	32458
3	3	6163	1510	1035	563	401	547	647	1460	32444
4	4	6471	1614	1144	625	438	583	636	1431	32302
5	5	6268	1525	1064	584	415	599	675	1406	32159
6	6	6125	1480	1006	560	368	608	669	1434	32258
7	7	6069	1498	995	545	340	599	660	1432	32733
8	8	5975	1468	1033	539	384	508	655	1388	32541
9, 10	9	6400	1635	1103	547	397	546	702	1470	32434
11	10	7820	2273	1530	694	488	651	725	1459	32572
Bkg	12	6469	1656	1128	595	352	609	696	1433	32471
Bkg	13	6528	1652	1111	597	377	596	670	1525	32173
12, 13	21	6536	1640	1136	584	340	635	660	1541	32272
14	22	5828	1321	951	517	355	586	685	1413	32577
15	23	5253	1051	825	493	285	575	669	1355	32535
Bkg	24	5458	1230	864	465	344	515	620	1420	32732
16	31	5382	1208	799	485	329	540	683	1338	32475
Bkg	32	5044	936	764	491	316	551	672	1314	32578
17	33	6977	1860	1212	625	422	649	739	1469	32488
18	34	6063	1497	971	544	367	556	659	1469	32889
19	35	5692	1293	921	495	357	520	686	1420	32428
20	36	6330	1536	1067	585	415	580	684	1463	32314
21	37	7465	2097	1370	688	415	648	703	1543	32538
22	38	7222	1942	1304	663	457	625	702	1527	32277
23	39	6451	1662	1168	597	379	617	692	1336	32207
24	40	7065	1906	1236	643	436	615	724	1505	32782
Bkg	41	5870	1370	956	515	349	564	690	1426	32578
Bkg	42	16624	6329	3970	1607	898	1003	880	1937	32605

Appendix I

On the following pages are printouts of the spectral data for each drum or background sample taken during the week of 29 Oct -2 Nov 90. The format of the printout is:

- o Eight (8) lines of header information.
 - TAG A sequential number stored on tape to identify each spectrum.
 - LIVE TIME The length of the analysis period, corrected for the time required to acquire and store each detected gamma.
 - COLLECT STARTED The date and time of the start of sampling.

- o Data, channel by channel. Each channel represents an energy increment of 10 KeV. Thus, channel 60 corresponds to an energy of 600 KeV.

The live time and clock time for each analysis are stored in data channels 0 and 1, respectively. The data for the implanted Am-241 alpha source are in channels 160 - 200.

TAG NO. 1 SERIES 10 05 NOV 90 16:00 PAGE 1
 MEMORY= 1/16 LIVE TIME= 300 SECS TRUE TIME= 300 SECS
 COLLECT STARTED ON 30 OCT 90 AT 13:55:17
 AMP: INPUT= POS TC=SLOW GAIN= 12.285
 SCA: LLD= 1.000% ULD= 110.0%
 ADC: GAIN= 512 OFFSET= 0 ZERO= 2.00%
 PHA ADD PRESET= 300s LT
 HVPS: + 0V OFF STABLZ OFF

CHANNEL#	DATA								
0	300	300	152	146	133	103	124	91	
8	87	95	103	88	81	77	74	73	
16	78	56	59	47	52	50	55	46	
24	41	42	51	36	38	32	36	44	
32	33	24	31	31	24	37	29	27	
40	31	31	34	24	24	20	21	32	
48	31	30	34	22	28	29	29	35	
56	29	18	24	16	25	23	29	16	
64	18	18	27	13	21	17	31	20	
72	24	21	26	28	27	23	19	24	
80	26	20	21	16	18	17	23	24	
88	26	30	23	38	34	48	29	37	
96	36	50	52	63	48	43	44	52	
104	45	32	49	49	36	32	28	30	
112	29	29	25	22	31	21	23	30	
120	34	28	23	24	23	17	20	27	
128	30	22	30	17	19	31	23	42	
136	21	32	23	27	23	25	28	27	
144	21	25	23	34	33	20	25	39	
152	30	41	39	35	36	39	29	46	
160	31	52	45	40	46	58	79	76	
168	105	180	238	332	411	684	948	1159	
176	1538	1913	2146	2532	2827	2970	2868	2747	
184	2248	1922	1457	1005	713	461	304	181	
192	88	63	38	17	19	10	8	7	
200	7	5	2	3	0	4	0	1	
208	3	1	1	0	2	1	1	0	
216	1	1	0	0	1	0	2	2	
224	1	0	1	0	1	1	1	0	
232	1	0	2	2	0	0	1	0	
240	0	0	0	0	2	2	0	0	
248	1	0	1	1	0	1	0	1	

TAG NO. 2 SERIES 10 05 NOV 90 16:02 PAGE 1
 MEMORY= 2/16 LIVE TIME= 300 SECS TRUE TIME= 300 SECS
 COLLECT STARTED ON 30 OCT 90 AT 15:02:02
 AMP: INPUT= POS TC=SLOW GAIN= 12.285
 SCA: LLD= 1.000% ULD= 110.0%
 ADC: GAIN= 512 OFFSET= 0 ZERO= 2.00%
 PHA ADD PRESET= 300s LT
 HVPS: + OV OFF STABLZ OFF

CHANNEL#	DATA							
0	300	300	128	167	105	120	112	94
8	93	83	94	67	83	55	58	76
16	81	56	56	62	45	51	55	57
24	41	51	46	42	37	46	39	36
32	34	38	34	36	34	25	33	22
40	38	33	27	33	16	36	20	24
48	24	26	20	30	24	25	27	28
56	20	25	24	17	22	24	20	27
64	21	18	23	17	29	21	30	28
72	26	16	23	13	20	25	17	19
80	17	24	14	25	18	26	25	23
88	18	28	39	20	39	30	36	30
96	44	43	54	48	44	48	41	43
104	46	23	32	45	28	38	30	38
112	30	31	33	32	23	24	25	26
120	33	30	19	24	22	28	26	24
128	21	20	28	21	16	25	34	20
136	24	23	18	18	27	25	25	26
144	25	25	29	38	25	36	27	38
152	26	34	32	30	28	47	33	39
160	35	45	33	42	36	52	44	66
168	63	84	103	159	217	313	446	590
176	862	1064	1328	1650	1864	2144	2480	2694
184	2746	2677	2415	2216	1788	1364	989	683
192	477	304	170	110	63	38	22	9
200	8	9	1	3	8	1	2	2
208	1	1	0	1	2	1	1	1
216	3	0	1	1	1	1	1	2
224	3	0	0	1	0	1	1	0
232	0	1	0	1	1	0	1	1
240	0	0	1	0	0	0	0	0
248	1	0	3	0	2	0	1	0

TAG NO. 3 SERIES 10 05 NOV 90 16:04 PAGE 1
 MEMORY= 3/16 LIVE TIME= 300 SECS TRUE TIME= 300 SECS
 COLLECT STARTED ON 30 OCT 90 AT 15:11:51
 AMP: INPUT= POS TC=SLOW GAIN= 12.285
 SCA: LLD= 1.000% ULD= 110.0%
 ADC: GAIN= 512 OFFSET= 0 ZERO= 2.00%
 PHA ADD PRESET= 300s LT
 HVPS: + OV OFF STABLZ OFF

CHANNEL#	DATA							
0	300	300	157	170	159	136	128	116
8	107	101	95	101	76	88	76	81
16	82	63	59	50	54	60	52	48
24	53	56	43	57	39	27	34	37
32	34	36	37	33	35	36	31	32
40	30	37	33	31	29	33	23	24
48	28	24	22	39	27	22	27	27
56	32	26	36	25	35	23	25	19
64	23	29	27	22	20	15	17	21
72	13	25	15	29	23	16	30	16
80	18	16	17	18	24	26	24	29
88	18	22	26	29	28	31	33	42
96	38	41	45	41	48	53	41	56
104	45	42	41	46	39	29	35	43
112	39	29	22	35	25	31	30	30
120	19	30	22	24	28	29	26	24
128	17	31	28	32	23	18	19	31
136	21	28	27	24	29	28	19	25
144	19	26	35	24	26	36	35	21
152	28	26	28	41	36	24	43	45
160	46	41	43	47	36	32	51	53
168	69	59	82	96	139	211	284	441
176	635	892	1070	1347	1631	1833	2203	2437
184	2675	2762	2724	2478	2143	1745	1356	1030
192	685	431	274	175	93	62	38	23
200	18	15	6	7	3	2	4	4
208	1	0	2	2	1	2	3	0
216	0	0	2	0	1	1	0	0
224	0	0	1	1	0	1	0	0
232	1	1	1	0	0	0	0	0
240	3	0	0	0	0	0	0	1
248	0	0	0	2	1	1	2	1

TAG NO. 4 SERIES 10 05 NOV 90 16:06 PAGE 1
 MEMORY= 4/16 LIVE TIME= 300 SECS TRUE TIME= 300 SECS
 COLLECT STARTED ON 30 OCT 90 AT 15:25:39
 AMP: INPUT= POS TC=SLOW GAIN= 12.285
 SCA: LLD= 1.000% ULD= 110.0%
 ADC: GAIN= 512 OFFSET= 0 ZERO= 2.00%
 PHA ADD PRESET= 300s LT
 HVPS: + OV OFF STABLZ OFF

CHANNEL#	DATA							
0	300	300	169	186	169	141	136	132
8	126	99	104	103	94	76	79	73
16	82	80	85	72	62	51	49	48
24	44	47	60	47	42	57	36	47
32	44	35	43	40	39	39	25	38
40	42	32	40	34	28	35	32	34
48	24	41	28	27	35	27	25	24
56	32	32	32	35	26	26	32	29
64	27	27	23	24	26	21	22	32
72	21	23	29	18	15	27	22	19
80	24	26	20	13	22	27	12	23
88	31	26	23	33	26	31	40	27
96	37	38	51	45	49	47	63	41
104	37	42	44	37	36	42	35	41
112	39	23	25	43	22	24	25	22
120	35	29	23	25	22	16	26	26
128	21	28	21	20	25	20	23	33
136	21	25	30	26	24	25	32	20
144	24	29	34	24	23	37	24	32
152	39	29	27	46	26	33	40	33
160	36	36	49	43	48	35	53	51
168	57	53	79	81	109	136	251	377
176	488	620	901	1112	1422	1653	2001	2306
184	2567	2727	2714	2716	2320	1983	1623	1283
192	849	573	422	229	158	82	48	24
200	23	15	5	6	6	2	4	2
208	4	2	2	2	2	2	3	2
216	3	1	1	0	0	1	0	1
224	1	1	1	1	1	1	0	2
232	2	1	0	0	4	0	1	1
240	1	0	2	0	1	1	1	0
248	0	0	3	2	1	2	1	0

TAG NO. 6 SERIES 10 05 NOV 90 16:10 PAGE 1
 MEMORY= 6/16 LIVE TIME= 300 SECS TRUE TIME= 300 SECS
 COLLECT STARTED ON 30 OCT 90 AT 16:35:48
 AMP: INPUT= POS TC=SLOW GAIN= 12.028
 SCA: LLD= 1.000% ULD= 110.0%
 ADC: GAIN= 512 OFFSET= 0 ZERO= 2.00%
 PHA ADD PRESET= 300s LT
 HVPS: + 0V OFF STABLZ OFF

CHANNEL#	DATA							
0	300	300	168	133	137	144	131	119
8	96	112	94	88	97	77	84	69
16	79	61	63	58	55	58	46	40
24	50	51	37	67	46	31	44	30
32	35	32	28	26	40	31	29	32
40	35	29	37	20	23	22	27	34
48	25	26	34	32	31	30	23	22
56	30	19	25	28	24	25	20	25
64	28	17	20	24	23	18	20	21
72	22	19	23	19	16	19	24	15
80	21	26	24	24	25	29	33	22
88	37	23	31	36	34	23	42	45
96	41	35	51	54	50	53	38	42
104	50	39	48	39	40	44	41	29
112	25	26	37	25	22	33	28	25
120	26	23	22	29	25	18	24	20
128	18	34	27	21	28	23	24	33
136	21	19	25	31	24	24	24	19
144	32	23	33	31	30	30	34	25
152	29	31	37	43	40	32	36	33
160	42	41	32	45	42	41	56	58
168	90	102	139	194	317	423	648	888
176	1188	1484	1728	2073	2408	2585	2722	2803
184	2675	2455	2045	1527	1184	839	551	345
192	222	113	71	47	32	20	8	8
200	9	8	6	5	2	3	1	0
208	1	0	3	2	1	1	0	0
216	0	1	1	1	1	1	1	0
224	1	3	0	1	0	0	0	0
232	0	1	0	0	1	2	0	0
240	0	1	0	2	0	0	0	0
248	0	0	0	2	0	1	0	1

TAG NO. 7 SERIES 10 05 NOV 90 16:12 PAGE 1
 MEMORY= 7/16 LIVE TIME= 300 SECS TRUE TIME= 300 SECS
 COLLECT STARTED ON 30 OCT 90 AT 16:50:07
 AMP: INPUT= POS TC=SLOW GAIN= 12.028
 SCA: LLD= 1.000% ULD= 110.0%
 ADC: GAIN= 512 OFFSET= 0 ZERO= 2.00%
 PHA ADD PRESET= 300s LT
 HVPS: + 0V OFF STABLZ OFF

CHANNEL#	DATA								
0	300	300	173	170	168	120	125	106	
8	125	102	106	77	64	79	83	61	
16	85	64	54	61	54	44	51	56	
24	30	44	62	36	43	41	41	29	
32	31	38	38	32	23	42	39	32	
40	28	28	31	27	34	24	32	27	
48	37	27	22	27	20	26	19	23	
56	30	26	21	27	12	21	18	18	
64	20	23	23	15	21	25	17	24	
72	18	17	33	15	15	19	19	18	
80	22	24	16	26	28	19	24	26	
88	27	26	26	40	33	40	44	34	
96	45	49	45	50	40	56	45	47	
104	43	36	43	48	46	33	41	30	
112	28	32	33	29	28	29	21	21	
120	22	29	23	25	8	26	26	19	
128	27	23	18	24	23	25	29	27	
136	25	23	25	27	23	27	20	29	
144	27	23	25	25	33	35	28	30	
152	30	38	40	33	36	40	49	38	
160	37	46	57	57	44	69	41	60	
168	60	88	120	145	223	364	490	663	
176	873	1185	1581	1936	2205	2608	2927	3044	
184	2875	2568	2302	1840	1335	1040	740	479	
192	255	178	110	60	25	12	13	10	
200	5	4	7	4	4	6	2	2	
208	0	3	1	0	1	1	0	1	
216	2	1	3	2	2	0	0	4	
224	4	3	1	1	1	0	1	0	
232	0	1	0	0	0	0	1	0	
240	0	1	0	1	0	2	0	0	
248	0	0	1	0	0	1	2	1	

TAG NO. 8 SERIES 10 05 NOV 90 16:14 PAGE 1
 MEMORY= 8/16 LIVE TIME= 300 SECS TRUE TIME= 300 SECS
 COLLECT STARTED ON 30 OCT 90 AT 16:59:36
 AMP: INPUT= POS TC=SLOW GAIN= 12.028
 SCA: LLD= 1.000% ULD= 110.0%
 ADC: GAIN= 512 OFFSET= 0 ZERO= 2.00%
 PHA ADD PRESET= 300s LT
 HVPS: + 0V OFF STABLZ OFF

CHANNEL#	DATA							
0	300	300	173	148	143	138	119	108
8	114	89	105	89	97	73	72	72
16	64	76	73	59	58	55	38	64
24	43	45	43	43	33	42	50	38
32	43	34	31	29	26	25	30	23
40	33	38	25	28	27	32	35	30
48	23	28	21	28	31	28	28	34
56	26	28	19	25	27	29	19	18
64	22	21	34	24	16	20	22	17
72	20	14	22	14	21	21	17	14
80	18	13	18	26	17	20	24	23
88	19	22	20	28	38	30	32	32
96	32	47	45	52	53	56	60	47
104	44	34	40	38	40	35	43	33
112	25	25	27	24	40	19	26	24
120	26	23	23	22	38	24	24	23
128	12	31	25	20	27	25	25	17
136	21	21	18	28	22	25	33	30
144	26	17	23	27	30	17	36	26
152	31	30	32	35	34	33	40	49
160	33	33	38	43	42	45	56	57
168	45	69	71	95	128	213	310	418
176	620	937	1273	1714	2145	2608	2872	3118
184	3157	2914	2458	2101	1660	1179	796	490
192	328	230	115	69	31	21	16	20
200	6	7	2	4	3	1	2	5
208	1	4	2	2	1	0	2	0
216	2	0	4	1	3	0	0	0
224	1	0	1	1	1	0	4	1
232	4	1	2	1	0	1	1	1
240	0	0	0	0	0	0	0	0
248	2	0	0	1	0	0	0	1

TAG NO. 9 SERIES 10 05 NOV 90 16:16 PAGE 1
 MEMORY= 9/16 LIVE TIME= 300 SECS TRUE TIME= 300 SECS
 COLLECT STARTED ON 30 OCT 90 AT 17:17:35
 AMP: INPUT= POS TC=SLOW GAIN= 12.028
 SCA: LLD= 1.000% ULD= 110.0%
 ADC: GAIN= 512 OFFSET= 0 ZERO= 2.00%
 PHA ADD PRESET= 300s LT
 HVPS: + OV OFF STABLZ OFF

CHANNEL#	DATA							
0	300	300	173	181	154	179	133	123
8	108	131	101	90	97	83	82	84
16	90	66	63	60	56	50	61	45
24	44	70	49	48	41	43	41	42
32	42	34	29	45	30	35	40	26
40	29	28	33	17	35	28	29	31
48	25	31	31	26	23	28	22	26
56	35	32	31	28	24	28	24	18
64	18	23	26	20	18	20	26	20
72	18	21	17	22	18	18	25	17
80	20	17	18	21	20	15	31	23
88	23	19	24	28	31	32	48	42
96	37	41	51	40	63	45	58	56
104	57	43	40	40	47	42	29	31
112	31	33	39	21	41	28	32	28
120	26	24	14	33	27	22	25	25
128	24	28	23	26	17	31	27	26
136	19	22	22	25	25	23	25	32
144	32	31	18	27	31	23	24	39
152	41	24	41	30	38	33	37	54
160	43	43	44	34	41	42	57	46
168	52	59	70	69	93	136	230	343
176	489	672	1042	1402	1881	2358	2792	3046
184	3109	3124	2797	2398	1879	1420	1004	631
192	426	278	139	71	51	30	12	18
200	6	5	6	6	1	1	0	2
208	1	0	0	1	0	0	0	2
216	0	3	2	1	1	0	2	0
224	1	1	0	1	0	0	0	2
232	1	2	2	0	2	1	0	1
240	0	0	1	2	1	1	0	0
248	1	0	1	0	0	2	0	0

TAG NO. 10 SERIES 10 05 NOV 90 16:18 PAGE 1
 MEMORY=10/16 LIVE TIME= 300 SECS TRUE TIME= 300 SECS
 COLLECT STARTED ON 30 OCT 90 AT 17:31:05
 AMP: INPUT= POS TC=SLOW GAIN= 12.028
 SCA: LLD= 1.000% ULD= 110.0%
 ADC: GAIN= 512 OFFSET= 0 ZERO= 2.00%
 PHA ADD PRESET= 300s LT
 HVPS: + 0V OFF STABLZ OFF

CHANNEL#	DATA							
0	300	300	266	261	227	213	189	168
8	143	173	126	142	126	116	123	107
16	114	110	96	88	90	94	70	67
24	73	63	65	61	60	62	65	70
32	40	47	38	50	39	35	38	50
40	40	34	39	42	36	25	41	29
48	41	34	32	34	36	35	34	37
56	33	44	24	21	33	35	36	20
64	32	35	31	30	25	31	21	25
72	31	22	18	21	26	27	27	25
80	33	21	24	20	26	20	31	26
88	24	31	30	27	29	43	44	38
96	48	55	59	43	44	58	50	43
104	59	42	52	41	46	47	39	25
112	34	45	30	26	27	24	39	24
120	25	24	21	23	26	28	24	24
128	29	22	31	24	24	11	41	29
136	36	36	20	19	19	33	24	25
144	19	27	23	21	36	26	28	37
152	32	26	38	38	36	31	33	34
160	43	43	45	40	41	49	47	50
168	31	59	68	83	86	110	215	272
176	438	637	909	1289	1691	2212	2633	2954
184	3202	3174	2845	2551	2062	1566	1070	790
192	517	321	205	98	70	42	23	21
200	13	9	7	7	3	2	1	0
208	2	1	2	1	3	1	3	0
216	1	1	1	1	2	1	0	0
224	1	0	0	1	2	0	0	2
232	1	1	2	3	1	1	0	2
240	0	0	0	0	1	0	2	0
248	0	1	3	1	0	1	0	0

TAG NO. 12 SERIES 10 05 NOV 90 16:20 PAGE 1
 MEMORY=12/16 LIVE TIME= 300 SECS TRUE TIME= 300 SECS
 COLLECT STARTED ON 30 OCT 90 AT 17:55:14
 AMP: INPUT= POS TC=SLOW GAIN= 11.772
 SCA: LLD= 1.000% ULD= 110.0%
 ADC: GAIN= 512 OFFSET= 0 ZERO= 2.00%
 PHA ADD PRESET= 300s LT
 HVPS: + 0V OFF STABLZ OFF

CHANNEL#	DATA							
0	300	300	182	181	159	163	151	131
8	106	109	104	91	103	86	90	98
16	69	76	73	68	52	61	51	63
24	50	60	60	45	36	48	40	32
32	39	35	27	45	34	35	37	36
40	42	19	26	34	27	35	33	36
48	36	29	25	26	25	24	26	26
56	21	23	26	19	21	23	22	25
64	20	19	26	18	21	14	28	20
72	19	21	34	31	31	25	23	22
80	22	20	22	23	21	15	19	18
88	23	22	33	39	24	47	35	42
96	40	46	44	35	55	47	67	43
104	55	53	47	49	32	41	34	43
112	46	35	39	28	19	23	27	36
120	23	29	22	18	31	29	27	26
128	26	23	21	27	21	24	22	28
136	28	17	22	24	27	24	24	20
144	29	31	23	23	29	31	28	20
152	35	31	28	30	37	38	36	37
160	34	25	35	45	47	42	42	47
168	51	54	66	74	89	110	159	254
176	333	507	751	1018	1423	1974	2411	2707
184	3067	3172	3013	2712	2324	1793	1397	997
192	665	416	281	173	99	46	29	12
200	11	8	4	3	2	5	2	1
208	1	3	2	4	3	1	1	3
216	3	0	2	2	3	2	1	1
224	3	2	3	1	4	0	1	0
232	0	0	1	1	1	0	0	0
240	0	1	0	0	1	1	0	0
248	1	0	2	0	1	0	0	0

TAG NO. 13 SERIES 10 05 NOV 90 16:22 PAGE 1
 MEMORY=13/16 LIVE TIME= 300 SECS TRUE TIME= 300 SECS
 COLLECT STARTED ON 30 OCT 90 AT 18:02:34
 AMP: INPUT= POS TC=SLOW GAIN= 11.772
 SCA: LLD= 1.000% ULD= 110.0%
 ADC: GAIN= 512 OFFSET= 0 ZERO= 2.00%
 PHA ADD PRESET= 300s LT
 HVPS: + 0V OFF STABLZ OFF

CHANNEL#	DATA							
0	300	300	186	153	178	141	153	137
8	103	116	117	104	99	96	69	71
16	75	72	63	52	72	70	65	36
24	60	40	38	36	63	38	39	33
32	44	56	45	43	53	24	27	30
40	29	32	33	32	33	31	33	36
48	32	26	25	28	25	35	33	21
56	41	23	28	34	18	25	22	19
64	16	21	18	26	30	17	18	22
72	24	16	17	22	22	18	21	16
80	22	24	18	22	22	23	28	28
88	29	30	30	36	27	42	37	47
96	39	51	44	49	44	53	46	51
104	47	55	42	34	36	32	33	47
112	40	26	31	18	38	23	32	19
120	24	24	32	23	23	26	27	20
128	27	26	27	26	23	31	14	22
136	33	17	30	30	23	29	24	31
144	29	25	36	32	37	37	40	24
152	27	40	34	36	41	37	53	31
160	47	36	46	39	47	46	55	55
168	89	91	140	152	219	347	544	774
176	1106	1512	1998	2448	2969	3146	3201	3055
184	2716	2157	1724	1178	817	588	366	212
192	127	74	39	16	17	13	6	4
200	4	5	6	1	1	2	1	3
208	0	2	1	0	2	1	1	1
216	0	2	2	0	0	1	0	0
224	2	1	3	1	0	1	0	0
232	1	0	0	1	0	0	0	3
240	0	0	0	0	0	1	1	0
248	0	0	0	0	0	1	1	0

TAG NO. 21 SERIES 10 05 NOV 90 16:24 PAGE 1
 MEMORY= 1/16 LIVE TIME= 300 SECS TRUE TIME= 300 SECS
 COLLECT STARTED ON 31 OCT 90 AT 10:51:49
 AMP: INPUT= POS TC=SLOW GAIN= 12.142
 SCA: LLD= 1.000% ULD= 110.0%
 ADC: GAIN= 512 OFFSET= 0 ZERO= 2.00%
 PHA ADD PRESET= 300s LT
 HVPS: + 0V OFF STABLZ OFF

CHANNEL#	DATA							
0	300	300	191	191	174	146	140	125
8	109	109	109	107	77	84	78	96
16	87	71	66	62	71	52	57	52
24	53	53	60	45	48	42	38	35
32	43	32	30	43	35	32	31	29
40	44	34	22	37	38	34	32	28
48	22	21	31	30	27	29	28	20
56	27	20	21	22	23	21	20	20
64	19	20	22	26	19	20	20	23
72	28	23	21	26	21	21	31	20
80	19	23	17	25	21	24	29	21
88	29	29	31	42	42	29	40	44
96	48	41	44	46	36	41	53	52
104	47	36	46	46	45	35	41	36
112	21	23	27	22	29	18	33	30
120	29	27	33	32	27	16	23	29
128	20	29	32	26	20	23	19	25
136	24	17	29	42	28	35	34	25
144	29	35	36	30	27	24	26	31
152	30	48	38	37	53	32	42	55
160	44	51	53	58	62	61	75	101
168	133	146	204	330	481	689	923	1196
176	1436	1719	2031	2242	2440	2596	2696	2680
184	2456	2045	1671	1274	877	609	351	254
192	134	78	49	32	14	10	7	3
200	5	3	4	3	1	2	3	3
208	2	3	1	0	1	1	0	2
216	2	0	1	2	0	0	0	2
224	1	0	0	1	2	1	1	2
232	1	1	1	1	0	2	0	0
240	0	0	0	0	1	0	0	0
248	0	0	0	1	0	1	0	2

TAG NO. 22 SERIES 10 05 NOV 90 16:26 PAGE 1
 MEMORY= 2/16 LIVE TIME= 300 SECS TRUE TIME= 300 SECS
 COLLECT STARTED ON 31 OCT 90 AT 11:24:58
 AMP: INPUT= POS TC=SLOW GAIN= 12.142
 SCA: LLD= 1.000% ULD= 110.0%
 ADC: GAIN= 512 OFFSET= 0 ZERO= 2.00%
 PHA ADD PRESET= 300s LT
 HVPS: + 0V OFF STABLZ OFF

CHANNEL#	DATA							
0	300	300	153	144	131	124	111	89
8	100	83	79	81	81	73	72	71
16	51	54	55	67	54	47	55	48
24	39	41	31	41	34	41	34	41
32	40	40	34	33	28	25	26	26
40	30	17	33	18	42	30	18	26
48	20	30	33	29	26	32	28	25
56	23	27	19	20	23	28	21	22
64	18	24	21	20	23	23	18	22
72	24	21	23	17	19	20	18	29
80	18	24	20	25	23	14	26	23
88	34	28	25	34	29	28	42	48
96	34	45	57	42	54	48	55	47
104	46	45	36	39	45	44	34	38
112	38	36	26	30	25	28	27	22
120	19	10	15	21	30	23	31	21
128	24	19	17	26	28	24	24	26
136	23	28	21	26	29	24	26	20
144	26	23	33	22	28	21	33	28
152	27	31	41	28	38	39	67	36
160	33	36	54	53	56	55	64	54
168	77	108	153	210	297	411	577	845
176	1062	1378	1662	1984	2148	2440	2684	2665
184	2703	2510	2221	1746	1382	1062	679	466
192	294	201	98	52	42	19	16	8
200	5	10	3	0	3	1	2	1
208	1	3	4	1	2	0	2	2
216	3	1	1	0	2	0	1	0
224	1	1	1	0	1	0	0	1
232	1	2	0	0	1	0	2	0
240	1	1	0	0	2	0	0	0
248	0	1	0	0	1	2	0	0

TAG NO. 23 SERIES 10 05 NOV 90 16:28 PAGE 1
 MEMORY= 3/16 LIVE TIME= 300 SECS TRUE TIME= 300 SECS
 COLLECT STARTED ON 31 OCT 90 AT 15:59:16
 AMP: INPUT= POS TC=SLOW GAIN= 12.142
 SCA: LLD= 1.000% ULD= 110.0%
 ADC: GAIN= 512 OFFSET= 0 ZERO= 2.00%
 PHA ADD PRESET= 300s LT
 HVPS: + OV OFF STABLZ OFF

CHANNEL#	DATA								
0	300	300	144	108	81	94	87	81	
8	77	68	69	60	76	56	50	55	
16	47	65	44	48	35	47	65	34	
24	35	30	46	28	46	31	20	28	
32	34	29	31	27	35	30	36	19	
40	25	36	37	25	23	26	19	19	
48	19	14	30	31	27	22	20	21	
56	15	22	23	17	12	17	19	20	
64	16	16	18	16	19	13	21	21	
72	16	19	21	20	20	22	18	18	
80	31	22	15	21	22	16	26	28	
88	26	29	22	27	35	41	39	35	
96	37	48	52	40	64	49	42	46	
104	51	38	52	31	45	39	28	35	
112	35	29	31	26	31	23	21	31	
120	17	27	26	22	21	15	8	26	
128	21	23	29	19	24	31	19	29	
136	22	26	23	24	24	17	22	18	
144	20	18	23	19	33	27	32	33	
152	36	33	34	29	34	39	34	39	
160	49	38	39	38	47	57	58	49	
168	80	94	98	169	218	349	524	709	
176	939	1230	1502	1861	2266	2520	2809	2802	
184	2740	2598	2339	1923	1449	1075	673	510	
192	315	180	101	44	30	36	11	9	
200	6	9	3	4	4	0	3	2	
208	0	0	0	3	0	0	0	2	
216	3	0	0	1	1	3	2	1	
224	0	0	0	0	1	0	0	0	
232	0	0	0	2	0	0	2	0	
240	0	2	0	0	2	1	0	1	
248	0	1	1	4	0	3	0	0	

TAG NO. 24 SERIES 10 05 NOV 90 16:30 PAGE 1
 MEMORY= 4/16 LIVE TIME= 300 SECS TRUE TIME= 300 SECS
 COLLECT STARTED ON 31 OCT 90 AT 16:07:35
 AMP: INPUT= POS TC=SLOW GAIN= 12.142
 SCA: LLD= 1.000% ULD= 110.0%
 ADC: GAIN= 512 OFFSET= 0 ZERO= 2.00%
 PHA ADD PRESET= 300s LT
 HVPS: + 0V OFF STABLZ OFF

CHANNEL#	DATA							
0	300	300	145	114	105	116	103	124
8	84	95	73	74	72	69	56	71
16	63	81	52	49	44	42	30	39
24	42	36	41	36	36	34	28	29
32	20	33	29	29	29	20	28	24
40	18	22	24	24	19	26	33	23
48	32	20	22	23	20	32	26	26
56	29	21	23	28	16	24	15	32
64	18	14	23	25	12	18	20	20
72	15	16	23	18	13	22	17	18
80	24	22	22	24	19	19	22	26
88	20	23	22	13	29	36	32	39
96	45	36	48	42	37	46	37	67
104	46	36	42	30	34	35	27	32
112	24	36	30	31	21	25	33	24
120	28	23	22	30	28	18	23	27
128	35	25	25	24	27	26	26	20
136	18	26	24	23	22	24	26	24
144	28	19	34	26	20	23	19	26
152	34	42	39	42	37	40	43	42
160	29	36	37	39	43	45	60	66
168	82	87	114	177	259	409	531	746
176	1031	1333	1652	1938	2272	2499	2855	2854
184	2820	2580	2243	1775	1394	962	672	418
192	273	171	103	74	31	23	8	9
200	11	6	4	2	7	4	0	3
208	2	0	0	0	1	0	3	3
216	2	1	2	3	0	2	0	2
224	0	1	0	1	1	0	1	1
232	2	0	0	0	0	0	1	0
240	0	0	1	1	2	0	1	0
248	2	1	2	1	0	0	1	0

TAG NO. 31 SERIES 10 05 NOV 90 16:32 PAGE 1
 MEMORY= 5/16 LIVE TIME= 300 SECS TRUE TIME= 300 SECS
 COLLECT STARTED ON 01 NOV 90 AT 09:44:07
 AMP: INPUT= POS TC=SLOW GAIN= 12.142
 SCA: LLD= 1.000% ULD= 110.0%
 ADC: GAIN= 512 OFFSET= 0 ZERO= 2.00%
 PHA ADD PRESET= 300s LT
 HVPS: + OV OFF STABLZ OFF

CHANNEL#	DATA								
0	300	300	134	140	120	107	108	91	
8	96	78	83	75	67	47	62	61	
16	67	59	39	42	49	34	35	31	
24	39	37	41	46	27	37	27	34	
32	29	21	24	20	27	36	29	27	
40	25	20	25	26	28	31	24	24	
48	24	21	28	29	25	17	19	30	
56	21	24	20	17	20	13	19	21	
64	17	22	31	12	15	23	24	12	
72	13	17	27	17	15	24	25	22	
80	21	22	13	17	20	27	18	22	
88	27	21	30	26	41	30	33	31	
96	39	48	52	53	55	62	50	39	
104	42	38	48	44	43	39	42	41	
112	35	30	23	22	26	19	14	22	
120	23	22	24	28	19	18	20	33	
128	21	34	19	26	20	22	14	25	
136	35	22	16	25	36	28	23	23	
144	29	29	26	26	28	12	33	18	
152	24	32	29	23	34	41	34	39	
160	31	32	42	48	44	48	47	52	
168	44	54	77	87	122	170	263	385	
176	545	810	1172	1523	1931	2335	2717	3001	
184	3069	2913	2624	2196	1866	1414	1003	705	
192	438	263	181	105	63	46	23	9	
200	8	10	8	3	5	2	5	3	
208	2	1	0	2	2	0	3	0	
216	1	0	0	0	2	1	1	1	
224	0	2	2	1	0	0	1	1	
232	0	2	0	3	1	1	2	0	
240	0	0	1	0	0	2	1	0	
248	0	1	1	1	1	0	0	1	

TAG NO. 32 SERIES 10 05 NOV 90 16:34 PAGE 1
 MEMORY= 6/16 LIVE TIME= 300 SECS TRUE TIME= 300 SECS
 COLLECT STARTED ON 01 NOV 90 AT 09:56:04
 AMP: INPUT= POS TC=SLOW GAIN= 12.142
 SCA: LLD= 1.000% ULD= 110.0%
 ADC: GAIN= 512 OFFSET= 0 ZERO= 2.00%
 PHA ADD PRESET= 300s LT
 HVPS: + 0V OFF STABLZ OFF

CHANNEL#	DATA								
0	300	300	96	97	93	79	68	66	
8	83	61	59	50	53	74	57	57	
16	58	49	49	50	30	36	31	38	
24	31	33	33	39	25	35	25	27	
32	34	30	23	31	28	32	25	21	
40	27	31	22	32	33	35	19	21	
48	18	22	25	25	17	21	37	16	
56	23	22	17	22	29	21	18	22	
64	16	9	22	16	15	22	26	15	
72	15	19	18	20	12	22	19	27	
80	18	20	21	15	22	21	27	15	
88	24	26	26	39	30	40	40	47	
96	49	36	41	48	51	59	58	55	
104	43	36	35	38	46	30	35	41	
112	20	16	32	17	22	14	20	28	
120	31	20	17	23	17	26	24	19	
128	21	22	31	22	26	15	24	29	
136	21	20	20	22	27	22	16	19	
144	28	20	36	32	20	25	27	29	
152	29	27	30	32	32	41	46	38	
160	43	42	49	47	34	56	53	70	
168	69	81	117	183	254	380	554	858	
176	1060	1506	1929	2359	2700	2993	3150	2941	
184	2811	2337	1878	1345	1005	669	430	259	
192	145	91	51	30	21	8	7	4	
200	2	11	5	1	1	1	2	3	
208	1	0	1	1	0	1	1	2	
216	2	0	0	0	2	1	0	0	
224	0	0	1	2	0	2	2	0	
232	1	1	0	1	0	0	0	0	
240	1	0	0	0	1	3	0	0	
248	0	2	0	2	0	1	0	1	

TAG NO. 33 SERIES 10 05 NOV 90 16:36 PAGE 1
 MEMORY= 7/16 LIVE TIME= 600 SECS TRUE TIME=
 COLLECT STARTED ON 01 NOV 90 AT 10:39:49
 AMP: INPUT= POS TC=SLOW GAIN= 12.142
 SCA: LLD= 1.000% ULD= 110.0%
 ADC: GAIN= 512 OFFSET= 0 ZERO= 2.00%
 PHA ADD PRESET= 300s LT
 HVPS: + OV OFF STABLZ OFF

CHANNEL#	DATA							
0	600	601	448	420	361	323	311	276
8	269	234	231	223	230	216	178	192
16	179	152	139	143	109	121	125	103
24	125	106	116	98	107	90	90	98
32	85	85	67	94	78	83	70	57
40	72	64	61	79	80	54	58	80
48	62	58	61	59	55	67	52	63
56	61	56	53	55	57	57	62	56
64	47	62	39	43	45	53	36	38
72	53	36	65	38	64	52	46	47
80	47	49	48	32	38	54	44	51
88	64	61	57	66	79	80	89	84
96	93	106	102	109	102	109	109	105
104	104	91	86	89	102	88	79	61
112	61	59	51	59	49	48	47	57
120	49	31	50	61	58	65	44	52
128	47	43	41	59	51	46	43	55
136	54	49	41	51	41	65	53	35
144	62	56	56	81	78	59	64	69
152	70	70	70	72	73	69	68	87
160	79	84	77	76	88	96	94	118
168	118	144	202	225	319	465	709	1094
176	1468	2036	2890	3563	4541	5096	5813	6015
184	6101	5651	4817	3778	2989	2252	1508	975
192	608	424	230	120	87	51	25	19
200	10	11	7	7	3	6	7	5
208	3	5	3	3	2	2	4	3
216	4	4	3	4	1	1	2	2
224	4	1	1	3	2	2	1	1
232	1	2	1	3	2	0	1	1
240	3	3	0	2	2	0	2	3
248	0	2	0	2	2	0	0	2

TAG NO. 34 SERIES 10 05 NOV 90 16:38 PAGE 1
 MEMORY= 8/16 LIVE TIME= 300 SECS TRUE TIME= 300 SECS
 COLLECT STARTED ON 01 NOV 90 AT 11:02:03
 AMP: INPUT= POS TC=SLOW GAIN= 12.142
 SCA: LLD= 1.000% ULD= 110.0%
 ADC: GAIN= 512 OFFSET= 0 ZERO= 2.00%
 PHA ADD PRESET= 300s LT
 HVPS: + 0V OFF STABLZ OFF

CHANNEL#	DATA							
0	300	300	168	174	155	137	135	113
8	120	92	92	84	87	67	73	82
16	82	65	59	38	55	44	43	48
24	64	44	40	33	52	38	27	26
32	35	37	28	31	30	20	25	34
40	31	38	29	26	19	46	34	31
48	35	28	27	28	25	22	16	21
56	24	28	27	17	22	20	28	25
64	21	22	28	16	23	20	25	11
72	17	16	15	16	26	23	19	17
80	20	19	21	19	18	17	25	17
88	33	30	29	32	29	46	41	34
96	45	39	39	40	43	45	43	50
104	42	47	51	51	48	42	44	34
112	31	20	33	23	30	27	26	17
120	27	27	20	34	23	31	26	30
128	22	31	32	27	24	29	31	23
136	25	27	24	26	32	19	26	28
144	28	25	20	35	22	33	25	33
152	32	33	25	23	37	29	45	45
160	50	44	40	43	48	48	58	52
168	42	65	63	86	98	177	215	345
176	522	774	1067	1377	1770	2179	2601	2987
184	3066	3142	2805	2423	1940	1534	1137	810
192	501	332	208	139	56	32	17	24
200	22	9	6	2	4	4	2	2
208	6	2	2	1	3	2	2	0
216	0	0	0	0	0	3	0	2
224	0	1	0	1	1	0	1	0
232	2	1	0	0	0	2	1	0
240	0	1	1	1	1	0	1	0
248	0	0	0	0	2	0	1	1

TAG NO. 35 SERIES 10
 MEMORY= 9/16 LIVE TIME= 300 SECS
 COLLECT STARTED ON 01 NOV 90 AT 11:40:14
 AMP: INPUT= POS TC=SLOW GAIN= 12.142
 SCA: LLD= 1.000% ULD= 110.0%
 ADC: GAIN= 512 OFFSET= 0 ZERO= 2.00%
 PHA ADD PRESET= 300s LT
 HVPS: + 0V OFF STABLZ OFF

05 NOV 90 16:40 PAGE 1
 TRUE TIME= 300 SECS

CHANNEL#	DATA							
0	300	300	146	137	130	115	114	99
8	99	88	86	70	64	82	63	64
16	61	56	72	55	52	47	45	41
24	45	41	39	33	35	28	38	26
32	31	32	40	40	31	29	25	30
40	38	34	23	22	27	24	27	29
48	18	23	21	31	14	22	27	23
56	23	35	21	16	19	20	16	20
64	24	27	24	16	34	21	18	19
72	13	21	24	14	21	19	28	19
80	20	12	23	12	23	19	21	26
88	25	20	25	19	31	32	34	33
96	37	40	36	54	49	43	54	72
104	50	46	57	36	44	35	34	36
112	24	34	47	20	33	23	24	28
120	17	22	29	26	25	21	31	22
128	23	38	28	26	23	23	28	23
136	20	21	26	14	31	25	27	22
144	31	21	29	21	26	27	30	30
152	29	29	30	27	40	45	32	35
160	44	36	49	50	51	49	54	45
168	39	48	66	78	85	135	150	243
176	308	449	697	1006	1310	1719	2112	2494
184	2794	3035	2995	2776	2456	2031	1709	1122
192	806	545	348	229	127	76	54	30
200	22	14	3	4	8	4	4	2
208	1	1	3	1	1	0	1	4
216	1	0	0	0	0	0	0	0
224	0	2	1	0	0	1	0	0
232	0	0	1	2	1	0	2	0
240	0	0	0	0	1	0	0	0
248	0	0	0	1	0	2	1	1

TAG NO. 36 SERIES 10 05 NOV 90 16:42 PAGE 1
 MEMORY=10/16 LIVE TIME= 300 SECS TRUE TIME= 300 SECS
 COLLECT STARTED ON 01 NOV 90 AT 11:48:59
 AMP: INPUT= POS TC=SLOW GAIN= 12.142
 SCA: LLD= 1.000% ULD= 110.0%
 ADC: GAIN= 512 OFFSET= 0 ZERO= 2.00%
 PHA ADD PRESET= 300s LT
 HVPS: + 0V OFF STABLZ OFF

CHANNEL#	DATA							
0	300	300	174	173	154	135	133	119
8	116	100	100	97	78	76	81	91
16	75	72	68	54	73	46	52	48
24	44	52	43	43	40	42	28	36
32	49	41	32	38	37	21	24	26
40	35	36	49	34	40	44	31	20
48	32	24	20	27	36	24	25	35
56	28	26	32	22	27	26	19	25
64	30	19	30	24	30	21	21	18
72	20	26	20	21	19	22	22	23
80	28	22	24	24	18	23	22	24
88	31	22	31	30	24	22	44	41
96	47	50	49	55	45	62	40	47
104	46	51	37	36	39	39	52	32
112	34	24	29	29	22	22	25	27
120	30	27	27	8	30	28	29	29
128	28	22	28	22	22	21	21	23
136	18	28	36	26	31	22	24	24
144	29	25	30	30	29	25	34	25
152	39	37	47	22	45	37	34	36
160	39	48	47	53	55	48	43	44
168	63	78	104	152	198	302	444	668
176	1037	1371	1724	2089	2632	2893	3131	2923
184	2864	2500	2090	1561	1172	706	486	328
192	185	104	74	44	23	9	12	6
200	3	2	5	1	2	5	2	3
208	1	1	3	2	3	1	0	2
216	1	1	2	0	1	1	0	2
224	0	1	1	0	1	1	1	0
232	1	1	0	2	1	0	0	0
240	2	0	0	0	0	0	1	0
248	0	0	1	0	1	1	0	0

TAG NO. 37 SERIES 10 05 NOV 90 16:44 PAGE 1
 MEMORY=11/16 LIVE TIME= 600 SECS TRUE TIME= 601 SECS
 COLLECT STARTED ON 01 NOV 90 AT 12:04:45
 AMP: INPUT= POS TC=SLOW GAIN= 12.142
 SCA: LLD= 1.000% ULD= 110.0%
 ADC: GAIN= 512 OFFSET= 0 ZERO= 2.00%
 PHA ADD PRESET= 300s LT
 HVPS: + 0V OFF STABLZ OFF

CHANNEL#	DATA								
0	600	601	492	448	437	376	365	350	
8	293	248	250	256	238	216	225	205	
16	187	189	179	180	170	146	139	143	
24	118	93	106	114	120	108	99	98	
32	98	84	70	94	67	91	96	74	
40	75	78	86	74	66	70	68	77	
48	75	52	64	72	64	69	59	47	
56	46	47	57	53	50	59	60	60	
64	50	49	47	63	49	47	46	53	
72	47	53	56	49	50	49	43	45	
80	43	41	42	55	59	56	46	62	
88	54	55	50	59	77	61	91	65	
96	105	106	87	108	104	102	106	88	
104	98	85	98	94	74	87	82	69	
112	62	65	62	55	70	47	51	50	
120	47	49	39	50	46	55	46	62	
128	48	43	61	48	60	69	51	53	
136	51	63	55	40	49	57	53	49	
144	63	60	69	63	54	77	55	65	
152	66	67	81	78	77	77	88	91	
160	98	93	88	77	83	98	94	108	
168	128	145	187	269	380	513	764	1130	
176	1755	2350	3065	3945	4751	5557	6001	6177	
184	5893	5338	4682	3557	2678	1868	1319	777	
192	497	293	175	93	60	33	26	18	
200	12	12	15	6	8	3	2	5	
208	4	6	3	3	3	2	3	2	
216	1	2	1	3	4	3	1	1	
224	1	6	4	4	3	3	0	1	
232	0	2	0	3	2	2	1	2	
240	1	4	1	1	1	1	3	2	
248	1	2	4	1	3	0	1	0	

TAG NO. 38 SERIES 10 05 NOV 90 16:46 PAGE 1
 MEMORY=12/16 LIVE TIME= 600 SECS TRUE TIME= 601 SECS
 COLLECT STARTED ON 01 NOV 90 AT 12:26:34
 AMP: INPUT= POS TC=SLOW GAIN= 12.142
 SCA: LLD= 1.000% ULD= 110.0%
 ADC: GAIN= 512 OFFSET= 0 ZERO= 2.00%
 PHA ADD PRESET= 300s LT
 HVPS: + OV OFF STABLZ OFF

CHANNEL#	DATA								
0	600	601	477	441	368	346	346	314	
8	257	246	253	226	209	210	191	193	
16	180	166	169	165	150	112	140	118	
24	119	114	112	107	134	112	94	82	
32	101	63	73	105	105	66	87	76	
40	89	66	70	72	62	70	55	68	
48	51	76	69	58	67	61	59	72	
56	68	50	65	72	62	49	52	54	
64	51	49	50	58	55	64	43	48	
72	40	62	47	45	37	42	44	44	
80	47	54	37	46	43	63	55	45	
88	56	45	60	57	82	75	77	92	
96	83	98	101	122	86	98	97	101	
104	105	98	83	84	80	77	71	73	
112	75	74	66	71	64	46	45	49	
120	43	59	53	49	59	49	39	43	
128	64	45	55	51	45	51	62	59	
136	49	51	49	44	61	55	55	43	
144	76	61	55	63	73	58	63	65	
152	81	74	67	60	77	94	71	68	
160	82	79	87	109	87	99	102	99	
168	121	136	172	212	296	456	706	1051	
176	1516	2089	2827	3816	4497	5384	6060	6150	
184	6096	5557	4694	3650	2825	1968	1400	871	
192	537	340	199	115	66	31	20	18	
200	17	18	5	7	7	3	5	5	
208	2	3	6	6	2	2	3	3	
216	3	5	2	2	1	3	1	1	
224	1	1	1	2	2	1	1	0	
232	1	3	1	3	2	1	0	0	
240	1	1	0	2	1	2	0	1	
248	2	0	0	0	3	1	0	4	

TAG NO. 39 SERIES 10 05 NOV 90 16:48 PAGE 1
 MEMORY=13/16 LIVE TIME= 300 SECS TRUE TIME= 300 SECS
 COLLECT STARTED ON 01 NOV 90 AT 12:46:19
 AMP: INPUT= POS TC=SLOW GAIN= 12.142
 SCA: LLD= 1.000% ULD= 110.0%
 ADC: GAIN= 512 OFFSET= 0 ZERO= 2.00%
 PHA ADD PRESET= 300s LT
 HVPS: + 0V OFF STABLZ OFF

CHANNEL#	DATA							
0	300	300	204	188	140	150	119	139
8	129	132	91	119	82	89	80	93
16	73	80	70	71	57	63	51	54
24	69	50	52	49	58	44	41	44
32	41	32	43	33	47	46	36	30
40	44	29	29	29	34	23	25	33
48	24	21	31	26	26	32	32	23
56	22	29	25	26	18	24	32	25
64	24	26	22	18	21	21	23	27
72	21	16	26	33	20	8	31	23
80	18	15	31	25	20	29	27	24
88	28	30	33	34	30	30	38	33
96	42	48	45	47	51	55	53	41
104	45	58	52	36	45	41	31	36
112	21	27	26	26	30	35	23	24
120	24	22	21	27	24	13	25	22
128	23	15	21	15	26	26	23	22
136	27	17	22	18	24	29	20	36
144	23	20	35	24	34	26	21	28
152	38	34	40	25	42	41	33	24
160	27	48	40	32	48	39	53	55
168	54	70	65	94	116	176	273	359
176	565	789	1181	1531	2058	2456	2841	3109
184	3223	2954	2550	2156	1606	1300	840	617
192	366	223	131	90	50	17	12	14
200	6	3	7	1	2	3	5	1
208	0	1	4	1	1	1	1	1
216	0	1	3	1	1	1	0	0
224	2	1	1	3	0	0	0	2
232	0	1	0	0	0	1	1	0
240	2	0	1	0	1	1	0	0
248	3	0	1	2	0	0	0	1

TAG NO. 40 SERIES 10 05 NOV 90 16:50 PAGE 1
 MEMORY=14/16 LIVE TIME= 300 SECS TRUE TIME= 300 SECS
 COLLECT STARTED ON 01 NOV 90 AT 12:51:04
 AMP: INPUT= POS TC=SLOW GAIN= 12.142
 SCA: LLD= 1.000% ULD= 110.0%
 ADC: GAIN= 512 OFFSET= 0 ZERO= 2.00%
 PHA ADD PRESET= 300s LT
 HVPS: + 0V OFF STABLZ OFF

CHANNEL#	DATA							
0	300	300	229	197	212	136	158	162
8	125	118	118	128	107	114	102	98
16	94	87	84	67	57	57	55	59
24	65	44	43	57	46	54	47	47
32	57	38	43	37	36	42	34	27
40	41	45	39	43	27	39	36	29
48	37	27	24	25	24	32	36	31
56	27	27	32	24	37	22	35	25
64	15	19	22	31	27	33	29	18
72	23	24	20	17	24	23	20	31
80	32	30	21	24	19	19	25	23
88	28	32	29	28	28	35	42	38
96	41	36	50	56	43	57	45	49
104	59	53	56	39	53	49	31	45
112	43	28	35	35	36	27	30	22
120	23	27	28	32	21	23	21	27
128	24	32	27	27	29	28	22	29
136	21	23	31	21	31	25	20	25
144	29	30	28	25	28	38	34	32
152	24	21	32	27	35	39	48	39
160	47	42	38	43	43	42	43	54
168	70	55	59	104	123	169	273	356
176	568	893	1133	1514	2002	2510	2796	3063
184	3157	3079	2684	2270	1755	1285	977	619
192	378	246	141	91	41	32	20	7
200	7	7	4	3	5	3	1	3
208	5	2	1	0	3	0	2	0
216	1	2	1	0	4	2	1	0
224	0	0	2	2	0	1	0	3
232	1	1	0	3	0	0	0	1
240	0	0	0	2	0	1	1	0
248	1	1	1	0	0	1	0	0

TAG NO. 41 SERIES 10 05 NOV 90 16:52 PAGE 1
 MEMORY=15/16 LIVE TIME= 300 SECS TRUE TIME= 300 SECS
 COLLECT STARTED ON 01 NOV 90 AT 13:02:24
 AMP: INPUT= POS TC=SLOW GAIN= 12.142
 SCA: LLD= 1.000% ULD= 110.0%
 ADC: GAIN= 512 OFFSET= 0 ZERO= 2.00%
 PHA ADD PRESET= 300s LT
 HVPS: + OV OFF STABLZ OFF

CHANNEL#	DATA							
0	300	300	155	152	140	128	119	115
8	93	86	98	61	84	62	77	68
16	64	66	55	63	47	40	57	43
24	48	45	46	38	34	55	30	22
32	34	30	37	34	28	22	27	35
40	38	33	24	22	24	22	37	27
48	30	23	31	21	26	27	18	24
56	17	26	36	26	23	32	16	24
64	17	19	22	17	10	21	19	22
72	28	16	26	32	21	21	21	19
80	24	18	13	24	20	28	24	27
88	21	18	32	23	28	32	26	41
96	49	40	40	52	47	46	60	45
104	59	46	46	38	38	43	36	33
112	29	36	23	34	31	35	19	28
120	26	20	24	23	24	23	31	24
128	21	21	21	31	25	31	20	19
136	27	26	23	19	28	27	18	21
144	19	26	21	38	31	26	33	31
152	34	37	32	43	24	34	38	38
160	44	24	38	39	40	50	48	39
168	52	60	71	88	119	165	233	284
176	468	735	1035	1405	1867	2413	2826	3026
184	3220	3034	2787	2336	1936	1414	981	689
192	458	238	149	84	50	27	26	11
200	13	2	3	5	5	1	5	1
208	0	1	0	1	1	0	1	1
216	2	0	0	1	2	0	0	2
224	0	0	1	1	2	1	0	5
232	1	0	0	0	1	0	0	2
240	0	1	1	0	0	0	1	1
248	1	1	2	0	0	1	0	0

TAG NO. 42 SERIES 10
 MEMORY=16/16 LIVE TIME= 300 SECS
 COLLECT STARTED ON 01 NOV 90 AT 13:13:38
 AMP: INPUT= POS TC=SLOW GAIN= 12.142
 SCA: LLD= 1.000% ULD= 110.0%
 ADC: GAIN= 512 OFFSET= 0 ZERO= 2.00%
 PHA ADD PRESET= 300s LT
 HVPS: + 0V OFF STABLZ OFF

05 NOV 90 16:54 PAGE 1
 TRUE TIME= 301 SECS

CHANNEL#	DATA							
0	300	301	706	659	629	618	512	491
8	494	435	381	341	376	347	340	320
16	294	293	266	224	239	228	208	213
24	204	178	157	181	154	121	134	121
32	107	109	114	105	108	80	76	79
40	79	99	84	91	104	91	104	90
48	65	84	61	74	76	78	84	91
56	79	78	67	75	59	49	49	50
64	46	50	36	40	53	36	40	45
72	43	47	45	39	55	40	48	36
80	39	30	46	29	38	28	36	33
88	41	47	38	53	47	49	51	53
96	62	50	47	50	65	71	65	64
104	58	67	57	62	54	55	54	47
112	55	39	41	41	37	34	50	30
120	42	34	40	35	44	33	31	40
128	40	29	26	33	28	32	48	34
136	28	34	31	30	28	24	28	31
144	46	42	39	43	34	36	38	49
152	35	31	42	38	39	48	43	55
160	48	44	59	40	46	53	53	51
168	59	75	109	113	178	246	347	504
176	677	1010	1269	1775	2245	2541	2946	3001
184	3116	2791	2465	2020	1502	1131	779	518
192	321	193	123	83	49	22	20	19
200	12	7	12	6	5	5	8	4
208	0	7	5	2	1	4	4	5
216	6	6	3	3	4	1	5	3
224	8	2	6	6	4	5	4	3
232	1	0	2	4	5	5	1	2
240	2	2	4	1	2	2	2	4
248	2	1	5	6	1	2	1	5

APPENDIX D



REPORT OF LABORATORY ANALYSIS

St. Paul Corps of Engineering
 1421 USPO & Custom House
 St. Paul, MN 55101-9808

December 31, 1990
 PACE Project
 Number: 901130506

Attn: Ms. Debbie Peterson

10047

PACE Sample Number:		10 0468517	10 0468525	10 0468533	
Date Collected:		11/27/90	11/27/90	11/27/90	
Date Received:		11/28/90	11/28/90	11/28/90	
Parameter	Units	MDL	1-1	1-2	2-1

INORGANIC ANALYSIS

INDIVIDUAL PARAMETERS

Barium	mg/L	0.01	0.02	0.02	0.02
Cadmium	mg/L	0.0005	0.001	0.001	0.002
Chromium	mg/L	0.005	ND	ND	0.011
Copper	mg/L	0.005	0.012	0.015	0.030
Lead	mg/L	0.005	0.020	0.028	ND
Nickel	mg/L	0.025	ND	ND	ND

ORGANIC ANALYSIS

GCMS FOR VOLATILE ORGANICS-8240

Date Analyzed			B 12/03/90	B 12/03/90	B 12/03/90
Chloromethane	ug/L	4.7	ND	ND	ND
Bromomethane	ug/L	7.1	ND	ND	ND
Vinyl chloride	ug/L	6.0	ND	ND	ND
Chloroethane	ug/L	4.1	ND	ND	ND
Methylene chloride	ug/L	10	ND	ND	ND
Acetone	ug/L	10	ND	12	ND
Carbon disulfide	ug/L	5.0	ND	ND	ND
1,1-Dichloroethylene	ug/L	6.5	ND	ND	ND
1,1-Dichloroethane	ug/L	4.4	ND	ND	ND
Trans-1,2-dichloroethylene	ug/L	3.7	ND	ND	ND
Chloroform	ug/L	4.5	ND	ND	ND
1,2-Dichloroethane	ug/L	3.9	ND	ND	ND
2-Butanone (MEK)	ug/L	10	ND	ND	ND
1,1,1-Trichloroethane	ug/L	4.3	ND	ND	ND
Carbon tetrachloride	ug/L	3.8	ND	ND	ND
Vinyl acetate	ug/L	2.8	ND	ND	ND
Bromodichloromethane	ug/L	4.3	ND	ND	ND

* Method Detection Limit
 ND Not detected at or above the MDL.



REPORT OF LABORATORY ANALYSIS

Ms. Debbie Peterson
Page 2

December 31, 1990
PACE Project
Number: 901130506

10047

PACE Sample Number:	10 0468517	10 0468525	10 045853
Date Collected:	11/27/90	11/27/90	11/27/90
Date Received:	11/28/90	11/28/90	11/28/90
<u>Parameter</u>	<u>Units</u>	<u>MDL</u>	<u>1-1</u> <u>1-2</u> <u>2-1</u>

ORGANIC ANALYSIS

GCMS FOR VOLATILE ORGANICS-8240

1,1,2,2-Tetrachloroethane	ug/L	2.5	ND	ND	ND
1,2-Dichloropropane	ug/L	3.0	ND	ND	ND
Trans-1,3-dichloropropene	ug/L	2.1	ND	ND	ND
Trichloroethylene	ug/L	3.5	ND	ND	ND
Dibromochloromethane	ug/L	3.0	ND	ND	ND
1,1,2-Trichloroethane	ug/L	3.1	ND	ND	ND
Benzene	ug/L	2.7	ND	ND	ND
Cis-1,3-dichloropropene	ug/L	1.4	ND	ND	ND
2-Chloroethylvinyl ether	ug/L	6.3	ND	ND	ND
P. moform	ug/L	4.0	ND	ND	ND
2-hexanone	ug/L	10	ND	ND	ND
4-Methyl-2pentanone (MISK)	ug/L	10	ND	ND	ND
Tetrachloroethylene	ug/L	2.2	ND	ND	ND
Toluene	ug/L	4.3	ND	ND	ND
Chlorobenzene	ug/L	2.5	ND	ND	ND
Ethyl benzene	ug/L	4.2	ND	ND	ND
Styrene	ug/L	1.7	ND	ND	ND
Xylene, total	ug/L	5.0	ND	ND	ND

METHOD 608-PESTICIDES AND PCBS IN WATER

Date Analyzed		NA	NA	G 12/13/90
Date Extracted		-	-	12/4/90
a-BHC	ug/L	0.002	-	NA
a-BHC	ug/L	0.0022	-	-
a-BHC	ug/L	0.040	NA	ND
b-BHC	ug/L	0.014	-	-
b-BHC	ug/L	0.015	-	-
b-BHC	ug/L	0.28	NA	ND
g-BHC (Lindane)	ug/L	0.002	-	-

NDL Method Detection Limit
 Not detected at or above the MDL.
 NA Not analyzed due to laboratory accident.



REPORT OF LABORATORY ANALYSIS

Ms. Debbie Peterson
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December 31, 1990
PACE Project
Number: 901130506

10047

PACE Sample Number:		10 0468517	10 0468525	10 04685	
Date Collected:		11/27/90	11/27/90	11/27/90	
Date Received:		11/28/90	11/28/90	11/28/90	
Parameter	Units	MDL	1-1	1-2	2-1

ORGANIC ANALYSIS

METHOD 608-PESTICIDES AND PCBS IN WATER

g-BHC (Lindane)	ug/L	0.0022	-	-	ND
g-BHC (Lindane)	ug/L	0.040	NA	-	-
d-BHC	ug/L	0.001	-	NA	-
d-BHC	ug/L	0.0011	-	-	ND
d-BHC	ug/L	0.020	NA	-	-
Heptachlor	ug/L	0.001	-	NA	-
Heptachlor	ug/L	0.0011	-	-	ND
Heptachlor	ug/L	0.020	NA	-	-
Aldrin	ug/L	0.055	-	NA	-
Aldrin	ug/L	1.1	NA	-	-
Heptachlor epoxide	ug/L	0.003	-	NA	-
Heptachlor epoxide	ug/L	0.060	NA	-	-
Endosulfan I	ug/L	0.003	-	NA	-
Endosulfan I	ug/L	0.060	NA	-	-
Dieldrin	ug/L	0.003	-	NA	-
Dieldrin	ug/L	0.0033	-	-	ND
Dieldrin	ug/L	0.060	NA	-	-
Endrin	ug/L	0.007	-	NA	-
Endrin	ug/L	0.0077	-	-	ND
Endrin	ug/L	0.14	NA	-	-
4,4-DDD	ug/L	0.006	-	NA	-
4,4-DDD	ug/L	0.0066	-	-	ND
4,4-DDD	ug/L	0.12	NA	-	-
Endosulfan II	ug/L	0.005	-	NA	-
Endosulfan II	ug/L	0.10	NA	-	-
4,4-DDT	ug/L	0.009	-	NA	-
4,4-DDT	ug/L	0.0099	-	-	ND
4,4-DDT	ug/L	0.18	NA	-	-

Method Detection Limit

ND Not detected at or above the MDL.
NA Not analyzed due to laboratory accident.



REPORT OF LABORATORY ANALYSIS

Ms. Debbie Peterson
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December 31, 1990
PACE Project
Number: 901130506

10047

PACE Sample Number:	10 0468517	10 0468525	10 0468533
Date Collected:	11/27/90	11/27/90	11/27/90
Date Received:	11/28/90	11/23/90	11/28/90
Parameter	Units MDL 1-1	1-2	2-1

ORGANIC ANALYSIS

METHOD 608-PESTICIDES AND PCBs IN WATER

4,4-DDE	ug/L	0.007	-	NA	-
4,4-DDE	ug/L	0.0077	-	-	ND
4,4-DDE	ug/L	0.14	NA	-	-
Endrin aldehyde	ug/L	0.20	-	NA	-
Endrin aldehyde	ug/L	4.0	NA	-	-
Endosulfan sulfate	ug/L	0.056	-	NA	-
Endosulfan sulfate	ug/L	1.1	NA	-	-
o-xaphene	ug/L	1.0	-	NA	-
p-xaphene	ug/L	2.0	NA	-	-
PCB-1016	ug/L	0.10	-	NA	-
PCB-1016	ug/L	0.11	-	-	ND
PCB-1016	ug/L	2.0	NA	-	-
PCB-1221	ug/L	0.10	-	NA	-
PCB-1221	ug/L	0.11	-	-	ND
PCB-1221	ug/L	2.0	NA	-	-
PCB-1232	ug/L	0.10	-	NA	-
PCB-1232	ug/L	0.11	-	-	ND
PCB-1232	ug/L	2.0	NA	-	-
PCB-1242	ug/L	0.10	-	NA	-
PCB-1242	ug/L	0.11	-	-	ND
PCB-1242	ug/L	2.0	NA	-	-
PCB-1248	ug/L	0.10	-	NA	-
PCB-1248	ug/L	0.11	-	-	ND
PCB-1248	ug/L	2.0	NA	-	-
PCB-1254	ug/L	0.10	-	NA	-
PCB-1254	ug/L	0.11	-	-	ND
PCB-1254	ug/L	2.0	NA	-	-
PCB-1260	ug/L	0.10	-	NA	-

MDL Method Detection Limit
 NA Not analyzed due to laboratory accident.
 ND Not detected at or above the MDL.



REPORT OF LABORATORY ANALYSIS

Ms. Debbie Peterson
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December 31, 1990
PACE Project
Number: 901130506

10047

PACE Sample Number:		10 0468517	10 0468525	10 0468533
Date Collected:		11/27/90	11/27/90	11/27/90
Date Received:		11/28/90	11/28/90	11/28/90
Parameter	Units	MDL	1-1	1-2
			2-1	

ORGANIC ANALYSIS

METHOD 608-PESTICIDES AND PCBS IN WATER

PCB-1260	ug/L	0.11	-	-	ND
PCB-1260	ug/L	2.0	NA	-	-
Chlordane (tech)	ug/L	0.10	-	NA	-
Chlordane (tech)	ug/L	0.11	-	-	ND
Chlordane (tech)	ug/L	2.0	NA	-	-

MDL Method Detection Limit
ND Not detected at or above the MDL.
Not analyzed due to laboratory accident.



REPORT OF LABORATORY ANALYSIS

Ms. Debbie Peterson
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December 31, 1990
PACE Project
Number: 901130506

10047

PACE Sample Number: 10 0468541
Date Collected: 11/27/90
Date Received: 11/28/90
Parameter: Units MDL 2-2

INORGANIC ANALYSIS

INDIVIDUAL PARAMETERS

Barium	mg/L	0.01	0.02
Cadmium	mg/L	0.0005	0.002
Chromium	mg/L	0.005	0.010
Copper	mg/L	0.005	0.027
Lead	mg/L	0.005	ND
Nickel	mg/L	0.025	ND

ORGANIC ANALYSIS

FMS FOR VOLATILE ORGANICS-8240

Date Analyzed			B 12/05/90
Chloromethane	ug/L	4.7	ND
Bromomethane	ug/L	7.1	ND
Vinyl chloride	ug/L	6.0	ND
Chloroethane	ug/L	4.1	ND
Methylene chloride	ug/L	10	ND
Acetone	ug/L	10	ND
Carbon disulfide	ug/L	5.0	ND
1,1-Dichloroethylene	ug/L	6.5	ND
1,1-Dichloroethane	ug/L	4.4	ND
Trans-1,2-dichloroethylene	ug/L	3.7	ND
Chloroform	ug/L	4.5	ND
1,2-Dichloroethane	ug/L	3.9	ND
2-Butanone (MEK)	ug/L	10	ND
1,1,1-Trichloroethane	ug/L	4.3	ND
Carbon tetrachloride	ug/L	3.8	ND
Vinyl acetate	ug/L	2.8	ND
Bromodichloromethane	ug/L	4.3	ND
1,1,2,2-Tetrachloroethane	ug/L	2.5	ND
1,2-Dichloropropane	ug/L	3.0	ND

MDL Method Detection Limit
ND Not detected at or above the MDL.



REPORT OF LABORATORY ANALYSIS

Ms. Debbie Peterson
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December 31, 1990
PACE Project
Number: 901130506

10047

PACE Sample Number: 10 0468541
Date Collected: 11/27/90
Date Received: 11/28/90
Parameter Units MDL 2-2

ORGANIC ANALYSIS

GCMS FOR VOLATILE ORGANICS-8240

Trans-1,3-dichloropropene	ug/L	2.1	ND
Trichloroethylene	ug/L	3.5	ND
Dibromochloromethane	ug/L	3.0	ND
1,1,2-Trichloroethane	ug/L	3.1	ND
Benzene	ug/L	2.7	ND
Cis-1,3-dichloropropene	ug/L	1.4	ND
2-Chloroethylvinyl ether	ug/L	6.3	ND
Bromoform	ug/L	4.0	ND
2-Hexanone	ug/L	10	ND
4-Methyl-2-pentanone (MIBK)	ug/L	10	ND
Tetrachloroethylene	ug/L	2.2	ND
Toluene	ug/L	4.3	ND
Chlorobenzene	ug/L	2.5	ND
Ethyl benzene	ug/L	4.2	ND
Styrene	ug/L	1.7	ND
Xylene, total	ug/L	5.0	ND

METHOD 608-PESTICIDES AND PCBS IN WATER

Date Analyzed			G 12/13/90
Date Extracted			12/4/90
a-BHC	ug/L	0.0022	ND
b-BHC	ug/L	0.015	ND
g-BHC (Lindane)	ug/L	0.0022	ND
d-BHC	ug/L	0.0011	ND
Heptachlor	ug/L	0.0011	ND
Dieldrin	ug/L	0.0033	ND
Jrin	ug/L	0.0077	ND
4,4-DDD	ug/L	0.0066	ND
4,4-DDT	ug/L	0.0099	ND
4,4-DDE	ug/L	0.0077	ND



REPORT OF LABORATORY ANALYSIS

Ms. Debbie Peterson
Page 8

December 31, 1990
PACE Project
Number: 901130506

10047

PACE Sample Number: 10 0468541
Date Collected: 11/27/90
Date Received: 11/28/90
Parameter Units MDL 2-2

ORGANIC ANALYSIS

METHOD 608-PESTICIDES AND PCBS IN WATER

PCB-1016	ug/L	0.11	ND
PCB-1221	ug/L	0.11	ND
PCB-1232	ug/L	0.11	ND
PCB-1242	ug/L	0.11	ND
PCB-1248	ug/L	0.11	ND
PCB-1254	ug/L	0.11	ND
PCB-1260	ug/L	0.11	ND
Chlordane (tech)	ug/L	0.11	ND

MDL Method Detection Limit
ND Not detected at or above the MDL.



REPORT OF LABORATORY ANALYSIS

Ms. Debbie Peterson
Page 9

December 31, 1990
PACE Project
Number: 901130506

10047

PACE-Sample Number:		10 0468576	10 0468592	10 04685
Date Collected:		11/27/90	11/27/90	11/27/90
Date Received:		11/28/90	11/28/90	11/28/90
Parameter:	Units	M-1 leachate (2)	M-2 leachate (2)	C1+2 leachate (2)

INORGANIC ANALYSIS

INDIVIDUAL PARAMETERS

Mercury	mg/L	0.0008	ND	ND	ND
RCRA TOXICITY METALS					
Arsenic	mg/L	0.094	ND	ND	ND
Barium	mg/L	0.006	0.43	2.7	0.95
Cadmium	mg/L	0.006	ND	0.48	ND
Chromium	mg/L	0.010	0.12	0.083	ND
Copper	mg/L	0.045	0.10	2.0	ND
Selenium	mg/L	0.081	ND	ND	ND
Silver	mg/L	0.005	ND	ND	ND

ORGANIC ANALYSIS

TCLP SEMIVOLATILES

Date Analyzed			C 12/12/90	C 12/12/90	C 12/12/90
Date Extracted			12/10/90	12/10/90	12/10/90
o-Cresol	mg/L	200	ND	ND	ND
m-Cresol	mg/L	200	ND	ND	ND
p-Cresol	mg/L	200	ND	ND	ND
1,4-Dichlorobenzene	mg/L	7.5	ND	ND	ND
2,4-Dinitrotoluene	mg/L	0.13	ND	ND	ND
Hexachlorobenzene	mg/L	0.13	ND	ND	ND
Hexachloro-1,3-butadiene	mg/L	0.5	ND	ND	ND
Hexachloroethane	mg/L	3.0	ND	ND	ND
Nitrobenzene	mg/L	2.0	ND	ND	ND
Pentachlorophenol	mg/L	100	ND	ND	ND
Pyridine	mg/L	5.0	ND	ND	ND

-) All analysis performed on Toxic Characteristic Leachate.
- (2) All analysis performed on Toxic Characteristic Leachate for Volatiles.
- MDL Method Detection Limit
- ND Not detected at or above the MDL.



REPORT OF LABORATORY ANALYSIS

Ms. Debbie Peterson
Page 10

December 31, 1990
PACE Project
Number: 901130506

10047

Parameter	Units	MDL	10 0468576 11/27/90 11/28/90 M-1 leachate (2)	10 0468592 11/27/90 11/28/90 M-2 leachate (2)	10 046860 11/27/90 11/28/90 C1+2 leachate (2)
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ORGANIC ANALYSIS

TCLP SEMIVOLATILES

2,4,5-Trichlorophenol	mg/L	400	ND	ND	ND
2,4,6-Trichlorophenol	mg/L	2.0	ND	ND	ND

TCLP VOLATILES

Substrate Analyzed	ug/L	MDL	B 12/13/90	B 12/13/90	B 12/13/90
benzene (TCLP Regulatory List)	ug/L	27	ND	ND	ND
Carbon tetrachloride (TCLP Reg. List)	ug/L	38	ND	ND	ND
Chlorobenzene (TCLP Regulatory List)	ug/L	25	ND	ND	ND
2-Butanone (MEK) (TCLP Regulatory List)	ug/L	100	ND	ND	110
Tetrachloroethylene (TCLP Reg. List)	ug/L	71	ND	ND	ND
Trichloroethylene (TCLP Regulatory List)	ug/L	35	ND	ND	ND
Chloroform (TCLP Regulatory List)	ug/L	45	ND	ND	ND
1,2-Dichloroethane (TCLP Regulatory List)	ug/L	39	ND	ND	ND
1,1-Dichloroethylene (TCLP Reg. List)	ug/L	65	ND	ND	ND
Vinyl chloride (TCLP Regulatory List)	ug/L	60	ND	ND	ND

- (1) All analysis performed on Toxic Characteristic Leachate.
- (2) All analysis performed on Toxic Characteristic Leachate for Volatiles.
- MDL Method Detection Limit
- ND Not detected at or above the MDL.

- PCB

- Bioassay

09100023

9-1-90
ORG. FURN. PY91-1

09100023A

MINNESOTA DEPT. OF HEALTH
Chemical Laboratory Section
Organic Chemistry Unit

Date Collected: 11/27/90

Date Received: 12/21

Collected by: P. Swenson

Chain of
Custody #:

WATER ANALYSES ONLY

Budget #:

Report To: W. Wells

Field
Blank #:

Laboratory Number	Field Number	Sample Description	Number	Container Type
9100033	a	Water Drum 1 - Lake Superior Boards	1	amber
9100024	b	Water Drum 2	1	amber
	c			
	d			
	e			

Analysis Request Options	A.I.D.	a	b	c	d	e
VOLEATILE ORGANICS			9100033	9100024		
VOLEATILE HALOGENATED ORGANICS (THM)	X					
GASOLINE/FUEL OIL + HALOGENATED						
VOLEATILE ORGANICS BY GC/MS						
CHLOROPHEMOXY ACID HERBICIDES (CPA)						
POLYNUCLEAR AROMATIC HYDROCARBONS (PAH)						
POLYCHLORINATED BIPHENYLS (PCBs)						
PHENYLATE ESTERS						
PESTICIDES, CHLORINATED						
TOTAPENE						
TECHNICAL CHLORINATE						
DDT GROUP						
PESTICIDES, NITROGEN/PHOSPHOROUS						
SPECIAL SAMPLE HOURS						

JAN 09 1991

ANALYSIS REPORT

JAN 10 20

MPCA

Post #1 brand tax bracketed amount \$37.13

Bob Demery
 Co. U.S. Capitol Bldg
 Dept. of Health
 300-2354

09100023

9.7.90
ORG. PURH. PY91.1

09100023
MINNESOTA DEPARTMENT OF HEALTH
Chemical Laboratory Section
Organic Chemistry Unit

Date Collected: 11/27/90

Date Received: 1-2-91

Collected by: R. Swenson

WATER ANALYSES ONLY

Chain of Custody #:

Budget #:

Report To: W. Matthews

Field Blank #:

Laboratory Number	Field Number	Sample Description	Number	Container-Type
91000023	a	Water Drum 1 - Lake Superior Boards	1	amber
91000024	b	Water Drum 2 "	1	amber
	c			
	d			
	e			
Analyses Request Options		JAN 09 1991		
	ALL	a	b	c
		91000023	91000024	
VOLATILE ORGANICS	465			
VOLATILE HALOGENATED ORGANICS (THH)	464			
GASOLINE/FUEL OIL + HALOGENATED	463			
VOLATILE ORGANICS BY GC/MS	466			
CHLOROPHENOLY ACID HERBICIDES (CPA)	574			
POLYCYCLIC AROMATIC HYDROCARBONS (PAH)	470			
POLYCHLORINATED BIPHENYLS (PCBs)	420			
PHTHALATE ESTERS	490			
PESTICIDES, CHLORINATED	502			
TOXAPHEN	520			
TECHNICAL CHLORDANE	530			
DDT GROUP	550			
PESTICIDES, NITROGEN/PHOSPHOROUS	571			
SPECIAL SAMPLE HOURS	560			

Post-it brand fax transmittal memo 1571 # of pages 3

From: Bob Demery
 Co: U.S. Corp of Eng
 Dept: 297-11
 Fax: 290-2256

From: Bob Swenson
 Co: MPCA
 Phone: 297-11
 Fax: 296-970

Laboratory Notes:

Field Notes:

202-052 21

2.4 MINNESOTA DEPARTMENT OF HEALTH - CHEMICAL LABORATORY
VOLATILE HYDROCARBONS (code 465)

SAMPLED: 11/27/90
 ANALYZED: 01/04/91
 REPORTED: 01/08/91

LAB SAMPLE #: 9100023
 FIELD BLANK #: NONE

COMPOUND	REPORTING LIMIT (UG/L)	AMOUNT FOUND (UG/L)	COMPOUND	REPORTING LIMIT (UG/L)	AMOUNT FOUND (UG/L)
Chlorodifluoromethane	< 1.0		1,1,2,2-Tetrachloroethane	< 0.2	
Chloromethane	< 2.0		1,2,3-Trichloropropane	< 0.5	
Methyl Chloride	< 1.0		Bromobenzene	< 0.2	
Fluoromethane	< 2.0		2-Chlorotoluene	< 0.5	
Chloroethane	< 1.0		4-Chlorotoluene	< 0.5	
Chlorofluoromethane	< 1.0		1,3-Dichlorobenzene	< 0.2	
Dichlorofluoromethane	< 2.0		1,4-Dichlorobenzene	< 0.2	
Dichloro-trifluoroethane	< 0.2		1,2-Dichlorobenzene	< 0.2	
1,1-Dichloroethane	< 0.5		1,2-Dibromo-3-Chloropropane	< 2.0	
Methyl Chloride	< 0.5		1,2,4-Trichlorobenzene	< 0.5	
Ethylene Chloride	< 0.5		Hexachlorobutadiene	< 0.5	
1,1,2-Dichloroethane	< 0.1		1,2,3-Trichlorobenzene	< 0.5	
1,1-Dichloroethane	< 0.2		Ethyl Ether	< 2.0	
1,2-Dichloropropane	< 0.5		Acetone	< 20	
1,2-Dichloroethane	< 0.2		Methyl tertiary-Butyl Ether	< 2.0	
Chloroform	< 0.1		Methyl Ethyl Ketone	< 10	
Monochloromethane	< 0.5		Tetrahydrofuran	< 10	
1,1,1-Trichloroethane	< 0.2		Benzene	< 0.2	
1,1-Dichloropropene	< 0.2		Methyl Isobutyl Ketone	< 5.0	
Carbon Tetrachloride	< 0.2		Toluene	< 0.2	
1,1,1-Trichloroethane	< 0.2		Ethyl Benzene	< 0.2	
1,1,1-Trichloroethane	< 0.1		m+p-Xylene	< 0.2	0.4
1,2-Dichloropropane	< 0.2		o-Xylene	< 0.2	0.2
Monodichloromethane	< 0.2		Styrene	< 0.2	
Bromomethane	< 1.0		Isopropyl Benzene	< 0.5	
1,3-Dichloropropene	< 0.2		n-Propyl Benzene	< 0.5	
1,3-Dichloropropene	< 0.2		1,3,5-Trimethylbenzene	< 0.5	
1,2-Trichloroethane	< 0.2		tert-Butyl Benzene	< 0.5	
1,3-Dichloropropane	< 0.2		1,2,4-Trimethylbenzene	< 0.5	
Tetrachloroethane	< 0.2		sec-Butylbenzene	< 0.5	
Chlorodibromomethane	< 0.5		p-Isopropyltoluene	< 0.5	
1,2-Dibromoethane	< 1.0		n-Butylbenzene	< 0.5	
Chlorobenzene	< 0.2		Naphthalene	< 0.5	
1,1,2,2-Tetrachloroethane	< 0.2				
Chloroform	< 1.0				

COMMENTS:

Legend:

< = less than
 PP = peak present

Ames

APPENDIX E



US Army Corps
of Engineers
St. Paul District

#PA-27-90
3 October 1990

MEDIA ADVISORY

Corps awards contract for Lake Superior barrel search

WHO: St. Paul District, U.S. Army Corps of Engineers, St. Paul, Minnesota

WHAT: Has awarded a contract to Hazard Control, Inc. of Minneapolis, Minn., in the amount of \$16,950.00 to conduct a search of the Lake Superior bottom near Duluth, Minn., for barrels dumped into Lake Superior by the U.S. Army between 1959 and 1962. The 1,437 barrels contain metal scraps produced during the research and manufacture of classified munitions.

The search operation has three phases. First, the contractor will conduct an electronic search of the 20-square mile target area using sonar and electro-magnetic detection systems. The second phase of the search involves a search of possible barrel locations based on historical records and data from the electronic search. The second phase will use a two-person submarine provided by the contractor to attempt to locate and photograph as many barrels as possible. The contract allows for approximately five days of search operations. If time permits within the contract, a third phase might include closer inspection of located barrels and an attempt to recover one or two barrels. Any barrel recovered will be sealed in an over-sized container and sent to an independent laboratory for analysis of the contents.

WHERE: The search operation will be conducted in an approximately 20-square mile area off the North Shore of Lake Superior between the Lester River and the Knife River. Records indicate that the barrels were dumped in water greater than 100-300 feet in depth.

WHEN: The contract was awarded on September 28, 1990. The search is tentatively scheduled to begin on Thursday, October 11, 1990, weather permitting.

WHY: The barrel search project is being conducted under the Defense Environmental Restoration Program, a Department of Defense subsection of the EPA Superfund Program. One aspect of the restoration program includes finding and inspecting sites formerly owned or used by DoD. Once located, the sites are inspected for hazardous debris, munitions or toxic materials related to the operation of the site by DoD. Since the barrels contained material generated by a DoD contractor working on a classified defense munitions contract and the disposal was directed by an Army organization, the barrel disposal site qualifies for review and analysis under the Defense Environmental Restoration Program for Formerly Used Defense Sites. The current contract will provide data to be used by the Corps in determining the need for any future remedial action.

MEDIA ARRANGEMENTS: Media arrangements (news conferences, equipment demonstration, Duluth media center telephone number, etc.) will be announced on October 9th.

CONTACT: Ken Gardner or Joan Guilfoyle at 612/220-0201. US Army Corps of Engineers, 1421 US Post Office, St. Paul MN 55101-9808. The project's media center will open at the Corps' Duluth Area Office on Thursday, October 11th.

SATURDAY, JULY 14, 1990



STAFF GRAPHIC

DIVE

▼ CONTINUED FROM 1A

reporting a sludge oozing out when one tipped on the barge, and others have suggested radioactive materials could be in the barrels because Honeywell used depleted uranium in some of its defense work at the arsenal.

The rumors and the intrigue have resurfaced periodically over the years. In 1977, a barrel became entangled in a fisherman's nets. The corps went out to the area where the fisherman had been and sent a diver down, but he was unable to find any more of the barrels.

The corps, the Minnesota Pollution Control Agency and Honeywell began talking about the barrels again in May, but the one meeting they scheduled was postponed, said PCA spokeswoman Laura Fisher. Among other difficulties was whether the PCA's superfund division or its tanks and spills unit should work on the project. The assignment was given recently to the superfund group, she said.

The biggest obstacle to revealing the barrels' secrets has been trying to find the barrels. Dempsey said the barrels are in 300 to 400 feet of water, a mile or two from shore, between the Knife and Lester rivers. That is an area of 100 square miles or more.

By now, the barrels might be covered by sediment, he added.

The submarine, owned by a private contractor, will be available only for a week, and in that time can cover about 20 square miles, Dempsey said. So in the intervening weeks, his crew will try to narrow down the search area by using metal detectors and other devices, he said.

If the sub should find the barrels, its crew will take photos of the area, looking for any barrels that may have spilled their contents. If necessary, another ship could be called upon to hoist one or two of the barrels to the surface, Dempsey said.

Should the barrels turn out to contain scrap metal, as Honeywell maintains, the remaining barrels will be left undisturbed. If they contain something else, then the corps, the PCA and Honeywell would have to reconsider their options, Dempsey said.

"It's hard to understand why they were dropped in the lake in the first place," Dempsey said. "This should get rid of the public's concern and put the issue to rest. If it turns out to be what they said, we have no intentions to salvage. It's not a hazard to the environment."

Honeywell spokeswoman Lynne Warne said the company was surprised to learn of the submarine venture and did not have any details about it. However, she said the company intends to work with the state and federal authorities.

Dempsey said the submarine's hunt will cost less than \$40,000. The money and the corps' willingness to undertake the project stems from 1936 amendments to the federal superfund law that authorized the corps to investigate old Defense Department sites for possible environmental problems.

St. Paul Pioneer Press

Sub will search Superior for barrels of secret grenade parts

CHARLES LASZEWSKI STAFF WRITER

It won't make anyone forget the hunt for Red October, but the U.S. Army Corps of Engineers said Friday it will send a two-man submarine to the bottom of Lake Superior in September to search for 1,437 barrels filled with grenade parts. The barrels, which came from Honeywell's de-

fense work at the Twin Cities Army Ammunition Plant in Arden Hills, were dumped in the lake from 1959 to 1961 to keep the top secret grenade design out of Soviet hands, said Bob Dempsey, project manager for the corps defense environmental restoration program.

"These were classified designs of hand grenades and they didn't want them copied," Dempsey said. "They poured concrete in the top and the

bottom of the barrels and rolled them off the barges because there wasn't a classified smelter. Since then, there have been all kinds of rumors of what is in them."

Affidavits from people involved in the project claim only lead and other metals are in the barrels. At least one other story has a crew member

DIVE CONTINUED ON 7A ▶

Around Minnesota

Minneapolis company to search for barrels dumped into Lake Superior 30 years ago

A Minneapolis company has been hired to lead a search for barrels dumped into Lake Superior 30 years ago.

The Army Corps of Engineers awarded Hazard Control Inc. a \$16,950, five-day federal contract Tuesday for the search, expected to begin Oct. 12.

The seven-year-old business sells products and services to help other companies handle hazardous materials, but its aquatic division is only a few months old.

"This is a fairly new venture for us, but we've done extensive previous investigation regarding these barrels," said owner Mike Stich. "We've done a very thorough job as far as research goes."

In the search's first phase, sonar and other electronic equipment will be used to look for the barrels. A

miniature submarine will then move into the area, take photos and pull one barrel near the surface if there's time, said Corps spokeswoman Joan Guilfoyle. A second contract to pull up a 55-gallon barrel could be awarded if they're located, she said. The barrel would be sent to a lab for testing.

The 1,437 barrels came from defense work done by Honeywell Inc. at the Twin Cities Army Ammunition Plant in Arden Hills. They were dumped into the lake between 1959 and 1961 to keep a top-secret grenade design out of Soviet hands, corps officials said.

Since then, rumors about the barrels' contents have persisted. A barge crew member reported a sludge oozing from a barrel; radioactive materials also have been suggested because Honeywell used depleted uranium in some of its defense work.

Ex-pollution control chief criticizes recovery efforts

Pegors says finding barrels should be top priority

By Julie Gravelle
News-Tribune staff writer

A former state official blasted the U.S. Army Corps of Engineers Friday, claiming it isn't putting enough priority on finding barrels dumped in Lake Superior 30 years ago.

Although the project is one of 200 sites in Minnesota and Wisconsin named by the Department of Defense for cleanup, it isn't a priority because the barrels aren't known to contain hazardous substances, said Ken Gardner, public affairs officer for the corps' St. Paul district.

Corps officials say the barrels contain scrap metal, but rumors suggest they could contain toxic wastes or other hazardous materials.

"The cleanup costs would be infinitesimal compared with the potential contamination of the world's largest body of fresh water," said John Pegors, former head of the Minnesota Pollution Control Agency's Duluth regional office. "I think this is a terrible



John Pegors

priority. It seems to me your top brass are asleep at the switch or they don't know the value of the lake out there."

U.S. Environmental Protection Agency reports indicate the barrels

could contain heavy metals and depleted uranium, which Honeywell used in some of its defense work. The corps conducted an unsuccessful search for the barrels in the late 1970s.

If the barrels do contain hazardous waste, the resulting cleanup would be placed on a Department of Defense list whose funds are restricted, Gardner said.

The search should be overseen by EPA or PCA officials, and workers should be trained in hazardous materials recovery, Pegors said.

Hazard Control Inc. of Minneapolis is being paid \$16,950 for the weeklong underwater search. The company is using four boats equipped with sonar, video cameras and magnetometers. A submarine is to be added Sunday.

Video released from Thursday's search revealed the lake bottom and some logs, but no barrels. The sonar detected 40 to 50 targets that could be barrels, and workers returned to those areas Friday, Gardner said.

Duluth News-Tribune

Duluth News Tribune

Barrels sighted at bottom of Superior Army Corps will inspect with subs

Searchers find 100 barrels

By Marienne Benner
Duluth News Tribune Staff Writer

A search crew Saturday located nearly 100 barrels that were dumped into Lake Superior 30 years ago and will proceed with plans to raise at least one to the surface.

More than 1,400 barrels from Honeywell Inc. were dumped into the lake from 1959 to 1961 to keep a top-secret grenade design out of Soviet hands. The barrels contain scrap metal and concrete from bomb-making operations at Honeywell and are rumored to carry radioactive material.

The crew found the barrels about 11:30 a.m. in 200 feet of water and captured three on videotape. The rest were detected with sonar equipment along a span of

Please see Barrels, Page 6A

Barrels: Searchers will raise one to the surface

From Page 1A

about 1,500 feet, said Bob Dempsey, engineer manager for the project at the U.S. Army Corps of Engineers.

At a press conference Saturday, Corps officials played a videotape which captured the ghostly barrels floating near the lake bottom. "It's in excellent condition. We're very excited about it," said Dempsey,

referring to one of the videotaped images. Rumors have been circulating since a crew member who dumped the barrels saw a purplish sludge oozing from one container.

Pollution Control Agency officials in 1978 were concerned that the barrels could be corroding and polluting the lake, but a search at that time was halted because of the cost.

Now that the barrels have been located, the crew will bring them to the surface and look inside. Hazard Control Inc., which is conducting the search, will use a submarine today to scan the bottom of the lake and record better video. Once the crew determines the barrels are safe to lift, they'll use a crane barge to raise at least one of the estimated 700-pound barrels. "If the weather cooper-

ates, we can bring one up this week," said Dempsey. The barge can operate only if the waves are less than one foot high. They'll also look for open barrels in the lake today. "We're handling this as hazardous material," said Dempsey. The barrels wouldn't be opened for at least seven days after they're brought to the surface because a qualified contractor must be on hand.

Spokesman Ken Gardner said sonar readings showed what appeared to be 65 barrels in a straight line at the bottom of the lake, about 5 miles north of Duluth. A remote TV camera videotaped three of the barrels, he said.

The barrels are some of the 1,437 barrels dumped into the lake between 1959 and 1962 by the Army and Honeywell Corp.

The corps plans to launch two two-person submarines today to visually inspect and videotape "as many barrels as we can find," Gardner said.

"Our main goal is to locate and map and get some photography documentation of the barrels," he said. "A final phase could be to try to recover

Crews searching Lake Superior off Duluth found several barrels of 30-year-old military refuse on the bottom early Saturday afternoon, according to a spokesman for the U.S. Army Corps of Engineers.

Spokesman Ken Gardner said sonar readings showed what appeared to be 65 barrels in a straight line at the bottom of the lake, about 5 miles north of Duluth. A remote TV camera videotaped three of the barrels, he said.

The barrels are some of the 1,437 barrels dumped into the lake between 1959 and 1962 by the Army and Honeywell Corp.

The corps plans to launch two two-person submarines today to visually inspect and videotape "as many barrels as we can find," Gardner said.

"Our main goal is to locate and map and get some photography documentation of the barrels," he said. "A final phase could be to try to recover

Scrap continued on page 6B

Scrap

Continued from page 1B

one of two barrels."

The Army and Honeywell maintain that the barrels contain metal scrap from the manufacture of classified explosives by Honeywell at the Army's Arden Hills plant and do not contain hazardous material.

But critics say they fear the barrels could contain harmful waste because traces of such substances were found on the floor of the building where the explosives were made.

State



Scott Patterson of Duluth climbs off a 14-foot submarine Sunday. Engineers crew found 100 barrels dumped into Lake Superior 36 in Duluth. On Saturday, Patterson and a U.S. Corps of Army years ago. AP LaserPhoto

Wind delays closer inspection of barrels

Associated Press

DULUTH — If the weather cooperates today, a crew planned to conduct closer inspection of a string of barrels found and videotaped earlier during a search of the bottom of Lake Superior.

Sonar readings taken Saturday showed the barrels in a straight line about 200 feet below the surface, Ken Gardner, a spokesman for the U.S. Army Corps of Engineers, said Sunday.

However, choppy water Sunday prevented the two-person submarines from venturing out for a closer look, Gardner said.

"It's real windy and cloudy and looks like a storm is blowing in. That's the reality of being outside," he said.

More than 1,400 barrels from Honeywell Inc.

were dumped into the lake from 1959 to 1961 to keep a top-secret grenade design out of Soviet hands. The barrels came from Honeywell's work at the Twin Cities Army Arsenal Plant in Arden Hills. The barrels contain scrap metal and concrete from bomb-making operations and rumors have persisted that the barrels contain radioactive material because Honeywell used depleted uranium in some of its defense work.

Boats dragging a sonar device below the surface detected the barrels, Gardner said.

"We got good sonar on 65 or 70," he said of Saturday's search. "It's a beautiful sonar print-out that shows a barrel every half an inch."

One or two barrels will be brought up Tuesday or Wednesday if conditions are right, Gard-

ner said. The barrels would be placed, while underwater, in two large foam containers and brought to the surface by a crane on a barge, he said.

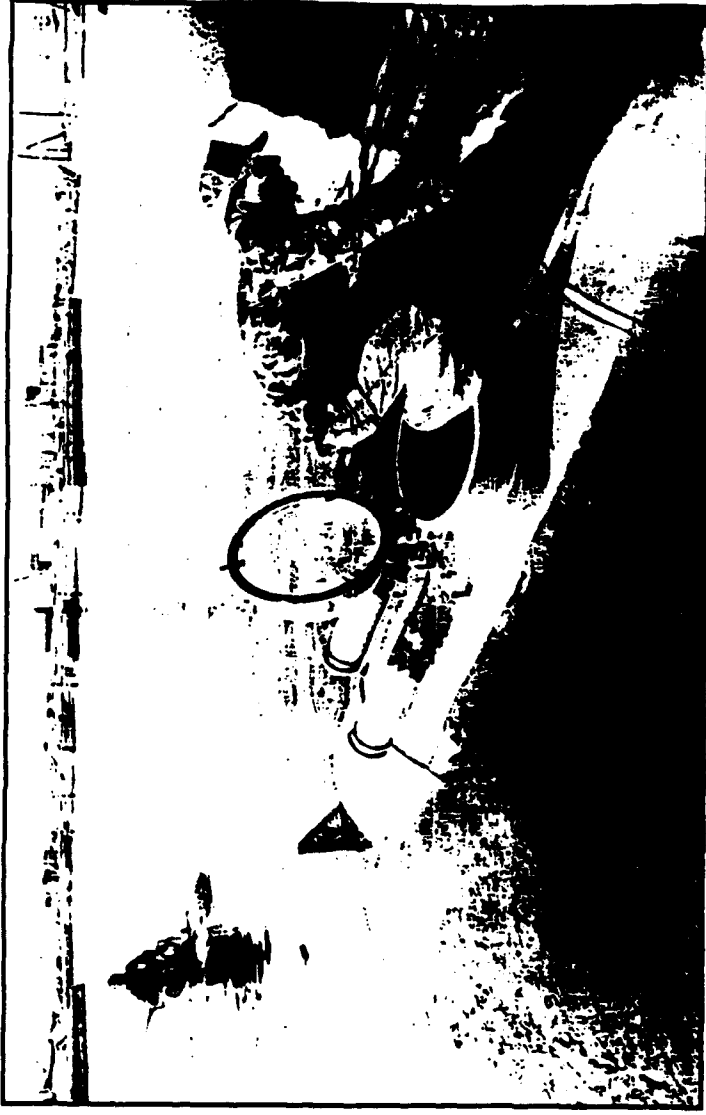
The containers would be sent to an independent lab, Gardner said.

A Geiger counter will be placed on the subs as a precaution he said, although Army records indicate that the barrels do not contain hazardous material.

The U.S. Army Corps of Engineers has \$40,000 budgeted for the operation, Gardner said. Honeywell is not picking up any costs because they simply produced the item and were not responsible for the dumping of the barrels, he said.

Duluth
news
Tribune

Weather delays barrel search



Scott Patterson of Hazard Control of Duluth climbed off his 14-foot submarine in the Duluth-Superior harbor on Sunday morning. A plan to examine some barrels dumped in Lake Superior was delayed Sunday because of poor weather.

Dave Bellard/News-Tribune

By Chuck Frederick
News-Tribune staff writer

Choppy waters on Sunday prevented two submarines from inspecting a newly discovered string of barrels dumped into Lake Superior 30 years ago, an official said.

A 2,000-foot long string of barrels was located Saturday in about 180 to 190 feet of water near Duluth.

About 35 more were found in the area Sunday, but searches in other locations turned up empty, said Ken Gardner, a spokesman for the U.S. Army Corps of Engineers.

Plans to better photograph the string of barrels were scrapped Sunday when poor weather prevented the subs from going out, he said.

More than 1,400 barrels from Honeywell Inc. were dumped into the lake from 1959 to 1961 to keep a top-secret grenade design out of Soviet hands. The barrels contain scrap metal and concrete from bomb-making operations at Honeywell. They are rumored to hold radioactive material because Honeywell used depleted uranium in some of

its defense work.

Four search boats will return to the waters this morning, Gardner said. And, weather permitting, one of the subs will dive to take photos of the barrels.

"I heard a weather report that didn't sound real encouraging, though," Gardner said. "But the plan is still for at least one sub to go out."

"They'll go to the good string we found and go down and visually inspect the barrels and take videotape and still photography so we have an idea of what's down there," he said.

One or two barrels will be brought up Tuesday or Wednesday if conditions are right. The barrels would be placed in two large foam containers and brought to the surface by a crane on a barge, he said. The containers would be sent to an independent lab for analysis, Gardner said.

A Geiger counter will be placed on the subs as a precaution, he said, although Army records indicate that the barrels do not contain hazardous material.

The Associated Press contributed to this story.

Waves keep subs in port

SEARCHERS TEST MYSTERY BARRELS FOR RADIOACTIVITY

By Julie Gravelle
News-Tribune staff writer

Searchers took readings on 12 of Lake Superior's mystery barrels Tuesday but still don't know whether they contain radioactive material.

U.S. Environmental Protection Agency employees used a remotely operated probe to test the barrels, which are among 105 dumped about 10 miles northeast of Duluth.

But the results were inconclusive, said Dale Mazar, chief of the engineering management branch for the U.S. Army Corps of Engineers in St. Paul.

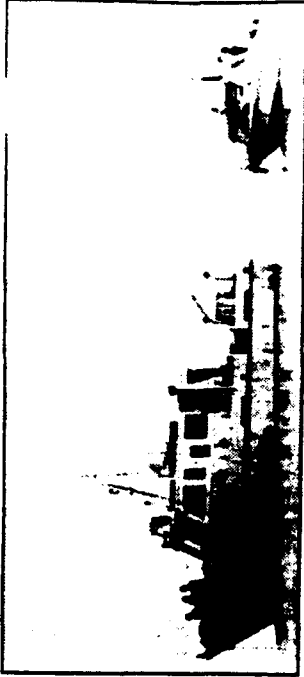
The search will continue today

and Thursday if weather remains good, Mazar said. If bad weather cuts short the \$15,000 operation, the search would be finished for the season, he said.

The data collected by the EPA equipment will be analyzed by the agency's National Air and Radiation Lab in Montgomery, Ala. The analysis is expected to take two weeks.

Search crews earlier this month recorded low-level radiation readings on a Geiger counter during a dive near the barrels, which are in 180 to 190 feet of water about a

Please see **Barrels**, back page



Clara Wir/News-Tribune

U.S. Environmental Protection Agency workers took readings Tuesday on 105 barrels dumped in Lake Superior about 10 miles northeast of Duluth.

Barrels: Searchers measure for radioactivity

From Page 1A

mile offshore from the Lakeview Castle restaurant and motel. But subsequent dives picked up no readings because a submarine was unable to return to the exact spot. The probe now being used is 100 times more sensitive than a Geiger counter, Mazar said, adding that the Corps didn't plan to find any radioactive material.

A search crew organized by Hazard Control Inc. of Minneapolis tried unsuccessfully to raise a sampling of barrels during a five-day search earlier this month. Hazard officials were on the lake Tuesday, conducting additional tests for the Corps.

Contrary to previous predictions, Corps officials said they probably won't try again to raise any barrels this fall.

The 105 barrels that have been dumped in Lake Superior between 1959 and 1962 to keep a top-secret grenade design out of Soviet hands, officials say the barrels contain scrap metal and concrete from Honeywell Inc.'s bomb-making operations in the Twin Cities. But rumors persist that they hold radioactive material because Honeywell used depleted uranium in some of its defense work.

EPA tests barrels in Lake Superior

DULUTH NEWS-TRIBUNE

Environmental Protection Agency workers on Thursday took radiation surveys of two barrels sitting in about 30 feet of water along the shore of Lake Superior. Results from those tests are expected Monday.

If weather permits, the barrels could be pulled out as early as Tuesday, officials said. An environmental testing lab will be set up in the Corps Vessel Yard on Park Point to run further tests.

The barrels were pulled close to shore by a private salvage operation earlier this week. Army Corps of Engineers official Dale Mazar said Hazard Control Inc. workers

acted without the corps' knowledge, but the company's owner said he had approval from the corps project manager in Duluth, Bob Dempsey.

Hazard Control had been in charge of earlier recovery attempts, but its contract with the corps expired Oct. 17. The company could face criminal or civil penalties for violating a U.S. Coast Guard rule restricting access to the barrel dump site, said Mazar, who is chief of the corps' engineering management branch in St. Paul.

The corps will use divers from its St. Paul district to raise the barrels, which are in front of Lakeview Castle restaurant and motel.

"Honeywell didn't have the authority to use radioactive material until 1969," Mazar said. If the barrels contain radioactive material, the entire recovery operation would be moved under the jurisdiction of the EPA's Superfund program. The Corps is paying for the current search operations with Department of Defense money that authorizes them to investigate old Defense Department sites.

Duluth News-Tribune

Nov. 1, 1990

THURSDAY

THE NORTHLAND'S NEWSPAPER

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Volume 121, No. 207

35 CENTS

Barrels dragged to shallower part of lake; Corps' role unclear

By Julie Grenville
Duluth News-Tribune staff writer

The Army Corps of Engineers and private salvage workers Wednesday had conflicting accounts of a surprise operation that dragged two barrels from a 180-foot-deep dump site to shallower waters along the shore of Lake Superior a day earlier.

The Corps is coordinating a search for more than 1,400 barrels it dumped in Lake Superior 30 years ago. Defense contractor Honeywell Inc. says the sunken barrels contain scrap metal from top-secret grenade designs. Environmentalists and others are concerned that the barrels might contain radioactive materials.

Although a Corps official said Wednesday his agency didn't know about Tuesday's barrel-salvage operation and that it may have been illegal, the man who led the effort said he retrieved the barrels with another Corps official's approval.

Getting to bottom of barrel story isn't easy

By Julie Grenville
Duluth News-Tribune staff writer

The 30-year-old mystery surrounding barrels dumped in Lake Superior hasn't become any clearer since the Army Corps of Engineers began overseeing search operations a few weeks ago.

The Corps' inability to provide reliable information about the search has eroded confidence and raised questions about what the barrels could contain and why they're so difficult to recover, environmentalists say.

The Corps dumped more than 1,400 barrels in Lake Superior from 1959 to 1962. Defense contractor Honeywell Inc. says they contain scrap metal from top-se-

cret grenade designs. Environmentalists and others are concerned that the barrels might contain radioactive materials.

Although Corps officials said Tuesday they wouldn't try to raise any barrels until spring, the following day they announced

Please see Story, back page

develop a fail-safe clamping device and presented it to (Corps project manager) Bob Dempsey," Stich said. "He asked us if we wanted to try to retrieve some barrels with it, which we did. All I needed was the OK from Dempsey to give it a try."

During a Wednesday press conference, another Corps official denied his agency approved Hazard Control's salvage operation Tuesday. Dale Mazar, chief of the Corps' engineering management branch in St. Paul, also said the company could face criminal and civil charges for violating a U.S. Coast Guard rule restricting access to the barrel dump site.

"This was done without our knowledge or approval," Mazar said. The Corps directed Hazard Control not to retrieve any of the barrels when the company's contract ended, he said.

Stich and other Hazard Control workers and a U.S.

Please see Barrels, back page

Mike Stich, owner of Hazard Control Inc., said he designed and built a remote-controlled clamp in his workshop after a submarine his company used last month came up empty trying to lift barrels from the lake's bottom. Hazard Control was hired by the Corps for a five-day search-and-retrieval operation that ended Oct. 17.

"After the submarine failed, I took it upon myself to

Stacy: Conflicting accounts raise questions

From Page 1A

that two barrels had been moved into shallow water and will be retrieved next week.

Corps officials initially were less than forthcoming about radioactivity level readings taken near the barrels.

A Corps official last week denied a report that the Environmental Protection Agency would become involved in the barrel

operation. EPA workers showed interest about the barrels, and people want to know what's going on.

Minnesota Pollution Control Agency officials had to press the Corps to keep the search process open and maintain regular contact with the media and the public.

"They wanted to just slip out of town with nobody knowing about it, but we told them that's not the way to do it," PCA spokeswoman Laura Fisher said. "There's a lot of

information from them."

Another critic suggested the Corps has a conflict of interest regarding the barrels.

"Honeywell is a major defense contractor, and if they find a barrel with a radiation reading, the whole area will be declared a hazardous waste site that will cost hundreds of thousands of dollars to clean up," said Alden Lind, a member of Save Lake Superior Association. The association has called for 15 percent of the barrels from the seven dump sites to be raised.

"They'd just as soon not stick Honeywell with that responsibility," Lind said. "The relationship between the military and defense contractors is very close. One has to wonder what the Army Corps is protecting."

Barrels: Role of Corps isn't clear

From Page 1A

Environmental Protection Agency crew were aboard two boats Tuesday examining barrels located during last month's operation. The Hazard Control crew was performing unfinished survey work promised in the company's contract, Mazar said.

Higher-than-normal radioactivity levels, which the Corps calls "inconclusive," were detected near a barrel during the Hazard Control surveys last month. The EPA crew was brought in to do radioactivity checks on the barrels.

Mazar said Tuesday the operation was strictly for taking readings, and that barrels probably wouldn't be retrieved until spring.

Stich and his crew snagged two barrels from 180 feet down and towed them to a point in about 30 feet of water off the Lakeview Castle restaurant and motel.

"Dempey came on our boat and observed the whole thing," Stich said. "It took a couple of hours to do it."

Mazar said during Wednesday's press conference that Dempey told him although he was in the EPA boat anchored next to Hazard Control's salvage operation, Dempey didn't notice barrels were being raised.

"It was dark in (the EPA) boat — they were looking at screens," he said.

When told Stich's version later Wednesday, Mazar

Chicago Tribune, Tuesday, November 9, 1990

Lake Superior to yield 60s military cache

DULUTH—Divers planned Monday to raise two 55-gallon barrels from Lake Superior after weekend tests indicated that they are not radioactive, according to a U.S. Army Corps of Engineers official. The barrels are among 1,400 drums that weapons contractor Honeywell Inc. says contain scrap metal from grenades. The Corps dumped the barrels

into Lake Superior between 1959 and 1962, intent on keeping their contents secret. Some people remain concerned, however, that the barrels might contain hazardous or radioactive material.

The two barrels will be shipped into large polyfoam containers, raised and taken by barge to the Corps Vessel Yard on Park Point to be opened, said spokesman Ken Gardner.

Correction

A story in Friday's News-Tribune incorrectly reported how money used to run a scholarship fund for medical students was raised. More than \$15,000 is in the fund set up by Peggy LaVaque of Chisholm, but only \$7,800 was raised through donations to help pay for her husband's medical costs. LaVaque put the rest of the money into the fund herself, she said. The News-Tribune regrets the error.

We make every effort to be accurate. If you have a question, comment or complaint about our coverage, write to Robert W. Jordan, editor, Duluth News-Tribune, 424 W. First St., P.O. Box 160000, Duluth, Minn. 55816-0000. Or call 725-9228.

said he wasn't sure about Dempey's role in the salvage operation. "The facts will come out in the end," he said. "I'd like to get all the facts together before I go on. Right now there's a lot of miscommunication."

Stich was dumfounded when he learned of Mazar's comments during the press conference. He said he's concerned that his company's reputation has been hurt.

"That they would even talk about this being illegal just surprises the heck out of me," he said. "I thought they would be really pleased."

The Corps wants to retrieve the barrels resting in shallow water soon because currents could move them during the winter, Mazar said.

"We're afraid we might not know where they are by spring," he said.

Although Mazar said Hazard Control wouldn't be involved in the salvage operation, Stich said he believes his company will be asked to do the job.

"We've been successful in everything we've done so far, so we hope they'll stay with us," he said. "My objective has always been to find out what's in those barrels."

The data from the EPA radioactivity surveys this week will be analyzed by the agency's National Air and Radiation Lab in Montgomery, Ala. Results won't be ready for two weeks, Corps officials said.

Coming up empty



Dave Ballard/News-Tribune

Submarine operator Harold Maynard explained the situation on the bottom of Lake Superior to Roger Chapman (left) and Bob Dempsey after an unsuccessful dive to retrieve a barrel dumped 30 years ago. Chapman is the salvage dive coordinator and Dempsey is a supervisor from the U.S. Army Corps of Engineers.

Searchers fail to recover barrel

By Marianne Renner
News-Tribune staff writer

Searchers in Lake Superior failed to hang onto a mystery barrel long enough to recover it Tuesday — their last scheduled day of work.

The search team dived four times in a submarine 10 miles northeast of Duluth to retrieve any of more than 1,400 barrels dumped 30 years ago to keep a top-secret grenade design out of Soviet hands.

Searchers took photographs and videotape of one barrel during the first dive but found nothing during the second dive.

The team suffered a 2½-hour

setback during the third dive in mid-afternoon when the submarine's battery failed and had to be recharged, said Joan Gullfoyle, U.S. Army Corps of Engineers spokeswoman.

A final submarine dive in the evening was a near hit, when the search team finally got a line attached to a barrel at 190 feet. The plan was to tow the barrel to shallow water and put it in a container for transporting to the surface. Then it would be taken to a laboratory where its contents could be analyzed. The towing was unsuccessful, however, when the barrel slipped from a mechanical arm attached to the

submarine.

"The general consensus is that the clamping device on this submarine is not strong enough," said Gullfoyle.

The Army Corps of Engineers apparently underestimated the weight of the barrels, which earlier was reported at 600 to 800 pounds. "The clamp is a strong clamp. We know now the barrel is heavy — at least 1,000 pounds," said Bob Dempsey, engineer manager for the project at the Corps.

The Corps of Engineers hired Hazard Control Inc. to find the

Please see Barrels, back page

Barrels:

Searchers fail

From Page 1A

barrels, which contain scrap metal and concrete from bomb-making operations at Honeywell Inc. The barrels are rumored to hold radioactive material because Honeywell used depleted uranium in some of its defense work.

Hazard Control had a one-week contract to find the barrels and, if time permitted, bring one to the surface. The contract expired Tuesday, and it was unclear Tuesday night whether a search will continue at a later time.

On Saturday, searchers found a 2,000-foot-long string of about 100 barrels one mile off the North shore from the Lakeview Castle restaurant and motel. Photos and videotape show the barrels to be in "great shape," Gullfoyle said.

The crew had to wait until Monday to inspect the barrels because the submarine couldn't dive in Sunday's choppy waters. Monday's search posed problems when the clamp wouldn't grip and the video camera refused to work.

Hazard will take photographs and videotape of the barrels to St. Paul, where they will be studied, Gullfoyle said Tuesday morning.

The search crews then will make further recommendations about what should be done next in terms of finding the barrels.

"It's disappointing," said Dempsey. "We'd like to answer at least one of the 150 questions we have — that is, what's in at least one barrel."

(No! Barrel never left bottom)

BK.

Duluth News Tribune

Divers may try to bring up barrels next week

By Chuck Frederick
Herald Tribune staff writer

Divers could be used as early as next week in an effort to recover some of the barrels dumped in Lake Superior about 30 years ago by the Army Corps of Engineers.

Search crews hired by the Corps spent the past week exploring the lake bottom between Duluth and Knife River seeking 1,400 barrels said to contain scrap metal and concrete from bomb-making operations at Honeywell Inc. in the Twin Cities. They found and photographed more than 100 barrels scattered over 2,000 feet, but a submarine couldn't bring any to the surface.

Officials said Wednesday that they're not ready to give up, and began planning for more underwater work — this time without a sub.

"We have the crews available, and we could get in the water next week. We know where the barrels are," said Bob Dempsey of the Corps of Engineers. "But we have 100 items to pull together before Friday. I can't say for sure that we'll be in the water next week."

Among the obstacles facing the Corps are getting money and permission to continue the operation before fall weather makes further diving impossible.

The Corps hired Hazard Control Inc. to find the barrels, which were dumped between 1950 and 1961 to keep secret their classified contents. Speculation persists that the barrels hold hazardous materials.

Even though they weren't able to recover any barrels, members of the search crew refused to call their efforts a failure. Talking to reporters Wednesday, they pointed out that barrels were found and that Geiger counter readings taken near some of the barrels didn't indicate any radioactivity.

In future dives, a submarine won't be used. Plans now call for divers to attach cables to a barrel so it can be lifted from depths of 180 to 190 feet.

Using divers to recover the barrels poses several problems. Divers can work in 200 feet of water only for short periods before having to return to the surface. Also, choppy waters pose a threat to the divers because cables dangling from the dive boat could bounce dangerously under water.

"It's going to take a major operation to move any of them," Dempsey said.

Officials hope to get new contracts for the search in place by the end of the week. If not, the Corps may have to wait until next spring.

Plans call for pulling up about 10 percent of the 105 barrels located, which would be considered a representative sample, Dempsey said.

Coast Guard officials plan to set up a 2-mile safety zone around the area where the barrels were found. Before it is established, the Coast Guard is asking that boaters and divers stay away from the site, said Lt. Jim Hilliers of the Coast Guard.

Divers to try retrieving barrels in Lake Superior

DULUTH NEWS-TRIBUNE

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The Corps hired Hazard Control Inc. to find the barrels, which were dumped between 1950 and 1961 to keep their classified contents a secret. Speculation persists

that the barrels hold hazardous materials, and officials hope that pulling some out of the water for inspection will dispel the rumors.

Even though they weren't able to recover any barrels, members of the search crew refused to call their efforts a failure. Talking to reporters Wednesday, they pointed out that barrels were found, and that Geiger counter readings taken near some of the barrels do not indicate radioactivity.

"We did not get the hint of a reading on the Geiger counter," Dempsey said. "We didn't even get a background click... The weight of the barrel is what caused the failure (Tuesday), not the operation and not the equipment."

Search crews made four dives Tuesday with a submarine. Using the sub's mechanical arm, they tried to grab one barrel so they could drag it to shallower water, put it in a protective case and pull it out of the water. But the barrel proved too heavy for the arm.

"We didn't expect to find them so deep," said Mike Stich of Hazard Control. "We didn't expect them to be so darn heavy."

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Barrels

Continued from page 1B

operation, crews using sonar, magnetometers and underwater videocameras discovered one of the seven areas into which the Army and Honeywell secretly dumped barrels between 1959 and 1962, to get rid of what they now say was scrap metal from a classified explosives project.

Some critics say they worry that the barrels may have contained radioactive material or hazardous waste because traces of uranium and chemical wastes have been found in the floor drains of the building where Honeywell worked on ammunition and explosive projects for the Army at its Arden Hills ammunition plant.

The discovery site, which searchers say was used by the barrel dumpers in 1961, is about a mile off the Talmadge River mouth, on Lake Superior's North Shore near Duluth, in about 160 to 180 feet of water, said Dempsey.

The search found and mapped 105 barrels in apparently good condition, sitting on sandy silt in an area of about 2 square miles, said Dempsey. Geiger-counter readings taken Tuesday by a search submarine "didn't detect even a trace" of radioactivity, he said.

Searchers made four submarine dives Tuesday to try to pull up one of the barrels, estimated to weigh at least 1,100 pounds. The effort was defeated by a submarine power failure, heavy bottom silt that obstructed vision and a clamp that slipped off the barrel when a tugboat tried to raise it, crew members said.

"We didn't expect to find them (the barrels) so deep and we didn't expect them to be so darn heavy," said Mike Stich of Hazard Control Inc., the Minneapolis firm that was awarded a five-day, \$17,000 contract to search for them.

The project, financed by the federal pollution-abatement "superfund," will be on hold until the corps can secure more money and permission from Washington, said Dempsey, an engineer in the corps' St. Paul district.

"We have to take it one step at a time, but for now we would really like to recover a representative sample of those 105 barrels," he said.

Minneapolis Star Tribune

Recovery project met main goal, feds say

By Larry Oakes
Northern Minnesota Correspondent

Duluth, Minn. — Although they came up empty-handed, federal officials trying to recover some of the 1,432 barrels of military refuse dumped into Lake Superior 30 years ago say the effort was a success.

Bob Dempsey, manager of the recovery project for the Army Corps of Engineers, said Wednesday that even though the project ran out of money and stalled Tuesday without recovering a barrel, it was a success because searchers accomplished their main goal of finding and photographing some of the barrels.

Dempsey said they'll try to get the permission and money necessary to continue a quest this fall to recover some of the barrels, dumped in 1961 by the Army and Honeywell Inc.

Extremely high waves on the western end of the lake starting Wednesday would have made continuing the project yesterday impossible anyway, officials said.

On Saturday, the third day of the

Barrels continued on page 3B

DULUTH NEWS-TRIBUNE
Wedn., Oct. 24, 1990

OPINION

Barrel project over a barrel

Sometimes we wonder which is more difficult: bringing a few barrels up from the bottom of Lake Superior or making it through the bureaucratic labyrinth surrounding the project.

So far it's pretty close to a draw. But there has been progress compared to the first attempt to retrieve some of the mysterious drums that were dumped into the lake off the North Shore about 20 years ago. The barrels from Honeywell Inc. are said to contain harmless scrap metal and concrete, but no one has been able to prove it.

The progress this fall has been that barrels have actually been located in searches sponsored by the U.S. Army Corps of Engineers. Attempts in 1977 failed to locate them. But aside from finding some of the cache, efforts to retrieve even one — and many more should be examined — have been unsuccessful.

So much for the background. In these environmentally conscious

times, everyone should recognize that it is important that a percentage of the barrels be retrieved — and as soon as possible.

We hesitate to criticize the U.S. Army Corps of Engineers' good-faith effort this fall, but so far the operation has looked like it is being conducted by the Keystone Kops.

Barrels are found but not retrieved because they're "too heavy" or equipment broke down or money has run out in the contract with a private salvager without a lengthy rebidding process — the list is long.

We are convinced the Corps is as interested in retrieving the barrels as citizens on shore, who wonder if they could be dangerous and want them retrieved to be sure. Certainly the technology exists to bring some of them up.

So let's get on with it, although at this writing the lateness of the season and the red tape appear to be combining against getting the job done before next spring.

WEDNESDAY, NOVEMBER 7, 1990

SAINT PAUL PIONEER PRESS

Suspect barrels recovered from Lake

JULIE GRAVELLE DULUTH NEWS-TRIBUNE

The Army Corps of Engineers workers retrieved and opened two cement-filled barrels from Lake Superior on Tuesday, but the full story on the barrels' contents won't be known for several weeks.

"I think everybody here is happy," said Dale Mazar, chief of the corps' engineering management branch. "We got the barrels up to

be able to test them."

Large yellow plastic containers holding the barrels were hoisted from a barge in the corps vessel yard as reporters and other spectators looked on. The barrels' lids were removed to reveal concrete-topped contents inscribed with numbers. The corps said it will take two weeks to find out what is within the concrete covering.

Officials speculated the numbers on the concrete could indicate

the barrels' weight, which is between 600 and 1,000 pounds apiece.

More than 1,400 barrels were dumped into Lake Superior 30 years ago by the corps for Honeywell Inc., a defense contractor. Honeywell officials and records indicate that the 55-gallon drums contain scrap metal from top-secret grenade designs. Environmentalists are concerned the barrels might contain radioactive materi-

-7D

Superior; contents still unknown

als. Preliminary tests over the weekend had shown that the two barrels recovered Tuesday aren't radioactive.

Corps divers worked for about three hours Tuesday to lift the barrels, which rested in about 30 feet of water off the Lake Superior shore near Lakeview Castle, about 10 miles northeast of Duluth.

Divers followed lines attached to the barrels and fitted the plas-

tic containers over them. The barrels then were hoisted onto a barge and towed to the Duluth-Superior harbor. One barrel was in fairly good condition and the other was "pretty corroded," Mazar said.

The corps will award a contract for testing the barrels' contents within the week, and results should be available in another week. Although corps officials aren't sure whether they will test

more barrels next spring, a Minnesota Pollution Control Agency official who accompanied the corps on its searches said two barrels isn't a large enough sample.

"Certainly we need more than two," said Ron Swenson of the agency's groundwater and solid waste division. "We're not sure what the magic number is, but the technology is here and it's proven itself. We certainly should go out there and look for more."

The above article also ran in the 11-7-90 Duluth News-Tribune with the following addition:

Poor weather conditions limit
of the Environmental Protection Agency to surveying only 25 out of 100 barrels for radioactivity in one of the dump sites last week.

A private contractor who designed the dump that retrieved the barrels last week said he'd been ignored during Tuesday's mission.

"I begged to go out there, but they really didn't want me there," said Mike Stish, owner of Hazard Control Inc. of Minneapolis, a company hired earlier by the Corps to survey and salvage the barrels. "I'd like Hazard Control to get more credit than all of the

had publicity."

Corps officials differed on whether Stish had authorization to retrieve the barrels, and suggested Stish's barrel-salvage operation may have been illegal. They had earlier said they wouldn't try to retrieve any barrels until spring.

"We poured our hearts into this and lost a lot of money," Stish said. "I would have liked to have seen this through to the end. We were after the same goal, to get the barrels up and that's what we did. Whatever glory there was, we deserved a small slice of it."

Barrels opened for analysis

By Julie Gravelle
News-Tribune staff writer

Two barrels pulled from Lake Superior several weeks ago were broken apart Tuesday to help analyze their contents for hazardous substances.

Workers from OHM Corp. of New Hope, Minn., used a carbon saw and backhoe to rip the metal barrels from their concrete-encased contents, and then break the concrete into small chunks.

Preliminary tests with a hand-held Geiger counter indicated no radioactive contents.

The barrels had been stored in large yellow plastic containers in the U.S. Army Corps of Engineers Arsenal Yard at Park Point since Nov. 7. OHM Corp. was hired by the Corps to break apart the barrels.

The barrels had been retrieved from Lake Superior last month by workers from Hazard Control Inc. They're part of a group of more than 1,400 dumped into Lake Superior 30 years ago by the Corps for Honeywell Inc., a defense contractor. Honeywell officials and records indicate that the 55-gallon drums contain scrap metal from top-secret grenade designs, but environmentalists are concerned that the barrels might contain radioac-

Please see Barrels, back page



Claire Wu/News-Tribune

Bob Dempsey of the U.S. Army Corps of Engineers on Tuesday held a jar filled with metal scraps and packing material taken from a barrel dumped in Lake Superior 30 years ago.

Wed. Nov 28, 1990
Duluth News-Tribune

Barrels:

From Page 1A

tive materials or other hazardous substances.

The two barrels' contents were checked for radiation with a small hand-held Geiger counter, and workers wore several layers of protective clothing to protect themselves from chemicals, oils or gases. The operation took most of the day and into the night.

A glass jar filled with brownish paper packing material and small gray metal parts from the first barrel was displayed at about 6 p.m.

The parts resembled gears, springs, timers and scrap metals that could be from the grenade designs Honeywell said they had dumped into Lake Superior to keep them out of Russian hands.

"I think this would be consistent with what Honeywell said was in the barrels," said Corps spokesman Ken Gardner.

Workers broke the second barrel apart at 9:30 p.m. Gardner said "quick hazard tests" for explosives, flammable gases and radiation indicated that the barrel contained no hazardous substances. He expected to have samples from it to look at later Tuesday night.

Both barrels' contents will be shipped to Pace Inc. environmental lab in Minneapolis for analysis. Results are expected in about four weeks.

The Corps hasn't decided whether to bring up more barrels, but Minnesota Pollution Control Agency officials said they'll urge them to do so to ensure a representative sample.

Lake Superior Newsletter



A special interest publication of *Lake Superior Magazine*

EDITOR: James R. Marshall

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NOVEMBER-JANUARY 1991

ROLL OUT THE BARRELS

After 30 years, the U.S. Army Corps of Engineers is getting around to cleaning up the Defense Department's messes. More than 1,400 55-gallon barrels, which came from Honeywell Inc.'s defense work with the army, were dumped into Lake Superior in 1959 and 1960, and the Army Corps of Engineers is now taking steps to determine if they are causing any pollution. All indications are that the barrels contain nothing more than the scrap metal that they are supposed to contain.

"Historical records show they are full of scrap metal left over from what were then classified grenades," says Joan Guilfoyle of the U.S. Army Corps of Engineers Public Affairs Office in St. Paul. "Honeywell was under contract to produce the grenades, and the leftover parts started piling up. They didn't know what to do with them, and it was important to keep all the pieces classified. They asked the Department of the Army to find a means of disposal. (Dumping them in the lake) was the solution because it was cheap.

"In 1985," Guilfoyle says, "the Defense Environmental Restoration Program (DERP) required us to go back and look at all the formerly used and owned Department of Defense sites to determine if there are any materials left over that should be cleaned up or removed. This

dump site is a DERP site — it's just one on a list.

"The ecological and environmental awareness of the whole country has changed since the 1960s," Guilfoyle says. "I can't imagine anyone who would consider doing this today. The Department of the Army is trying to

go back and clean things up."

Over the years, rumors have started that perhaps the barrels contain something more toxic than scrap metal. "In one of the buildings that Honeywell used, they cleaned out the sewers and found PCBs and other hazardous materials in the sewers," Guilfoyle says. "But there's no evidence that there's anything other than grenade scraps (in the barrels)."

What was found on November 27, 1990, supports that

theory. Although the OHM Corporation, which opened the barrels, took extreme precautions in the procedure, the barrels appeared to contain only parts for fuses from grenades says Dale Mazar, chief of engineering management branch with the Army Corps of Engineers in St. Paul.

"There was a lot of speculation," says OHM site supervisor Randy Potter. "For our workers' safety we treat it as a worst-case scenario, but basically we found exactly what the Army Corps told us. We were pleased not to find any unknowns."



JOAN GUILFOYLE

Project manager Bob Dempsey (right), U.S. Army Corps of Engineers, talked to submarine pilot Harold Maynard while the Corps investigated some of the 1,400 waste barrels discarded in Lake Superior by Honeywell and the Army in 1959 and 1960.

Tuesday/January 8/1991/Star Tribune

Tests show barrels from Lake Superior didn't contain chemical

By Larry Oakles
Northern Minnesota Correspondent

Duluth, Minn. — Military scrap recovered from Lake Superior in November was not tainted with hazardous chemicals or explosives, the U.S. Army Corps of Engineers said Monday.

Ken Gardner, a spokesman for the Corps' 3d Field District, said results released Friday by a Twin Cities laboratory confirmed earlier reports that

the two barrels containing the waste held only a mixture of concrete and metal scrap, and no detectable chemicals or residues from chemicals. The barrels were among more than 1,400 believed to have been dumped in Lake Superior from 1959 to 1962.

The two barrels were pulled from the lake in early November, after a sonar and submarine search discovered one of seven areas into which the Army and Honeywell Inc. secretly dumped 1,437 barrels to get rid of what they

now say was scrap metal from a classified explosives project. Some critics have said the barrels may have contained radioactive material or hazardous waste because traces of uranium and chemical wastes were found at the source of the waste, an Arden Hills building where Honeywell worked on ammunition and explosives projects for the Army.

When the two barrels were opened in late November salvage workers said they contained a mixture of concrete

sure that none of the barrels cor toxic waste.

Gardner said yesterday that the results of this test just in, not in a position to make any announcements about our future (page) plans.

Environmentalists have asked the government to test a representative sample of barrels from each of the seven underwater dump sites to en-

Post-Bulletin 25 Nov 90

Lake's barrels hold scrap metal

Associated Press

DULUTH — Two barrels recovered from the depths of Lake Superior were smashed open to reveal a mixture of concrete and metal scrap, and apparently not the hazardous waste some had feared, officials said.

"They appear to have little metal pieces that look like they could be timers or fuses from munitions," Ken Gardner, a spokesman for the U.S. Army Corps of Engineers, said Tuesday. "There are some thin plates with little springs, some packed in little cardboard boxes and some in a tissue wrapping material."

The barrels, two of about 1,400 barrels dumped in Lake Superior 30 years ago, were opened amid heavy precautions.

The crew wore plastic "moon" suits, carried Geiger counters

and toxic gas detectors and took cover behind blast shields when the barrels were opened. They set up decontamination zones, "hot" zones and roped off the area.

The company awarded the contract to open them also built a dike around the two barrels on a Corps pier at Duluth's Park Point. The workers took water samples from the barrels before smashing them open with a backhoe equipped with a blast shield.

"We have to be careful, but we're not real worried about an explosion," said Jerry D. Canfield, project manager for OHM Corp. "If it was likely to go up, it probably would have gone up by now."

The Corps of Engineers said it will send samples of the barrels' contents to an environmental testing lab, where the scrap, con-

crete and water will be tested for toxic or radioactive waste. A decision will be made later whether to retrieve the other 1,400 barrels.

The two barrels were pulled from the lake earlier this month after a sonar and submarine search sponsored by the Corps pinpointed the spot where the Army and Honeywell Inc. secretly had dumped 1,437 barrels between 1959 and 1962. The dumping was to get rid of material from a classified explosives project.

Some critics have said they feared that the barrels contained radioactive material or hazardous waste because traces of uranium and chemical wastes were found in the floor drains of the Army Ammunition Plant in Arden Hills, where Honeywell worked on projects for the Army.

Sunday/December 30/1990/Star Tribune

1990 was truly a year to remember

By Al Sicherman/Staff Writer

Where was Gerskdo?
Amid heavy precautions, a crew from the Army Corps of Engineers, wearing plastic moon suits and carrying Geiger counters and toxic-gas shields, took cover behind blast shields when two barrels of material from a classified explosives project were recovered from the depths of Lake Superior and opened. The barrels contained chunks of concrete and metal scrap — thin plates with little springs, some packed in little cardboard boxes and some in a tissue wrapping material. "Perhaps when you unwrapped them, they were supposed to wave little flags that said 'bang.'"

ATTACHMENT 2

Statement released today by St. Paul Corps of Engineers:

St. Paul -- Analysis of water samples taken from the bottom of Lake Superior where some 22 barrels of classified defense waste were located by the Corps of Engineers on Dec. 4 showed no difference from samples taken upstream.

According to a summary of an analysis related to the St. Paul District by the Environmental Protection Agency, Environmental Research Lab, Duluth, concentrations of metal at the dump site were within the range of values observed in the western tip of Lake Superior, the summary points out.

The report stated that rigid precautions were taken to avoid contamination of the samples by containers and equipment used, and that the plan of evaluation was to compare water directly in the dump area and ambient water.

Tests were made of the samples for 11 metals and a number of organic chemicals which could be harmful or dangerous in concentrated amounts. In its conclusion the summary states that the water quality around the barrels is good "and we find no detectible contributions from them by the elements and chemicals we are able to measure routinely."

The summary also states beta and gamma-emitting radio nucleoids showed no difference between sampling points. According to the St. Paul District, a search of Department of the Army records will continue in an effort to determine accurately the metallurgical composition of about 1400 barrels of the scrap disposed of in Lake Superior more than 15 years ago, to prove conclusively that the contents are not harmful.

The Minnesota Pollution Control Agency and the Departments of Natural Resources of both Wisconsin and Michigan have informed the St. Paul District Corps of Engineers that they concur with this approach.

(more)

The St. Paul district, in an effort to ease public concern over the barrels, recently secured an affidavit from Milton M. Rothman, a former Army officer who supervised production of classified munitions by Honeywell Inc. from 1962-64. In his statement, Rothman said that he knew of no special treatment in the production which would have employed radioactive material or chemicals or metal compounds considered harmful.

LAKE SUPERIOR MYSTERY BARREL SEARCH YIELDS MYSTERY WRECK

by THOM HOLDEN and KEN MERRYMAN



CANAL PARK MARINE MUSEUM

The A.C. Adams was photographed entering the Duluth Ship Canal in the late 1890s.

Nearly 30 years ago, the Army Corps of Engineers secretly dumped barrels containing classified scrap metal from production of grenades into Lake Superior along the Minnesota shore, since no economic alternative disposal method existed at the time. These mystery barrels remained out of sight and out of mind until the mid-1970s when rumors surfaced that they might contain nuclear waste or other hazardous substances. A search of the lake bottom at that time resulted in what were simply called "barrel tracks," furrows in the bottom, but no barrels.

Amid persistent rumors and growing public concern for the barrels and their pollution potential, the Corps mounted another attempt in October and November 1990 to locate some of the barrels and eventually recovered two of them for analysis of their contents. The analysis process is currently under way. Visually, the contents of two recovered barrels appears to be only what historical documentation indicates was supposed to be in them.

The limited sidescan sonar and magnetometer barrel search was successful in the discovery of more than 100 of the 1,437 barrels dumped. During the search, other items on the lake floor were also reported and investigated. In the course of those investigations, a previously uncharted vessel was located 100 to 120 feet deep about 3/4-mile off the mouth of the Lester River near Duluth,

Minnesota. Subsequent visual confirmation of the anomaly by a video camera mounted in a Remote Operated Vehicle (ROV) indicated vessel wreckage, and not a mound of barrels. The Corps of Engineers promptly notified Minnesota state historic preservation officials of the discovery.

This is believed to be the first time in western Lake Superior that new wreckage was located by sidescan sonar and confirmed by ROV video.

Initial verbal reports based on the ROV video were of a relatively small wooden vessel, steam powered, possibly sidewheel. Historical records of shipwrecks in the area elicited several vessels as possibilities. One was the 96-foot wooden fish tug *Thomas Friant*, presumed lost between about 12 miles off Knife River, Minnesota, and about 9 miles off Port Wing, Wisconsin, after being ice cut in January 1924. Another was the 76-foot former sidewheeler *E.T. Carrington*, which had been reduced to a barge by the time she was lost in August 1907 while in tow toward Duluth by the freighter *Frederick B. Wells*. She foundered when less than 18 miles out. The little propeller *A. Booth* was suggested as another possibility. She had been wrecked in late August 1886 at Grand Marais, Minnesota, thought to have been salvaged, and later foundered en route to Duluth. The 147-foot scow-schooner *Mayflower*, lost off the Superior entry in June 1891 was

another of the as yet unlocated possibilities.

The prized, but ever elusive and historically significant, *Belle P. Cross* was also among the early runners, even though she was reportedly wrecked at the mouth of the Oseberry River where her 153-foot hull was badly beaten in a late April 1903 storm. Much of her machinery was later recovered, but disposition of the remaining hull is unknown.

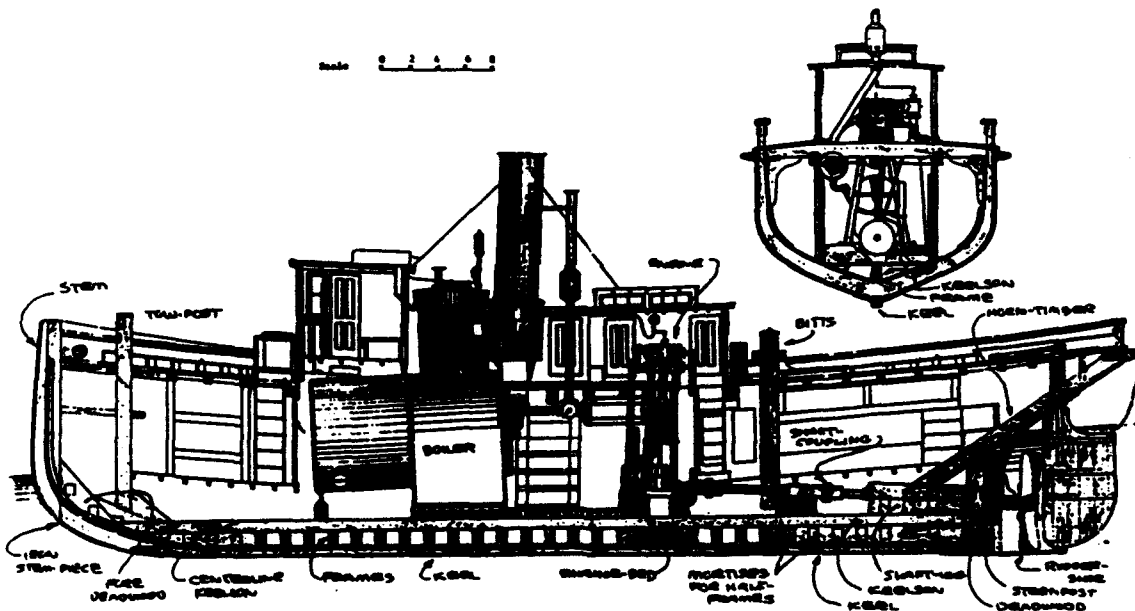
Following completion of the Corps' barrel search contract, several divers, including Ken Merryman of the *Heyboy*, and Ray Julian and Mike Stich of the *Northern Comfort*, all of the Minneapolis-St. Paul metropolitan area, made dives on the new discovery.

As the divers began to amass firsthand observations of the new wreckage, they determined the length from the stem to rudder post to be approximately 60 to 62 feet. The hull was indeed wooden, but was at least partially sheathed with tin or light steel. The vessel's engine was in place, a one-cylinder unit with several pieces missing such as the crank shaft, connecting rod and cylinder head.

The vessel also was listed hard to starboard with the starboard rail near the forward end nearly buried in the sand. Near there, the letters "AMS" were observed and appeared to be part of the vessel name or possibly that of the company which owned her.

As these observations were processed, the list of shipwrecks previously developed began to quickly shrink to nothing. The key observations of missing machinery parts and the plugged shaft hole began to strongly indicate an abandoned vessel, not one which met catastrophic end in some classic north shore nor'easter.

Records of abandoned vessels are scant, so a computer search of nearly 6,000 vessel names associated in one capacity or another with Lake Superior was searched using the key letters, "AMS." Only a handful of new possibilities were developed, among them the tug *A.C. Adams*. Meanwhile, additional diver observations began to surface. Finally, indisputable identification was made. Carved into one of the deck beams in the small hold was the official registry number and a tonnage figure. The of-



COURTESY CANAL PARK MARINE MUSEUM

The inboard profile drawing of a typical steam tug shows the arrangement of structural features like those found on the *A.C. Adams*. This plan represents the *Julian V. O'Brien*, built in 1888 at Buffalo, New York. See text of story for parts that are missing from the *Adams* wreck.

The cylinder appeared to be 16 to 18 inches in diameter. The boiler was also in place and of an "older" design. The divers also observed that the rudder was askew, but in place, while the shaft and propeller were missing and the shaft hole definitely and deliberately plugged. The bow was intact while the stern was beginning to come apart. There was green paint remaining on part of the bow. Hull construction seemed to be reasonably heavy for the over-size of the vessel, but the limited cabin structure was absent or entirely collapsed.

The vessel rested in a depression on a hard sand bottom, standing seven to 10 feet above the surrounding ter-

restrial number was 105994 and the report indicated the tonnage figure was 90 and xx/100 tons. Frame by frame review of video documentation showed the tonnage to be carved with rather flourishing numbers and actually 20 and 88/100 tons.

Records in the Corps of Engineers Canal Park Marine Museum were consulted and the vessel's identification positively confirmed as the tug *A.C. Adams*, built in 1881 at Buffalo, New York, by the Union Dry Dock Company. Her official number was 105994 with a gross registered tonnage of 41.76 tons and net tonnage of 20.88 tons. She was built of oak with a one-cylinder, high pressure, non-

condensing steam engine. The engine cylinder diameter was 18 inches and its stroke was 20 inches. Further records indicated this vessel was officially abandoned during the year prior to June 30, 1923, probably in the fall of 1922 or early spring of 1923, although there is no present documentation of the abandonment procedure.

Many of the documents of enrollment for the *A.C. Adams* were available in the collection of the Canal Park Marine Museum in Duluth. Missing in the ownership record were her first several years. These documents show that in March 1890 the *Adams* was owned one-third each by Frederick W. Smith, John W. Fee and Edward S. Smith, all of Duluth. Prior to that time she had been registered in and operating out of Marquette, Michigan, and before that at Buffalo, New York.

The following spring, in April 1891, ownership was listed as the Smith-Fee Company (or Smith-Fee Towing Company of Duluth). B.B. Inman acquired the vessel in October 1893 and continued to operate it out of Duluth. Ownership was changed to Inman Tug Company in April 1897. Then in November 1899, the *Adams* was acquired by Union Towing & Wrecking Company where it remained until abandoned.

The 1923 Merchant Vessel listing for the fiscal year which ends on June 30, 1923, notes the *A.C. Adams* as "abandoned" without notation on where, when or why. One is left to presume age and condition played key roles in the decision.

The last owner of record prompted a small detour in the search for more of the vessel's history. Prior to the turn of the century, a host of small, independent companies such as Smith-Fee and Inman operated tugs, salvage equipment and lighters throughout the Great Lakes. Competition was fierce, sometimes violent, and vessel owners were hit with a barrage of confusing rates. Their vessels were at the mercy of the tug companies, sometimes with costly delays of several days or more.

Things began to change on July 7, 1899. On that date Great Lakes Towing was incorporated in New Jersey to "provide harbor and other towing service, as well as wrecking and salvage service throughout the Great Lakes, their connecting and tributary waters." The numerous smaller companies began being bought out by the new corporation and its subsidiaries at what was termed fair, but conservative, prices. Sellers also signed restrictive agreements barring them from re-entering the tug and salvage business for several years. Inman Towing was among those independent tug companies acquired by the growing corporation.

Great Lakes Towing grew rapidly to a fleet of 150 or more tugs, lighters, wreckers and other work craft operating in virtually every harbor and river on the Great Lakes. Subsidiary companies were quickly formed, among them the Union Towing & Wrecking Company, a West Virginia corporation chartered on September 12, 1899. Great Lakes Towing owned 995 of the 1,000 corporate shares, with the few remaining shares presented as courtesy shares to various individuals instrumental in forming the subsidiary and its parent corporations. Thus,

the *A.C. Adams* was indirectly a Great Lakes Towing and assumed, over the years, its still familiar red and green livery.

Alexander C. Meakin's definitive history of Great Lakes Towing notes that the *Adams* was converted to a "floating shop at Duluth about 1906." Just what this meant is not certain, but frequently a vessel no longer suited to towing would be used primarily as a steam generator to be used by vessels wintering in port that needed to operate winches or other machinery without the necessity of firing up the ship's main boiler. She might also have been similarly used to steam frozen ore in the late season. It is assumed that the 1905-06 season largely concluded her active role as a working tow vessel.

The *Adams* appears in a few instances in Dr. Julius F. Wolff Jr.'s comprehensive *Lake Superior Shipwrecks* as both a vessel assisting in time of casualty and as victim. In 1887 the *A.C. Adams* towed lifesavers to the wreck of the *George Sherman* on the shoals off Shot Point, 12 miles from Marquette, Michigan. In 1888, just a year later, the *Adams* was nearly successful in dragging the sinking *Reed Case* into the Portage Ship Canal.

The following year, the *Adams* was at the other end of a shipwreck. That June she was towing the schooner *Monterey* about 15 miles northeast of Whitefish Point in dense fog. Both vessels ended up on the shoals near Sandy Island, the *Adams* suffering a broken propeller while the *Monterey* was initially abandoned, only to be recovered and sail beyond the turn of the century. Wolff chronicles the *Adams* again in June 1892 when she suffered some damage in a collision at Superior, Wisconsin. Further research will undoubtedly add many more details to the life of this little vessel operating in and out of the Twin Ports for more than three decades.

C. Patrick Labadie, curator of the Corps' Canal Park Marine Museum and an authority on Great Lakes wooden vessel construction, provided the initial diving crew with an inboard profile plan for a tug similar to that of the *A.C. Adams* for orientation. This particular vessel plan, that of the *Julian V. O'Brien*, is of a very similar tug also built in Buffalo and just a few years after the *Adams*. The *O'Brien* was slightly larger, but the plan provides an excellent likeness to the *Adams*. The plan clearly shows the arrangement of the house, machinery and boiler as well as construction details.

Minnesota Historical Society (MHS) has not publicly disclosed the wreck location, and divers report that even when returning to the wreck with Loran C coordinates, it is not easy to locate due to the surrounding bottom terrain. MHS is currently formulating plans to include the *A.C. Adams* in a new contract for complete on-site documentation during 1991 along with a few other vessels in the Minnesota waters of Lake Superior. The Corps of Engineers recently completed an initial archaeological survey of the schooner *Samuel P. Ely* at Two Harbors in cooperation with MHS, data which should be available during the 1991 dive season, while MHS is currently analyzing data gathered this past summer on the *Madeira* and *Thomas Wilson* wrecks.

APPENDIX F

Media Relations Plan for Barrel Search/Recovery

1. The Lake Superior Barrel Project created extensive interest among Duluth area residents and media, as well as among Twin Cities media.

2. Public Affairs and Engineering Division spokespersons had 20-25 media contacts each day of the operation. Many of the contacts were made during news conferences which usually had 8-10 reporters in attendance. Other contacts included in-person and telephone interviews and telephone contacts not involving an interview.

3. Based on earlier experience when the barrel search contract was awarded, Public Affairs anticipated this high level of media interest and prepared a media plan to address media issues during the initial barrel search operation. This plan was based on the following concepts:

- a. There would be high public and media interest in the project. We needed to be available and responsive to media needs in order to tell the Corps story.
- b. Space limitations on the search boats would not allow media to accompany the search team. To help compensate for this limitation, an equipment demonstration would be held at the beginning of the search and daily media briefings would be held to keep media and the public informed on the progress of the search.
- c. Contractual arrangements were made to have quick photo processing and videotape duping available in Duluth to provide media with copies of photos/videotape taken during the search. In addition, a television newsclip service was located in Duluth and a contract was arranged for copies of all Duluth television news coverage of the barrel project.
- d. A media center would be established at the Duluth Area Office. A least one public affairs specialist would be in Duluth during the entire project. An answering machine would be used at the media center to record messages from media who called while the Public Affairs representative was out of the office.
- e. All media requests for interviews would be directed to Public Affairs. This was to include interviews with both Corps and contractor personnel.

4. While we tried to anticipate media relations requirements during the initial search in our media plan, the barrel search and recovery operations were dynamic and often unpredictable. This unpredictability required a flexible public affairs posture and rapid response to ever-changing situations. Several news conferences were called on short notice. Media needs varied greatly and our ability and willingness to make a Corps spokesperson available helped develop and maintain a positive working relationship with reporters covering the project.

5. This good relationship was a significant factor during the barrel opening. Reporters, some who were on the scene before 7 a.m., maintained a day-long vigil at the opening site, until the first barrel was opened in the early evening. Even though they were there for as long as 10 or 12 hours,

they remained calm and generally positive about the Corps efforts in the project.

6. As with any effort of this magnitude, there were public affairs activities that went "right" and some things that could have been improved. Here are some of each:

a. Providing media advisories at the beginning of each operational phase gave reporters advance notice of what was happening and what media arrangements they might expect.

b. By coordinating with the Duluth Area Office for media center space, we had work space waiting for us when we arrived in Duluth and we were able to provide media center telephone numbers in advance. Locating the media center at the Duluth Area Office generally worked well. For the initial search operation we had our own office space; for later operations, we used an empty desk in the administrative area of the area office. Being situated in the Area Office, we were readily available to media, close to the Maritime Museum conference room where most of the news briefings were held, and close to the Corps Vessel Yard from which all of the search/recovery operations were staged. We also had access to long distance telephones, fax and copiers and the office staff could take messages for us when we were out of the office which was an important consideration since most of the time there was only one Public Affairs representative staffing the media center.

c. The initial equipment demonstration for reporters and photographers was held on Sunday morning (October 14) rather than prior to (or at) the beginning of the search operation. The demonstration provided a good opportunity for them to shoot file footage of the mini-sub, underwater cameras, and sonar equipment and to talk to all of the technical experts. Ideally, this should have been scheduled at the very beginning of the operation (Wednesday) but the mini-sub was not available until Sunday.

d. Having a large map of the search area was a useful tool during the news briefings and individual interviews.

e. Having a spokesperson available and willing to talk to media allowed us to meet reporters' needs while maximizing our opportunities to tell the Corps' story on the barrel project and DERP in general. On several days, we did our first interview live on radio at 7 a.m. and finished the day after 10 p.m.

7. We learned an important lesson in this area. If the Corps does not have a spokesperson readily available, the media will more than likely find someone else with whom to talk. In one situation, where the boat returned later than expected and the Corps was not available when a reporter thought we would be, the reporter interviewed a local activist. This television report was very one-sided and contained a number of inaccuracies. While we can't stop the media from interviewing biased or unreliable sources, we try to insure that a Corps spokesperson is readily available to present the Corps perspective and the facts.

8. Our willingness to be available and responsive to reporters laid the groundwork for a good working relationship between the Corps and media.

9. Scheduling daily media briefings worked extremely well and reduced the number of requests for individual interviews each day during the initial search in October. During later operations, we held news conferences at the beginning and at the end of each operation and called special news conferences to announce special events or activities. However, daily news conferences were not required in the later operations. All news conferences were well attended by Duluth media (three television stations, 2-3 radio stations, Duluth and Superior, Wis., newspapers, and the Duluth correspondent for the Minneapolis Star-Tribune). Some news conferences, especially during the search operation, were attended by Twin Cities television crews.

10. The lack of good, reliable communications between the media center on shore and the project coordinator on the search vessel made getting information difficult. During the first phase of the search, we were able to use a contractor-owned cellular telephone and reimburse the contractor through the contract for the government use. Without the contractor's cellular phone, we were limited to ship-to-shore radio which was awkward to use, often had poor reception and was subject to monitoring by other boats, media and individuals with similar radios or scanners.

11. This communications arrangement became complicated during the initial barrel recovery effort when reporters on-board the Corps tug wanted to use the contractor's cellular phone, agreeing to reimburse the contractor for their use. The contractor submitted the bill for the Corps and the media's use of his cellular phone several months after the event, requiring the Corps to contact the reporters for reimbursement. In the future, the district should purchase or lease several cellular telephones to provide communications during events similar to this. This would have significantly improved public affairs and operational communications and, possibly, decision-making throughout the barrel project.

12. Our initial media mailing list missed several smaller but important media outlets. In the future, we need to make sure that all appropriate media are included on the initial media mailing list. This can be accomplished by checking the newspaper and broadcast media directories.

13. In a project as sensitive as this, there needs to be closer coordination and control of contractor contact with the media. While there were not any serious incidents in this regard, the potential existed. Representatives of the search contractor, Hazard Control, Inc., were asked to refer all questions to one of the Corps representatives.

14. In summary, we anticipated the high level of public and media interest in this project and planned a media relations program to meet that interest within the public affairs resources available. Our success was based on anticipating media requirements, keeping media representatives informed of planned activities, being open and being available.

A positive and responsive media relations effort contributed to the success of the overall project.