MEMORANDUM

TO: GWM File

FROM: Michael A. Fracasso, DEP: WEED: GWC

DATE: July 15, 1992

SUBJECT: Operations and Maintenance (OAM) Inspection Summary:
AVCO Textron Lycoming; Stratford, CT
[EPA ID No. CTD 001181502]

SITE STATUS-- The AVCO Textron Lycoming (AVCO) RCRA regulated unit comprises four former surface impoundments: three adjacent sludge-drying lagoons and one flow equalization lagoon, positioned somewhat offset from the row formed by the other three (see Site Map). The lagoons were used until July 1987 for treatment of wastes generated during electroplating operations (F006, F007, F009, D006, D007 wastes); the sludge and underlying contaminated soils above the water table were removed in 1990 and the unit was certified closed as a landfill. An assessment ground water monitoring program was implemented in 1987; the program was up-graded in 1990 in response to CT DEP Order HM-358. Regulated waste parameters have been detected in site ground water down-gradient of the regulated unit; consistently high VOC concentrations site-wide have been attributed, in part, to contamination from sources unrelated to the regulated unit because of contaminant presence in up-gradient wells. The last CME for this site was performed in 1989 by M. J. Bamberger (CT DEP). Ground water in the site area is classified GB.

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SITE DESCRIPTION

The federal government-owned, contractor-operated AVCO facility manufactures engines which are used in tanks, fixed-wing aircraft, and helicopters. The site is located in the city of Stratford on the coast of Long Island Sound (LIS), just east of Sikorsky Memorial Airport and west of the confluence of the Housatonic River with LIS. The regulated unit, situated on a relatively flat coastal plain, is bordered by a tidal wetland to the east, southeast and south; a "tidal ditch" adjoins the former equalization lagoon (see Site Map) and receives the facility's permitted NPDES discharge. Surrounding land use to the north, northwest and west is commercial/industrial.

TECHNICAL REVIEW

HYDROGEOLOGY

The basic site stratigraphy comprises fill overlying stratified drift sediments, overlying metamorphic bedrock. Site wells have documented fill up to 12 ft thick and stratified drift up to about 113 ft thick. The top of bedrock was penetrated by three deep wells, and ranges from about 103-164 ft below grade from north to south within the limits of well control. Site surface soils have been classified as Agawam types: loamy and well-drained, developed over stratified drift. The bedrock lithology is an amphibolite/schist, mapped as the Oronoque Member of the Orange Formation (Ordovician). The bedrock beneath the site forms the east limb of a northeast-striking syncline, which dips strongly to the south.

The uppermost aquifer comprises the fill and stratified drift over bedrock; the base of the aquifer has not been defined. The stratified drift sequence is lithologically heterogeneous, and beneath the regulated unit has been divided into "upper" and "lower" aquifer units, separated by a lenticular peat bed. The peat ranges from 4-7 ft thick beneath the regulated unit (maximum thickness 14 ft); overlying stratified drift and fill range from 9-12 ft thick, with an average saturated thickness of approximately 7 ft.

Ground water elevation contour maps demonstrate that ground water in the upper part of the stratified drift sequence is "mounded" over the peat. Pump test data have been interpreted to indicate that the peat and underlying strata have much lower hydraulic conductivities than overlying sediments. Consequently, the peat has been inferred to constitute a "leaky", semi-confining layer which retards downward ground water flow from the overlying aquifer sediments to the lower part of the aquifer. Ground water flow in the "mounded" aquifer above the peat is radial to the east, south, and southwest; the overall flow direction is to the southeast toward the tidal ditch, which appears to "capture" much

of the shallow ground water in the area of the regulated unit. Ground water in the deeper part of the aquifer, below the peat, flows to the southeast. Site ground water ultimately discharges into Long Island Sound.

Calculated hydraulic conductivities, derived from pump test data, appear to decrease with increasing depth. The average hydraulic conductivity of strata in the upper part of the aquifer (above the peat) is approximately 15.6 ft/day; the average hydraulic conductivity of deeper strata is about 3.0 ft/day. Ground water lateral gradients and associated calculated velocities are generally low, and also decrease with increasing depth, presumably reflecting proximity of the site to the coastal constant head boundary (mean sea level). The average lateral flow rate in strata above the peat is approximately 91 ft/yr; the average lateral flow rate in deeper strata is about 17.8 ft/yr. Ground water salinities reportedly increase with increasing depth, although most reported values are within the brackish range.

GROUND WATER MONITORING PROGRAM

The ground water monitoring program at the AVCO facility comprises 22 wells. Five wells were installed in 1981 as the initial RCRA detection monitoring system; additional wells were installed in 1983 (2), 1985 (6), 1989 (3), and 1991 (6) during subsequent assessment phases. Wells have been completed in shallow, intermediate, and deep parts of the aquifer. Eight wells are single well installations; the remaining 14 wells were installed in five clusters, each cluster comprising from 2 to 4 wells which monitor different depths in the aquifer. Screen lengths are 10 ft (19), 15 ft (1) and 20 ft (2); top-of-screen elevations range from (+) 9.7 ft to (-) 81.7 ft (re. mean sea level). No wells are screened in bedrock.

Monitored parameters whose detected concentrations exceeded CT or Federal drinking water standards (DWS), or both, during the period encompassed by this review (1989 calendar year to present) include: nickel, cadmium, chromium, vinyl chloride, 1,2 dichloroethene, 1,1-dichloroethene, 1,2 dichloroethane, tetrachloroethylene, trichloroethylene, and benzene. Both inorganic and organic parameters have been detected at concentrations above DWS in upgradient and downgradient wells, and in the upper and lower parts of the aquifer. The data can be reasonably interpreted to suggest the presence of several contaminant plumes. One source appears to be the regulated unit; other sources presumably exist elsewhere on- and/or off-site. Those organic parameters which were presumably derived from the regulated unit are most concentrated in the upper part of the aquifer; the lateral and vertical distribution of inorganic parameter concentrations is less well defined and discrimination of potential source areas is more difficult to interpret.

The existing GWM program at AVCO appears to be adequate with

respect to present site conditions. AVCO has recently proposed to modify its ground water monitoring program; the proposal is being reviewed by CT DEP for regulatory compliance.

FIELD INSPECTION

I performed a field inspection of a quarterly ground water sampling event and well conditions on 12 May 1992. The weather was partly cloudy and warm (@ 69-72 degr. F). I arrived at the site about 9:30 AM and left the site around 3:00 PM. The AVCO facility contact is John S. Fleming, Supervisor, Environmental Compliance (203-385-3964); the CA Rich consultant contact is Thomas R. Hughes, Senior Hydrogeologist/Project Manager (516-674-3889); the CA Rich field team coordinator was Steve Sobstyl. Sampling requires two days because of the number and depths of on-site wells; I only observed field activities on the first day.

Site and Well Maintenance-- Well and site maintenance were generally adequate, with the following exceptions:

• The surface of the former flow equalization lagoon area was crossed diagonally from south to north by a PVC pipe line, which provides a drainage outlet from a reportedly temporary soil stockpile located adjacent to the western edge of the closed RCRA lagoon. The gravity-fed pipe line is variously supported by cinderblocks and suspended from "sawhorses" to maintain a constant slope where it crosses ground surface irregularities. The pipe line reportedly discharges into the AVCO waste water treatment system. Installation and maintenance of this pipe line on the surface of the closed lagoon is a deviation from the specifications of the closure/post-closure care plan, and it should be removed as soon as possible. I note that the surface of the closed lagoon did not appear to have suffered damage related to the pipe line, and the pipe line did not appear to be leaking.

• The concrete surface aprons around a number of the wells are beginning to deteriorate. This is probably not significant at present with respect to the possibility of surface water infiltration downward along the well bores, because the wells were reportedly grouted for much of their casing lengths. However, the contractor should evaluate the potential need for concrete surface seal maintenance in the near future.

Sampling Protocol-- CA Rich has been performing recent GW sampling at the AVCO facility in overall accordance with the Sampling and Analysis (S & A) plan presented in Metcalf & Eddy (1987). Minor deviations of field practice from the S & A plan have generally been documented in written reports and correspondence.

Ground water elevations were measured twice at each well, because the sampling episode occurred over a two day interval. The initial measurements were obtained with SINCO electric probes, and were recorded in sequence for each well scheduled for sampling on

a given day immediately prior to its evacuation and sampling. These initial elevation values were used only to verify evacuation volumes. After sampling of all wells was completed on the second day, a second suite of ground water elevations was recorded from each well using weighted steel tapes (field personnel stated that measurement resolution of steel tape was higher than electric probe). These values were obtained from all site wells within a short time span, and were used to determine ground water gradient. Field personnel stated that recharge was rapid for all site wells, and that a sufficient period of time was allowed for complete recharge of all wells between the end of sampling and the final round of ground water elevation measurements.

The top of the PVC inner casing was used as the measurement reference point; the SINCO probes and steel tapes were rinsed with DI water between wells. Five well volumes of water were purged from the wells prior to sampling; evacuated water was pumped into scribed polyethylene buckets for volume measurement. Wells were evacuated using motor-driven mechanical pumps with dedicated inlet tubing; MW-3S was evacuated with a fluorocarbon bailer because of its shallow depth and small evacuation volume. Evacuated water was disposed of on the ground away from the wells. Four replicate measures of the field parameters pH, T, and conductivity were recorded at roughly evenly-spaced intervals during purging, in order to document that purging had resulted in stabilization of the well water. A YSI SC-T indicator was used to measure conductivity and temperature; pH was measured with a Cole Parmer pH meter. Instruments were reportedly calibrated every morning prior to sampling; the pH meter possessed a "red-line" indicator allowing for calibration checks prior to each measurement. Measuring instruments were rinsed with DI water between wells.

Wells were sampled using dedicated fluorocarbon bailers of 2-in diameter; MW-1SI required use of a narrower, 1.66-in diameter fluorocarbon bailer which could pass through a slight bend in the upper part of the casing. Polyethylene sheets were placed on the ground around wells to minimize the possibility of instrument and sampling device contamination by ground contact. Sample containers were pre-labeled, with preservatives already added. Samples were obtained as follows: each well was sampled for cyanide immediately after purging; cyanide samples were obtained first because the short holding time prior to analysis requires delivering those samples to the analytical lab as soon as possible after sampling, rather than at the end of the day. After all cyanide samples have been obtained, each well is re-visited and sampled for the remaining parameters. Subsequent samples were taken in the following order: (1) VOC, (2) chromium (hex), (3) TOC and TOX, (4) metals, and (5) inorganics. Metal samples were field-filtered for subsequent laboratory analysis of dissolved constituents. Trip blanks, matrix-spiked samples, and matrix-spiked duplicate samples were utilized as checks on QA/QC.

Filled sample bottles were placed in iced coolers, which were to be hand-delivered or shipped by over-night delivery at the end of the day to the EnviroTest analytical lab in Newburgh, NY. I did not observe the use of sample container seals; field personnel stated that samples were usually hand-delivered to the analytical lab and were not out of the collectors' possession until transfer of custody to the lab.

The chain-of-custody record and sample analysis request sheet were incorporated as a single form, including fields for: well number, sampler identification, facility name, sample date, sample type, parameters to be analyzed, sampler's signature, inclusive dates of possession, and signatures of persons involved in chain of possession.

Record Keeping-- Record keeping appears to be in order. Records pertaining to the RCRA-regulated waste management area are stored in a file cabinet in the facility's environmental compliance group office area. The files are accessible and appear to be complete.

REPORTING

Annual Report Content-- I examined the content of annual reports for the calendar years 1989, 1990 and 1991 for compliance with CT Hazardous Waste Management (HazWaste) Regulations. The following out-of-compliance items were noted, in rough order of their specification in CT regulations:

- CT regulations require inclusion of a data table for each well, with parameter concentrations and ground water elevations on the vertical axis, and sample date as the horizontal axis. The data tables in the 1989 report were not formatted as required.

- Parameters whose concentrations exceeded Federal/CT drinking water standard (DWS) maximum concentration levels (MCL's) were insufficiently identified in the 1989 report. Sample dates and wells in which parameter concentrations exceeded a CT DWS were not specifically identified.

- Ground water elevation contours did not accurately reflect posted ground water elevation values, and ground water flow directions were inaccurately portrayed on maps presented in the 1989 report. Required "as-built" diagrams for new wells were inadequate in the 1989 and 1991 reports. Said diagrams must illustrate specific construction and completion details (ie., "as built") for each newly installed well. "As-built" diagrams presented in the 1989 and 1991 reports comprised a single generalized schematic applicable to all the newly installed wells.

- Graphs of ground water elevation and parameter concentration versus sample date were deficient in the 1989 report. The use of histograms and inclusion of multiple wells on each graph in the

1989 report was unusual in format and very difficult to interpret. Organic parameters were not graphed in the 1989 report. Graphs of ground water elevation presented in the 1990 and 1991 reports displayed data for only a single year (current reporting year), rather than a three-year record as required by regulation. Graphs were not provided in the 1990 and 1991 reports for all monitored parameters as required; only parameters whose concentrations exceeded a DWS were graphed.

• Discussion and interpretation of data were deficient in the 1989 report. The site hydrostratigraphy was not adequately described, and the rate of migration, extent, and degree of contamination were not discussed. The extent of contamination was inadequately discussed in the 1990 and 1991 reports.

• Evaluation of the adequacy of the ground water monitoring program was deficient in the 1989, 1990, and 1991 reports. Discussion in each report was limited to the physical condition of wells. The ability of the ground water monitoring program to fully delineate the rate of migration, degree, and extent of contamination was not evaluated.

• Copies of laboratory analytical reports and field log sheets were not included in the 1990 and 1991 annual reports. I note that laboratory analytical data were compiled as tables in the reports, but original lab analytical reports were not included. However, original lab analytical reports were included with each of the reviewed quarterly reports.

Most of the deficiencies documented above that pertain to the 1989 report (prepared for AVCO by EML) were remedied in the 1990 and 1991 reports (prepared for AVCO by ESE and CA RICH, respectively). Unresolved deficiencies are noted in the section "Issues and Recommendations."

Quarterly Report Content-- I examined the content of selected quarterly reports submitted during the calendar years 1990, 1991 and 1992, for compliance with CT HazWaste regulations. The following out-of-compliance items were noted, in rough order of their specification in CT regulations:

• Required "as-built" construction diagrams for new wells were inadequate in the 1st quarter 1991 report. Said diagrams must illustrate specific construction and completion details (ie., "as built") for each newly installed well. The "as-built" diagram presented in the 1st quarter 1991 report comprised a single generalized schematic applicable to all six newly installed wells.

• The scheduled date of the next sampling event was not stated in any of the quarterly reports.

Timeliness-- Annual report submittals have been timely during

the period encompassed by this review (1989 CME to present). Four of the six quarterly reports reviewed during this inspection (3rd quarter 1990, 1st quarter 1991, 4th quarter 1991, 1st quarter 1992) were received late by CT DEP, ranging from 10-26 (average 15) days after the required submittal date.

ENFORCEMENT STATUS

AVCO's ground water monitoring program is currently subject to Order HM-358. The facility's progress toward compliance has encompassed several phases of assessment, and AVCO is approaching full compliance with the order.

ISSUES AND RECOMMENDATIONS

The issues discussed below relate to specific observations and/or deficiencies noted elsewhere in the inspection summary memo, which are deemed of sufficient importance to require being addressed by the facility.

• The presence of the PVC pipe line crossing over the former equalization lagoon area is considered to be a post-closure maintenance issue and only peripherally related to the focus of this inspection; it is being separately addressed in the course of a closure/post-closure compliance inspection by D. Ringquist (CT DEP).

• Deviations in field practices from the Sampling & Analysis Plan (Metcalf & Eddy, 1987), which have not yet been addressed in prior submittals or correspondence, should be documented and justified in an addendum to the S & A plan and submitted to CT DEP. Alternatively, adjustments of field protocol to more closely reflect the S & A plan and/or preferred practice would not require submittal of an addendum. Specific concerns are: (1) the practice of measuring ground water elevations on the second day, after completion of sampling, for use in determining ground water gradients, and (2) sampling of wells in two stages, with cyanide samples obtained first, and VOC's and other parameter samples being obtained later. It seems reasonable that the ground water elevations in all site wells could be measured initially on the first day, prior to evacuation and sampling. This would negate any questions about whether the wells had fully recovered from sampling prior to ground water elevation measurement and determination of gradient.

The constraint of short holding time which requires early sampling for cyanide is acknowledged. However, it seems reasonable that VOC samples could also be obtained at the time of early cyanide sampling (VOC samples should be obtained first), with samples for other parameters being obtained later. This would negate any question about whether VOC concentrations had decreased by volatilization between the time of evacuation and cyanide sample

removal, and later sampling of the well for remaining parameters.

• Future annual reports must include graphs of ground water elevation versus sample date with the required three-year record, rather than only the current report year record. In addition, CT regulations require that annual reports include graphs of parameter concentration versus sample date for all monitored parameters, not just for parameters whose concentrations exceeded a DWS. In practical consideration, future annual reports should include, at minimum, graphs of concentration versus sample date for all monitored parameters whose recorded concentrations exceeded method detection limits for two or more consecutive sampling events.

• Future annual reports must more completely discuss and interpret data pertaining to the degree, rate of migration, and extent of contamination. Specifically, the horizontal and vertical extent of organic and metals contamination should be depicted by the use of contaminant concentration contour maps. I note that AVCO is in the process of preparing such maps in the context of compliance with HM-358; inclusion of such maps, updated as appropriate, into future annual reports should suffice to accomplish regulatory compliance.

• Future annual reports must more completely evaluate the adequacy of the monitoring program with respect to well maintenance and ability of the existing well network to depict the degree, rate of migration, and extent of contamination. Specific issues to be addressed include an evaluation of the condition of concrete surface seals around wells, and the extent of metals contamination (chromium, cadmium, nickel) (see also preceding issue).

• Future annual reports must include copies of field log sheets and laboratory analytical reports for the sampling events encompassed by the report period.

• If additional monitoring wells are installed in the future, as-built construction diagrams illustrating specific construction and completion details for each new well must be presented in the quarterly report for the first ground water sampling event following the well installation, and also in the annual report for that year.

• Future quarterly reports must contain the scheduled date of the next sampling event in each report; each quarterly report must be received by CT DEP no more than 60 days after the sampling date.

SOURCE DOCUMENTS

Crowley, W. P. 1968. The Bedrock Geology of the Long Hill and Bridgeport Quadrangles, with Maps. State Geologic and Natural History Survey of Connecticut Quadrangle Report No. 24, 81 p.

CA Rich. 1991. Textron Lycoming Eighth Year, Third Quarter Groundwater Assessment Monitoring Program. dated October 27, 1991.

CA Rich. 1991b. Supplementary Hydrogeologic Investigation Report, Textron/Lycoming, Stratford, CT. Vols. 1 & 2. dated December 1991.

CA Rich. 1992. Textron Lycoming Eighth Year, Fourth Quarter Groundwater Assessment Monitoring Program. dated January 1992.

CA Rich. 1992b. Textron Lycoming 8th Year Annual Summary Report, Groundwater Assessment Monitoring Program. dated January 1992.

CA Rich. 1992c. Textron Lycoming Ninth Year, First Quarter Groundwater Assessment Monitoring Program. dated April 1992.

EML. 1990. Textron Lycoming Fifth [Sixth?] Year Groundwater Monitoring Program Annual Report for 1989. Dated January 15, 1990.

ESE. 1990. Textron-Lycoming, Stratford, Connecticut: Seventh Year, Third Quarter Report, Ground Water Assessment Monitoring Program. dated May 7, 1991.

ESE. 1991. TEXTRON Lycoming Eighth Year, First Quarter Report, Groundwater Assessment Monitoring Program. dated May 7, 1991.

ESE. 1991b. TEXTRON Lycoming Eighth Year, Second Quarter Report, Groundwater Assessment Monitoring Program. dated June 26, 1991.

ESE. 1991c. Seventh Year, Annual Summary Report, Groundwater Assessment Monitoring Program, Textron Lycoming, Stratford, Connecticut. dated February 6, 1991.

Metcalf & Eddy. 1987. Avco Lycoming TEXTRON, Groundwater Monitoring Assessment Program. dated March 1987.

Metcalf & Eddy. 1987b. Avco Lycoming TEXTRON, Surface Impoundment Closure Plan. dated September 1987.

US EPA. 1986. RCRA Ground-Water Monitoring Technical Enforcement Guidance Document. OSWER-9950.1

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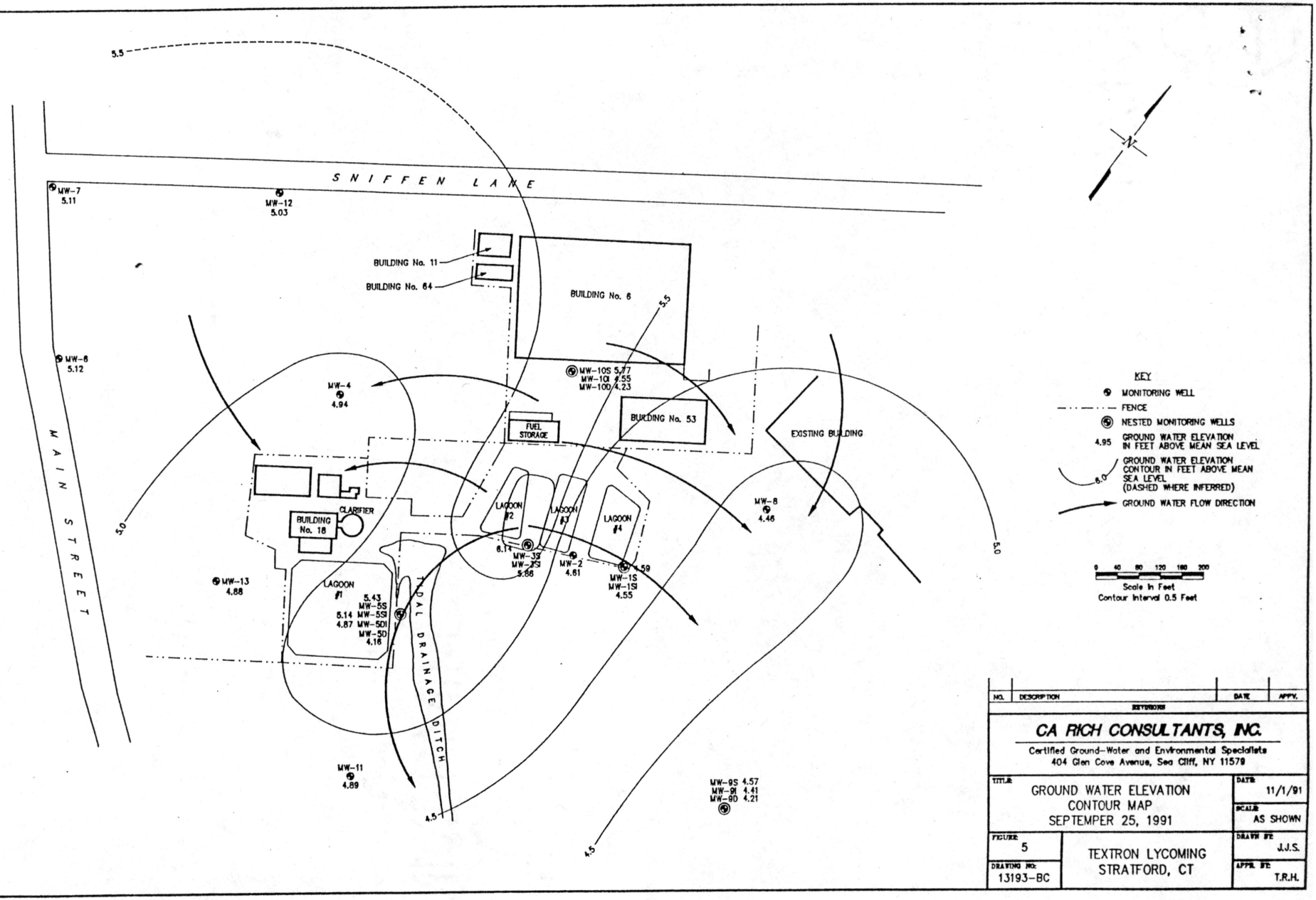

NO.	DESCRIPTION	DATE	APPV.
	REVISIONS		

CA RICH CONSULTANTS, INC.

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TITLE: GROUND WATER ELEVATION CONTOUR MAP SEPTEMPER 25, 1991		DATE: 11/1/91
		SCALE: AS SHOWN
FIGURE: 5	TEXTRON LYCOMING STRATFORD, CT	DRAWN BY: J.J.S.
DRAWING NO: 13193-BC		APPR. BY: T.R.H.