STATE OF CONNECTICUT
DEPARTMENT OF ENVIRONMENTAL PROTECTION

October 06, 1992

Dr. John S. Fleming
Environmental Compliance
Textron Lycoming
550 Main Street
Stratford, CT 06497-2452

Dear Dr. Fleming:

I have reviewed Textron's report titled "Supplementary Hydrogeologic Investigation Addendum, Textron/Lycoming, Stratford, CT" (prepared by CA Rich Consultants, Inc.; dated August 1992), which was submitted in response to my technical review (dated 13 April 1992) of a prior report (submitted in partial compliance with the requirements of Order HM-358). The addendum largely comprises clarification and expansion of concepts and conclusions developed in the original document.

Based on my review, I have several technical comments regarding issues discussed in the addendum. My comments are numbered to correspond with the appropriate sections of the addendum, and are also cross-referenced to the numbered issues raised in my letter of 13 April 1992. My comments are as follows:

3.0 (letter item 1): Textron's refinement and illustration of the vertical flow separation model of ground water migration within the uppermost aquifer represents a significant clarification of probable ground water flow dynamics beneath the site. Textron plausibly argues that ground water flow is predominantly horizontal in the site area, and that shallow flow beneath the regulated unit largely discharges proximally into the nearby tidal ditch and subsequently into the shallow surface waters of Long Island Sound (LIS), whereas deep flow in the aquifer discharges more distally into the deeper waters of LIS.

Nonetheless, I still feel that available evidence does not strongly support existence of a discrete, definable boundary between shallow and deep flow patterns (such flow separation would in general be expected to be gradual, as recognized in paragraph 2, p. 5 of the report). However, I accept that because of the apparent close approximation in stratigraphic levels of the former lagoon bases, the peat lens, and the tidal ditch and mean sea level, the stratigraphic position of the peat appears to constitute a convenient reference horizon above which most ground water can reasonably be expected to discharge into the tidal ditch.

4.0 (letter items 2, 3): Textron's graphical presentation of hydraulic conductivity (HC) data (Plate 1) represents a significantly improved depiction of the distribution and variability of HC values obtained from site wells. The geometric means and variances computed for the HC data indicate that the deeper part of the aquifer is characterized by lower HC values than the upper part of the aquifer. However, the data as presented do not allow an unequivocal distinction to be made between models of (1) two distinct populations (upper vs lower glacial aquifers) of HC values, versus (2) a single population of HC values which systematically varies from shallow to deep. At present, Textron's discussion and graphical illustration of HC data appears to be sufficient for the purpose of evaluating adequacy of the ground water monitoring program and dynamics of contaminant plume configuration; no further work is required at this time.

5.0 (letter item 4): Textron indicates that redox data are now being obtained from site wells; this data will serve as the basis of a forthcoming report which will discuss the geochemical influence of the peat horizon on contaminant fate and transport.

6.0 (letter item 5): I am still somewhat confused by the use of aerial photographs to facilitate delineation of the original extent of the peat sequence. I had assumed the peat sequence to be an entirely subsurface unit (ie., representing a "fossil" marsh, contemporaneous in age with the immediately underlying and overlying "glacial" sediments. However, I note that the stratigraphic position of the peat in wells along the southern edges of the former dewatering lagoons is approximately the same as present mean sea level. Just south of these former lagoons is an existing tidal marsh area (which the report references in its use of the aerial photos), also developed at about mean sea level.

Use of the existing marshy areas evident in aerial photographs to help delineate the extent of the subsurface peat only makes sense if the two are continuous; ie., that the subsurface peat sequence, at least in part, represents a landward extension of the existing marsh that has been covered by fill or by sub-Recent clastic sediments which have prograded over the former marshy area, or both. If this is the case, then the boundaries of the peat horizon should have been extended further seaward to coincide with the borders of the existing marsh.

It appears that the configuration of the subsurface peat, and the relation of the peat to existing marshes to the south, have not yet been fully resolved. However, for the purpose of evaluating the adequacy of the existing ground water monitoring program, the existing characterization of the peat is sufficient and no additional work is required at this time. Further study of the peat may best be deferred to some future time, perhaps under the regulatory framework of a corrective action program, if additional stratigraphic resolution is then considered necessary.

7.0 (letter item 6): Textron's graphical presentations of chloride concentration data (Plate 2, Figure 6) represent a significantly improved depiction of the distribution and variability of ground water salinities (Cl concentration correlates with salinity) measured in site wells. The data corroborate the inference that ground water salinity in the site area increases with increasing depth, and decreases with increasing distance landward away from the tidal ditch. However, as also pertained to the hydraulic conductivity analysis, the question is whether the observed difference in mean salinities between the shallower and deeper parts of the aquifer reflects a real difference between two distinct aquifer units, or simply an arbitrary pooling of values along upper and lower line segments of a vertical salinity continuum. Figure 6 demonstrates that the peat sequence locally affects the vertical salinity gradient. However, as noted in the report text, "...there is no consistent relationship suggesting an abrupt increase in chloride levels coinciding with the base of the peat" (pg. 13).

Textron's characterization of salinity/chloride distributions, both laterally and vertically, is considered sufficient at this time for the purpose of evaluating the adequacy of the RCRA monitoring well network in relation to the dynamics of contaminant plume configuration and migration.

<u>8.0</u> (<u>letter</u> <u>items</u> <u>7</u>, <u>8</u>): Textron's illustration of the VOC concentration data by contouring (Plates 3, 4, 5) provides a significantly improved depiction of the three-dimensional configuration of the VOC contaminant plume emanating from the regulated units. It also facilitates the differentiation of other VOC contaminant plumes apparently unrelated to the regulated units. Consideration of actual (inferred) contaminant plume geometry should provide a desired constraint on models of contaminant migration based solely on inferences derived from site hydrogeologic, stratigraphic, and geochemical data.

Most important, with respect to Textron's postulated flow separation model of site hydrostratigraphy, is the evidence for VOC contamination in strata immediately below the base of the peat sequence. This VOC contaminant distribution appears to be most plausibly explained by migration of contamination from the regulated units either vertically downward through the peat, or around the peat, or both. Discussions in prior reports of contaminant fate and site ground water flow focused on the contaminant plume and ground water overlying the peat, which were plausibly inferred to discharge into the tidal ditch and subsequently into the surface waters of LIS. Future discussion of contaminant fate and transport (perhaps appropriately included as part of the requisite data interpretation in a RCRA ground water monitoring annual report) should evaluate the fate of the portion of the contaminant plume located below the peat sequence.

In order to more completely characterize the extent of contamination and to complement the VOC maps, Textron should also consider illustrating the distribution of inorganic contaminants (ie., metals) via contouring of concentration data. Contour maps depicting the configuration of inorganic contaminant plumes might appropriately be included in a future RCRA ground water monitoring annual report (see also NOV HM-508 issued to Textron on 09-17-92, Deficiency vi).

In summary, I largely agree that Textron's vertical flow separation model appears to be applicable to ground water migration beneath the regulated units. I also agree that many aquifer characteristics (hydraulic conductivity, salinity, contaminant concentrations, etc.) appear to vary vertically in a systematic manner. However, I consider it unresolved as to whether more-or-less discrete upper and lower glacial aquifers exist, or whether existing variation in aquifer parameters can be attributed to vertical gradients within a single, heterogeneous aquifer. At this time, I do not consider further study necessary in the context of evaluating the adequacy of the RCRA interim status ground water monitoring program.

I am presently evaluating two additional Textron submittals, titled "Addendum II, Supplementary Hydrogeologic Investigation Report, Textron/Lycoming, Stratford, CT" (summarizing redox studies of the peat as per item 5.0 above; prepared by CA Rich, dated September 1992; rec'd 09-25), and "Ground water Assessment Modification Plan, Textron/Lycoming, Stratford, CT" (prepared by CA Rich, dated September 1992; rec'd 09-25). I anticipate completing my reviews of these documents shortly, and will transmit my evaluations to you at that time. Cursory review of both documents indicates that everything appears to be in order.

Sincerely,

Michael A Fracasso

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xc: T. Hughes (CA Rich)