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# Document Information Form

Mine Number: C/007/0001

File Name: White Oak-Incoming

**To:** Mike Thompson - DOGM

**From:**

**Person** Richard B. White

**Company** Vaughn Hansen Assoc.

**Date Received:** Feb 9, 1979

**Explanation:** Map - Utah No. 2 Mine Vicinity.

**cc:**

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RECEIVED
FEB 9 1979
DIVISION OF OIL, GAS, & MINING

CONSULTANTS / ENGINEERS
VAUGHN HANSEN ASSOCIATES
WATERBURY PLAZA - SUITE A
5620 SOUTH 1475 EAST
SALT LAKE CITY, UTAH 84121
(801) 272-5263

Feb. 6, 1979

Mr. Mike Thompson
Utah State Division of Oil, Gas, and Mining
1588 West North Temple
Salt Lake City, Utah 84116

Dear Mr. Thompson:

Vaughn Hansen Associates recently completed a survey for Valley Camp Coal Company at their Utah No. 2 and Belina mine facilities to ascertain what steps would be necessary to bring them into compliance with recent OSM regulations. As a part of this study, sedimentation ponds were suggested and preliminarily designed to contain surface runoff. As you are probably aware, the Utah No. 2 facility is built adjacent to Mud Creek, a perennial stream. Because of the drainage patterns on the yard, it was necessary to propose that a sedimentation pond be built within 100 feet of the stream (see Figure 1). Valley Camp has, therefore, requested that we prepare the following information in order to obtain a variance in the regulation dealing with surface activities and stream buffer zones.

It was desirous to know if peak flows resulting from storms of relatively frequent occurence would impinge upon the proposed sedimentation pond, to be located in the flood plain. Precipitation depths of storms in the mine area with various return periods and a duration of 24 hours were taken from the Clear Creek Summit, Utah Station as reported in Richardson's publication entitled "Estimated Return Periods for Short-Duration Precipitation in Utah" (USU Department of Soils and Biometeorology Bulletin No. 1, see Table 1). The peak flow rate at the mine site resulting from these storms was determined using the SCS dimensionless hydrograph technique as described in the SCS National Engineering Handbook - Section 4 (Hydrology). As noted in NEH-4, the time to the hydrograph peak is a function of the watershed lag and also the duration of excess rainfall. The watershed lag for the Mud Creek drainage above the proposed pond site was determined using the equation

$$L = \frac{(\ell)^{0.8} \ (S+1)^{0.7}}{1900 \ Y^{0.5}}$$

Table 1. Estimated precipitation depths for various return periods and durations at Clear Creek, Summit, Utah (from Richardson (1971).

| RETURN PERIOD (years) | DURATION 5 Min | 10 Min | 15 Min | 30 Min | 1 Hr | 2 Hr | 3 Hr | 6 Hr | 12 Hr | 24 Hr |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | .10 | .16 | .20 | .28 | .35 | .46 | .57 | .84 | 1.08 | 1.33 |
| 2 | .12 | .19 | .25 | .34 | .43 | .57 | .70 | 1.04 | 1.34 | 1.65 |
| 5 | .16 | .24 | .31 | .43 | .54 | .72 | .90 | 1.34 | 1.73 | 2.14 |
| 10 | .19 | .29 | .37 | .51 | .65 | .86 | 1.06 | 1.55 | 1.99 | 2.45 |
| 25 | .24 | .38 | .48 | .66 | .84 | 1.08 | 1.31 | 1.88 | 2.39 | 2.92 |
| 50 | .25 | .38 | .48 | .67 | .85 | 1.13 | 1.40 | 2.07 | 2.67 | 3.29 |
| 100 | .27 | .42 | .53 | .73 | .93 | 1.24 | 1.54 | 2.29 | 2.96 | 3.65 |

where L is the watershed lag, in hours; $\ell$ is the hydraulic length of surface flow, in feet; Y is the average watershed slope, in percent; and S is a watershed storage factor, in inches, defined by the equation

$$S = \frac{1000}{CN} - 10$$

where CN is the SCS runoff curve number. The values of the variables used to obtain the watershed lag are shown in Figure 2.

According to NEH-4, the time to the hydrograph peak ($T_p$) is determined by the relationship

$$T_p = \frac{T_o}{2} + L$$

where $T_o$ is the duration of excess rainfall, in hours, and the other variables are as previously defined, both in hours. $T_o$ was determined using the Type II 24-hour rainfall distribution curve shown in Figure 3, taken from Kent's publication " A Method for Estimating Volume and Rate of Runoff in Small Watersheds" (SCS-TP-149). The ratio of 0.2S/P was entered on the abscissa to determine the rainfall duration prior to runoff occurrence. This duration was subtracted from 24 to obtain $T_o$.

Peak flow rate determinations for 24-hour storms of selected return periods are found in Table 2. In this table, the return period is expressed in years, P and Q are in inches, and all other units and variables are as previously discussed. The peak discharge increment of the dimensionless hydrograph (0.686 in each case) was taken from the appropriate table in NEH-4.

The flow depth resulting from the peak discharge was determined using Manning's equation. The value of the roughness coefficient (0.067) was estimated using methods outlined in Supplement B of the SCS National Engineering Handbook-Section 5 (Hydraulics). The hydraulic slope was found to be 0.0087 foot per foot. Once the channel was surveyed, the hydraulic radius was determined at various flow depths and a graph was constructed showing the relation between flow depth and rate in Mud Creek adjacent to the proposed pond. This graph was entered to determine the depth of flow resulting from the peak discharges noted in Table 2. The resulting peak flow depths in the channel during the various storms are shown in Figure 4.

Note from the figure that something in excess of the peak runoff rate resulting from the 50-year, 24-hour rainfall event would be required before the stream capacity would be exceeded. The fact that flooding is infrequent indicates that the construction of the pond in the proposed location will have a minimal, if any, adverse impact on Mud Creek. This conclusion is reinforced by the fact that the existing mine water discharge ponds for the Utah No. 2 mine had previously been approved for location on the same floodplain (see Figure 1). The previous approval of these

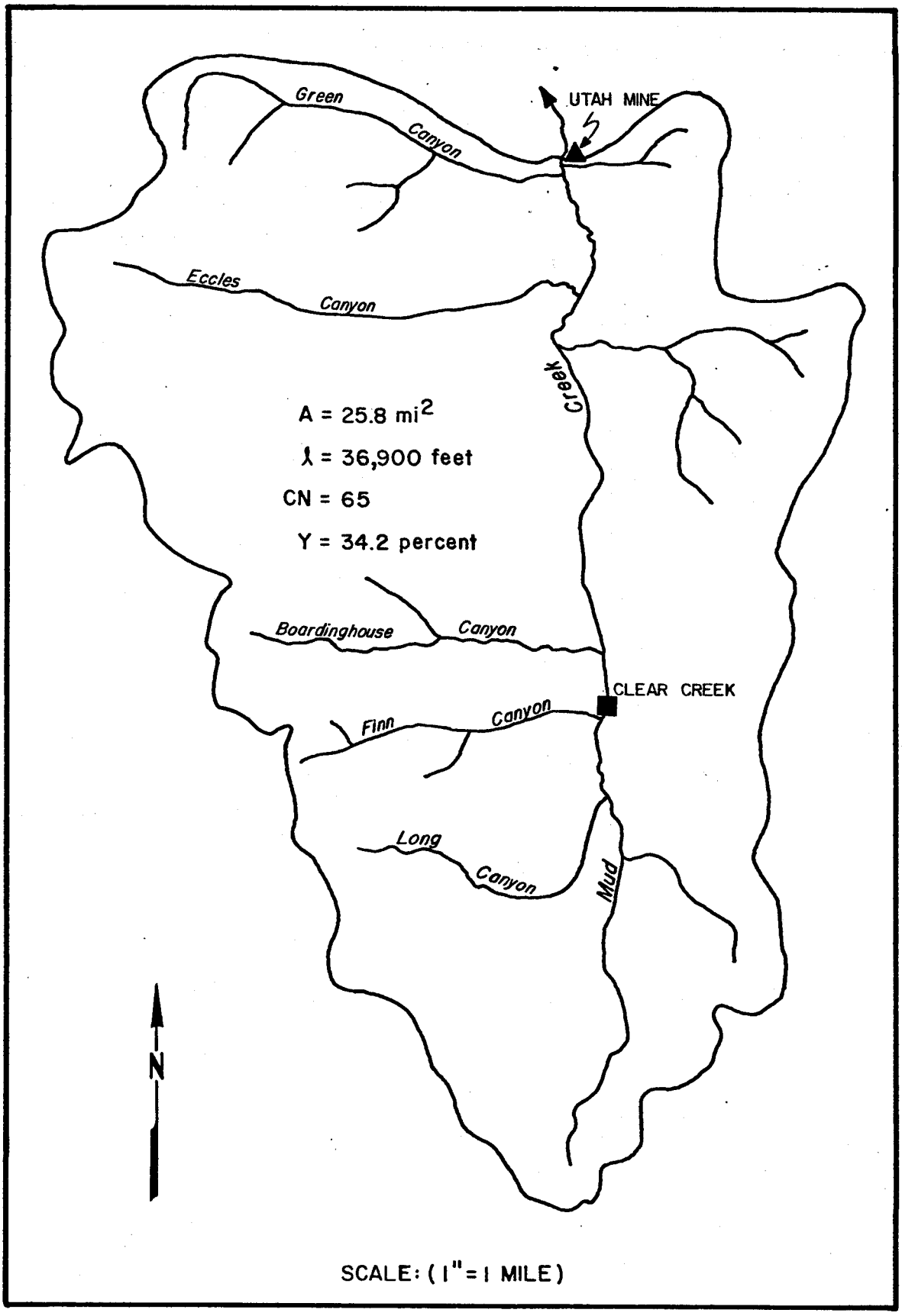


Figure 2. Drainage basin characteristics of Mud Creek Basin above the proposed sedimentation pond.

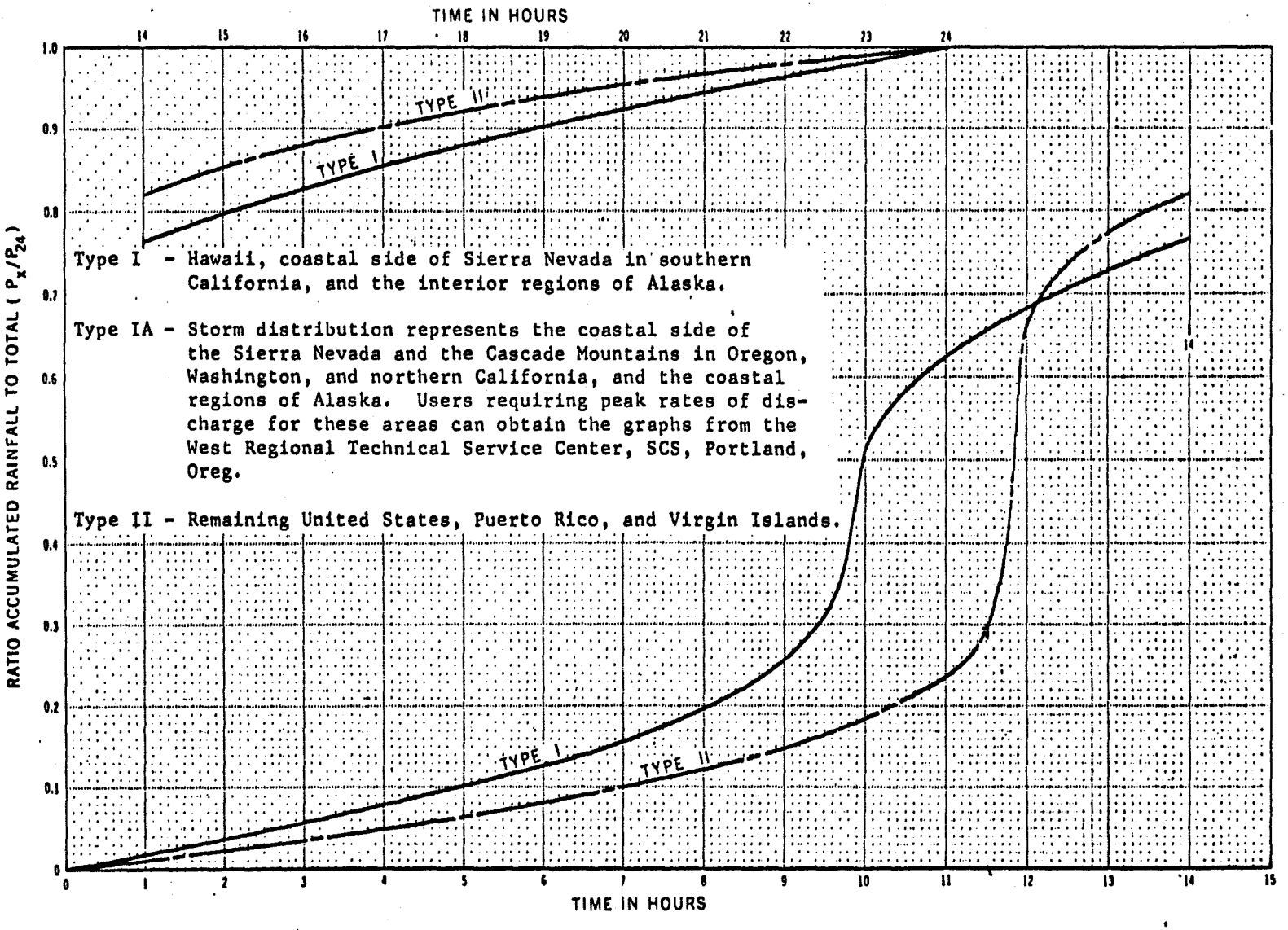


Figure 3. Twenty-four-hour rainfall distributions (from Kent, 1973).

Table 2. Mud Creek peak flow rate determination using the SCS dimensionless hydrograph method.

| Return Period | P | CN | Q | Hydro. Family Number | Computed $T_p$ | $T_o$ | $T_o/T_p$ Computed | $T_o/T_p$ Used | Revised $T_p$ | $\frac{484\ AQ}{(T_p)_{rev.}}$ | $q_p$ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 5 | 2.14 | 65 | 0.18 | 4 | 7.53 | 12.1 | 1.6 | 1.5 | 8.07 | 278.5 | 191 |
| 10 | 2.45 | 65 | 0.28 | 4 | 7.58 | 12.2 | 1.6 | 1.5 | 8.13 | 430.1 | 295 |
| 25 | 2.92 | 65 | 0.47 | 4 | 7.63 | 12.3 | 1.6 | 1.5 | 8.20 | 715.7 | 491 |
| 50 | 3.29 | 65 | 0.64 | 4 | 7.68 | 12.4 | 1.6 | 1.5 | 8.27 | 966.4 | 662.9 |
| 100 | 3.65 | 65 | 0.83 | 4 | 7.73 | 12.5 | 1.6 | 1.5 | 8.33 | 1244.2 | 853.5 |

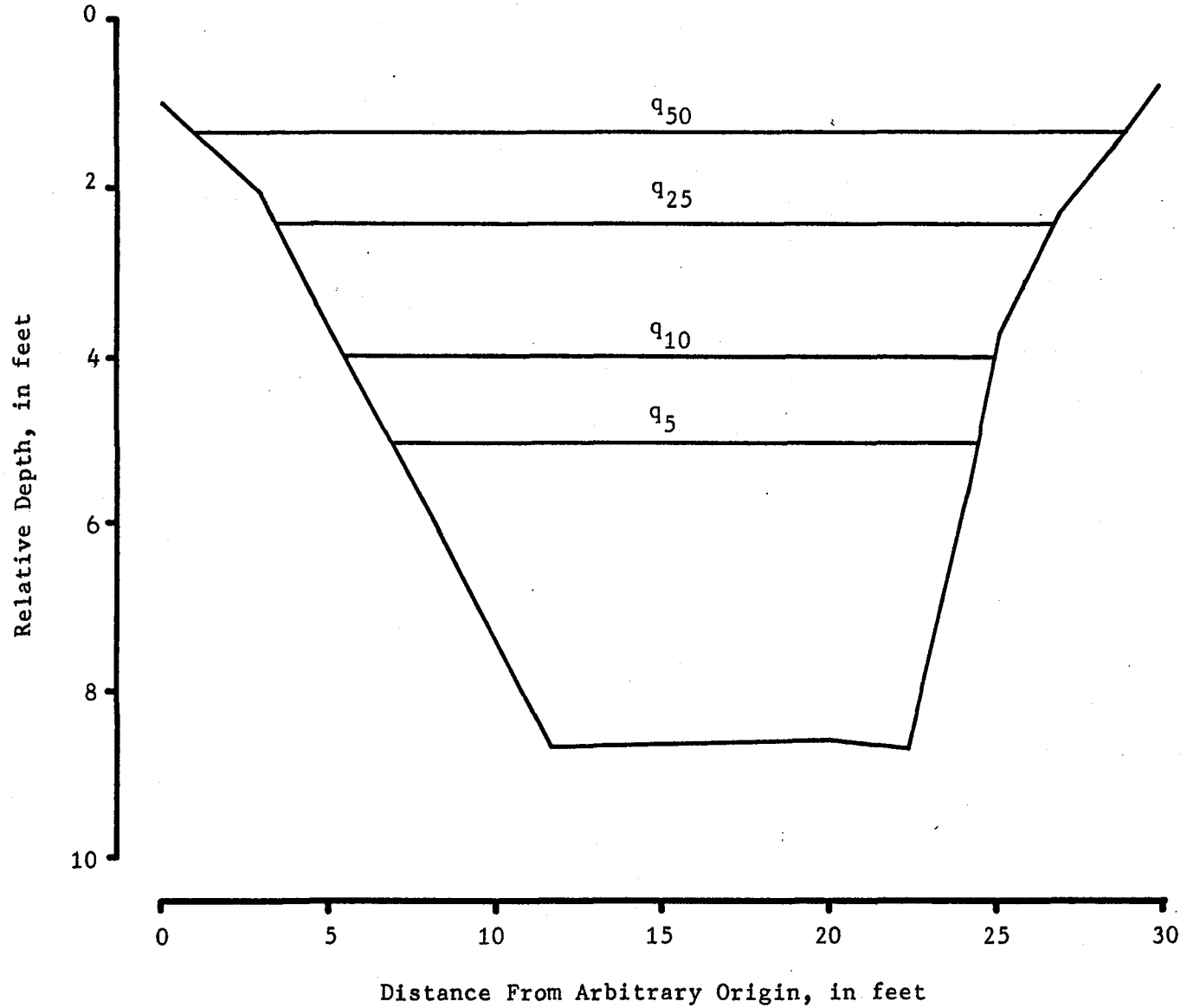


Figure 4. Flow depths in Mud Creek adjacent to proposed sedimentation pond resulting from 24-hour storms of various return periods.

discharge ponds indicates that no significant impact was expected by placing the ponds on the flood plain.

Hopefully this information will be sufficient to allow you to come to a decision. Please keep both myself and Valley Camp officials informed of the fate of the variance and whether or not you need additional information.

Sincerely,

Richard B. White

Richard B. White
Hydrologist

RBW/das

cc: Trevor G. Whiteside