Sediment Removal and Lake Rehabilitation Project

Dredge Material Disposal Facility Operation Plan

Lake Neshonoc Protection and Rehabilitation District
Lake Neshonoc, Wisconsin

SEH No. LAKNE9801.00

July 1998

SEH

Dredge Material Disposal Facility Operation Plan

Sediment Removal and Lake Rehabilitation Project

Prepared for:
Lake Neshonoc Protection and Rehabilitation District
Lake Neshonoc, Wisconsin

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July 2, 1998

RE: Sediment Removal and Lake Rehabilitation Project
Dredge Material Disposal Facility Operation Plan
Lake Neshonoc, Wisconsin
SEH No. LAKNE9801.00

Mr. Dave Pericak
Wisconsin Department of Natural Resources
3550 Mormon Coulee Road
La Crosse, WI 54601

Dear Mr. Pericak:

Enclosed are three copies of the "Dredge Material Facility Operation Plan" for the proposed 1 million cubic yard hydraulic dredging project at Lake Neshonoc. Included in this package is the application for the WPDES permit. We will be sending information on well and septic systems in the Shorewood Subdivision shortly. Please feel free to call me at (715) 720-6229 if you have questions concerning the information provided.

Sincerely,

Roger A. Clay

Roger A. Clay, P.E.
Project Manager

c: Buzz Sorge (letter only)
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Prepared for Lake Neshonoc Protection and Rehabilitation District

1.0 Introduction

The Lake Neshonoc Protection and Rehabilitation District (LND) proposes to dredge 1 million cubic yards of accumulated sediments from Lake Neshonoc. To accomplish this project the LND must construct a containment area or settling facility to receive and treat the sediment slurry discharged by a hydraulic dredge. The containment area will receive the sediment slurry, allow accumulation of the dredged sediment and allow settling to occur such that WPDES permit requirements are met for the carriage return water which will be discharged back to Lake Neshonoc.

Previous studies evaluated the benefits and costs of undertaking the project by lowering the lake and excavation the accumulated sediments with land-based equipment. The environmental and financial complications lead to the conclusion that hydraulic dredging was the preferred approach.

In order to obtain bids from a range of potential contractors there will be some latitude allowed in the selection of dredging equipment and schedule employed at the site. In general, it is anticipated a range of hydraulic dredging equipment will be allowed that would lead to a 2 year construction schedule for the project. Equipment and methods used will need to be balanced between providing the necessary production rate, managing the bulking of fines, meeting total suspended solid permit limits and preventing damage to nearby residents from groundwater mounding.

2.0 Containment Area

2.1 Location

Two locations are being considered for the containment area, both of which are on lands that are part of the La Crosse County Farm. The first, which is the preferred location, would involve construction of the containment area in the lower "bowl" portion of the county farm (Figure 1). This site, named Site A, has several advantages as follows: 1) The natural topography requires a containment berm to be built only on one side, 2) Close proximity to Lake Neshonoc minimizing the length of inlet and discharge pipes.

Disadvantages of Site A include the following: 1) Soils in the area may not be suitable or of sufficient quantity to construct the containment berm requiring fill to be brought in from adjacent parts of the La Crosse County Farm, 2) The capacity of the area may be insufficient to contain 1 million cubic yards of dredged material, bulking fine sediments will likely occur during hydraulic dredging and may cause the available containment space to be exceeded, (3) Groundwater mounding could increase costs due to close proximity to the Shorewood Subdivision, and 4) Potential for highly variable subsoils which would create difficult foundation conditions for containment area berms.

It is the intent of project to use Site A for the containment area. However, until soil boring data are obtained during final design, uncertainty exists in the containment area configuration which will ultimately be constructed. An alternative containment area is being included in the operation plan to allow greater flexibility during final design.

The alternative location, named Site B, involves construction of a containment area on the eastern end of the La Crosse County Farm (Figure 2). Site B would be used only on a contingency basis to contain sediment that would not fit in Site A and may not be used at all. Advantages of Site B include the relatively large capacity available and the greater separation distance to the Shorewood Subdivision. Disadvantages of Site B include: 1) Longer distance to Lake Neshonoc resulting in greater pumping and pipeline costs, 2) Greater elevation gain between the lake and Site B than occurs for Site A, 3) Soils with relatively low strength that are difficult to compact, and 4) Containment berms must be constructed on all sides.

The containment area configuration will be finalized during the final design stage. Regardless of which containment area configuration ultimately chosen, the construction sequence would be for the entire containment area to be constructed prior to the start of dredging. Construction of the berm(s) for either containment area could be accomplished while the dredge is mobilized and assembled at the site.

2.2 Site A

Site A involves building a single berm from hillslope to hillslope across the entrance of the old oxbow which forms the lower area of the La Crosse County Farm. It is anticipated the trapezoidal shaped berm would have 4h:1v side slopes and a top width of 10 feet. Preliminary, a finished elevation of approximately 740-feet is being considered which would be approximately 30 feet high from the toe of the outer side slope to top of berm. This layout would require approximately 250,000 cubic yards of fill to construct the berm. Berm dimensions will be finalized during final design. A top elevation of approximately 745-feet may be required to provide the needed capacity. Material to construct the berm would be excavated from within the containment area such that the floor of the containment area would lie between an elevation of 705 to 710 feet. If insufficient material is available within the bottom of the bowl then fill would be brought in from adjacent areas of the La Crosse County Farm.

2.3 Site B

Site B would involve construction of an irregular shaped containment area in the southeast corner of the La Crosse County Farm. The containment area shown in Figure 2 would hold 1 million cubic yards. If a smaller containment volume was needed at this location the western extremity of the containment area would be moved east. As shown on Figure 2, for a containment site that holds 1 million cubic yards of lake sediment, the berms at Site B are up to 20 feet high and would have a finished elevation of approximately 770-feet. The trapezoidal shaped berms would have 4h:1v side slopes and a 10 foot wide top. Fill for the berms would be obtained from within the containment area which would have a floor elevation of approximately 746-feet. These berms could require approximately 450,000 cubic yards of fill to construct.

3.0 Discharge Characteristics

3.1 Design Flow Rate

It is anticipated that a hydraulic dredge in the range of 12 to 16-inch size would be utilized to complete the project. Average anticipated operating flow rates would range from 4000 to 7500 gallons per minute, depending on the dredge employed. The maximum flow rate would be 10,000 gallons per minute.

Site specific soils data will be obtained for the containment area during the final design for the project. Accurate estimation of seepage rates from the containment area to groundwater cannot be made until the site specific soils data are acquired. Fine sediments dredged from Lake Neshonoc likely will plug the native soils and reduce seepage rates over time. The relatively thick layer of accumulated dredged sediments that will occur during the project (up to approximately 30 feet deep) will also further diminish the seepage rates over time at the containment area. Assuming a permeability of 0.1 inches per hour for the accumulated sediments, seepage rates would be on the order of 2 million gallons per day for Site A, which would be approximately 25 percent of the anticipate average inflow rate of 7500 GPM for the largest dredge being considered for the project.

The use of booster pumps may be required depending on the total length of discharge pipe, final top of berm, and size of the dredge pump. Booster pumps, if needed, will be placed along the pipeline route and set on the ground. The exact location will be determined by the contractor but would avoid areas of environmental concern identified during the environmental review process.

3.2 Site A Discharge Configuration

Site A would be operated such that the inflow line could be directed to any part of the containment area to ensure all available space could be utilized. This would be accomplished by having a temporary above ground pipeline that could be moved to the desired inflow location. The inflow point would be adjusted to allow infilling to be relatively uniform throughout the containment area. One portion of the containment area will not be completely filled before the inflow is directed to another part of the containment area. The inflow pipeline may terminate on a barge within the containment area to allow the discharge point to easily be moved to the desired location.

There would also be two outflow weirs which would be located at the north and south ends of the containment berm. One outfall would be operated at a time with the outfall providing the greatest amount of settling for a given inflow point being used. Temporary pipelines laid on the ground would carry the carriage return water back to Lake Neshonoc via an existing access road.

3.3 Site B Discharge Configuration

Site B would be operated such that the temporary above ground inflow pipeline would enter the northeast corner of the containment area. The outfall would be located on the eastern extremity of the containment area and would discharge down the hillside to the lower oxbow portion of the county farm and onward via a temporary above ground pipeline to Lake Neshonoc. To improve settling in the containment area the sediment slurry would be forced to flow around a secondary berm before the treated water would reach the outfall. Infilling of the containment area would begin near the inflow point and gradually move towards the outlet as the containment area fills.

4.0 Operation

Operation of either containment area would be similar. The following discussion provides details of anticipated operation measures that will occur at the containment area.

4.1 Water Depths and Settling

It is anticipated approximately 3 feet of clear water will be maintained above the accumulated sediments to provide settling. The water level will gradually rise in the containment area as infilling occurs.

There would be 3 feet minimum of freeboard provided at all times. It is anticipated that dredging would continue through most rain storms, except those with lightening, strong winds, or extremely high rainfall amounts. Site A has a contributory watershed of approximately 50 acres, including direct precipitation on the containment area (Figure 1). For Site B, only direct precipitation will enter the containment area. It will be necessary for the operator to monitor the rate water levels rise in the containment area during rain storms and adjust the outlet control structure to provide more ponding as needed to ensure discharge limits for total suspended solids are met.

A flocculant will be used to enhance the rate of settling. Testing of flocculants has been completed, the results of which are found in Appendix A. It is anticipated that Calgon Cat Floc L, or other flocculant of similar formulation, would be used. The incoming sediment slurry will be approximately 20% sediments, which corresponds to 200,000 parts per million (ppm) total suspended solids. Through settling and the use of a flocculant the effluent discharged to Lake Neshonoc would meet the 80 ppm discharge limit, which represents a treatment efficiency greater than 99.9%.

4.2 Hours

To allow the operator flexibility it is assumed the hydraulic dredge would be operated 7 days a week for 24 hours. Since typically there is down time each day to move the dredge or for other need it is anticipated that the dredge would operate 18-hours per day on average. Operation may occur during the April to November period between the end of snowmelt in the spring and freeze up in late fall. It is also anticipated the dredging project will last for 2 years with a shut down occurring over the intervening winter period.

4.3 Groundwater Management

Neither containment area would be lined and thus it is anticipated some of the discharge water would seep into the ground. A groundwater mound may occur under the containment area. Such a mound may extend laterally away from the containment site and potentially would require management actions to protect nearby residences, water supply wells, and septic systems. A conceptual groundwater management plan has been prepared which will be finalized prior to start up (Appendix B). Groundwater management actions which may be used during the project are described in this plan.

4.4 Seepage Management

Measures to control seepage through the embankments will be included in the design. Seepage control measures being considered at this time include a toe drain, drain tile, or cutoff wall. Seepage control measures to be constructed will be determined during final design for the project.

4.5 Sediment Characteristics

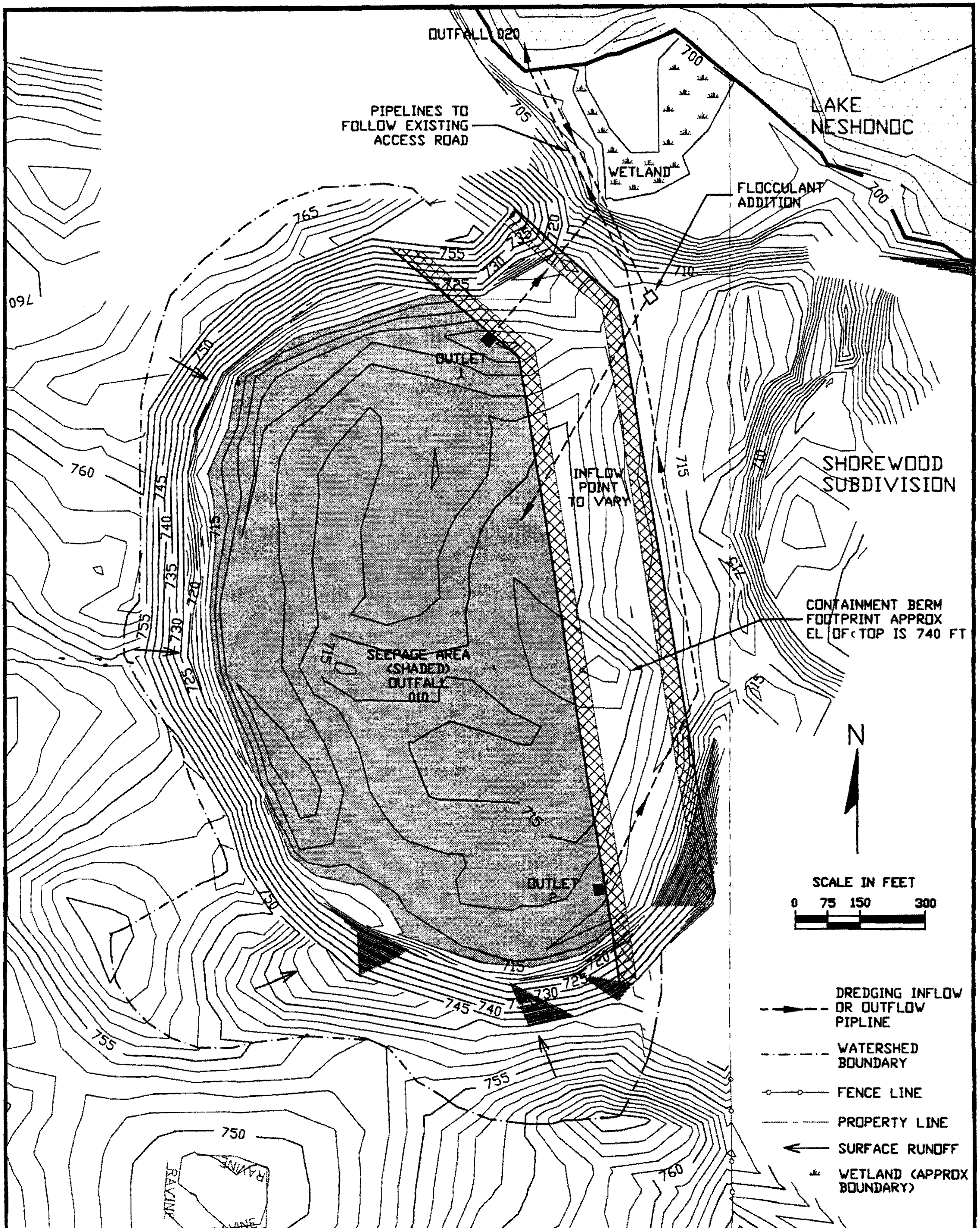
Results of physical, chemical and settleability tests are found in Appendices C, D and E respectively.

5.0 Proposed Dredge Cut

A preliminary layout of the proposed dredge cut in Lake Neshonoc is depicted in Figure 3. It is presently proposed that the dredging project be a combination of a sediment trap where the La Crosse River enters Lake Neshonoc, boat channels to allow boat traffic to proceed to the head of the lake and fishery enhancement channels along the north and south shores of the lake. It is presently anticipated that dredging would primarily be within the eastern half of the lake between the public boat landing on the south shore of the lake and inflow point of the La Crosse River. The proposed area to be dredge lies in relatively close proximity to the La Crosse County Farm where the containment area will be constructed.

6.0 WPDES Permit Application

Appendix F contains the permit application for WPDES Permit Number WI-0046558-2 which is needed for the proposed hydraulic dredging operation.



SEH

LAKE NESHONOC SEDIMENT REDUCTION PROJECT
PROPOSED SITE A CONTAINMENT AREA
(PREFERRED CONTAINMENT AREA)

FILE NO. LAKNE9801

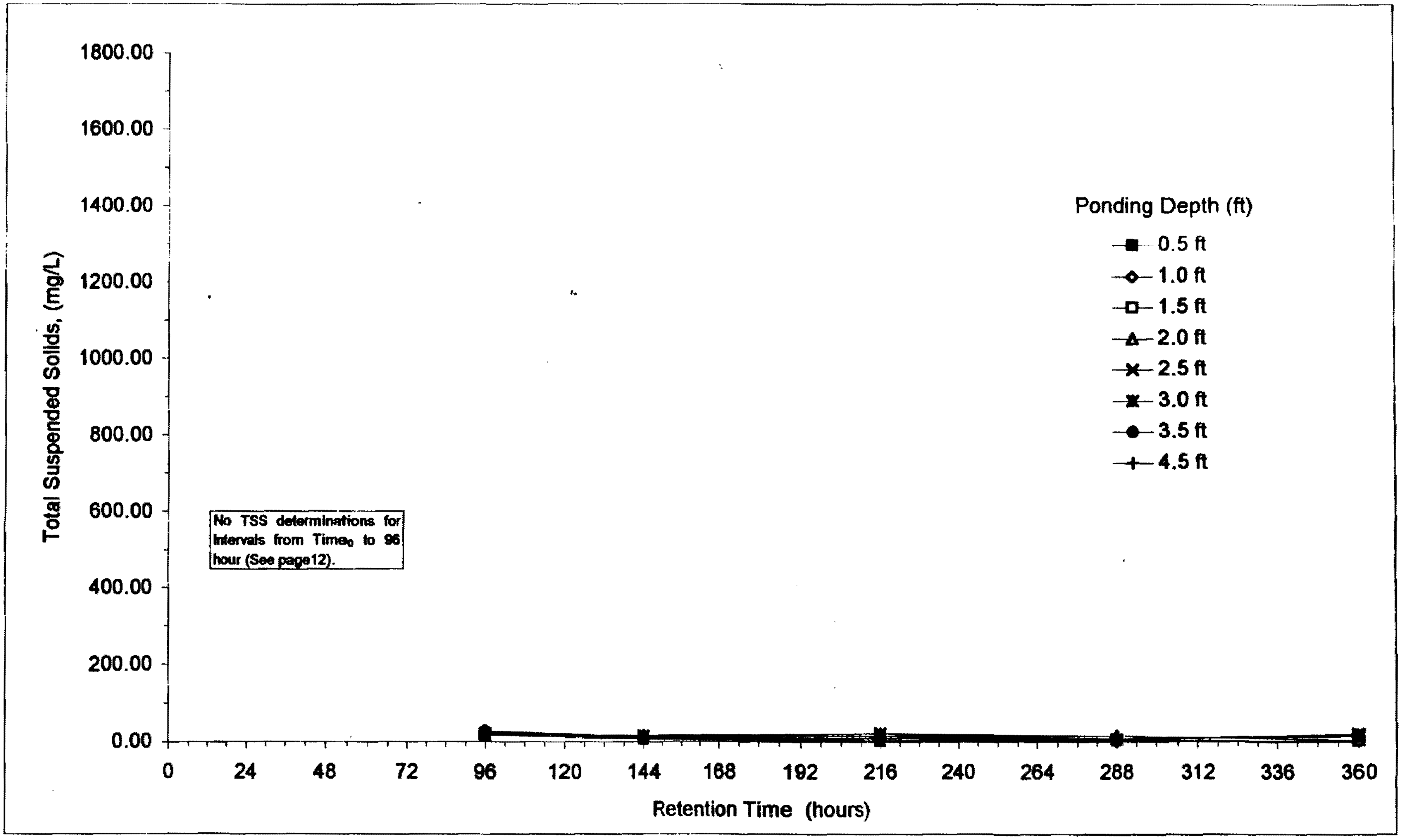
DATE 6/30/98

FIGURE 1

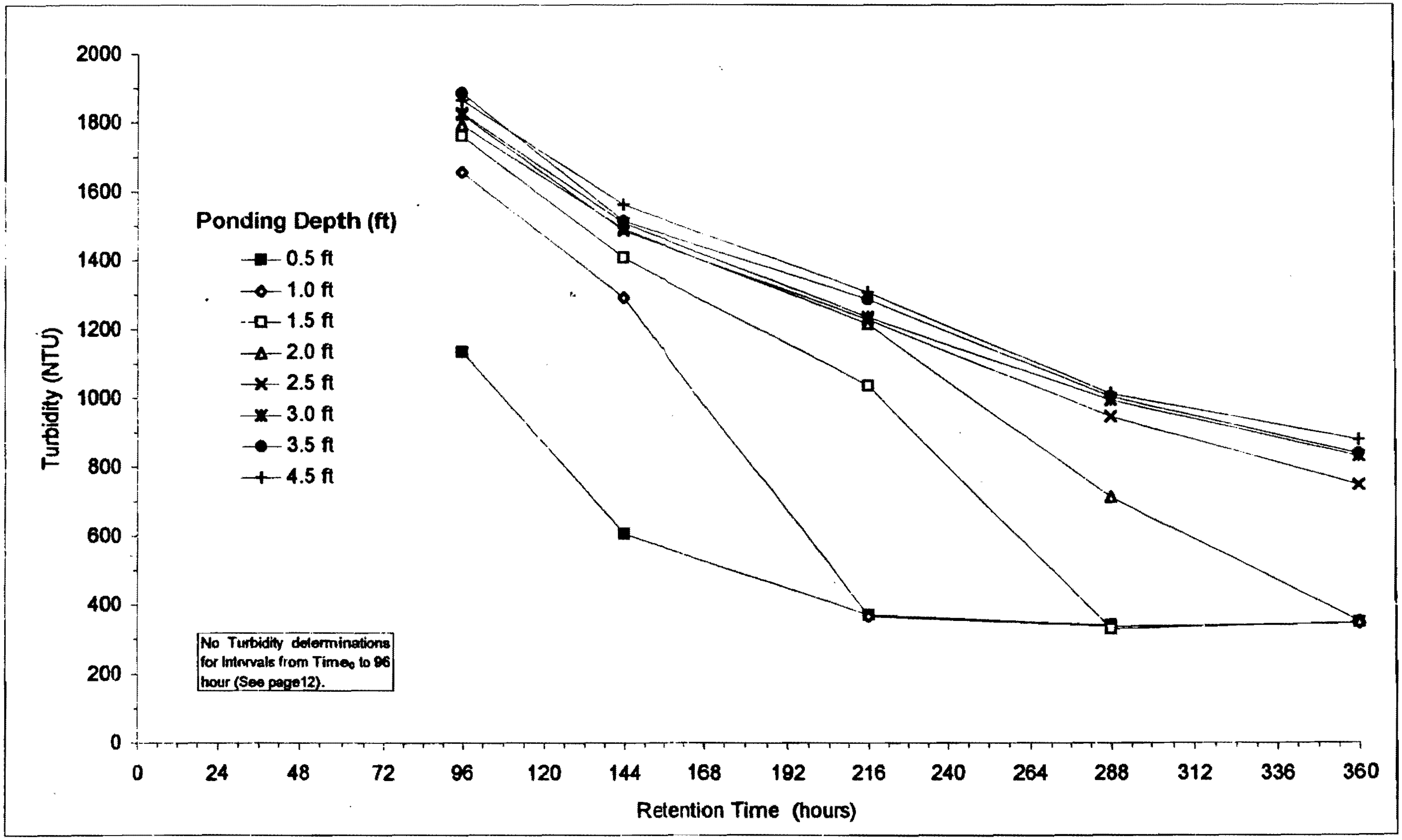
DRAWING FILENAME: PROPSITE.DWG
DRAWING DIRECTORY: E:\WATER\LAKNE
CURRENT/PLOT DATE: 06/30/98
CURRENT/PLOT TIME: 10:21 AM
CURRENT OPERATOR: DOYLE

SEH: Lake Neshonoc
Column Settling Analyses

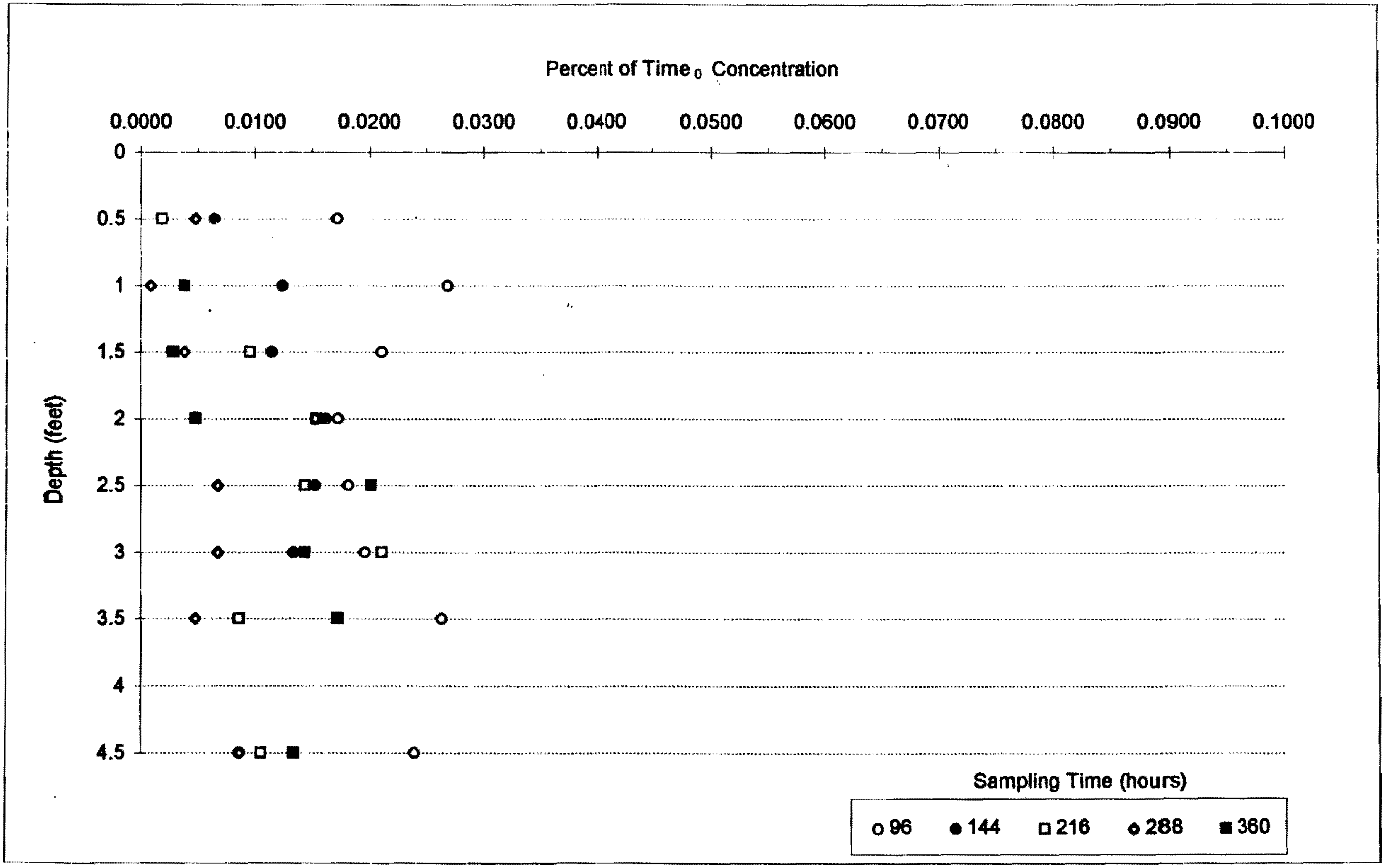
Graph 1: Retention Time vs. Total Suspended Solids



Graph 2: Retention Time vs. Turbidity

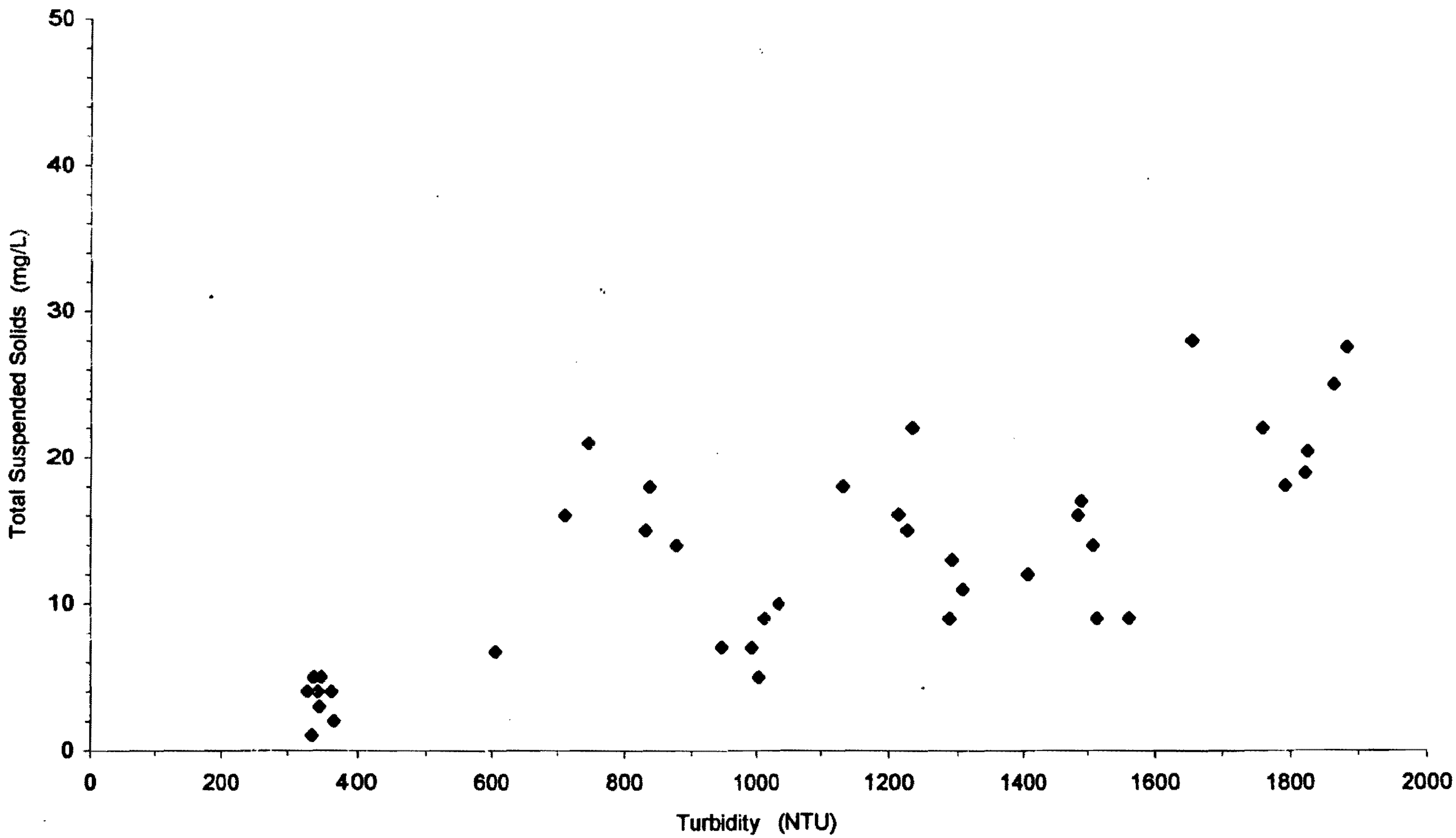


Graph 3: Concentration Profile[1]

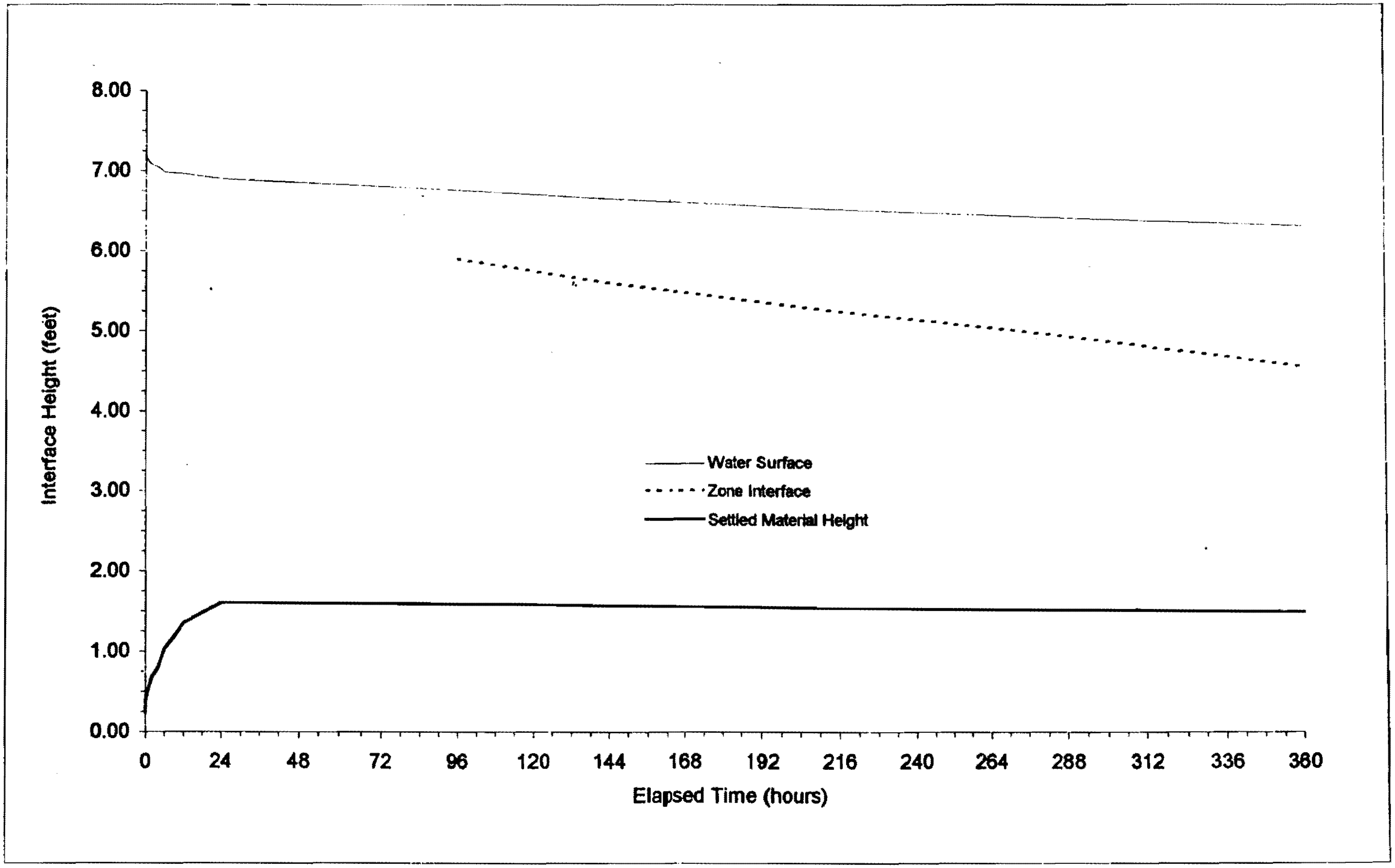


[1] Concentration percentages plotted from 96 to 360 hour interval only. (See Page 12).
Concentrations percentages based on Time$_0$ Concentration of 104 g/L.

Graph 4: Turbidity vs. Total Suspended Solids



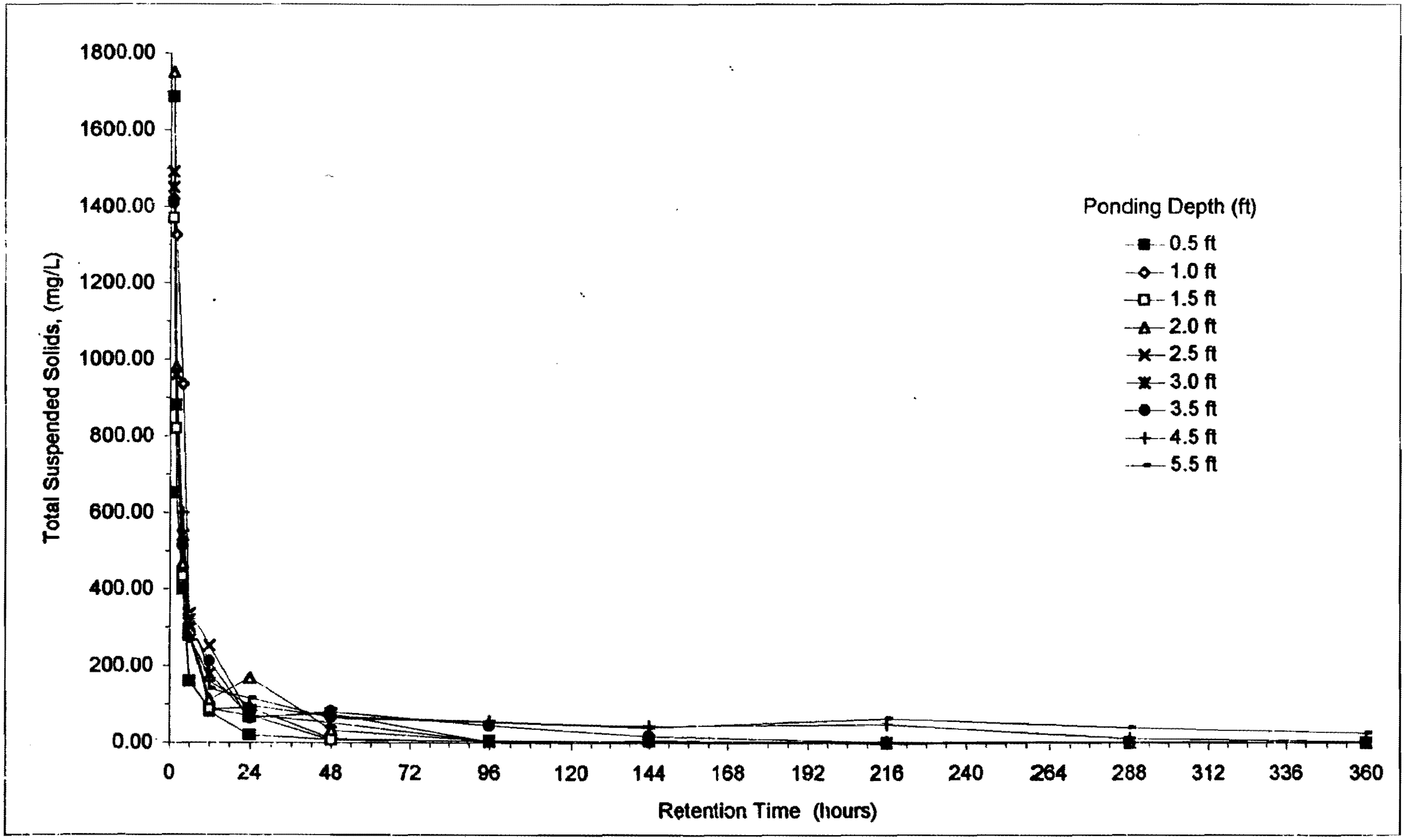
Graph 5: Elapsed Time vs. Interface Heights [1]



[1] Apparent decrease in water surface height reflects cumulative volume loss due to sample extractions.

SEH: Lake Neshonoc
Column Settling Analyses

Graph 1: Retention Time vs. Total Suspended Solids



Appendix B

Preliminary Groundwater Mounding Management Plan

Preliminary Groundwater Mounding Management Plan

Introduction

The Lake Neshonoc Sediment Reduction Project will involve hydraulic dredging which requires a large quantity of a slurry composed of sediment and water to be pumped through a sediment containment area. Some of the water entering the containment area will infiltrate into the ground and raise the water table underneath and adjacent to the containment area creating a groundwater mound. The purpose of this Groundwater Mounding Management Plan (GMMP) is to define a range of control measures which could be taken during the course of project construction to ensure groundwater mounding does not cause adverse offsite impacts. Presently the main area of concern is the Shorewood Subdivision that is adjacent to the east side of the La Crosse County Farm. Once soil borings have been obtained and monitoring wells installed additional areas of concern may be identified. This GMMP will be updated and finalized after soil borings have been obtained, monitoring wells installed, final design is completed and the bid process has been concluded. The contractor chosen to construct the project will prepare the final GMMP.

Surveillance

Observations of groundwater levels will be the first means of managing groundwater level. Several monitoring wells will be installed prior to beginning of construction along the perimeter of the containment area to allow tracking of the extent of the groundwater mound. Water levels in the monitoring wells will be checked once a month for three months prior to the beginning of dredging. When dredging begins the monitoring frequency will increase dramatically. It is anticipated that initially groundwater levels will be monitored daily when dredging begins. Relatively soon, after approximately two weeks of dredging, it is anticipated the monitoring frequency may be adjusted according to the rate of water level change that is observed. For instance, if water levels are observed to change relatively slowly, then less frequent sampling will be completed. If groundwater levels are rising relatively rapidly and water levels have risen to an elevation where there is a concern for an adverse impact offsite, then more frequent sampling may be completed. It is likely that after the initial start up period different wells would be monitored at different frequencies such that the monitoring frequency of a particular well reflects the rate of groundwater level change at that well.

The second aspect of surveillance relates to knowledge of facilities off site which may be at risk. Surveys have been conducted which have located private wells and drain fields at homes in the Shorewood Subdivision that are adjacent to the project site. In addition to this information, elevations of first floor or walkout have been obtained for the same residences. Septic system plans have been obtained from La Crosse County. This information on private facilities immediately adjacent to the east side of the containment area will allow decisions to be made on groundwater management measures needed to protect these facilities during project construction.

Management Measures

The following describes alternative groundwater mounding management measures which may be taken alone or in combination to control mounding at the project site:

Drain Tiles

A drain tile system may be incorporated into the containment area design that passively controls groundwater levels to a level that will prevent offsite impacts in the Shorewood Subdivision. Some options for the drain tile system would include having tiles under the containment area, having a tile system between the containment area and the Shorewood Subdivision or a combination of these two.

Dewatering Wells

A dewatering well system may be incorporated into the containment area design that can be activated as needed to control the extent of groundwater mounding. The dewatering well system may consist of shallow well points that isolate an area of concern or it may consist of high capacity dewatering wells design to control groundwater levels over a larger area. In either case, it would involve placing dewatering wells between the containment area and the Shorewood Subdivision.

Limiting Time of Operation

In general it is anticipated that the hydraulic dredging operation can proceed on a 24-hour basis for seven days a week. If necessary the hours of operation may be curtailed to reduce the amount of water flowing through the containment area. The curtailment could involve actions such as running only 16-hours per day (two shifts versus three), or in an extreme case the operation could be completely shut down until the appropriate measures were taken to protect off site facilities from groundwater mounding.

Note: Since approximately half the material to be dredged from Lake Neshonoc are fine sized sediments it may be that the bottom of the containment area becomes plugged with these sediments. The rate of infiltration would be drastically reduced by such plugging and groundwater mounding would become less of a concern.