S U R F A C E W A T E R

M A N A G E M E N T P L A N

F O R

T H E C I T Y O F P I N E S P R I N G S

Presented by
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Consulting Engineers
Under the direction of the Pine Springs City Council
December 1981

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Pine Springs City Council
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INTRODUCTION

Management of surface water runoff is an important governmental function designed to prevent property damage caused by flooding and erosion, and to preserve environmental balances as urbanization develops. Management of surface water runoff necessarily extends across municipal boundaries. The 4.6 square mile area of the Long Lake sub-area watershed, for example, includes all of the City of Pine Springs, portions of the cities of Oakdale, No. St. Paul, White Bear Lake, Mahtomedi, and a portion of Grant Township. The Long Lake Watershed shown in figure #1 is a sub-area of the Valley Branch Watershed District which empties into the St. Croix River. The Valley Branch Watershed District is a governmental agency created and empowered under State Statute to deal with surface water management in multi-jurisdictional situations.

The two principal sources of surface water runoff are summer rainstorms and spring snowmelt. Even though the floods of 1965, 1975, and 1978 bring to mind the results of heavy rainstorms, the Valley Branch Watershed District considers the spring snowmelt to be more critical because of the frozen ground and the 100 percent runoff. For this reason, the Valley Branch Watershed District has adopted the spring snowmelt as the principal design criteria for surface water management planning, and has established the basis of 7.2 inches of surface water runoff in 10 days of snowmelt. The probability of the occurrence of such an event is considered to be once in one hundred years.

While the 100 year event snowmelt has a potential runoff of 19.4 cubic feet per second per square mile of watershed, the Valley Branch Watershed District "Minimum Safe Design System" suggests a discharge rate of only 4 cubic feet per second per square mile as being the most cost effective approach to planning a surface water management system. Thus the need for an extensive system of ponding areas for temporary retention of the excess surface water runoff is apparent.

In local areas within the watershed, the rate of runoff may vary widely because of local topography. Within Pine Springs there are many local ponding areas that have been preserved rather than filled as development occurred. This practice has reduced the potential for downstream flooding. The entire Long Lake sub-area watershed is blessed with a generous share of natural and man-made pondinq areas, and wetlands. Pine Springs is committed to tie preservation of those areas within its municipal boundaries, and will rely on the Valley Branch Watershed District to insure the preservation of pondinq areas in other communities. Such action is necessary to minimize development impact on Long Lake and other water courses within the City of Pine Springs.

GOAL

The City of Pine Springs has developed and maintained a safe, comprehensive, and cost effective surface water management system which will minimize runoff and erosion to Long Lake and lower elevations in the Valley Branch Watershed District.

POLICIES

The City of Pine Springs has effectively utilized desirable surface water management practices in all of the City's developments to date. The following policies are the basis for the developments in place and shall remain in effect.

1. The City has identified and designated by obtaining easements of those areas of wetlands where development will be prohibited or restricted in order that these areas retain their natural water containing functions.

2. The City has established normal and flood stage elevations for all pondinq areas in order to create water storage capability. Building below these elevations is prohibited.

3. Open ditches are used to handle water flows wherever possible.

4. Developers of new sites or plats are required by development contracts to plan and install the proper sized ponds and drainage structures before development takes place.

5. All developments are required to comply with the surface water management plans of both the City of Pine Springs and the Valley Branch Watershed District.

IMPLEMENTATION

The City of Pine Springs, by its plat approval process, has been very successful in preserving its natural ponding areas. Figure #2 illustrates the locations of existing pending areas within the City. It is noted that the aggregate water storage capacity of the ponding area is over half the area of Long Lake itself, and the combination of Long Lake and the ponding areas represents a considerable portion of the total area of the City. Pine Springs has storage capacity well in access of the 100 year event criteria. This gives perspective to the utility of preserving ponding areas in the Physical Plan.

The ponding areas in Figure #2 are permanently designated within approved plats. Developers and subsequent land owners are not free to alter these ponds without the approval of the City and the Valley Branch Watershed District. These pondinq areas and water courses represent the Physical Plan for the area east of Long Lake, and no changes are expected. This east area has never contributed runoff to Long Lake, and the policy of the City is to maintain this status. Table #1 prepared by Short-Elliott-Hendrickson, Inc. Consulting Engineers, outlines criteria for 10 ponds in the WinMar development area. This table shows there is not enough runoff to Ponds #1 A & #1B from the development area within the City to raise the level from the normal level to the ponding easement level 955.00 MSL. Runoff (if ever) sufficient to cause discharge from the outlet of Pond #1B will come as a result of changes to property lying east and north of Pine Springs, specifically from Grant Town and/or Mahtomedi. Fortunately, there are a number of marsh and pond areas on these properties, which if properly utilized, will limit their discharges to the ponds shown to be available to them in Table #1.

Table #2 includes the areas and elevations of ponds #11 through #18 which are all within the development area of Pinehurst. The Pinehurst storm drainage plan which was prepared by Bannister-Short-Elliot- Hendrickson and Associates was designed for containing all runoff from a 100 year event within this development area.

Table #3 includes ponds #19 through #23 was prepared by Kurth Surveying Inc. for the Pine Plantation Development area located south of State Highway #36.

The Physical Plan for the west side of Long Lake which includes portions of White Bear Lake, Mahtomedi, and Oakdale is only partially complete. The completed portion is that provided by the Minnesota Highway Dept. as part of the construction of the interchange between State Hwy #36 and Interstate 694. Drainage facilities constructed by the Highway Department adequately handle the runoff from this area and the Highway right of way.

The uncompleted portion of the Physical Plan for the west side of Long Lake is a sub-area of somewhat less than one square mile within the Cities of Mahtomedi, Oakdale and Pine Springs. This area drains into Long Lake at a point just north of the NSP transmission lines. This sub-area is relatively undeveloped at the present time, but never-the-less has eroded a deep ravine at the point where its runoff enters Long Lake. As this sub-area develops, runoff rates will increase and aggravate the problem. No physical plans have been submitted for development of this area as yet, but it is clear that a drainage structure will be required to conduct this runoff under Oakdale Drive and down the steep slope into Long Lake. Future upstream developers in Mahtomedi and

Oakdale are logically responsible for the funding of these needed structures. Present Valley Branch Watershed District policy requires that any development in this area will have to limit the rate of runoff generated.

The existing outlet from Long Lake leading south to Lake DeMontreville is a 15 inch pipe which under normal conditions maintains the level of Long Lake at 937.5 MSL. This outlet is woefully inadequate to meet the Valley Branch Watershed District design criteria. The Watershed District plans to install a 36" diameter outlet as part of its "Main Stem Project", which is currently in the design stage. The proposed plan will raise the projected flood level of Long Lake to 943 MSL, which will unfortunately flood two homes, raise the lake level well above developed residential shorelines, and cause serious erosion to steep banks on the east, west, north and south shores of the Lake. In addition, this elevation of 943 MSL will bring the Long Lake level laterally within inches of the westerly driving lanes of State Highway #36. The City Council of Pine Springs maintains that the maximum design elevation of Long Lake be set at 939 MSL to avoid the aforementioned problems. The City has requested and will continue to request that the Valley Branch Watershed District amend its design levels for Long Lake and appropriately resize the lake outlet to correspond with the reduced level. In addition, to provide the North section of Long Lake adequate volume and rate relief, the culvert under Viking Drive from the north to the south sections of the Lake will likely have to be increased.

The implementation of the remaining portions of the Physical Plan will be effectuated through the Valley Branch Watershed District. Except for the construction of the outlet of Long Lake, the timing of these future structures and facilities will be dependent on the pace of development in primarily the Cities of Oakdale and Mahtomedi. It is presumed that the cost of all drainage facilities necessitated by new construction he born by the developers of the benefitting properties without regard to municipal boundaries.

Management of surface water runoff in Pine Springs is a function designed to prevent property damage due to flooding and erosion and to preserve environmental balance as urbanization takes place.
Ninety-six percent of the City of Pine Springs has already been platted and is being developed with the goals and policies of this plan. The many natural ponding areas within the City have been preserved rather than filled as development occurred, thus reducing the potential of downstream flooding.

The City of Pine Springs has demonstrated sound practices in surface water management and shall continue to do so in the future.

Maps

Figure #1 – Long Lake Watershed

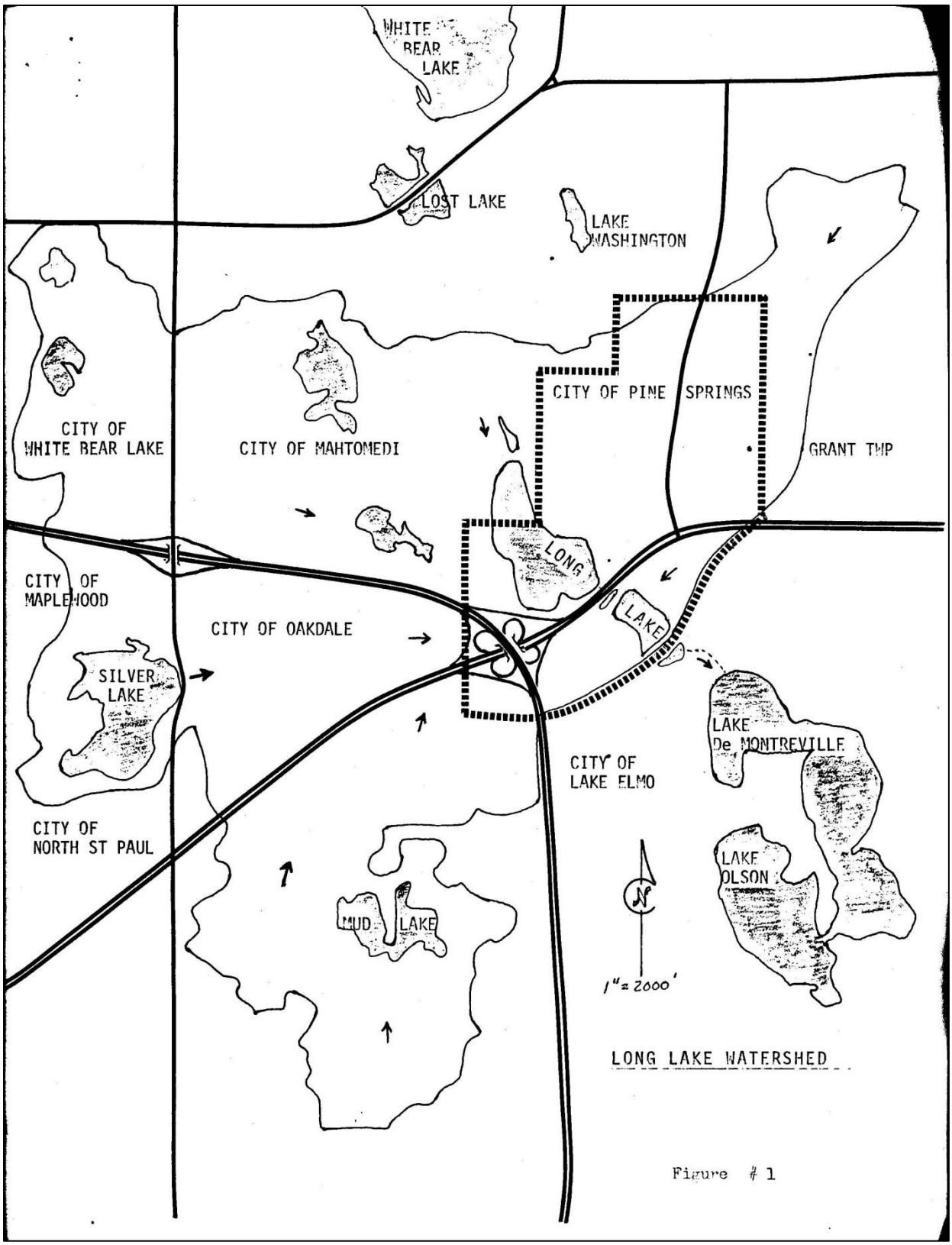

Figure #2 - Pine Springs Designated Ponding Areas

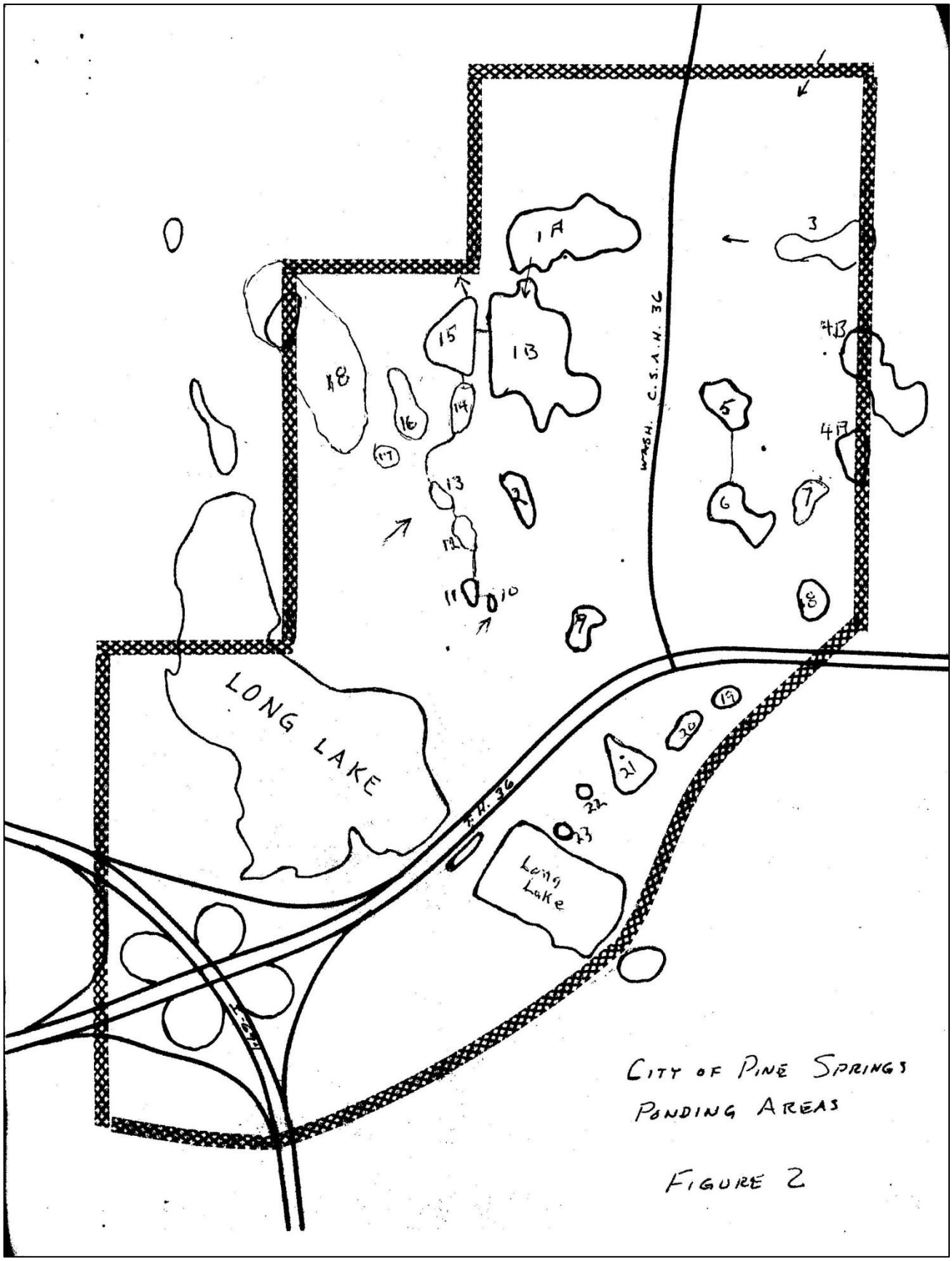

TABLE I

POND STORAGE TABULATIONS

POND NUMBER	1	2	3(6)	4(6)	5	6	7	8	9	10	TOTAL
TRIBUTARY AREA (A)	146.0(5)	20.0	10.8	9.5	22.0	33.4	5.5	4.0	9.9	6.7	267.8
NORMAL WATER LEVEL(1)	950.1	943.5	973.9	975.5	944.8	944.6	967.0	969.1	957.0	957.0	-
PONDING EASEMENT ELEV.	955.0	952.2	976.0	982.5	951.0	952.7	970.0	977.0	968.0	960.0	-
AVAILABLE STORAGE (A-F)(2)	103.1	15.0	5.4	16.0	16.5	28.2	1.0	3.0	5.3	0.5	194.0
100 YR VOLUME (A-F)(3)	73.0	10.0	5.4	4.8	11.0	16.7	2.8	2.0	5.0	3.4	134.1
100 YR VOLUME PLUS OVERFLOW (A-F)	73.0	10.0	5.4	4.8	11.0	18.5	2.8	2.0	5.0	3.4	
EXCESS STORAGE PROVIDED ABOVE 100 YR (A-F)	30.1	5.0	0	11.2	5.5	9.7	0	1.0	0.3	0	62.8
STORAGE AVAILABLE TO PROPERTY TO THE EAST (A-F)	30.1	0	0	11.2	0	0	0	0	0	0	41.3
REQUIRED TEMPORARY STORAGE (4) (A-F)	21.0	4.0	1.6	1.4	3.2	4.8	0.8	0.6	0(7)	1.0	38.4
OUTFLOW FROM 100 YR (A-F)	0	0	0	0	0	0	1.8 to Pond #6	0	0	2.9	2.9

(1) Normal water level is defined as the highest recorded water level in the past year. Levels were recorded 11/76, 6/17/77, 9/16/77 and 10/21/77.

(2) Available storage is computed between the normal water level and the ponding easement level.

(3) Based on six inches of runoff over tributary area.

(4) Calculated from Valley Branch Watershed District Water Management Plan. Used percent of sub-watershed area times 120 A-F.

(5) Includes area within plat plus about 34 acres from the north.

(6) Computed within Winmar Estates only.

(7) Pond #9 is not within the sub-watershed which requires storage.

Data prepared by

Short-Elliott-Hendrickson, Inc.
Consulting Engineers

City of

TABLE 2

PONDS IN PINEHURST DEVELOPMENT AREA

Pond number	Area in Acres	Normal Elevation	Flood Elevation	Minimum Building Elevation
11 (1)	0.4	960.0	962.0	964.0
12 (8)	0.8	946.0	952.0	957.0
13 (3)	0.7	946.0	949.3	957.0
14 (2)	0.5	948.1	952.0	957.0
15 (7)	3.1	947.8	949.1	957.0
16 (4)	1.4	940.0	948.0	955.0
17 (5)	0.2	945.0	948.0	955.0
18 (6)	3.2	932.0	940.0	951.0

(1 - 8) Original numbers of ponds

Data prepared by

Bannister-Short-Elliot-
Hendrickson and Associates

Table #2 - Ponds #11 thru #18 Pinehurst Development

WATER STORAGE - PINE PLANTATION (Proposed)
CITY OF PINE SPRINGS - WASHINGTON COUNTY, MINNESOTA

For purposes of computation, the following assumption is made:

Snow melt on frozen ground to give 9", or 0.75 foot of water. No evaporation or ground water flow figured.

N = Area designation Number
D = Water tributary, in Acres (Planimetered)
A = Acre-feet of storage necessary from Tributary D x 0.75
T = Total Acre-feet - Previous E + A
H = Spillover elevation (from Topog) on pond height
S = Storage available in Acre-feet (Planimetered)
E = Excess spillover to next pond, in Acre-feet

N	D	A	T	H	S	E
1	1.0	0.75	0	971	0.29	0.46
2	0.4	0.3	0.76	971	0.18	0.58
3	1.4	1.04	1.62	963	1.28	0.34
4	2.5	1.88	2.22	961	1.07	1.15
5	4.5	3.38	4.53	961	13.70 *	---
6	15.0 on site	11.25	0	950 }		
6	11.0 hwy.	8.25	0	950 }	21.05	---
7	0.9	0.68	0	967	1.2 **	---
8	1.1	0.82	0	963	1.47 ***	---
9 & 10	To Long Lake, per Mn. Hwy. Dept. R/W					
11 & 12	Directly to Long Lake, per Soo Line R. R. R/W					

* Storage capacity at elevation 956
** Storage capacity at elevation 963
*** Storage capacity at elevation 960

Data prepared by
Kurth Surveying Inc.