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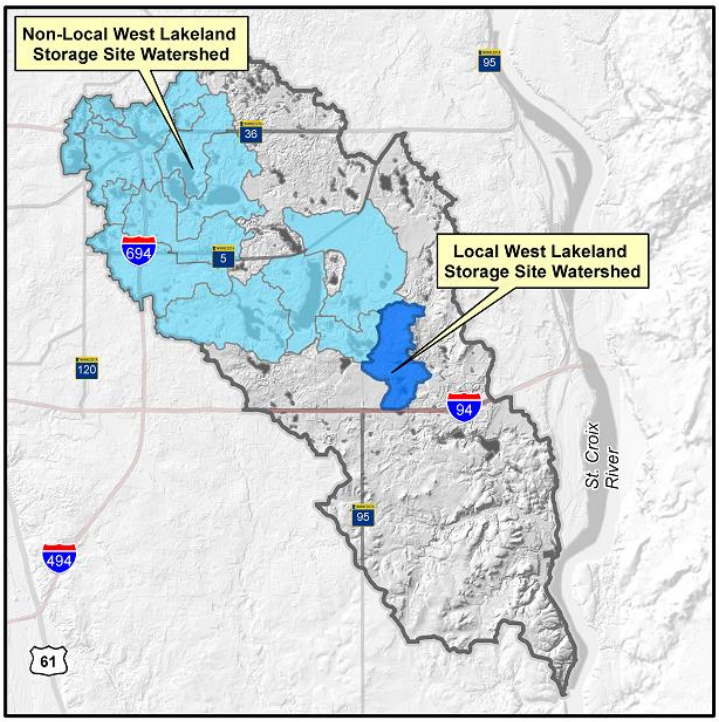
5.16 West Lakeland Storage Site Watershed Management Plan

5.16.1 General Information



West Lakeland Storage Site Local Watershed Information	
Tributary Area (acres)	1,139 (local, 16,171 total)
MDNR-Designated Basins within Watershed	82-0488W
Downstream Watershed	Rest Area Pond (can overflow to Fahlstrom Pond)
West Lakeland Storage Site Information	
MDNR Designation	82-0488W (north basin)
Surface Area (acres)	North Basin: 5.9 at El. 865.2; Middle & South Basins: 20.9 at El. 860.9
Mean Depth (feet)	Not calculated
Maximum Depth (feet)	Not calculated
Volume Below Discharge Elevation (acre-feet)	Not calculated
Discharge Elevation	864 (North Basin), 861.03 (Middle & South Basins)
Outlet Type	36-inch diameter RCP at South Basin
MDNR Ordinary High Water Level (OHW)	None Established
100-Year Flood Level	872.7 North Basin, 871.8 South Basin
VBWD "Allowable Fill" (cubic yards/lineal foot of shoreline) (See Section 4.7.)	0.9
VBWD Water Quality Priority Category	Stormwater Pond

The West Lakeland Storage Site consists of three depressions (north, middle, and south) located west of Neal Avenue North (CSAH 71), between I-94 and 10th Street North, in West Lakeland Township. Figure 5.16-1 shows the local West Lakeland Storage Site watershed. The entire local watershed is within West Lakeland Township.

Since Horseshoe Lake flows into the West Lakeland Storage Site, the total tributary area to West Lakeland Storage Site is much larger than the local watershed (16,171 acres instead of 1,139 acres). In a severe storm, stormwater from Interstate 94 will also back up into West Lakeland Storage Site. Therefore, parts of ten other communities can drain to the site.

Approximately half of the local watershed is occupied by residential land use, which is evenly scattered throughout the watershed. Some agricultural land use is located north of CSAH 10 and east of CSAH 15 (Manning Avenue). The remaining portions of the local watershed are undeveloped. West Lakeland Township's land use plan shows rural or large-lot residential development (2.5 acre lots) throughout the tributary watershed by 2030. Figure 5.16-2 shows the current (2010) and estimated future

(2030) land use of the local West Lakeland Storage Site watershed.

Use of the West Lakeland Storage Site is for floodwater detention and retention, water quality treatment, and sedimentation. The current recreational use of the three ponds is primarily aesthetic viewing by area residents and motorists on Neal Avenue North (CSAH 71). There is no public access to the ponds.

5.16.2 Water Quality Management Plan

The VBWD classified and will manage the ponds of the West Lakeland Storage Site as Stormwater Pond waterbodies (see Section 4.1 – Water Quality). This is consistent with the 2005 Plan and the 1995 Plan, in which the VBWD designated the West Lakeland Storage Site as a stormwater pond.

The VBWD water quality guidelines for Stormwater Ponds, including West Lakeland Storage Site, are related to maintaining the designed function of the water body.

Specific water quality implementation tasks for West Lakeland Storage Site include the following:

1. The VBWD will cooperate with other entities to monitor the water quality of the West Lakeland Storage Site as needed. The VBWD's ongoing water quality monitoring program (see Section 4.1 – Water Quality) does not specify monitoring intervals for waterbodies classified as Stormwater Ponds.

2. The VBWD will cooperate with other entities in support of macrophyte management efforts. VBWD efforts may include:

    - point-intercept surveys of aquatic vegetation
    - preparation of lake vegetation management plans (LVMP)
    - completion of Invasive Aquatic Plant Management (IAPM) Permit applications
    - design of herbicide treatment programs
    - participation in meetings with MDNR staff
    - other technical analysis

3. The VBWD will continue to implement its Rules and Regulations (2013, as amended) in the West Lakeland Storage Site watershed. The VBWD Rules address water quality performance standards for development and redevelopment projects, as well as required vegetated buffers around VBWD lakes, streams, and wetlands. The VBWD Rules and Regulations are included in this Plan as Appendix A-4.5.

5.16.2.1 Water Chemistry Data

The VBWD collected water quality samples from the three West Lakeland Storage Site ponds during May through August of 1986. Water quality samples are typically analyzed for total phosphorus and chlorophyll *a*, and Secchi disc transparency (see Appendix A-4.1 – Water Quality Background Information). The VBWD also collected water quality samples from the outflow of the West Lakeland Storage Site (at Project 1007 Structure 2B) during 1987, 1988, and 1989. The 1987, 1988, and 1989 samples were analyzed for nutrients, bacteria, contaminants, inorganics, sediments, metals, chloride, and other constituents. The outflow rates from the lower basin (out of Structure 2B) were recorded in 1987 and 1988.

Water quality was measured in the central basin twice in June 2008. Water quality in the north basin was measured during the summers of 2008, 2009, and 2010. North basin water quality is presented in Figure 5.16-3. Central basin water quality is presented in Figure 5.16-4.

Table 5.16-1 Summary of West Lakeland Storage Site summer average water quality

Basin	Parameter	Units	1986 Summer Average	10-year Average (2004-2013)	Trend in Average	MPCA Standard [1]
North	Total Phosphorus	ug/L	93	59	NA	NA
	Chlorophyll *a*	ug/L	21.7	22.7	NA	NA
	Secchi Disc Depth	m	1.07	1.44	NA	NA
Central	Total Phosphorus	ug/L	96	327 [2]	NA	NA
	Chlorophyll *a*	ug/L	40.2	25.0 [2]	NA	NA
	Secchi Disc Depth	m	1.1	0.38 [2]	NA	NA
South	Total Phosphorus	ug/L	91	NA [3]	NA	NA
	Chlorophyll *a*	ug/L	48.0	NA [3]	NA	NA
	Secchi Disc Depth	m	1.03	NA [3]	NA	NA

[1] There are no MPCA standards applicable to stormwater ponds

[2] Data is limited to 2 measurements from June 2008

[2] South basin has not been sampled since 1986

Although the 1986 Secchi disc measurements indicate good to excellent transparency depths in all three of the ponds, the water quality of the ponds was generally fair in 1986. Water quality in the north basin improved from 1986 to 2008, before declining in 2009 and 2010. Water quality generally worsened in the central basin between 1986 and 2008. There is insufficient data to determine if statistically significant trends exist in the data, but the north basin shows a decline in water quality from 2008 through 2010 (see Figure 5.16-3).

5.16.2.2 Biological Data

Biological data including macrophyte (large aquatic plant), phytoplankton (non-rooted floating plants – algae), zooplankton (microscopic aquatic animals), and fisheries data can provide insight into the ecological quality of a waterbody. Section 4.2 (Water Quality Background Information) provides more information about the importance of fisheries and other biological data.

The West Lakeland Storage Site ponds are not managed for fisheries by the MDNR. There are no stocking or survey efforts and no fish consumption advisories have been posted for the water body. The MDNR reports that carp are the only fish known to be present in the ponds. Reduction of carp populations may be difficult since they can swim downstream from Lake Elmo and Horseshoe Lake.

The VBWD performed macrophyte surveys of all three basins of the West Lakeland Storage Site in 2009. Appendix A-5.16 presents the results of the macrophyte surveys. The VBWD collects macrophyte data to identify the conditions of plant growth throughout the lake. Macrophytes are the primary producers in the aquatic food chain, converting the basic chemical nutrients in water and soil into plant matter through photosynthesis, which becomes food for all other aquatic life. Macrophytes can negatively impact the recreational use of a waterbody and are critical to the ecosystem as fish and wildlife habitat.

The West Lakeland Storage Site has a minimal macrophyte community. Parts of the storage site are usually dry, making them unsuitable for aquatic life. Areas where water remains for long periods of time, such as the north storage site, have some submerged and emergent plants. The north storage site also contains purple loosestrife (*Lythrum salicaria*), an invasive species. Based on the 2009 survey, the extent of purple loosestrife is not problematic, but it should be monitored for future spread and possible loss of native vegetation.

The VBWD will continue to provide technical assistance to entities seeking to manage aquatic invasive species.

Phytoplankton samples were collected during 1986.

5.16.3 Water Quantity Management Plan

In accordance with the cooperative agreement between the Minnesota Department of Transportation (MnDOT) and the VBWD, MnDOT may close the gate at the West Lakeland Storage Site outlet structure (Project 1007 Structure 2B) at any time. The VBWD operating procedure for Structure 2B addresses flooding threats, repairs, pollution events, and other circumstances which may result in closing the gate at the control structure. If the gate was closed and the West Lakeland Storage Site filled up to its overflow point (Elevation 870.6), discharge to Fahlstrom Ponds would occur. Although unlikely, this potential for discharge has a significant impact on the Fahlstrom Pond 100-year flood elevation (see Section 5.18, the Fahlstrom Ponds Water Management Plan).

The operation and maintenance of the outlet structure (Project 1007 Structure 2B) is the VBWD's responsibility. However, MnDOT has access to the structure should they need to operate the gate. Figure 5.16-5 presents the West Lakeland Storage Site outlet.

The VBWD will continue to monitor water levels on the north (upper) and south (lower) ponds of the West Lakeland Storage Site.

5.16.3.1 Drainage Patterns and Stormwater Issues

Prior to construction of Project 1007, the northern depression (an old gravel pit) held water, but the middle and southern depressions held little or no water even during average periods of precipitation. However, in 1984 and 1985 (a period of above-average precipitation) the south pond rose approximately 20 feet, which forced the evacuation of three homes. Neal Avenue North (CSAH 71) and 5th Street North were flooded and buried phone and power lines were threatened. As part of Project 1007, the VBWD purchased and removed the three flooded homes in the storage site and helped finance construction of a new road. This new road is that part of Midwest Avenue located between the 5th Street North cul-de-sac and the I-94 frontage road (Hudson Boulevard). Because Project 1007 now adds additional upstream water to this storage site, it is less likely that the depressions will dry up; however, the depressions do experience large fluctuations in water level. The 100-year flood elevation of the north storage site basin is Elevation 872.7 and the 100-year flood level of the central and south basin is Elevation 871.8 (NGVD29 datum).

VBWD began monitoring water levels of the north pond (also known as "the gravel pit") in 1979 and of the south pond in 1986. The highest recorded water level of the north pond was Elevation 886.5 (March 1980) and of the south pond was Elevation 871.1 (May 1987). Figure 5.16-6 and Figure 5.16-7 show the recorded water levels in the north (upper) pond and south (lower) pond, respectively.

As part of Project 1007, the outlet channel from the upper (most northerly) pond was deepened and widened and an outlet from the south end of the storage site to the MnDOT I-94 drainage system was constructed. A small drop structure and a driveway culvert were constructed between the upper and middle ponds. The overflow from the upper pond to the middle pond is a high point in the channel at Elevation 865.7 (NGVD29 datum). Channels (at Elevation 859.0) connect the middle and lower ponds to a control structure located near the north I-94 frontage road, west of Neal Avenue North (CSAH 71).

A cooperative agreement between VBWD and MnDOT allows VBWD to use the I-94 drainage systems from the West Lakeland Storage Site outlet control structure to the MnDOT Rest Area Pond and from the west end of the T.H. 95 entrance ramp onto I-94 to the St. Croix River. The VBWD connection to the MnDOT system is hydraulically possible because the discharge from the VBWD system is small relative to the capacity of the MnDOT system and it results from a long-duration event. In addition, the VBWD drainage system can tolerate short-term interruption. In comparison, the I-94 drainage system is designed to handle short-duration rainstorm events which will restrict runoff from the West Lakeland Storage Site until the highway runoff subsides. In extreme events, MnDOT's system backs up into the West Lakeland Storage Site. When the I-94 storm sewer east of

Neal Avenue is filled to design capacity by runoff from the interstate, backflow into the storage site occurs. As flow from the interstate decreases, outflow will once again occur from the storage site into the interstate pipe.

The outflow control structure for the West Lakeland Storage Site (Structure 2B) is located north of the I-94 frontage road, west of County Road 71. As shown on Figure 5.16-5, the outlet consists of a 36-inch diameter pipe into and out of an eight-foot diameter manhole. Within the manhole is a wall with a 48-inch square gate. The control elevation is Elevation 861.0 (NGVD29 datum), which is the invert of the 36-inch diameter pipe located just downstream of the gate. The control structure regulates flow from the VBWD drainage system into the I-94 drainage system. The I-94 system carries water from the control structure in a 36-inch diameter pipe under the north abutment of the Neal Avenue North (CSAH 71) overpass. Water then flows under I-94 to a point approximately 500 feet east of Neal Avenue North (CSAH 71).

In 2013, the National Oceanographic and Atmospheric Administration (NOAA) published Atlas 14, Volume 8 (see Section 4.7.6). Atlas 14 contains updated precipitation data for Minnesota and supersedes data used to establish the 100-year flood levels for the West Lakeland Storage Site. Within the VBWD, the 100-year, 24-hour event within the VBWD increased from 6.0 inches to 7.3 inches. The VBWD plans to update the 100-year flood level for VBWD waterbodies, including the West Lakeland Storage Site, to reflect Atlas 14 precipitation data and other current data sources. These updates may result in an increased flood level, which may place additional structures within the floodplain.

5.16.4 Groundwater

The storage area is important because it provides groundwater recharge, water storage, water quality treatment and sedimentation prior to discharge into the I-94 system. Prior to construction of Project 1007, the storage site functioned only as a seepage and evaporation site for upstream runoff. The results of the VBWD 1985 seepage study indicated that seepage from the storage area to groundwater is between 3.5 cubic feet per second (cfs) and 5 cfs. This relatively high infiltration capacity will help dissipate runoff from the upstream watershed. Suspended solids of silt and clay size settling into the pond could reduce this capacity over the long term. Therefore, erosion control in the immediately tributary watershed is very important and will continue to be regulated by VBWD. The operation of the storage site as three separate ponds results in the majority of sediment being retained in the upper (north) pond and preserves the infiltration capacity of the remainder of the storage site.

Water that seeps from the West Lakeland Storage Site could contribute to the groundwater feeding Valley Creek. The impact of groundwater on Valley Creek is described in greater detail in Section 5.20. The role of the VBWD in groundwater management is described in Section 4.2 of this Plan.

Sinkholes have developed occasionally in and along the channel that connects the northern basin of the West Lakeland Storage Site to the middle basin. When this has occurred, some nearby residents have reported that their drinking water has become discolored and smelly. In December 2000, the

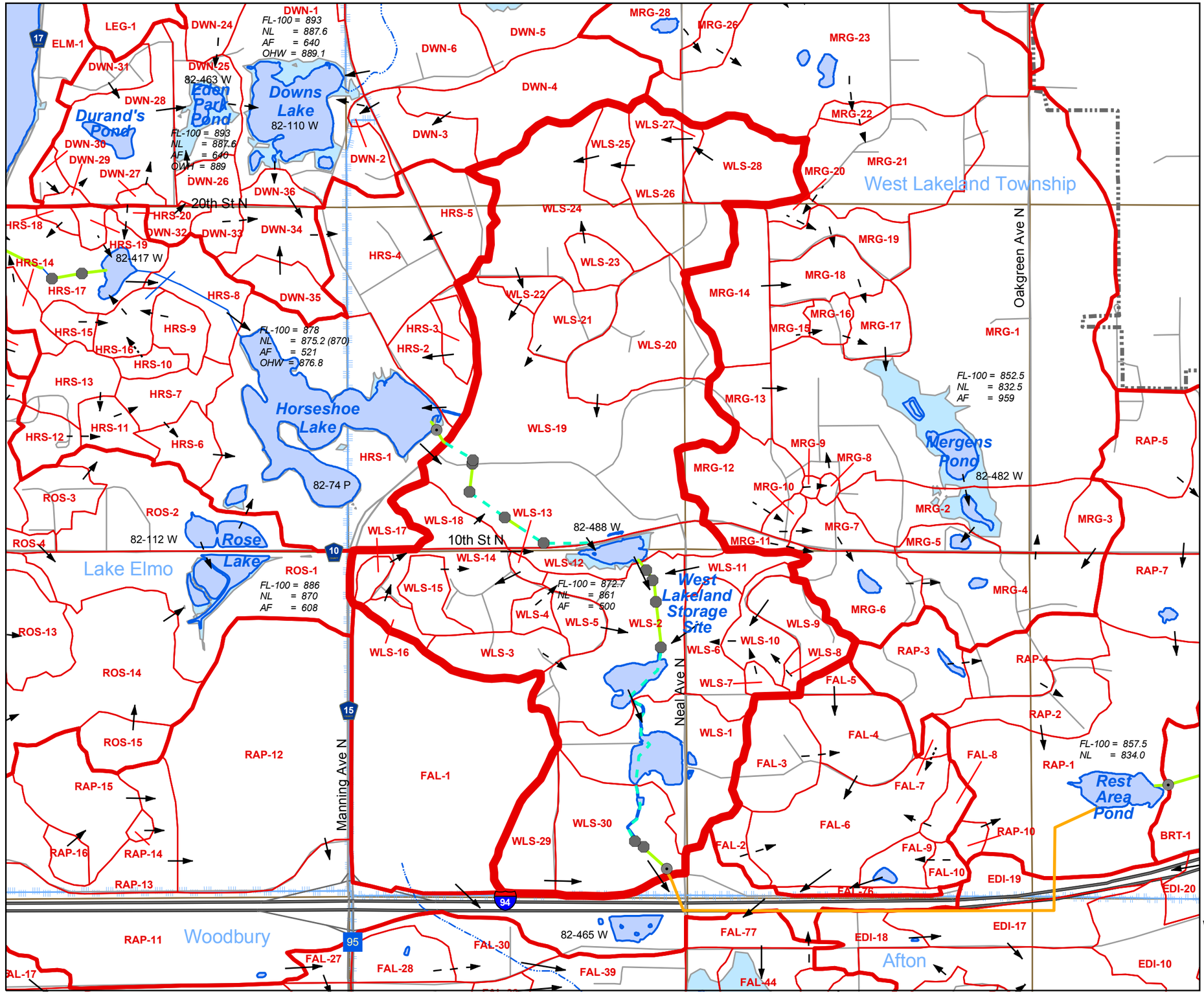
VBWD placed rock in a sinkhole that had developed in the channel. The rock was covered with a geosynthetic clay liner and soil.

5.16.5 References

Barr Engineering Company. September 1995. *Water Management Plan, Valley Branch Watershed District*.

Barr Engineering Company. December 2005. *Valley Branch Watershed District Watershed Management Plan.*

National Oceanographic and Atmospheric Administration (NOAA). 2013. Atlas 14 Precipitation-Frequency Atlas of the United States – Volume 8.

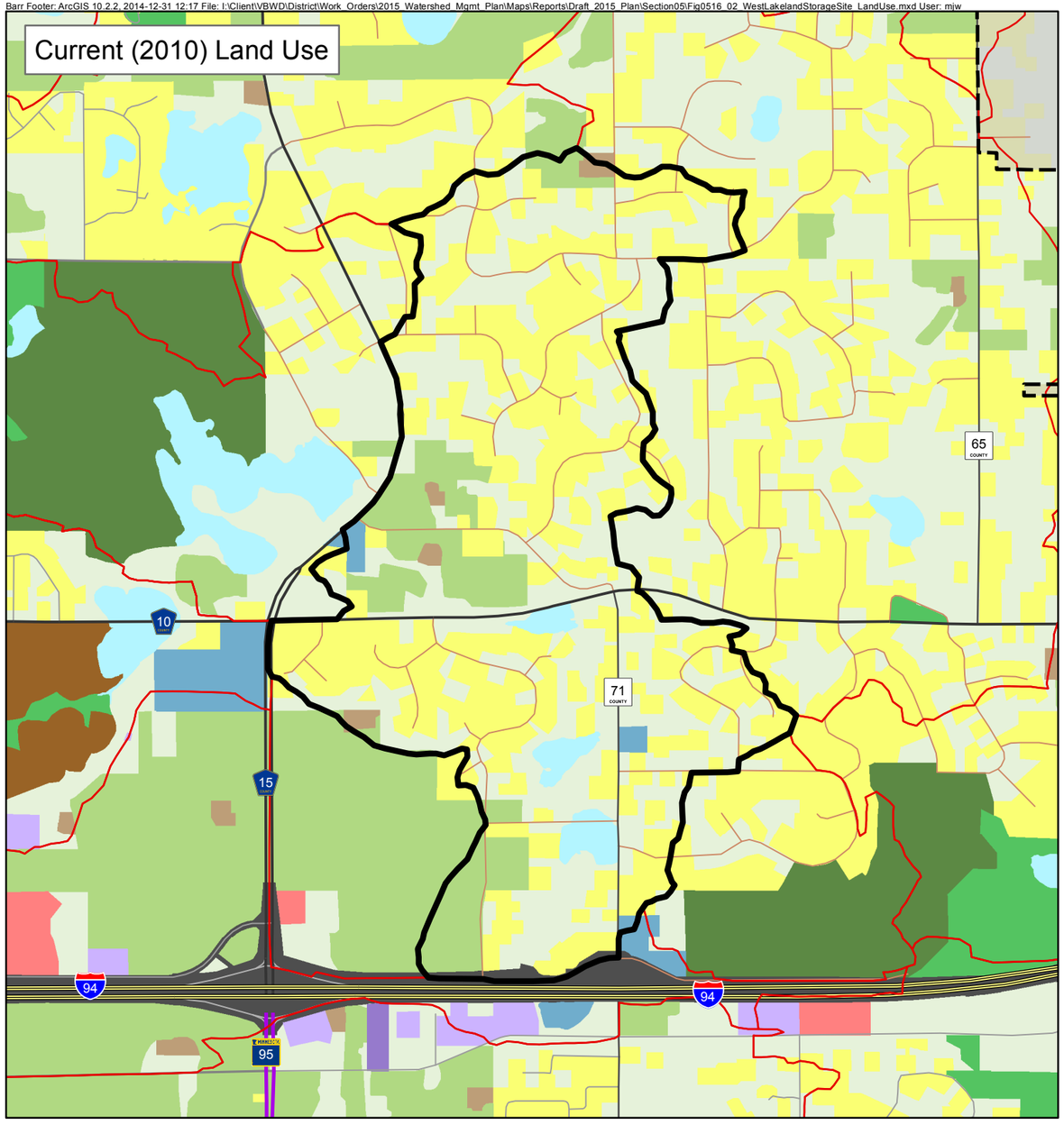


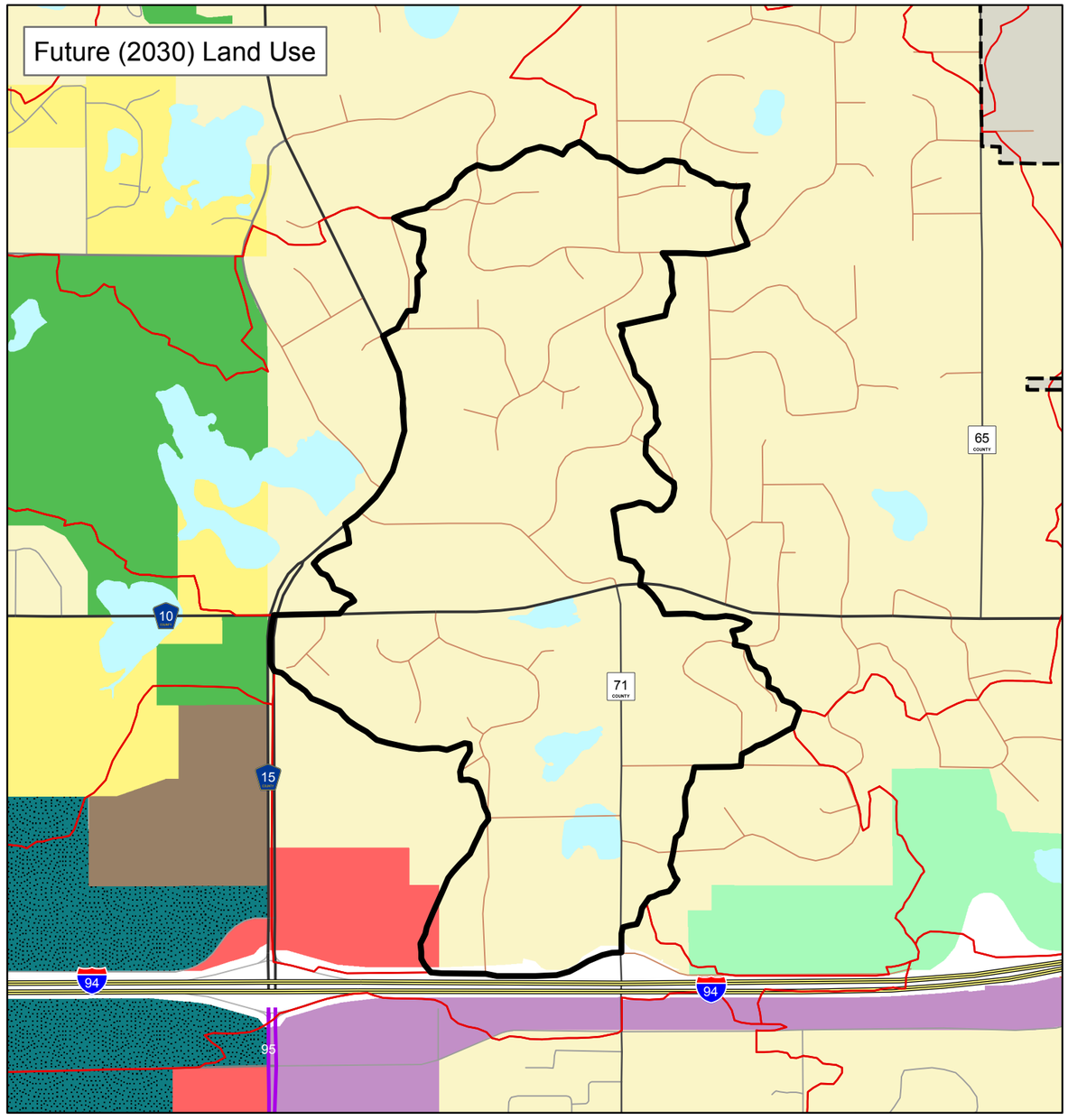
Landlocked: Basin does not overflow using VBWD simplified method for calculating its 100-year flood level or using a more detailed analysis, such as the 1% probability flood level.

Semi-Landlocked: Basin does not overflow in the 100-year 24-hour rainfall total or the 100-year 10-day snowmelt event, but does overflow when calulating its 100-year flood level based on the VBWD simplified method or the 1% probablility flood level.

Figure 5.16-1
WEST LAKELAND STORAGE SITE WATERSHED
Valley Branch Watershed District

Barr Footer: Date: 12/14/2005 3:58:33 PM File: I:\Client\Vbwd\District\Project\WtrshdPlan\Watershed_maps\16-WestLakelandStorageSite_Watershed.mxd User: lkp





Current (2010) Land Use
- Farmstead
- Seasonal/Vacation
- Single Family Detached
- Manufactured Housing Park
- Single Family Attached
- Multifamily
- Retail and Other Commercial
- Office
- Mixed Use Residential
- Mixed Use Industrial
- Mixed Use Commercial and Other
- Industrial and Utility
- Extractive
- Institutional
- Park, Recreational or Preserve
- Golf Course
- Major Highway
- Railway
- Airport
- Agricultural
- Undeveloped
- Water
- West Lakeland Storage Site Subwatershed
- Major Subwatershed Boundary
- VBWD Legal Boundary

Future (2030) Land Use
- Agricultural
- Rural or Large-Lot Residential
- Single Family Residential
- Multifamily Residential
- Commercial
- Industrial
- Institutional
- Mixed Use
- Multi-Optional Development
- Park and Recreation
- Open Space or Restrictive Use
- Rights-of-Way (i.e., Roads)
- Railway (inc. LRT)
- Airport
- Vacant or Unknown
- Open Water
- West Lakeland Storage Site Subwatershed
- Major Subwatershed Boundary
- VBWD Legal Boundary

Feet

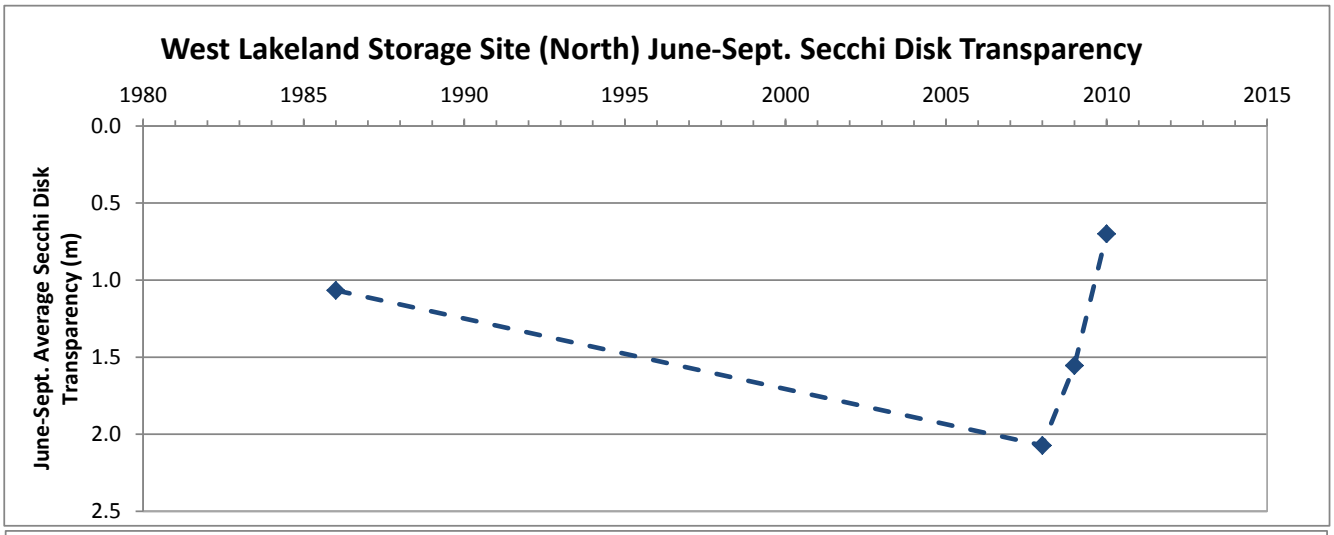
2,000 0 2,000 4,000

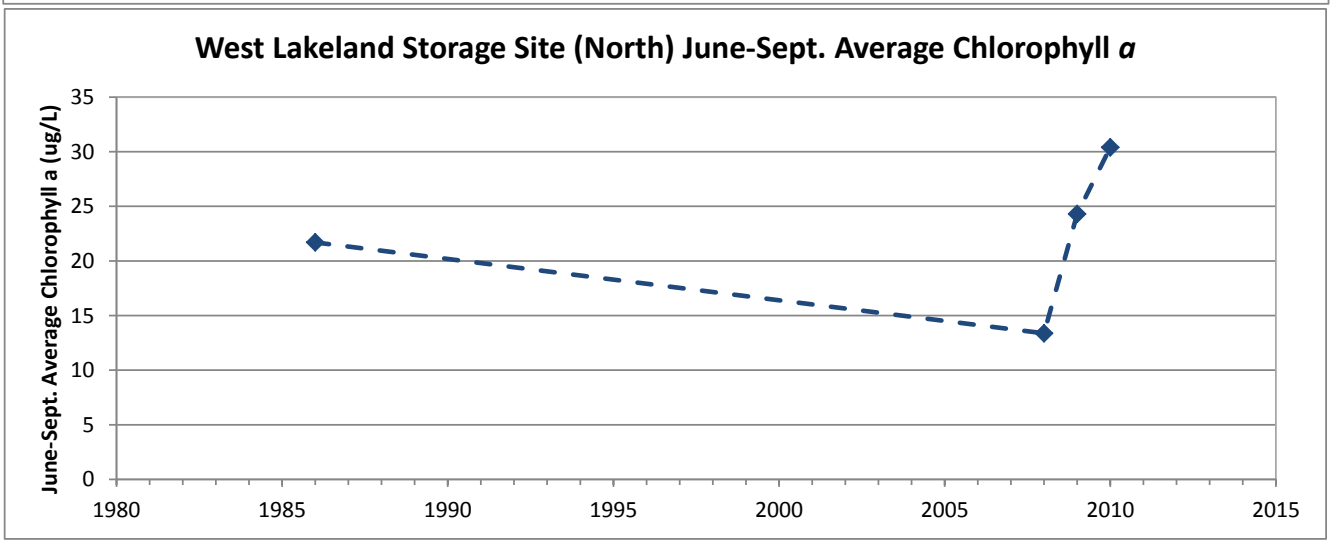
1 inch = 2,000 feet

Source: Metropolitan Council 2010

Figure 5.16-2

WEST LAKELAND STORAGE SITE WATERSHED
CURRENT (2010) AND FUTURE (2030) LANDUSE
2015-2025 Watershed Management Plan
Valley Branch Watershed District





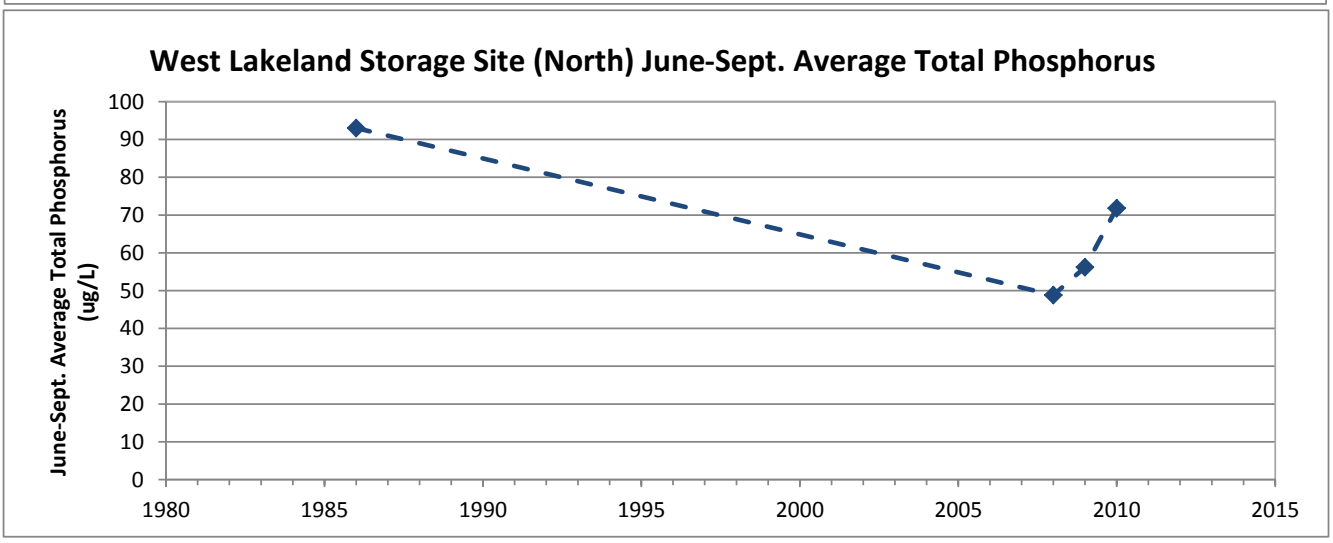
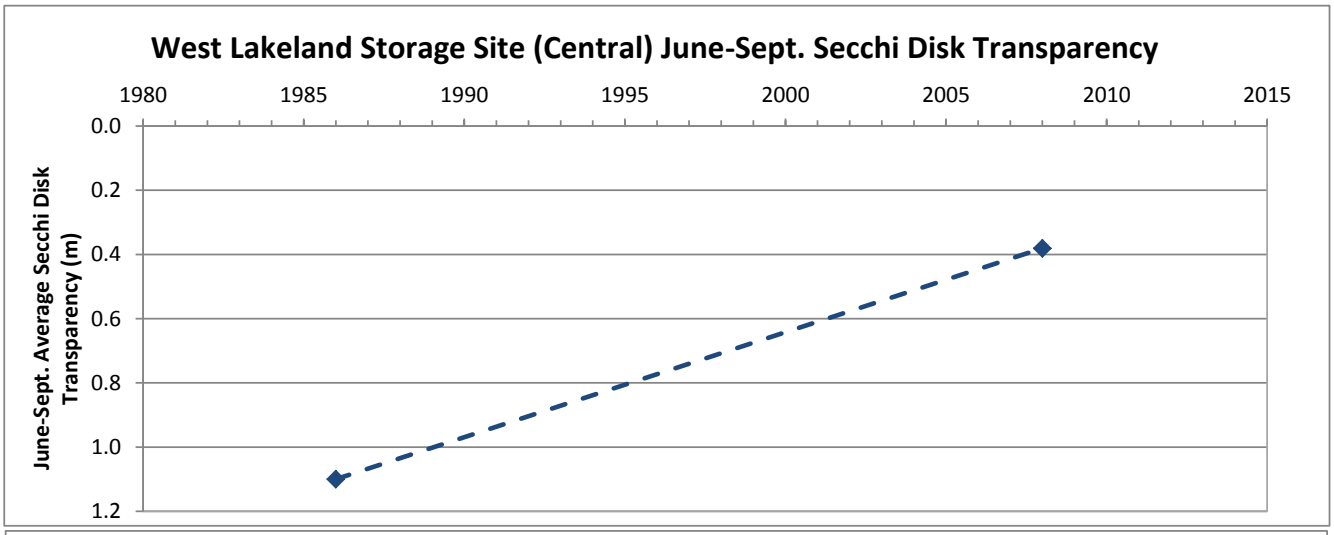
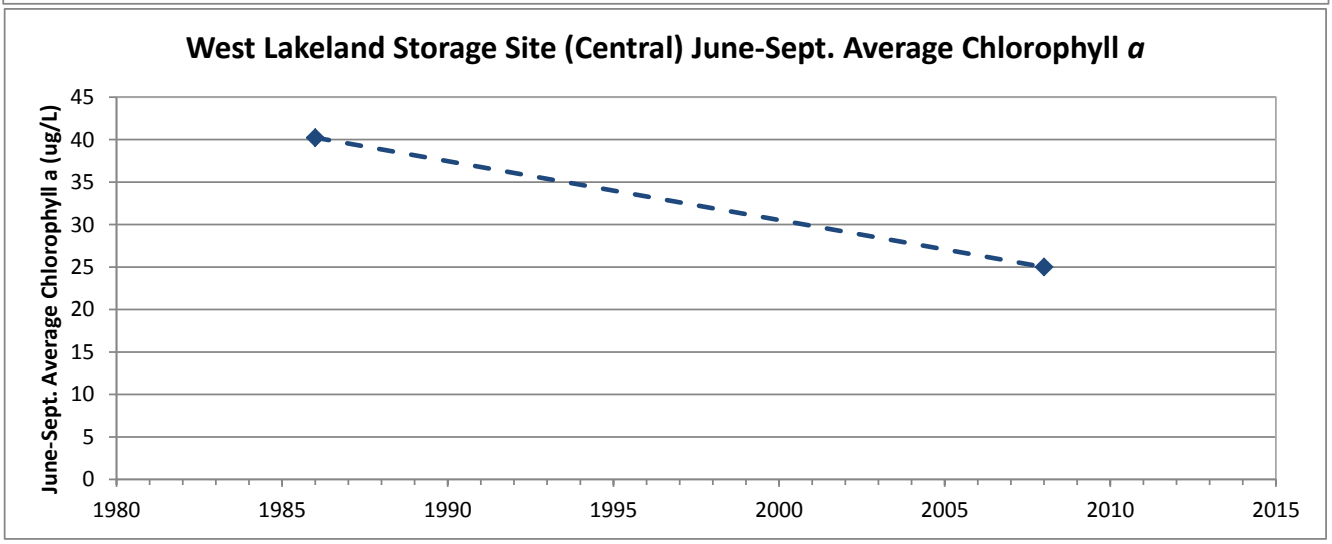


Figure 5.16-3

West Lakeland Storage Site (North) Water Quality
2015 - 2025 Watershed Management Plan
Valley Branch Watershed District





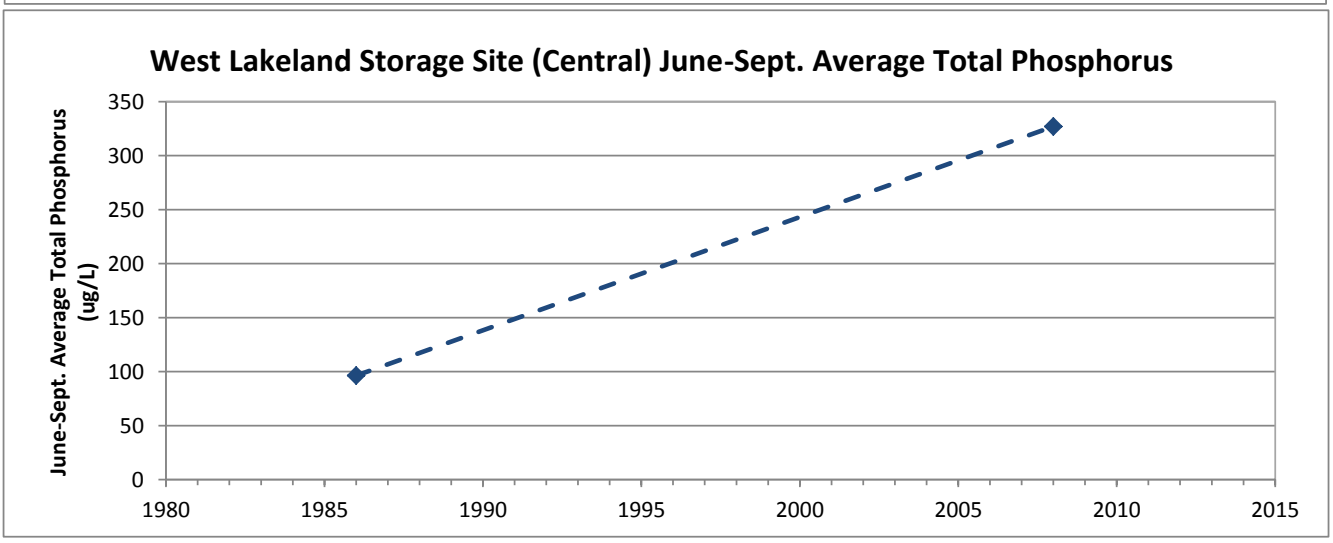
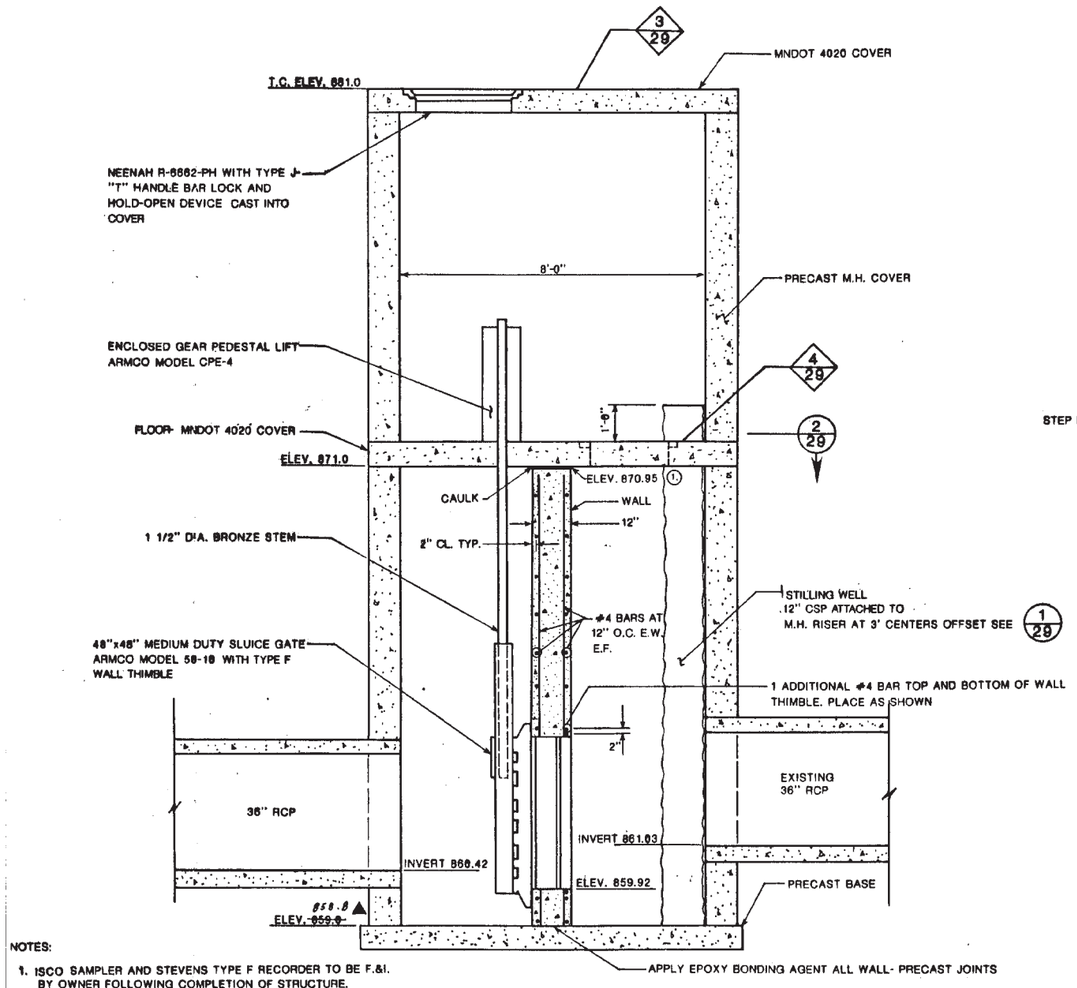


Figure 5.16-4

West Lakeland Storage Site (Central) Water Quality
2015 - 2025 Watershed Management Plan
Valley Branch Watershed District

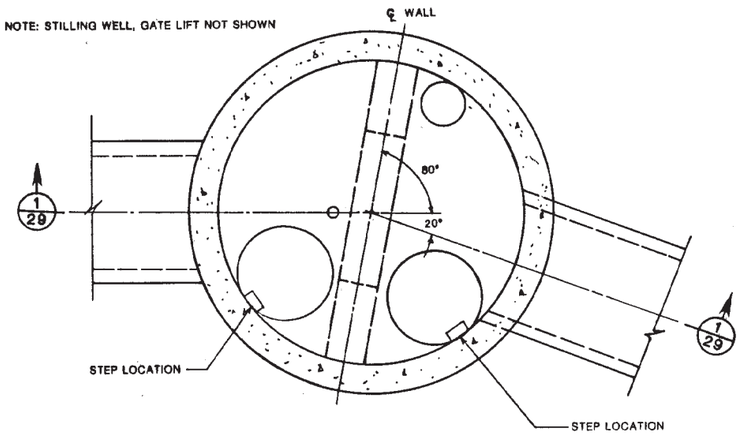


NOTES:

1. ISCO SAMPLER AND STEVENS TYPE F RECORDER TO BE F.&I. BY OWNER FOLLOWING COMPLETION OF STRUCTURE.
2. STEPS NOT SHOWN
   FOR STEP LOCATION BELOW FLOOR SEE 2/29
   FOR STEP LOCATION ABOVE FLOOR SEE 3/29
3. FOR ELECTRICAL SEE 5/29 6/29 7/29
4. PLACE 3- 1" DIA. HOLES AT 120° SPACING AROUND CIRCUMFERENCE OF STILLING WELL. HOLES TO BE PLACED EVERY 1" VERTICAL FOR BOTTOM 3' OF STILLING WELL

1/29 SECTION: STRUCTURE 2B

SCALE 1"=2'-0"



2/29 SECTION: STRUCTURE 2B

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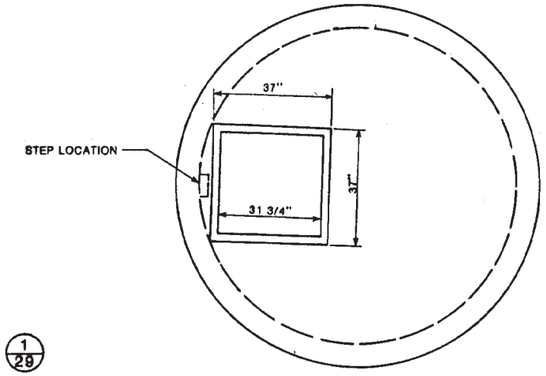
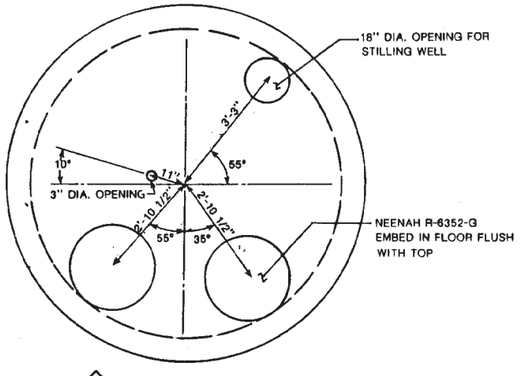


3/29 DETAIL: COVER

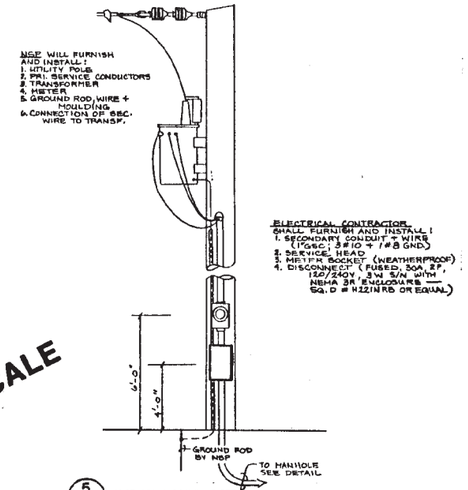
SCALE 1"=2'-0"



4/29 DETAIL: FLOOR

SCALE 1"=2'-0"

REDUCED TO HALF SCALE



5/29 SECTION: UTILITY POLE

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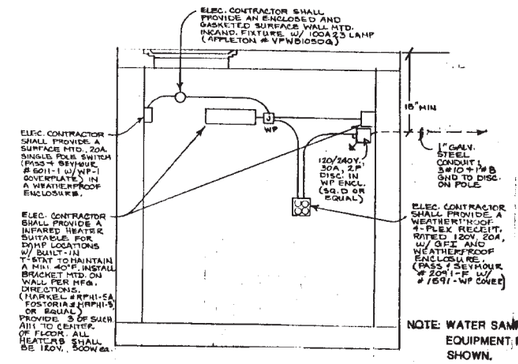

6/29 SECTION: STRUCTURE 2B

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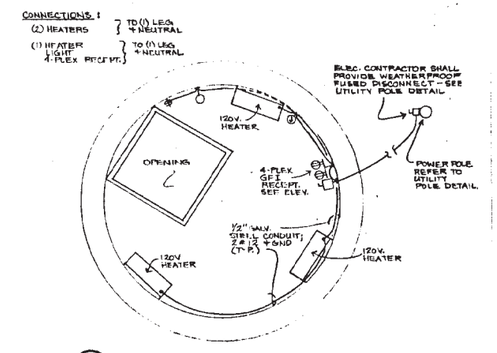


7/29 PLAN: STRUCTURE 2B

NOT TO SCALE

Figure 5.16-5

STRUCTURE 2B
Valley Branch Watershed District

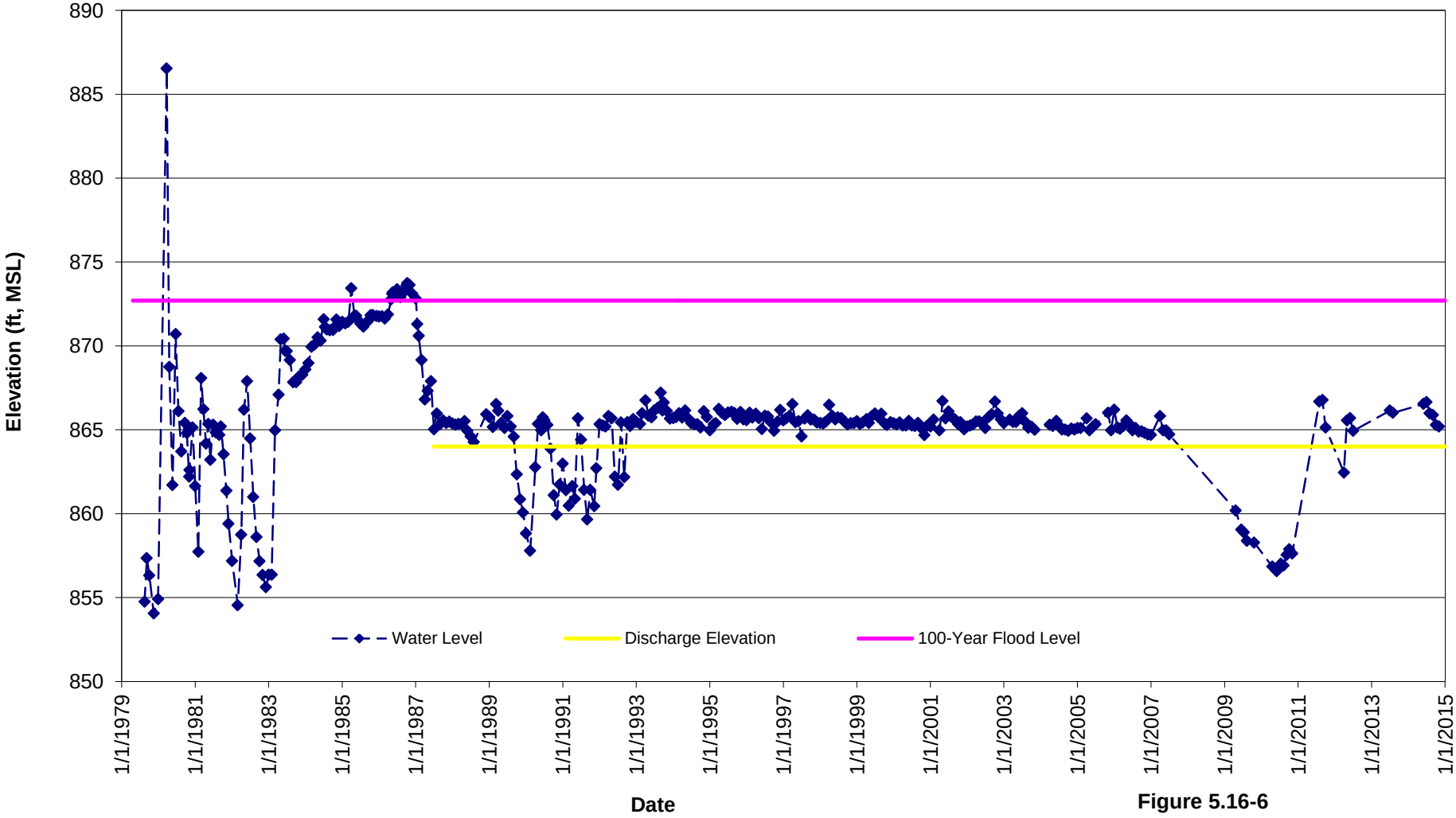


Figure 5.16-6

Elevations in NGVD29 datum
Water Surface Below Gage: 6/2/2009

UPPER (NORTH) WEST LAKELAND STORAGE SITE
2015 - 2025 Watershed Management Plan
Valley Branch Watershed District

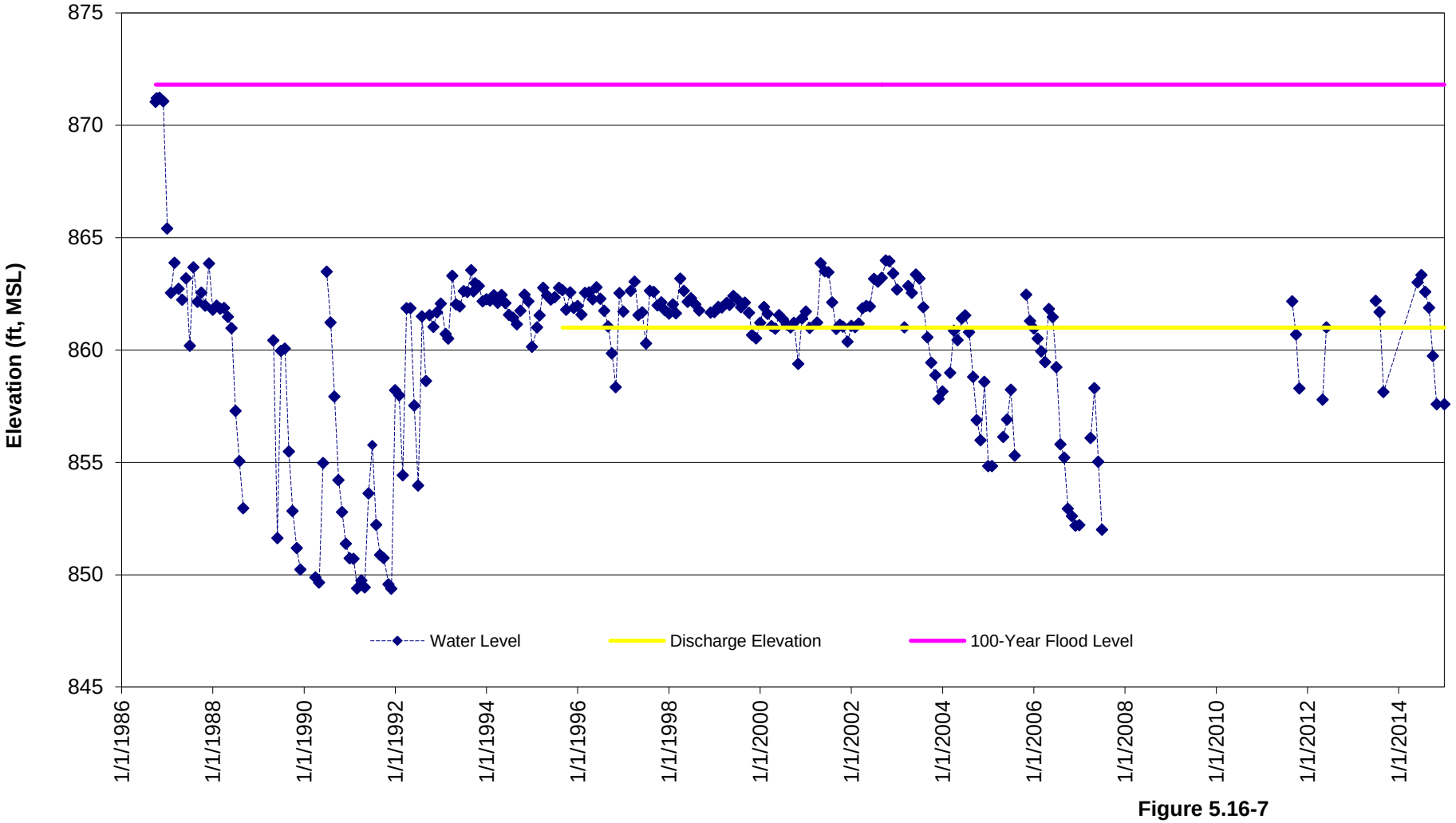
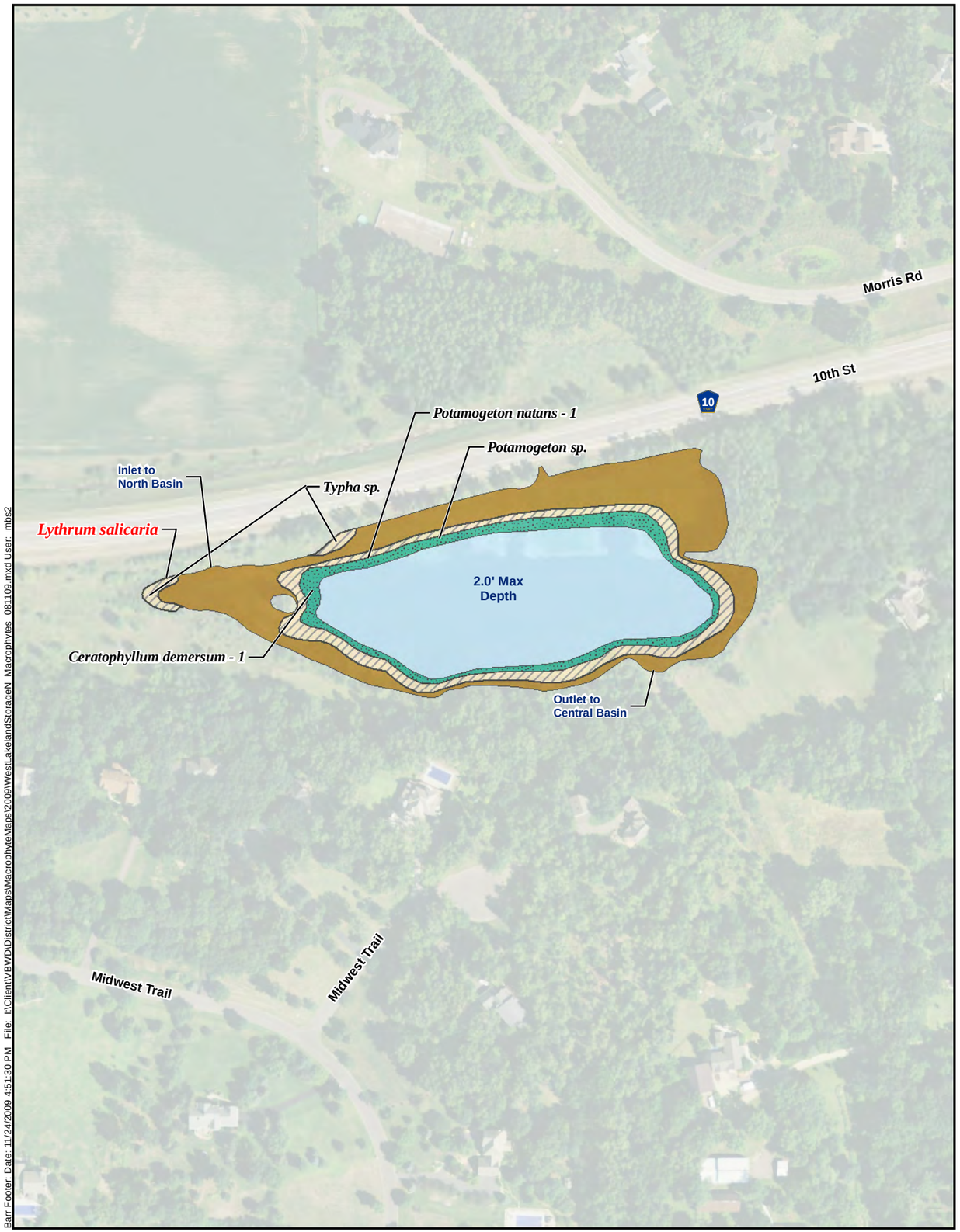


Figure 5.16-7

Elevations in NGVD29 datum

LOWER (SOUTH) WEST LAKELAND STORAGE SITE
2015 - 2025 Watershed Management Plan
Valley Branch Watershed District

Appendix A-5.16 Additional Macrophyte Information



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Submerged Aquatic Plants

Common Name	Scientific Name
coontail	*Ceratophyllum demersum*
narrowleaf pondweed	*Potamogeton sp.*
floating leaf pondweed	*Potamogeton natans*

Floating Leaf Plants

None Found

Emergent Plants

Common Name	Scientific Name
bulrush	*Scirpus sp.*
cattail	*Typha sp.*
water smartweed	*Polygonum sp.*
purple loosestrife	***Lythrum salicaria***
spikerush	*Eleocharis sp.*

*Note: Bold red name indicates extremely aggressive/invasive introduced species.

Legend

- Dry
- Emergent Plants
- Floating Leaf Plants
- Submerged Aquatic Plants
- No Aquatic Vegetation

N

0 200 400
Feet

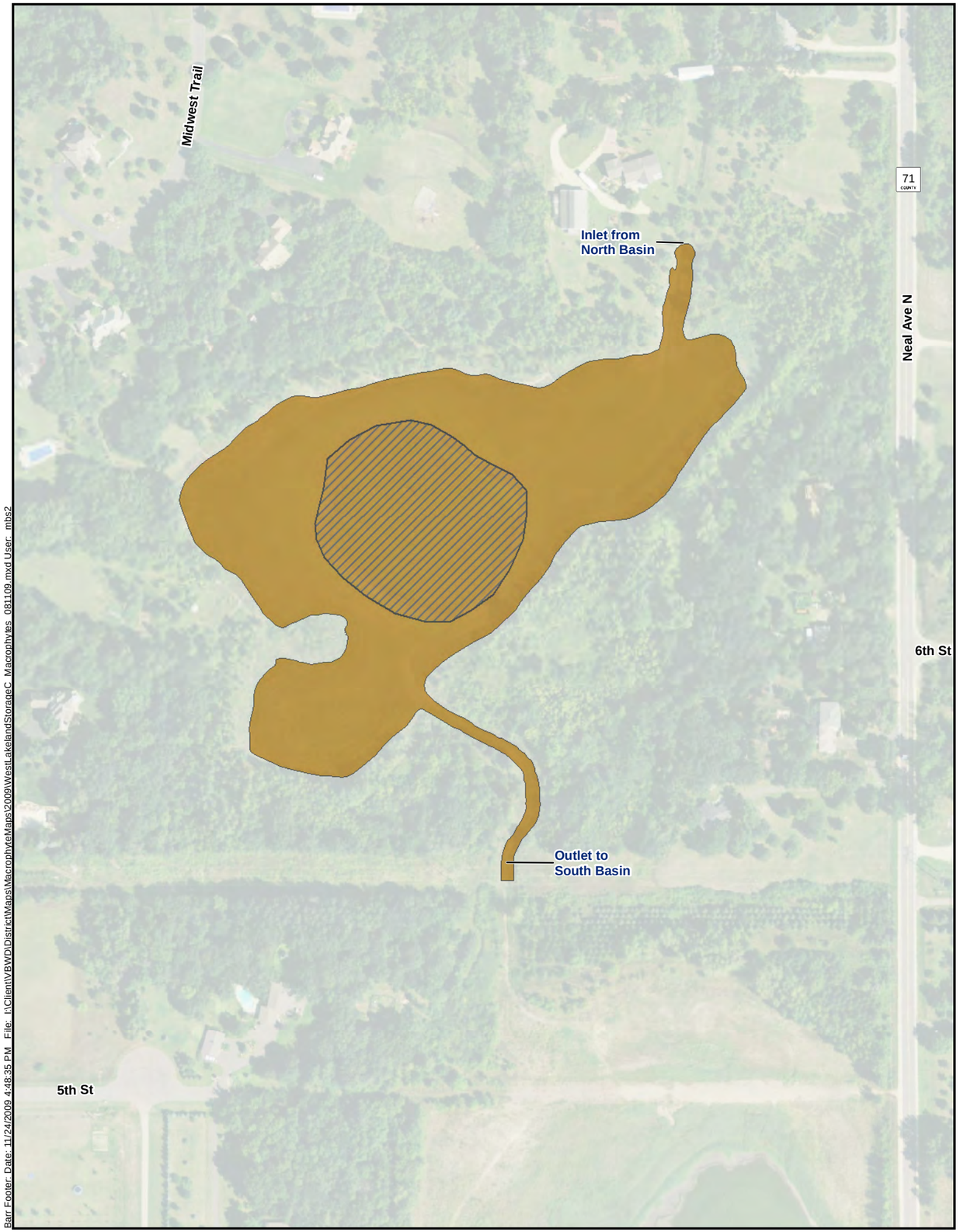
0 60 120
Meters

Imagery Source: 2008 AE

BARR

FIELD NOTES:
- Macrophyte densities estimated as follows: 1=light; 2=moderate; 3=heavy
- Fibrous algae at pond bottom
- Ceratophyllum demersum, Potamogeton sp. (narrowleaf) sporadic in 1.0' of water or less around entire perimeter
- Low water level
- Scirpus sp., Polygonum sp. and Eleocharis sp. present around entire pond perimeter

WEST LAKELAND STORAGE NORTH MACROPHYTE SURVEY RESULTS
August 11, 2009
Valley Branch Watershed District



Barr Footer: Date: 11/24/2009 4:48:35 PM File: I:\Client\VBWD\District\Maps\MacrophyteMaps\2009\WestLakelandStorageC_Macrophytes_081109.mxd User: mbs2

Submerged Aquatic Plants

None Found

Floating Leaf Plants

None Found

Emergent Plants

Common Name	Scientific Name
water smartweed	*Polygonum sp.*

FIELD NOTES:
- Macrophyte densities estimated as follows:
  1=light; 2=moderate; 3=heavy
- Basin is dry
- Polygonum sp. found in basin's center

Legend

- Dry
- Emergent Plants
- Floating Leaf Plants
- Submerged Aquatic Plants
- No Aquatic Vegetation

N

0 200 400
Feet

0 60 120
Meters

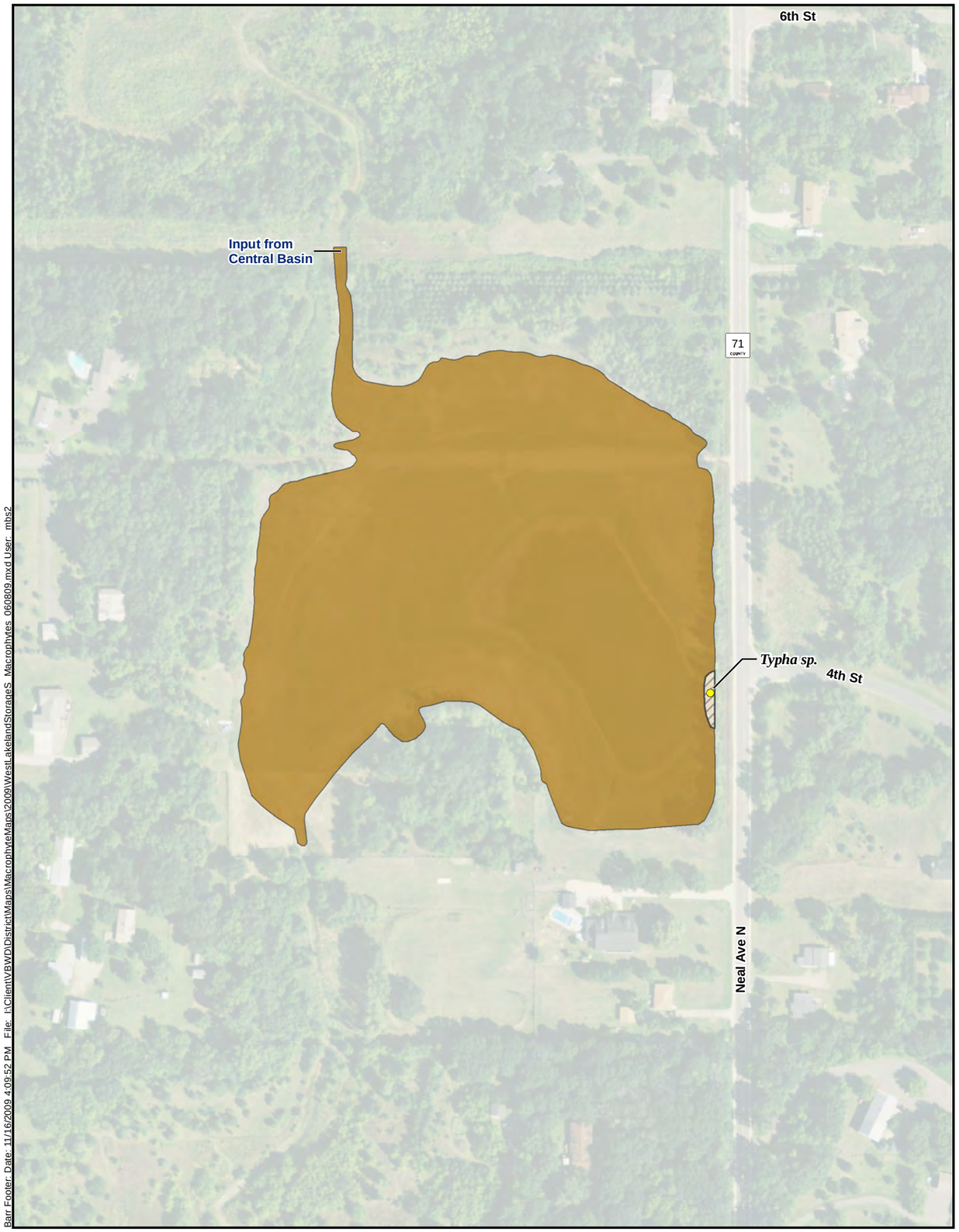
Imagery Source: 2008 AE

BARR

WEST LAKELAND STORAGE CENTRAL MACROPHYTE SURVEY RESULTS

August 11, 2009

Valley Branch Watershed District



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Legend

- Dry
- Emergent Plants
- Floating Leaf Plants
- Submerged Aquatic Plants
- No Aquatic Vegetation

Submerged Aquatic Plants

None Found

Floating Leaf Plants

Common Name	Scientific Name
water smartweed	*Polygonum amphibium*

Emergent Plants

cattail	*Typha sp.*

N

0 200 400
Feet

0 60 120
Meters

Imagery Source: 2008 AE

BARR

FIELD NOTES:
- Macrophyte densities estimated as follows: 1=light; 2=moderate; 3=heavy
- Basin dry
- Polygonum amphibium - dead plants remain around pond perimeter

WEST LAKELAND STORAGE SOUTH
MACROPHYTE SURVEY RESULTS
June 8, 2009
Valley Branch Watershed District