

HIAWATHA GOLF & PLAY

An introduction to

WATER MANAGEMENT CONCEPT **ALTERNATIVE 6**



The Bronze Foundation is pleased to present a water management design for historic Hiawatha Lake and Golf Course. It improves flood protection, reduces groundwater intrusion into neighborhood basements. It also will improve Lake Hiawatha water quality for swimming, and prevents problems associated with creating a second lake on the existing protected site.

Alternative 6 (A6) was named after analyzing “Alternatives 1-5” of the Minneapolis Park & Recreation Board’s (MPRB) efforts to create a “Master Plan”. A6 is an advanced solution of Minneapolis native Andy Komor, Vice President in the Environmental Water Division of Pacific Advanced Civil Engineering (PACE). Andy is a former Minneapolis Park Board Employee and graduated cum laude from the U of MN-College of Science and Engineering. He is a technical expert on water quality and engineering infrastructure. He has successfully designed, managed, and provided field services for more than 50 water resource projects in the last 15 years with capital funding over \$400 million.

A year ago, after seeing a summary of the MPRB “Master Plan” in the Star Tribune, Andy and three other technical experts he consulted confirmed the water management solutions offered in their “Master Plan” will not accomplish the stated objective of “reduced pumping,” but would create additional problems not presented in the MPRB plan.

The Alternative 6 brochure, that follows this introduction, details those problems of the MPBR “Master Plan”:

- 90 homes threatened by direct flood risk.
- 500 basements threatened by groundwater intrusion,
- Continued pollution in Lake Hiawatha,
- Potential nuisances caused by the “Master Plan” solution.

A6 illustrates the current hydrological conditions of the site, and shows graphically how water problems can be addressed while improving the park.

Please support the Bronze Foundation’s efforts to preserve and improve the water quality at Hiawatha Lake and golf course.



ABOUT PACE

PACIFIC ADVANCED CIVIL ENGINEERING

PACE specializes in advanced water solutions in partnership with nature. Recently PACE provided award winning designs for the Earvin “Magic” Johnson Park Lakes Project and SoFi stadium lakes project (shown above), the first USA lake to combine and recycle stormwater and recycled water for unrestricted reuse and downstream discharge.

ABOUT THE AUTHOR

ANDY KOMOR, MS, PE

Andy is a professional civil (water) engineer and has successfully performed design, PM, and field services for over \$400 million in capital infrastructure on over 60 completed water resource projects in the past 15 years. Andy prides himself on providing creative approaches which are advanced, innovative, cost effective, and highly-operable. Andy worked for the Minneapolis Park and Recreation Board for six years and graduated cum laude from the Department of Civil Engineering at the University of Minnesota.



SCAN TO WATCH
EARVIN “MAGIC” JOHNSON
PARK VIDEO

OPTIMIZED SOLUTION FOR THE

LAKE HIAWATHA BASIN

- IMPROVED FLOOD PROTECTION
- REDUCED GROUNDWATER INTRUSION
- ENHANCED WATER QUALITY
- RESTORED NATURALIZATION

OVERVIEW



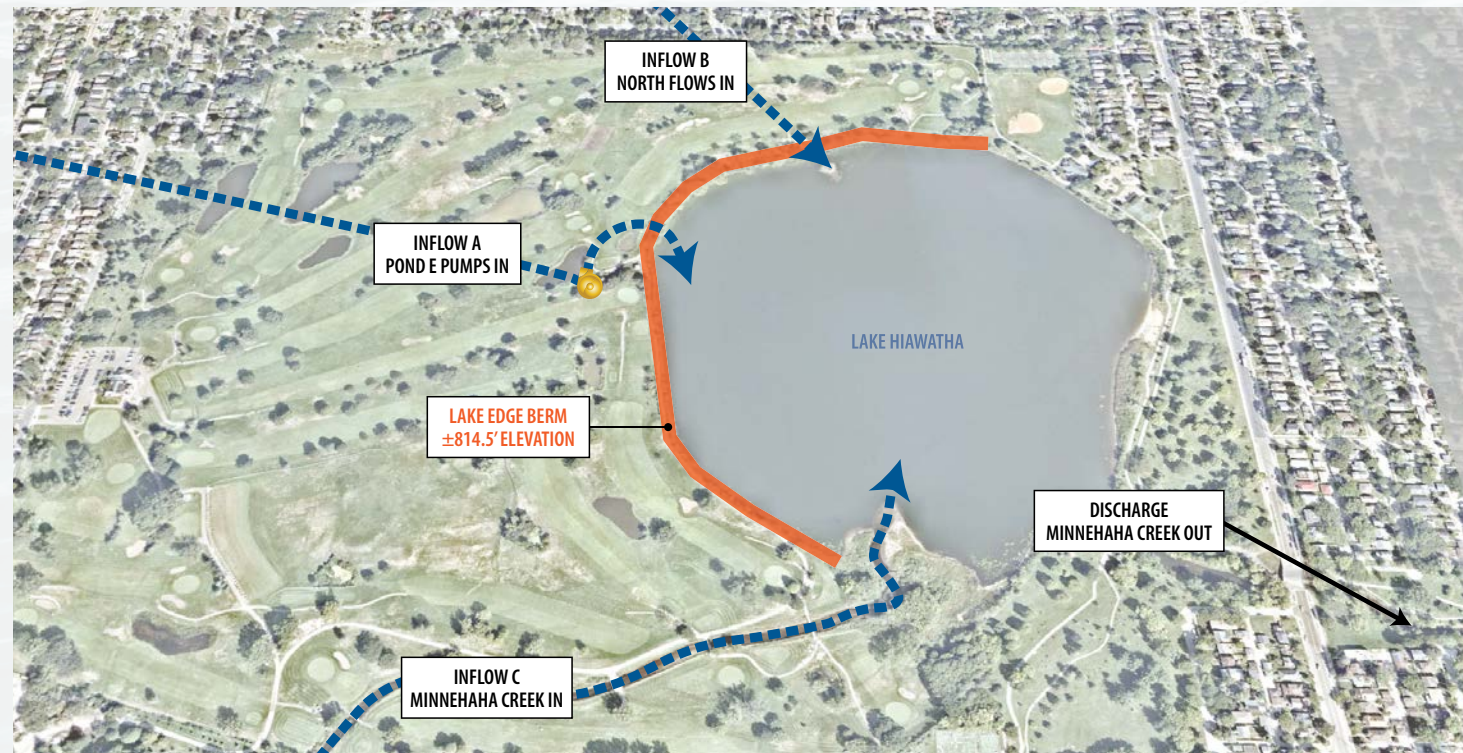
HIAWATHA BASIN BACKGROUND WATER FACTS

The Lake Hiawatha Basin is a 241-acre depression generally 20-30 feet below the regional elevation. Located near the downstream end of the Minnehaha Creek watershed, it receives flows from three sources. All three sources of incoming stormwater currently discharge into Lake Hiawatha prior to proceeding downstream to the Mississippi River:

- ◆ Inflow A - Small northwest low-lying depression near Hole 6 of Hiawatha Golf Course that receives Minneapolis stormwater from East 44th Street (This northwest inflow is pumped from under the golf course into the lake)
- ◆ Inflow B - Large north watershed flows of Minneapolis stormwater from North of 43rd St. along 20th Ave directly piped to the lake
- ◆ Inflow C - Minnehaha Creek flows up to 1000 cubic feet per second (cfs) of peak flow (Minnehaha Creek receives both water overflowing Lake Minnetonka and from local stormwater contributions from a large urban watershed downstream of Lake Minnetonka. Inflow C has the most consistent baseflow and the highest peak wet weather flow of the three inflows that currently discharge into Lake Hiawatha prior to proceeding downstream to the Mississippi River)



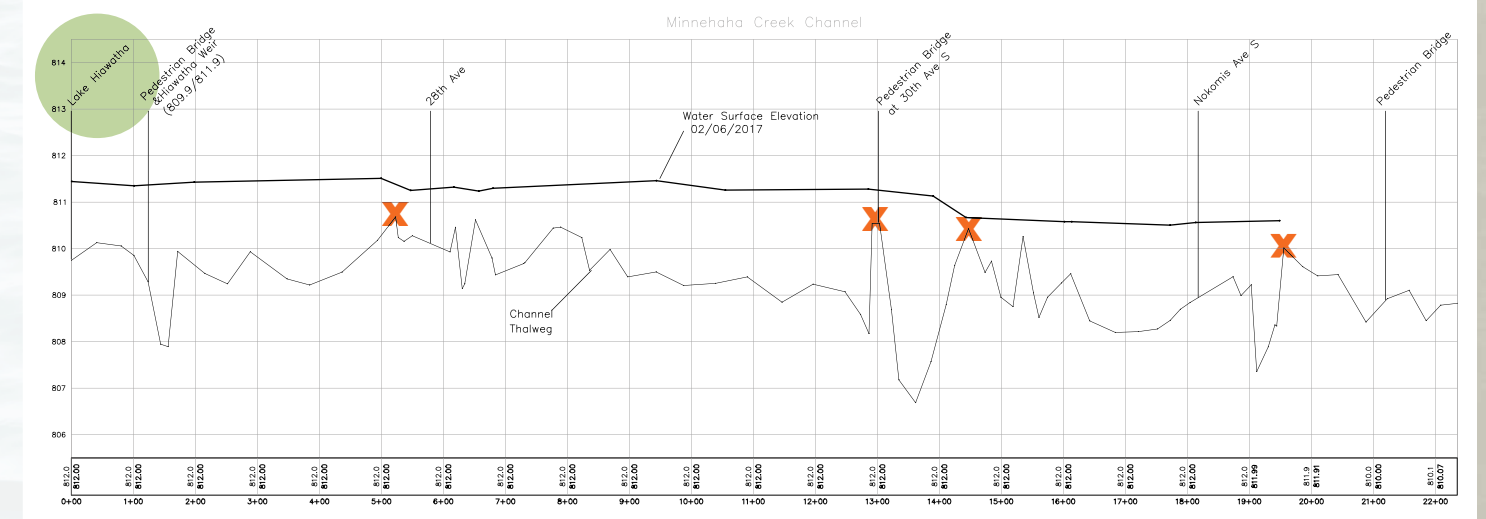
The Minneapolis Park and Recreation Board (MPRB) Master Plan Analysis presented a water isotope analysis that demonstrated a majority of the groundwater below the Golf Course is coming from Minnehaha Creek. Thus, Lake Hiawatha receives and leaks Minnehaha Creek water into the groundwater table currently.



▲ **Figure A.** The existing Lake Hiawatha Basin receives three independent stormwater inflows that pass through Lake Hiawatha on the way to the Mississippi River.

THE PROBLEM WITH BUSINESS AS USUAL

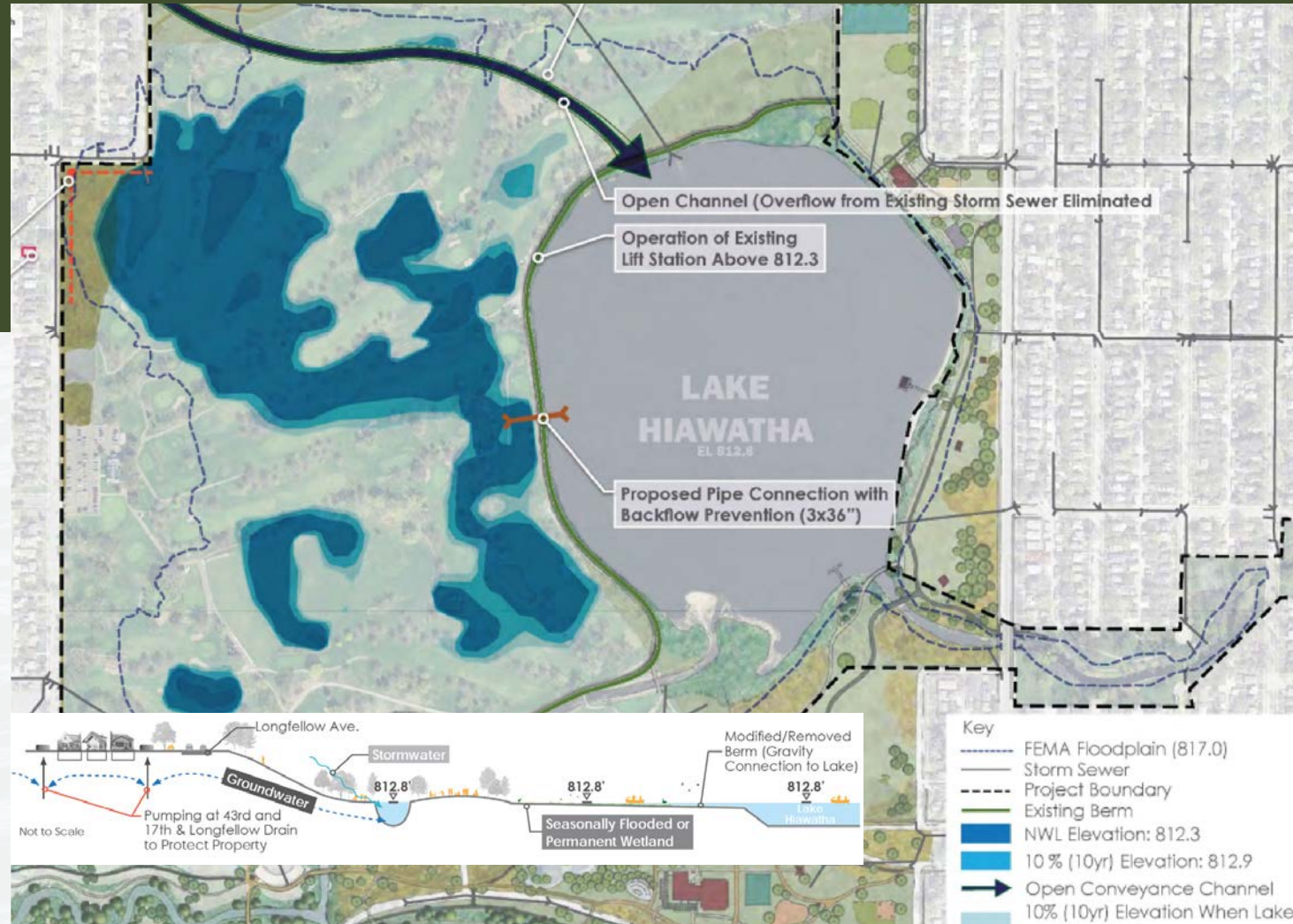
Due to the increase of stormwater entering the Lake Hiawatha Basin over the past two decades, more stormflow needs to be discharged downstream to prevent flooding the dry land on the site. In order to convey this additional water without pumping or removing restrictions downstream, the water surface elevation under normal dry conditions is kept high. Because the water surface is high under normal conditions, under wet weather/flood conditions the water surface must expand further. This creates increased flood frequency, elevation, and potential risk to property in and around the Lake Hiawatha Basin.



▲ **Figure B.** Increased stormwater needs to be conveyed out of the Lake Hiawatha Basin due to increased urbanization and climate change. Because of downstream restrictions shown (X) under Minnehaha Creek leaving Lake Hiawatha, current water management requires keeping the water level or hydraulic profile in the Lake Hiawatha Basin at ±812.8' elevation.

PROPOSED MASTER PLAN CONCEPT TO DRIVE EXTRA WATER DOWNSTREAM

The MPRB Master Plan would effectively raise the water surface elevation during both dry and wet weather conditions. The proposed solution would increase and hold the water surface elevation at $\geq 812.8'$ which is above historical floodwater elevations in both Lake Hiawatha and the proposed 50 acres of new permanently wetted area west of the lake.



▲ **Figure C.** MPRB Master Plan (2017) aerial-view and cross-section. Aerial view shows seasonally flooding and permanently wetting an area about the same size as Lake Hiawatha.

FOUR PROBLEMS WITH THE MASTER PLAN CONCEPT

PROBLEM 1: Higher Flood Risk for 90 Homes Northwest of Golf Course

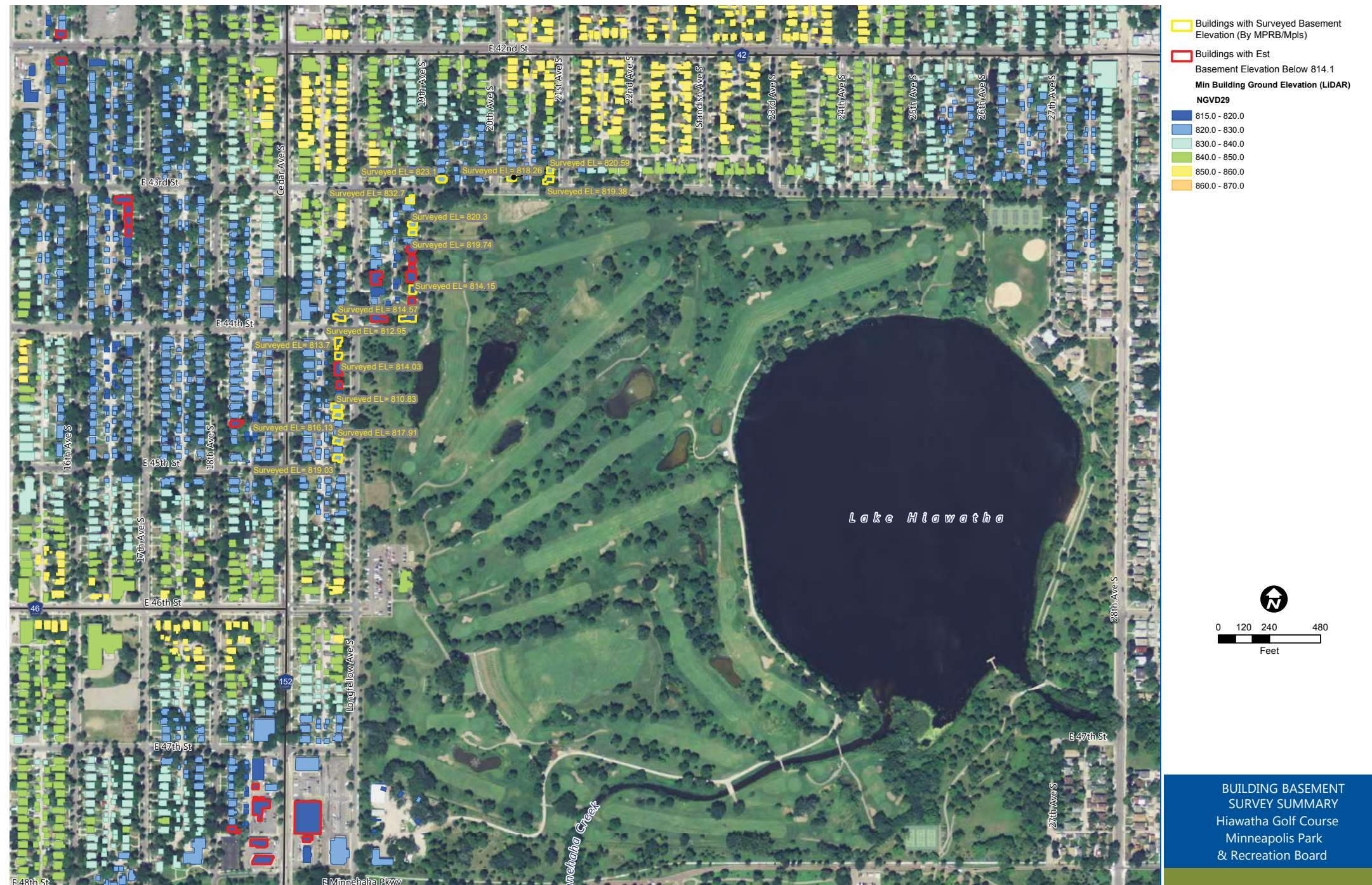
In the existing conditions, working for decades, stormwater inflows all enter the lake and are conveyed downstream to the Mississippi River. When high inflows exceed the downstream capacity, the lake fills up until it overflows the berm into the golf course at elevation 814.5' (about 3 feet higher than dry weather conditions). During these floods, about once every 10 years, the golf course's lower elevation provides an important function to reduce peak stormwater volume, below critical levels. In the proposed Master Plan Concept the berm between the lake and the golf course bowl would be removed, and the golf course floodplain would be flooded already. Stormwater from the beginning of a storm will be discharged at a lower flowrate because the water elevations of Lake Hiawatha and the new 50-acre wetland won't increase initially as fast as the existing condition. Floodwater may push further westward into residential areas.



▲ **Figure D.** 90 homes, northwest of the Hiawatha Basin, lower than 820' elevation, outlined in yellow, will be subject to flood risk with the Master Plan Concept due to higher peak flood water elevations.

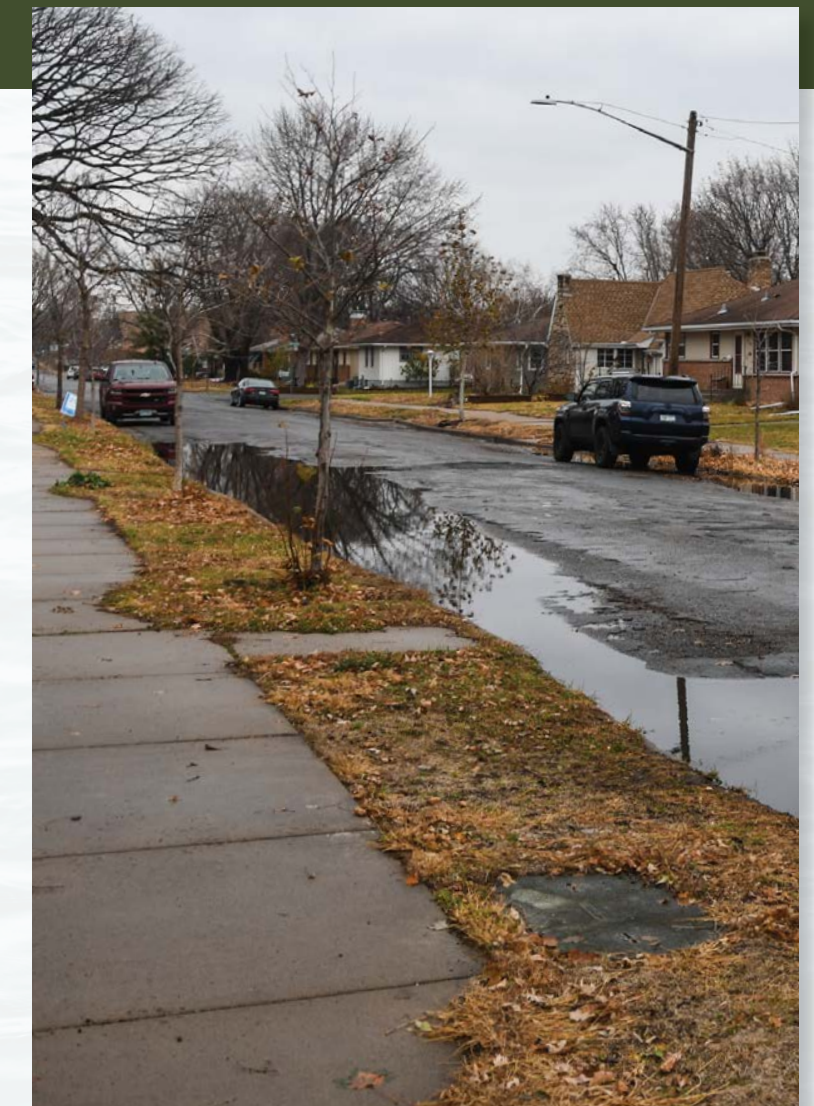
Stormwater at the beginning of a storm fills the new wetland/lake before the peak of the storm event. When the peak of the storm event arrives, XPSWMM (Stormwater Wastewater Management Module by Innovyze) **shows the peak wet weather water surface elevation will actually increase with the Master Plan Concept.** Unfortunately, there are 90 homes northwest of the park situated at low elevation ($<820'$) that may be more susceptible to property damage from surface water flooding if the golf course water surface exceeds the existing peak water surface elevation of $\pm 817'$.

PROBLEM 2: Groundwater Intrusion for >500 Basements



▲ **Figure E.** 500 Homes, shown in turquoise and blue, subject to groundwater intrusion into their basements with removal of the Lake Hiawatha berm, increasing groundwater elevation from 810' to 813'.

The regional groundwater table elevation is currently maintained at about 810' above sea level. Because most homes are situated at elevation 820' or higher, basement floors are approximately 813' elevation. Pumping from Pond E helps keep them dry from groundwater intrusion. In the proposed Master Plan, the groundwater elevation will no longer be maintained at elevation 810'. It will be about 812-813' during normal dry weather conditions. Considering hydraulic slope around the park, the Master Plan Concept groundwater elevations near surrounding homes will be higher than the floors of many basements. Additional groundwater intrusion is likely to occur for more than 500 homes.



PROBLEM 3: Lake Hiawatha Still Not Swimmable

Phosphorus and pathogens in stormwater from Minnehaha Creek and inflows from the 43rd St. culvert will continue to impair Lake Hiawatha under the Master Plan Concept. The Lake will remain unsightly and unsafe for swimming due to these inflowing pathogens. While the minor inflows from Pond E will be treated through the constructed wetlands system west of Lake Hiawatha, a majority of the phosphorus and pathogens will continue flowing into the Lake, preventing necessary improvements in its water quality. No internal recirculation treatment within the lake is proposed in the Master Plan. By contrast, Lake Nokomis is isolated from polluted inflows so it can be properly managed to provide optimal water quality for recreation and swimming.



▲ Lake Hiawatha beach closure due to high pathogen concentrations, August 10, 2022. The Master Plan Concept does not address pathogen content in the Lake.

PROBLEM 4: 55 Acres of Dry Park Land Lost



▲ The Master Plan Concept proposes "Shallow Lake Hiawatha #2" west of Lake Hiawatha. This will reduce park land from 186 to 131 acres and be subject to nutrient overload, nuisance mud, odors, and vectors from fluctuating shallow water.

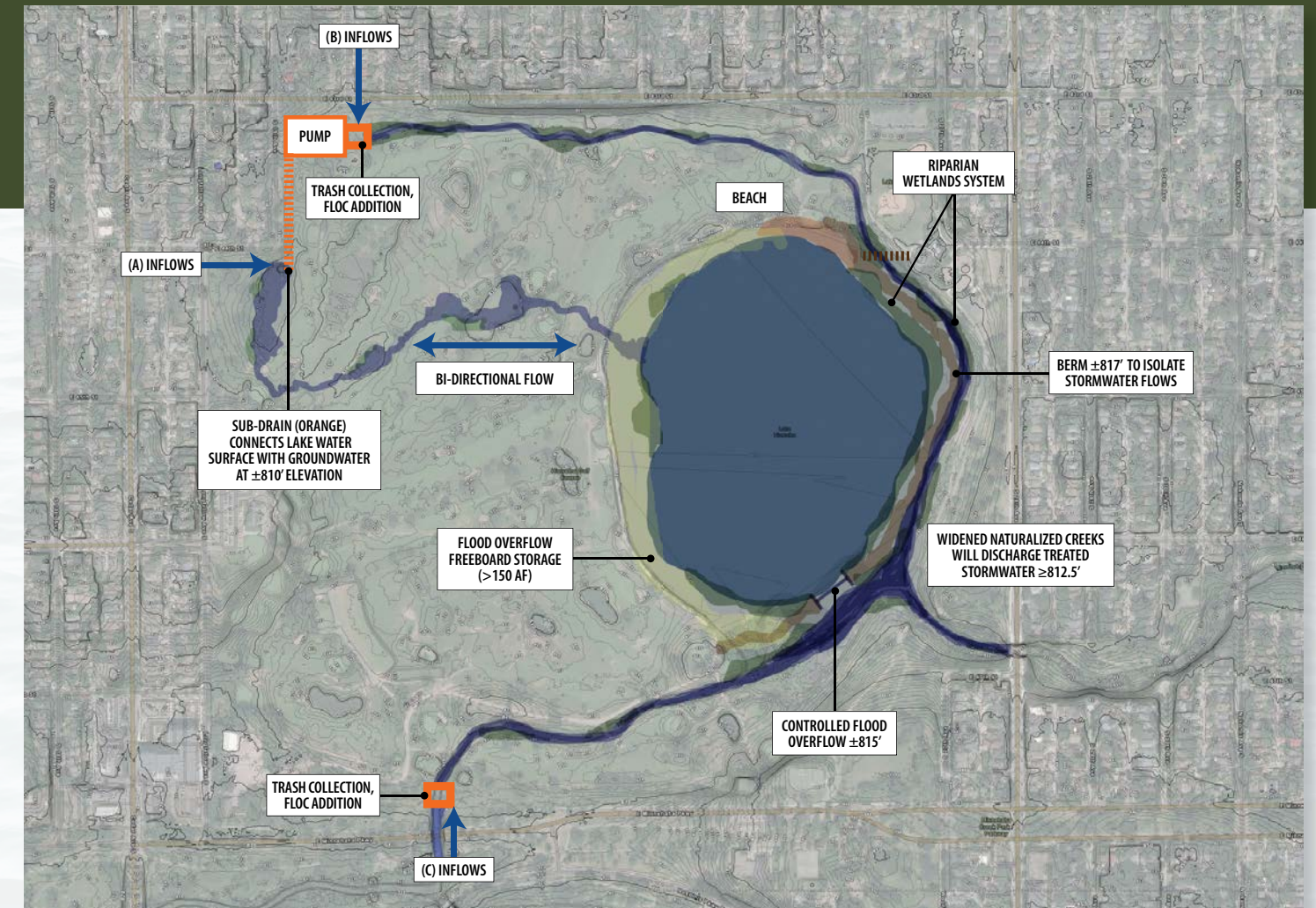
Of the 241-acre Lake Hiawatha Park property, Lake Hiawatha covers 55 acres. In the Master Plan Concept a second shallow Lake Hiawatha of 55 acres would be created, thus reducing valuable urban green-space from 186 acres (241 acres – 55 acres) to 131 acres (186 acres – 55 acres). Because the water surface elevation of Minnehaha Creek is so variable, with changes of several feet in monthly water surface elevations, the proposed shallow wetlands will dry out and expose shoreline mud and muck. This "wetland" will turn stagnant, odorous, and attract vectors, including mosquitoes.

A BETTER WAY FORWARD "ALTERNATIVE 6" WATER MANAGEMENT CONCEPT

An "Alternative 6" Water Solution has been developed, building on the Master Plan Alternatives 1-5, to improve the project:

1. Reduce Pumping, Maintain Dry Land for Park Uses and Urban Green Space Recreation
2. Provide Increased Flood Storage Capacity (>150 AF)
3. Reduce Groundwater Elevation to Protect Residences
4. Improve Lake Hiawatha Water Quality for Swimming and Recreation

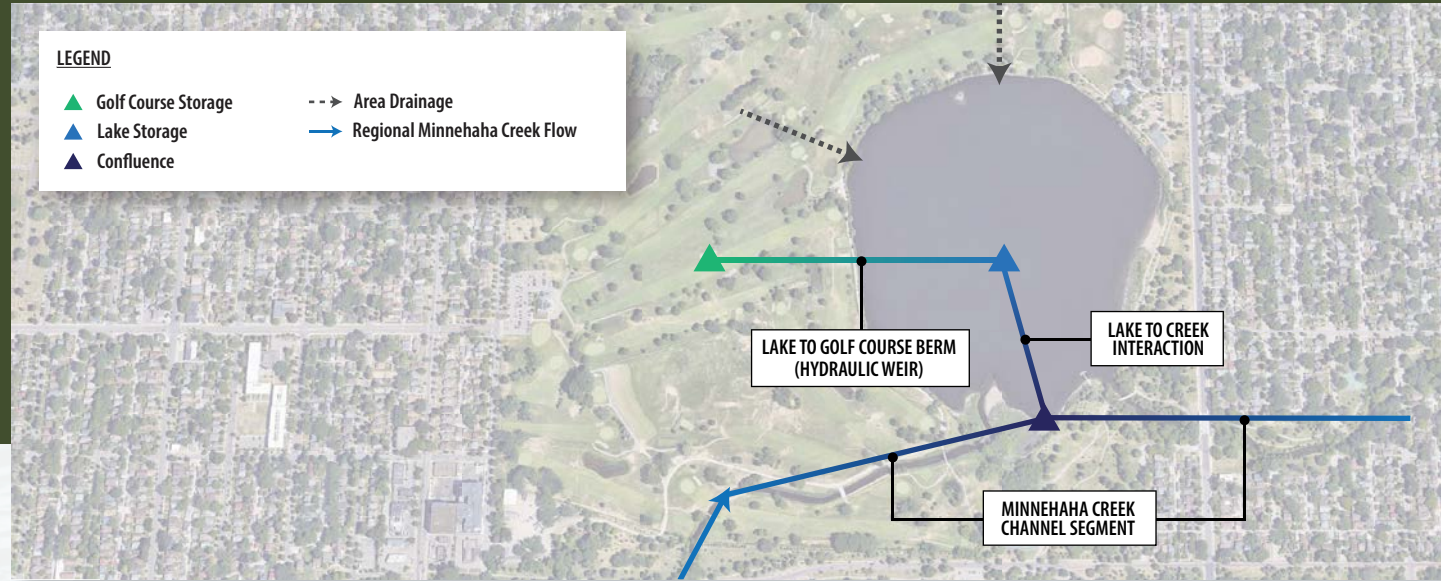
Instead of continuing to route all three inflows into the basin and Lake Hiawatha, "Alternative 6" copies the model of Lake Nokomis. Minnehaha Creek (Inflow C) would stay in its own naturalized creek extension and flow around Lake Hiawatha. The 43rd Street flows (Inflow B) would be routed through a new naturalized creek clockwise around the golf course and Lake. The 44th Street flows (Inflow A) would be lifted into the naturalized creek and combined with Inflow B flows to be treated for Trash Collection and Floc Addition. Thus, all city stormwater flows will be routed around, not through Lake Hiawatha. Minnehaha Creek (Inflow C) will also be treated for trash and nutrients prior to flowing downstream to the Mississippi River.



▲ Figure F. "Alternative 6" would route all three inflows around and not through the Lake.

HYDRAULIC EVALUATION OF EXISTING, MASTER PLAN, AND ALTERNATIVE 6 SOLUTIONS

The City of Minneapolis provided an XPSWMM stormwater model for evaluation of the existing condition, the Master Plan Concept, and the "Alternative 6" Solution. The results are shown in Figures G, H, I, and J as follows:

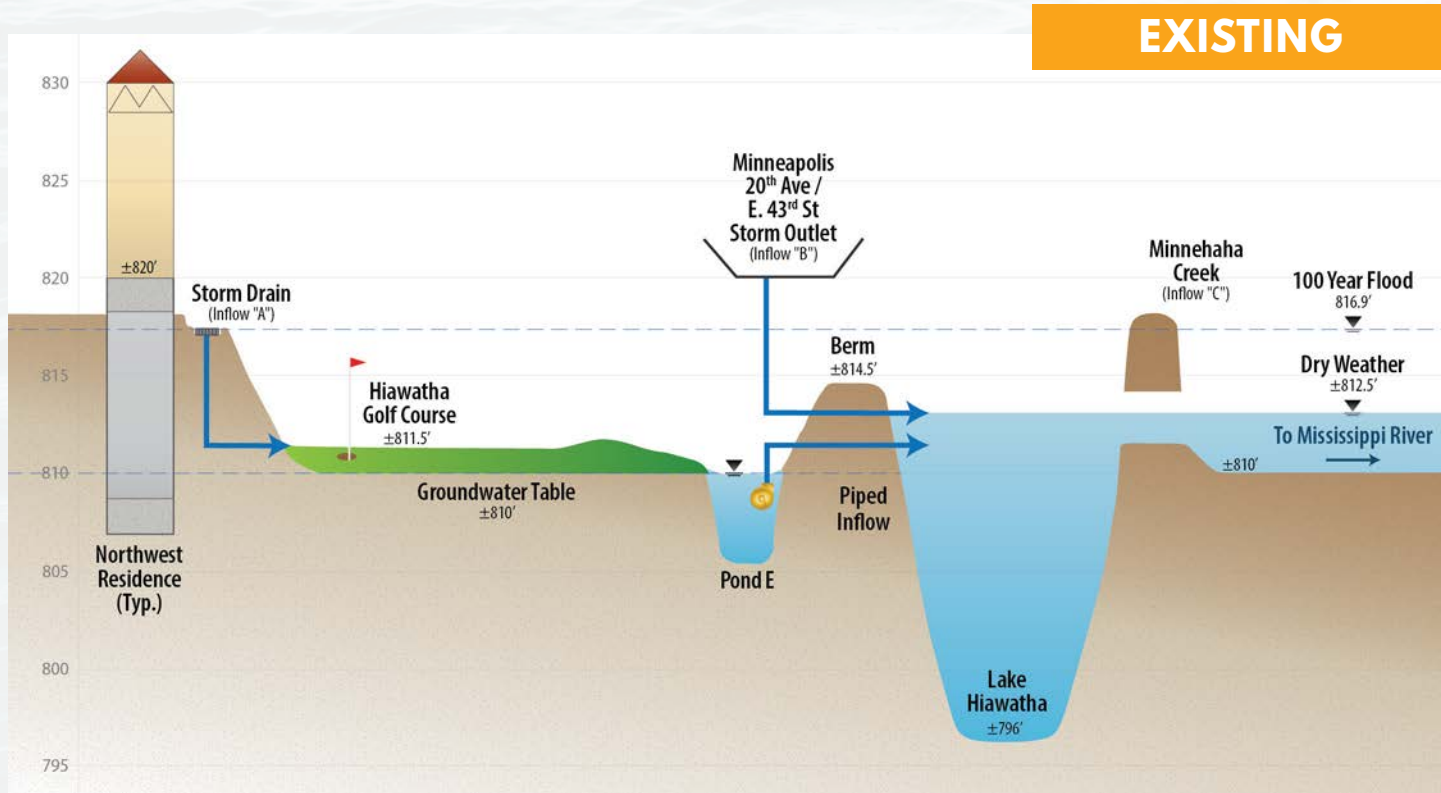


▲ **Figure G.** XPSWMM hydraulic network with storage, channel segments, and hydraulic structures.

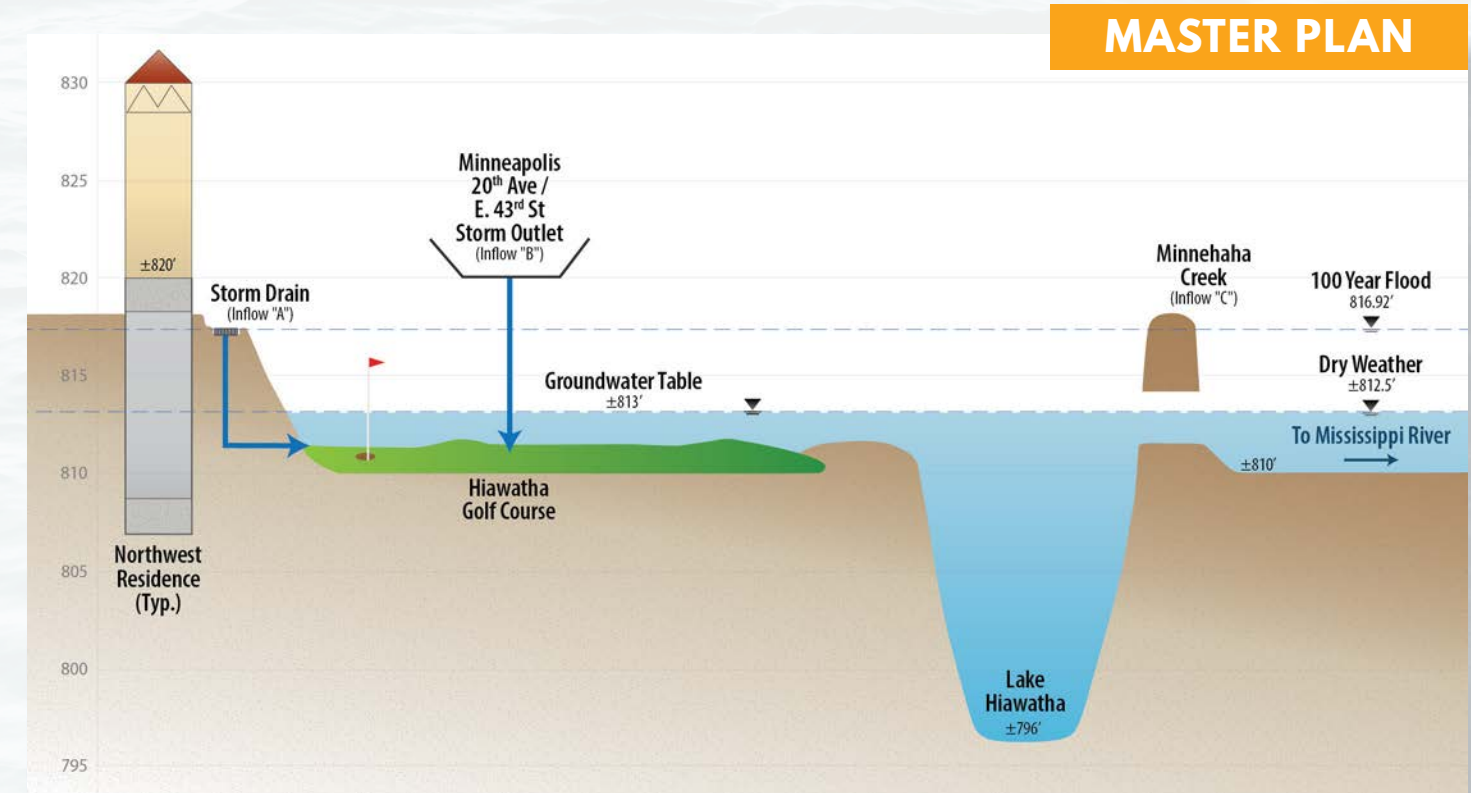


BENEFITS OF UPGRADED STORMWATER SIMULATION MODELS

- ◆ Corrected and Improved Regional XPSWMM Model
- ◆ Detailed Hydraulic Interaction of Lake and Creek
- ◆ Improved Understanding of Flood Conditions
- ◆ Leads to Improved Design with Best Performance to Meet Multiple Goals



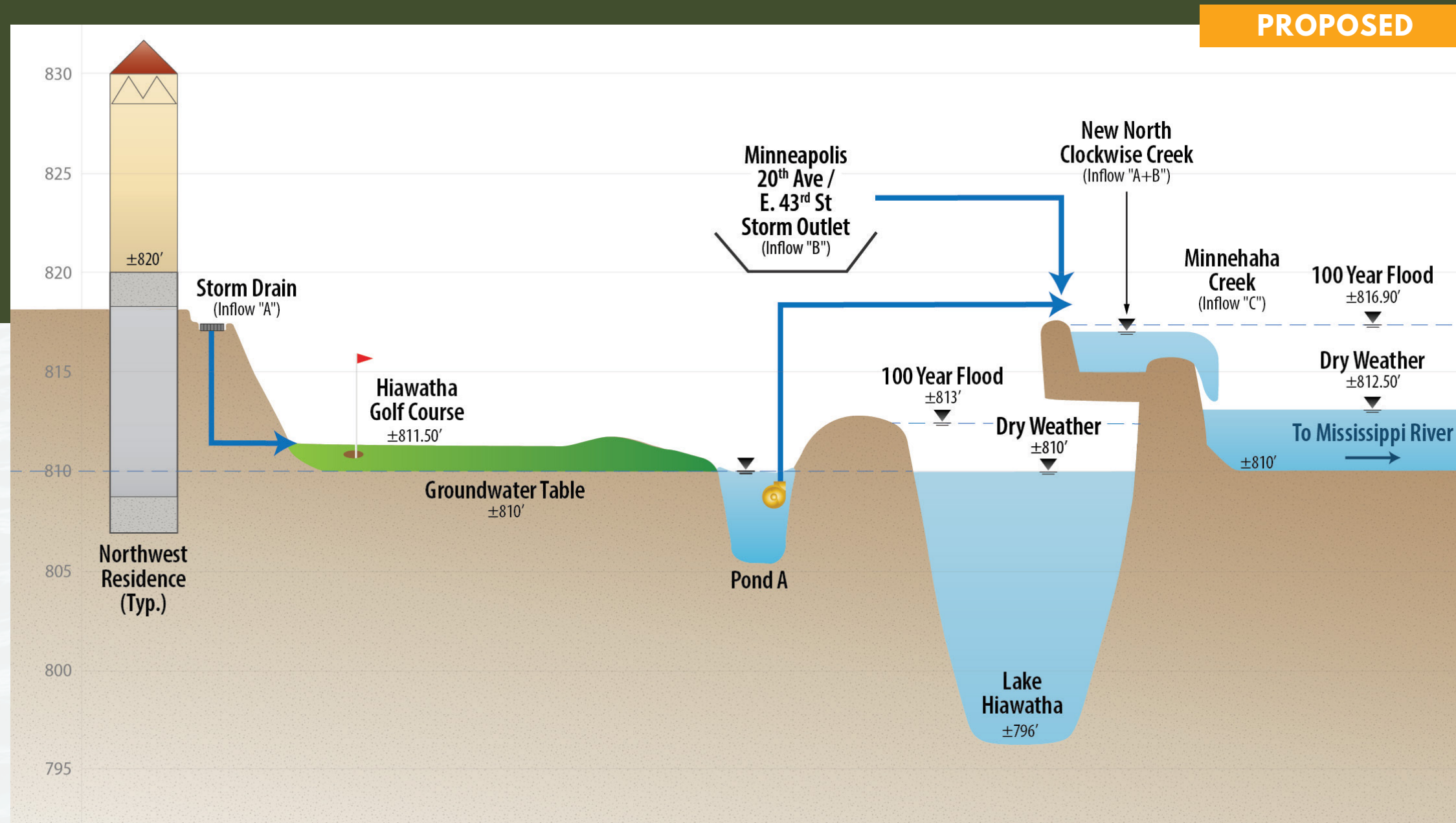
▲ **Figure H.** The existing condition is subject to persistent flooding of valuable dry land (the existing Hiawatha Golf Course) and requires improvement.



▲ **Figure I.** The MPRB Master Plan Concept permanently wets and seasonally floods a large portion of existing dry park land. The wet weather floodwater elevation will be worse than the existing condition, according to our XPSWMM results. Groundwater elevations will increase 3 feet, subjecting 500 basements near the Lake to flooding. The golf course area is permanently/regularly flooded.

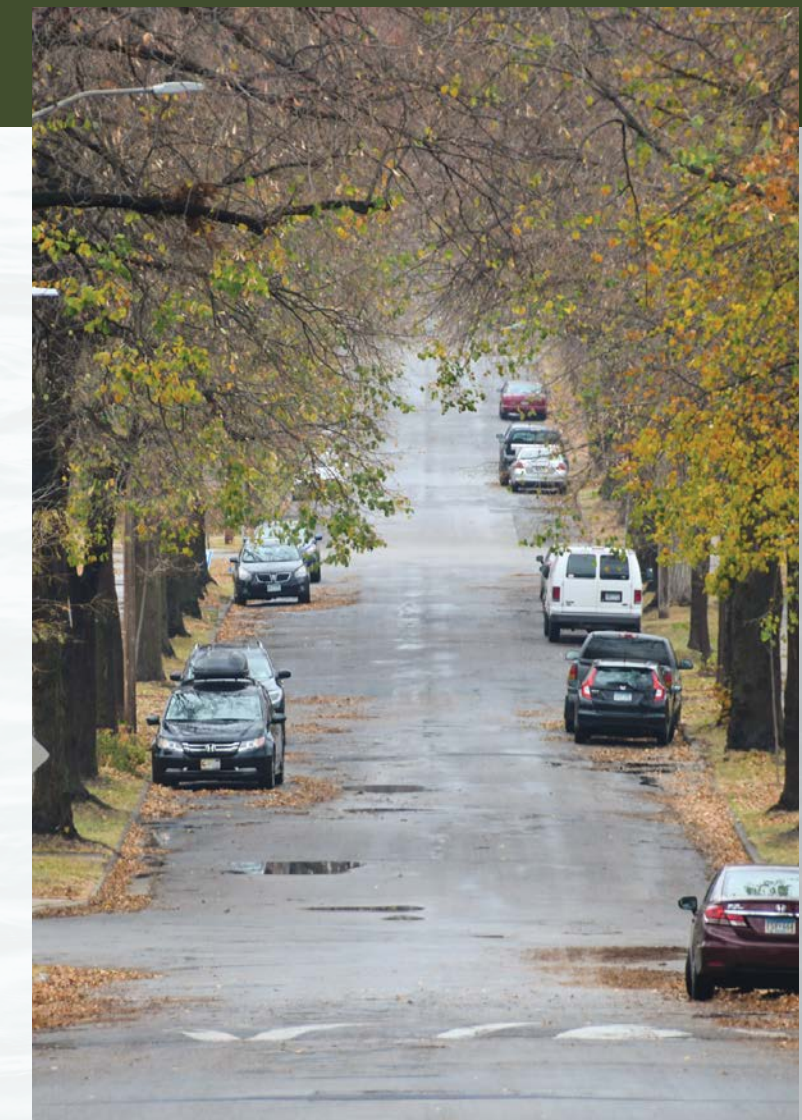
ALTERNATIVE 6 SOLUTION

PACE used the refined XPSWMM model with a corrected and more detailed representation of Lake Hiawatha, the Hiawatha Golf Course, and Minnehaha Creek to create an improved design concept.



PROPOSED

The XPSWMM model integrates surface storage, channel storage and conveyance, pipe hydraulics, and weir hydraulics. PACE analyzed multiple configurations to develop the design concept. The PACE design concept preserves the historic Hiawatha Golf Course and protects it from flooding, limits peak flood levels on Lake Hiawatha, and improves floodplain conditions on Minnehaha Creek. The "Alternative 6" approach provides better performance, in all areas, than either existing conditions or the proposed Master Plan design concept.



▲ **Figure J.** The Alternative 6 Solution maintains permanently unflooded dry park land, maintains existing groundwater surface elevations, and improves Lake Hiawatha water quality.