STRAND ASSOCIATES STUDY OF FLOODING IN GARDEN HOMES, ETC. 11/12/1991

see page 3

November 12, 1991

Village of Shorewood Hills
1008 Shorewood Boulevard
Madison, Wisconsin 53705-1499

Attention: Mr. Paul Moderacki
Village Administrator

Re: Village of Shorewood Hills
Willow Creek Storm Sewer Basin Review

Dear Paul:

The following is a letter report of our investigation of the reported drainage problems within the portion of the Village of Shorewood Hills, which is in the City of Madison Willow Creek Storm Sewer Basin.

Background

The portion of the Willow Creek Storm Sewer Basin reviewed in this report is bounded on the south by University Avenue, on the west by the intersection of University Avenue and the Soo Line Railroad, on the east by Shorewood Boulevard, and on the north by the ridge line within the Village of Shorewood Hills.

The basis for this storm sewer review and investigation is the reported localized flooding and storm water conveyance problems within the Garden Homes Subdivision, Kohl's Shopping Center, and Locust Drive. These lands drain by shallow overland flow, drainage ways, culverts, and storm sewer pipe systems to Willow Creek with outfall to Lake Mendota.

The entire Willow Creek Storm Sewer Basin includes a large tributary area. The tributary area of the basin is approximately 2100 acres. The majority of the basin is within the City of Madison. A large portion of the runoff from this basin is conveyed by a 12' wide by 5' high concrete box culvert that is routed through the Village of Shorewood Hills, including the area of this investigation and review. A complete study and analysis of the entire basin would require an extensive endeavor beyond the scope required for determining the village's needs.

The portion of the Willow Creek Storm Sewer Basin reviewed in this report is entirely developed. Current land use is a combination of residential,

professional offices and commercial development. Storm water runoff in this area has been consistent for some time due to the full development condition of the basin.

This storm water review is intended to analyze the existing secondary facilities (storm sewer system) at the Garden Homes Subdivision, Kohl's Shopping Center, and Locust Drive. We will provide the 100 year event peak runoff for the Village of Shorewood Hills portion of the basin studied based on existing land use development. The review and analysis will provide recommendations and probable costs to complete the recommendations.

Tributary Area

Field observations, Village of Shorewood Hills topographic maps, City of Madison storm sewer maps, and the Willow Creek Storm Sewer basin map were used to determine tributary drainage areas and existing storm sewer drainage systems. Based on this information, we have determined that approximately 320 acres are contained within the portion of this basin within the Village of Shorewood Hills. Approximately 60 acres of the total 320 acres are tributary to the secondary facilities (storm sewer system) analyzed and reviewed at the Garden Homes Subdivsion, Kohl's Shopping Center, and Locust Drive. Approximately 260 acres of the total 320 acres are tributary to the north side of the Soo Line Railroad. Analysis of storm water runoff was based on the basin at its existing full development state.

Design Methods

Major facilities were analyzed on the basis of a 100 year, 24-hour storm event. This is a rainfall event that has been statistically determined by the U.S. Department of Commerce Weather Bureau - Technical Paper No. 40 - Rainfall Frequency Atlas of the United States. A 100 year, 24 hour storm event has a one percent probability of occurrence in any given year. Major facilities include detention basins, retention basins, control structures, drainage-ways and culverts analyzed during this storm event. A runoff hydrograph for the 100 year, 24 hour storm event was generated using the Soil Conservation Services TR-55 method refined by Haestad Methods, Inc., Quick TR-55 computer program. Major facilities are designed for flood control and property protection during major storm events. Since the basin is fully developed, it is apparent that no land is available for the construction of drainage ways, detention or retention basins. We have generated a hydrograph and peak flow runoff for the 100-year, 24-hour storm event.

Existing secondary facilities (storm sewer systems) were analyzed on the basis of a 5-year peak flow storm event. Runoff rates were determined using the rational method for analyzing and designing local storm sewers. Secondary facilities are designed to provide convenience drainage during minor storm events. Secondary facilities are designed to promote drainage of streets and adjacent properties so that disruption to pedestrians and vehicles can be avoided.

Shorewood Hills only!

RECOMMENDATIONS

Major Facilities

A 100 year, 24 hour peak runoff rate for this 320 acre area is approximately 586 cfs. It would be uneconomical for the Village of Shorewood Hills to address this peak runoff due to the fact that this basin is fully developed and a large portion of the entire basin is the responsibility of the City of Madison. In order to address the effects of this runoff an entire basin study between the City of Madison and Village of Shorewood Hills would be required.

We recommend that major facilities culverts be installed at Highbury Road and Western Road on the north side of the Soo Line Railroad tracks. Preliminary analysis indicates that a 30-inch diameter culvert be installed at Highbury Road, and a 36-inch diameter culvert be installed at Western Road, or their hydraulic equivalent. These culverts will convey the 100 year, 24-hour runoff east to Shorewood Boulevard from the tributary drainage area north of the Soo Line Railroad.

At the northwest corner of Shorewood Boulevard and the Soo Line Railroad, there is an existing 42-inch diameter culvert. This 42-inch diameter culvert is exposed at one end and the other end outfalls to the existing 12'W x 5'H box culvert at Locust Drive. The exposed end of this culvert has been bulkheaded and an 18-inch diameter opening constructed with a flap check valve assembly. This measure protects this area from potential surcharge backwater from the existing box culvert, but provides negligible capacity for the 100 year event runoff. We recommend that the bulkhead and flap check valve be removed, install an apron endwall with pipe gate cage, install a cast-in-place structure at the 42-inch diameter junction to the existing culvert, and install a 42-inch diameter check valve in the cast-in-place structure at the 42-inch diameter culvert outfall. A storm sewer map illustrating these existing and recommended storm sewers is attached.

These 100 year, 24 hour storm event major facilities improvements mentioned above are recommended so that runoff during this storm event will be confined to an area along the north side of the Soo Line Railroad. Otherwise, the railroad would be overtopped, and this runoff would be directed south to the Garden Homes Subdivision, Kohl's Shopping Center, and Locust Drive.

The probable costs for these major facilities improvements are included with the Locust Drive Phase II cost tables attached.

Secondary Facilities

Existing secondary facilities outfall to the existing 12'W x 5'H box culvert located at Rose Place and Locust Drive. Existing secondary facilities reviewed include the following three areas, distinguished by their separate storm sewer systems and drainage areas: (See attached storm sewer plan)

1. Kohl's Shopping Center - Rose Place and Fern Drive

   This existing storm sewer system is under capacity. Existing inlets do not have the capacity to convey the storm water runoff into the storm sewer system. When the existing box culvert attains its capacity, surcharged backwater effects begin to occur. The drainage area is almost entirely impervious and runoff time of concentration is short. This area is lower than surrounding areas and additional runoff that bypasses the storm water system along University Avenue and Midvale Boulevard ponds in this area.

   We recommend that the existing storm sewer system be abandoned and a new storm sewer system with multiple, high capacity inlets be constructed to convey runoff to the existing box culvert. Additionally, we recommend that check valves be installed at outfalls to the existing box culvert to eliminate the possibility of surcharged backwater from the existing box culvert. These check valves can be maintained by accessing a manhole constructed at the junction of the proposed storm sewer and existing box culvert. A system map illustrating these existing and recommended storm sewers is attached.

2. Garden Homes Subdivision - Maple Terrace, Burbank Place, and Locust Drive West of Fern Drive.

   The storm sewer system is very shallow, under capacity and existing inlets do not have the capacity to properly convey the storm water runoff into the storm sewer system. This storm sewer system is routed between existing homes to the east to the existing box culvert at Rose Place. Field observations located existing pipes under a garage and in close proximity to a house foundation. The existing pipe material is corrugated metal and is very shallow. Ground subsidence indicates that this existing storm sewer pipe has had some structural failures over the years.

   We recommend that the existing storm sewer system be abandoned and a new storm sewer system with multiple, high capacity inlets be constructed. The new storm sewer system would be routed to the north to Locust Drive then east to an existing 36-inch diameter storm sewer pipe. The existing 36-inch storm sewer pipe outfalls to the existing box culvert at Locust Drive behind Kohl's Shopping Center. Additionally, we recommend that check valves be installed at the outfall to the existing 36-inch diameter pipe to eliminate the possibility of surcharge backwater from the existing box culvert. These check valves would be maintained by

accessing a manhole constructed at the junction of the proposed storm sewer and the existing 36-inch diameter pipe. These recommendations are shown on the attached system map.

3. Locust Drive - East of Fern Drive to Shorewood Boulevard

As previously mentioned the 12' wide by 5' high box culvert is routed east within the Locust Drive right-of-way. Existing storm sewer inlets along Locust Drive are connected directly to the box culvert without any maintenance access manholes. Existing storm sewer inlets are small and do not provide sufficient capacity during heavy rains. Existing storm sewer pipe size is adequate but is restricted by 90° elbow fittings at the inlets.

The Locust Drive recommended improvements have been separated into two phases for budgeting purposes.

PHASE I

In Phase I we recommend that existing inlets and 90° elbow fittings be removed and replaced with high capacity inlets and new storm sewer pipe. Access points are to be constructed at the junctions of new storm sewer pipe and the existing box culvert. New storm sewer pipes are to be connected to proposed manholes constructed at the existing box culvert so that check valves may be installed at outfall pipes at a later date should surcharged backwater flooding be observed. These recommendations are also shown on the attached system map.

PHASE II

Locust Drive Phase II recommendations include major facilities on the north side of the Soo Line Railroad (Facilities to handle the 100-year storm event) as well as flood protection measures along Locust Drive east of Fern Drive.

We recommend that storm sewer inlets in Locust Drive east of Fern Drive be monitored during heavy rains to determine if surcharged backwater flooding occurs. Proposed storm sewer improvements under Phase I recommendations in this area will be small diameter pipe and can be designed at a higher elevation than other storm sewer systems proposed in this report. Also, the elevation of the existing box culvert is lower and provides additional freeboard from the hydraulic gradient elevation and inlet elevations. Should surcharged backwater flooding be reported, we recommend that check valves be installed on all storm sewer outfalls to the existing box culvert system. These check valves are expensive and there would be ten 12-inch check valves required. These check valves are included in the attached Locust Drive Phase II probable cost tables.

The following is our recommended priority of construction to address the reported problems based on the severity of the flooding as analyzed in the study area:

1.	Kohl's Shopping Center Rose Place and Fern Drive:	$ 75,298.00
2.	Garden Homes Subdivison Maple Terrace, Burbank Place, and Locust Drive west of Fern Drive:	$110,883.00
3.	Locust Drive East of Fern Drive to Shorewood Boulevard, Phase I:	$ 51,544.00
4.	Locust Drive East of Fern Drive to Shorewood Boulevard, Phase II:	$ 77,724.00
	TOTAL:	$315,449.00

Probable Costs

The attached cost tables are based on field observations and investigation, preliminary analysis, and existing topographic maps. Probable costs will be refined to a greater degree following field surveys and detailed design. The cost tables have segregated the recommended improvements to match the previously mentioned priority of construction.

Should you have any questions or comments concerning information provided in this report, please call.

Sincerely,

STRAND ASSOCIATES, INC.

Robert C. Ehlers, P.E.

Russell P. Kiviniemi

258-760/RCE:RPK:TK

PROBABLE COSTS

1. KOHL'S SHOPPING CENTER

Item No.	Estimated Quantity	Unit of Measure and Description	Unit Price	Extension
1.	30	LF, 12-IN RCP Storm Sewer	$28.00	$840.00
2.	50	LF, 15-IN RCP Storm Sewer	$30.00	$1,500.00
3.	350	LF, 18-IN RCP Storm Sewer	$32.00	$11,200.00
4.	220	LF, 27-IN RCP Storm Sewer	$45.00	$9,900.00
5.	10	EA, 2-Ft. x 3-Ft. Storm Inlets	$1,000.00	$10,000.00
6.	3	EA, 4 Ft. Dia. M.H.	$1,200.00	$3,600.00
7.	1	EA. 4-Ft. Dia. M.H. @ Exist. Box Culvert	$2,000.00	$2,000.00
8.	650	LF, Asphaltic Concrete Street and Parking Lot Restoration	$15.00	$9,750.00
9.	1	LS, Restoration, Remove and Abandon Exist. Storm Sewer	$3,000.00	$3,000.00
10.	1	EA, 27-IN Tide Flex Check Valve	$5,000.00	$5,000.00
11.	1	EA, 15-IN Tide Flex Check Valve.	$2,500.00	$2,500.00

Subtotal:	$59,290.00
15% Construction Contingency:	$ 8,893.00
12% Engineering:	$ 7,115.00
Total Estimated Cost:	$75,298.00

PROBABLE COSTS

2. GARDEN HOMES SUBDIVISION

Item No.	Estimated Quantity	Unit of Measure and Description	Unit Price	Extension
1.	45	LF, 15-IN RCP Storm Sewer	$30.00	$1,350.00
2.	30	LF, 18-IN RCP Storm Sewer	$32.00	$960.00
3.	700	LF, 24-IN RCP Storm Sewer	$40.00	$28,000.00
4.	200	LF, 30-IN RCP Storm Sewer	$50.00	$10,000.00
5.	8	EA, 2-FT. by 3 FT. Storm Inlets	$1,000.00	$8,000.00
6.	1	EA, 6-FT DIA MH W/Inlet	$2,000.00	$2,000.00
7.	1	EA, 4-FT DIA MH	$1,200.00	$1,200.00
8.	1	EA, 5-FT DIA MH	$1,600.00	$1,600.00
9.	1	EA, 6-FT DIA MH @ Exist. 36-IN RCP	$3,000.00	$3,000.00
10.	1,000	LF, Asphaltic Concrete Street and Curb Restoration	$15.00	$15,000.00
11.	1	LS, Restoration and Abandon Exist Storm Sewer	$8,000.00	$8,000.00
12.	1	EA 30-IN Tide Flex Check Valve	$5,700.00	$5,700.00
13.	1	EA, 15-IN Tide Flex Check Valve	$2,500.00	$2,500.00

Subtotal:	$87,310.00
15% Construction Contingency:	$13,096.00
12% Engineering:	$10,477.00
Total Estimated Cost:	$110,883.00

PROBABLE COSTS

3. LOCUST DRIVE - PHASE I

Item No.	Estimated Quantity	Unit of Measure and Description	Unit Price	Extension
1.	135	LF, 12-IN RCP Storm Sewer	$28.00	$3,780.00
2.	165	LF, 18-IN RCP Storm Sewer	$32.00	$5,280.00
3.	11	EA, 2-FT by 3-FT Storm Inlet	$1,000.00	$11,000.00
4.	5	EA. 4-FT DIA. Manhole at Exist. Box Culvert	$2,000.00	$10,000.00
5.	300	LF, Asphaltic Concrete Street Restoration	$15.00	$4,500.00
6.	100	LF, Curb and Gutter Restoration	$10.00	$1,000.00
7.	1	LS, Remove Exist. Storm Sewer and Restoration	$5,000.00	$5,000.00

Subtotal:	$40,560.00
15% Construction Contingency:	$ 6,084.00
12% Engineering:	$ 4,900.00
Total Estimated Cost:	$51,544.00

PROBABLE COSTS

4. LOCUST DRIVE - PHASE II

Item No.	Estimated Quantity	Unit of Measure and Description	Unit Price	Extension
1.	100	LF, 30-IN RCP Storm Sewer Culvert	$50.00	$5,000.00
2.	100	LF, 36-IN RCP Storm Sewer Culvert	$60.00	$6,000.00
3.	100	LF, Asphaltic Concrete Street Restoration	$15.00	$1,500.00
4.	2	EA, 30-IN Apron Endwall w/ Pipe Gate	$800.00	$1,600.00
5.	2	EA, 36-IN Apron Endwall w/ Pipe Gate	$900.00	$1,800.00
6.	1	EA, 42-IN Apron Endwall w/ Pipe Gate, Remove Exist. Bulkhead and Flap Check Valve	$1,500.00	$1,500.00
7.	1	EA. Cast-IN-Place Structure at Exist. 42-IN RCP & Box Culvert	$8,000.00	$8,000.00
8.	1	EA, 42-IN Tide Flex Check Valve	$14,000.00	$14,000.00
9.	9	EA, 12-IN Tide Flex Check Valve	$1,800.00	$16,200.00
10.	1	EA, 18-IN Tide Flex Check Valve	$2,600.00	$2,600.00
11.	1	LS, Restoration	$3,000.00	$3,000.00

Subtotal:	$61,200.00
15% Construction Contingency:	$ 9,180.00
12% Engineering:	$ 7,344.00
Total Estimated Cost:	$77,724.00

STRAND ASSOCIATES STUDY 01/10/1992 FILE:
FOLLOW-ON TO STUDY OF 11/12/1991

SHOREWOOD HILLS
258-7600

see page 2
re: BCC water to Garden Homes

STRAND
ASSOCIATES, INC.
ENGINEERS
910 West Wingra Drive
Madison, Wisconsin 53715
(608) 251-4843

January 10, 1992

Village of Shorewood Hills
1008 Shorewood Boulevard
Madison, Wisconsin 53705-1499

Attention: Mr. Paul Moderacki
Village Administrator

Re: Village of Shorewood Hills
Willow Creek Storm Sewer Basin Review

Dear Paul:

We reviewed our letter report on the above subject at the November 25, 1991 Board of Public Works Meeting. During the meeting we were requested to review several additional areas in more detail. We were also asked to further research the existing use and track record of the Tide-Flex check valves. Following are the results of our further investigations.

Walnut Grove Center/Pyare Square Site

Our November 12, 1991 letter report recommended drainage improvements within the Garden Homes Subdivision. Concerns were expressed about the possibility of storm water runoff from the Walnut Grove Center and Pyare Square Offices into the Garden Homes Subdivision.

Field observations at the Walnut Grove Center and Pyare Square site were made. Two separate storm sewer systems exist in this area. One system collects storm water from the Walnut Grove Center and Pyare Square offices and conveys storm water east by a 24-inch diameter pipe. The other system collects storm water runoff from the Blackhawk Country Club, State Office Building complex west of Pyare Square offices, and State Office Building complex at the southwest corner of University Boulevard and Segoe Road. This system conveys storm water east by a 36-inch diameter pipe. These two storm sewer pipe systems are located within the north parking lot of the Walnut Grove Center and Pyare

Square Offices and are both parallel to the Soo Line Railroad and both discharge into the large box culvert.

Two culverts exist under the Soo Line Railroad that convey storm water runoff onto the north parking lot of the Walnut Grove Center and Pyare Square Offices from the Blackhawk Country Club. It is our opinion that the north parking lot storm sewer system was intended to collect storm water for the Walnut Grove Center and Pyare Square offices and not additional runoff from the Blackhawk Country Club.

Elevations within the Walnut Grove north parking lot and access drive from the north parking lot to Locust Drive were verified. We have concluded that excess runoff would be conveyed to the Garden Homes Subdivision.

We recommend that landscape areas along the north parking lot east boundary be bermed and the access drive at the east boundary be built-up to contain runoff in this area to the north parking lot. Two additional drainage inlets should be constructed within the north parking lot on the existing 36-inch diameter pipe where the two culverts exit under the Soo Line Railroad. An existing solid manhole grate on the 36-inch diameter pipe should be changed to an open grate. These additional inlets and berming at the east property boundary will provide additional storm water capacity for the Blackhawk Country Club runoff.

Probable costs for these recommended improvements are attached. These improvements should be addressed with the Garden Homes Subdivision improvements.

Northwest Corner of Shorewood Boulevard and Locust Drive

Our November 12, 1991 letter report recommended the installation of culverts at Highbury Road and Western Road on the north side of the Soo Line Railroad and improvements to the existing 42-inch diameter culvert at the northwest corner of Shorewood Boulevard and Locust Drive. Concerns were expressed about potential flooding in this area when closure of the proposed check valve occurs.

Field observations and some topographic information were obtained in this area to determine the most cost effective solution to address the Village's concern.

Existing drainage is naturally conveyed from this area to the east along the Soo Line Railroad. When the 42-inch diameter check valve closes, storm water will be detained in this area. We recommend that two horizontal elliptical 19"H x 30"W culverts, or their hydraulic equivalent, be installed at Shorewood Boulevard on the north side of the Soo Line Railroad. These culverts will provide a secondary outlet for storm water from the northwest corner to the northeast corner of Shorewood Boulevard and Locust Drive. An

open drainage ditch should be constructed from these culverts east to an existing ditch on the north side of the Soo Line Railroad at Columbia Road and Purdue Street. These recommendations will spread detained storm water during major storm events over a larger area preventing flooding of existing structures.

Probable costs for these recommended improvements are attached. These improvements should be addressed with Locust Drive Phase II improvements.

Tide-Flex Check Valves

As requested by the Board of Public Works, we have researched and obtained additional information concerning the proposed use of TF-2 Tide-Flex check valves.

Attached is a Red Valve Company - Tide-Flex Check Valve Catalog with some references for the TF-2 check valve. The catalog states that Tide-Flex check valves are in use in cities along both the east and west coasts, the Great Lakes and many major rivers in North America and Europe. They state that Tide-Flex check valves have successfully withstood severe winter freezes, hurricanes, and resulting flooding.

We have contacted several references provided in the catalog and were provided favorable responses from all concerning their past experience with TF-2 Tide-Flex check valve. None of the references contacted have had any problems with severe winter freezes.

Should you have any questions or comments concerning this report, please call.

Sincerely,

STRAND ASSOCIATES, INC.

Robert C. Ehlers, P.E.

Russell P. Kiviniemi

258-760/RCE:RPK:TK

STRAND
ASSOCIATES, INC.

PROBABLE COSTS

WALNUT GROVE CENTER/PYARE SQUARE SITE

Item No.	Estimated Quantity	Unit of Measure and Description	Unit Price	Extension
1.	2	EA. Storm Inlets at Exist. 36-IN CMP	$1,500.00	$3,000.00
2.	1	EA, Drainage Grate at Exist. Manhole	$200.00	$200.00
3.	1	LS, Berm Construction	$1,500.00	$1,500.00
4.	150	Ton, Asphalt Restoration and Berm	$30.00	$4,500.00

Subtotal:	$ 9,200.00
15% Construction Contingency:	$ 1,380.00
12% Engineering:	$ 1,300.00
Total Estimated Cost:	$11,880.00

11,680
2,200
13,880

STRAND
ASSOCIATES, INC.

PROBABLE COSTS

SHOREWOOD BOULEVARD AND LOCUST DRIVE

Item No.	Estimated Quantity	Unit of Measure and Description	Unit Price	Extension
1.	240	LF, 19-in by 30-in HERCP	$40.00	$9,600.00
2.	4	EA, 19-in by 30-in Apron Endwalls	$400.00	$1,600.00
3.	1	LS, Pavement Restoration	$1,000.00	$1,000.00
4.	1	LS, Traffic Control	$1,000.00	$1,000.00
5.	1	LS, Ditch Construction	$5,000.00	$5,000.00
6.	1	LS, Restoration	$1,000.00	$1,000.00

Subtotal:	$19,200.00
15% Construction Contingency:	$ 2,880.00
12% Engineering:	$ 2,500.00
Total Estimated Cost:	$24,580.00

258-760/RCE:RPK:TK

STRAND
ASSOCIATES, INC.

LETTER FROM GARDEN HOMES RESIDENT

To The Editor of Village Bulletin
Village of Shorewood Hills
1008 Shorewood Boulevard
Madison, WI 53705

Madison, Jan. 22, 1997

I ask you to kindly publish this letter in the next bulletin.

Dear Sir or Madam:

The residents of The Garden Homes owe thanks to Mr Thomas Brock for the brief history of our small neighborhood in the last issue of V.B. Until then I had heard only bits and pieces of recollections by early occupants. Towards the end of Mr Brock's account he tells how the flooding problem here was greatly increased with Midvale Boulevard and Hilldale Shopping Center going in. Some people say, that the most severe problems came later with Pyare Square, McDonalds, Walnut Grove, and their respective parking lots. I am told Garden Homes residents feared bad flooding and opposed the plans. Promises were made that the over-flow would be managed by increasing and improving the sewer system in our residential area. Thankfully the promises were kept thus lessening the volume and duration of floods. However, some sewer intakes at the low point of Pyare Square parking lot might have alleviated water back-ups, if indeed there exists sewer capacity to handle the influx of this much water. In addition to this, the other design compounding our flooding woes are four culverts leading run-off from the golf course and from the residential area west of Highbury Street, under the railroad track, practically straight into our neighborhood.

Within a six year span, from June 28, 1990 to June 10, 1996, the area took three major flash floods. Long time residents have told me that such severe floodings hadn't happened in the previous 20 years. Of these three recent floods, the last one on June 10 reached 29" at my location; the other two 24" each. My own losses were worst in 1990 because I was not at home; leaving home during summer flood season has ever since remained a concern. At the time of the next flood, my neighbor was in England and came home to find among other things, a flood-damaged car. But the flood last summer did the most destruction; people in our neighborhood suffered heavy financial losses including structural damage to some houses on top of enormous work, worry and misery. Since the last deluge this area has gained flooding notoriety. In the future, will prospective buyers, aware of the situation, pay market-value prices on especially the lowest-lying properties?

I would like this to go on record as an environmental impact statement of sorts, before another land-speculation development unfolds. I am referring to the last green plot just bulldozed along Locust Drive east of Dorn's Hardware. This green space probably absorbed hundreds of tons of water from surrounding paved land during heavy down-pours. If this surface becomes another strip-mall encircled by parking-area, we will be victim to more run-off, since our homes would then stand on the only unpaved island in an even larger expanse of concrete.

The Garden Home residents never ventured any reckless gamble against nature by building hill-side, lake-front or on a river-bank. They were already there when the authorities of the time, in spite of protests from forty-some home owners, albeit small, approved the plans and blue-prints. We are here now when another money-driven development, perhaps now even more critical, is afoot, and again we anticipate with dread what it will do to our lives.

Sincerely, Karolina Johnson

Karolina Johnson,
813 Burbank Place, Madison, WI 53705

2/10/1997

(Petition, signed by many residents of Garden Homes, and submitted to the Shorewood Hills Board of Trustees in advance of the Trustee's meeting of February 10, 1997)

To the Board of Trustees of the Village of Shorewood Hills:

I am a resident and property owner in the Garden Homes neighborhood of the Village of Shorewood Hills.

My enjoyment of my property and the market value of my property has been severely reduced by a series of floods in the recent past, the most recent and worst occurring last June 17.

Neither my enjoyment of my property nor the market value of my property will recover until plans are drawn up and resources are committed to policies and projects designed to relieve the threat of such floods in this neighborhood.

I reject the argument that I am not entitled to relief because I should have foreseen when I bought my property that such floods would occur. When I bought my property, there was no history of such floods, and no reason to believe that storm run-off from future development in the surrounding watershed would not be responsibly managed. It was never my responsibility to anticipate and manage the storm run-off from the property of others. That is what local governments are for.

I also reject the argument that, because much of the storm water that causes these floods arrives from land located in the City of Madison, that I am not entitled to relief from the Village of Shorewood Hills. I believe that the Village of Shorewood Hills is obligated to protect my person and my property from storm water run-off from wherever it originates, no less than it is obligated to protect my person and property from other threats that originate outside the Village limits. If someone who lives in the City of Madison should happen to assault me in my home, or vandalize my car or set fire to my house, I don't expect that the Village authorities will direct me to the City of Madison for relief.

If relief for the flooding problem, in whole or part, should be sought from the City of Madison, then it is the proper role of my Village government, not for me personally, to seek it there. However, to say that the Village, in its turn, should seek relief from the City of Madison or elsewhere is not to say that the Village, merely by making the attempt, can relieve itself of its obligation to me and my neighbors.

I hereby request that the Board of Trustees of the Village of Shorewood Hills speedily begin to set the political, organizational and financial resources of the Village government upon the task of relieving its residents and property owners from the Garden Homes neighborhood of the threat of future flooding.

Signed:

Printed Name	Signature	Number and Street	Date

Letter from Bill Thomas to Curt Hastings 2/12/1997

3230 Tally Ho Lane
Madison, WI 53705

February 12, 1997

Curt Hastings, Chair
Village Public Works Committee
3636 Lake Mendota Drive
Madison, WI 53705

Dear Curt,

I am delighted that the Public Works Committee has taken on the job of coming up with a solution to the flooding problem. I am sure the Committee will do very well without any further input from me, but I'd like to pass on some things that have come to my attention in the course of my own inquiries.

The City of Madison Engineer I talked to, last August, name of Michael Dailey, apparently is in charge of storm drainage. He is the one who told me that the University Avenue at Midvale floods were Madison's 2nd biggest storm drainage problem, and that he figured 90% of the water involved originated in Madison. Just off the top of his head, he thought my estimate of 10 acre-feet of surplus water was probably in the ball park. He thought that my idea of a detention pond had merit but that it would cost $30,000 to $40,000 just to evaluate the idea and he had his resources pretty well committed. He said the Village had never approached Madison about the flooding problem, so far as he knew.

Mr. Dailey mentioned that Rennebohm Park was an area he was thinking about as a possible detention site, so I checked it out myself, and I think from my limited expertise that it could be modified at small expense to detain a lot of water. In fact it looks like such a natural candidate for detention that I don't understand why Madison has not exploited it already. There is a 900-foot long, 150-foot wide "drainway" that lies between the main body of Rennebohm Park and Segoe Road. It receives storm run-off from two culverts of 36" diameter at its Rennebohm Park end as well as all of the surface run-off from Rennebohm Park itself. It carries this water about 450 feet, then puts it through a 60" diameter culvert which pierces an earthen dam that provides a walkway between the apartment complexes on either side of the drainway. After another 450 feet the water reaches a weir, just before passing into a 4' high by 6 ' wide box culvert to pass under Segoe Road. The threshold of this weir is only 2' above the bed of the drainway, and it appears to me that it could be placed 3' higher, to detain much more water, without causing any problems. Another obvious location for a wier is back at the earthen dam and its 60" culvert. To my untrained eye, it looks as though, at the modest cost of a couple of weirs, as much as 4 acre-feet of water, obviously headed for the University Avenue/Rose Place area, could be temporarily detained in this drainway. It also appears that a lot of storm water could be detained on the surface of Rennebohm Park itself merely by placing a berm across the east end of the park and draining it with a drop inlet instead of, as now, letting all of the run-off flow unimpeded into the "drainway".

I enclose a letter I wrote to Gard Strother last fall, recommending a joint City/Village committee on the flooding problem.

Yours truly,

Bill

Bill Thomas

Letter to Mayor Soglin from Gard Strother, Village President 02/18/1997

THE VILLAGE OF SHOREWOOD HILLS

February 18, 1997

Mayor Paul Soglin
City of Madison
210 Martin Luther King, Jr. Blvd
Madison, WI 53709

Dear Mr. Soglin:

The Village of Shorewood Hills and the City of Madison have problem which is, or ought to be, of some considerable mutual concern. I refer to the flooding which periodically occurs at the intersection of Midvale Boulevard and University Avenue. Our Village is interested in beginning, without delay, a dialogue which will address the problem, and will have as its goal the development of measures which will control the flooding.

You are no doubt aware that there have, over the past several years, been several severe storm water inundations, following heavy rains, in the vicinity of the Midvale/University Avenue intersection. The storm water is predominantly runoff from streets and properties to the south, in the Midvale Boulevard/Tokay Boulevard watershed. Rainwater is channelled into a large culvert which carries the water to the north, along and under Midvale Boulevard. The culvert eventually runs underground, into our Village to the west of the Kohl's shopping center, and then into a huge underground culvert which carries the water behind the Kohl's shopping center and then to the east, eventually discharging the water into Lake Mendota.

Unfortunately, the volume of water which has accumulated in recent heavy rains has exceeded the capacity of the storm water culverts to carry the runoff, and the water has discharged to the surface, through manhole covers, street drains, etc., in the vicinity of the Midvale/University Avenue intersection. Last summer, this resulted in a surface accumulation of water on the order of two to three feet, over a broad area, with flooding of businesses, and flooding of Village residences to the west of the intersection, with considerable damage. Affected business people, and Village residents, are understandably very concerned about the problem, and have begun lobbying intensively for action addressed to finding a solution.

Two years ago, the Village of Shorewood Hills expended

1008 Shorewood Boulevard • Madison, Wisconsin 53705-1499 • 608-266-4781 • FAX 608-266-5929

approximately $100,000 to make improvements to the drainage system, in the hope of solving, or at least mediating, the flooding. The improvements which we made may well have been of some help, but clearly did not fully address the problem. It appears that improvements are needed upstream, along the Midvale Boulevard culvert, to control the accumulation of rainwater; no doubt additional improvements need to be made near the Midvale/University Avenue intersection as well. However, this cannot be accomplished by the Village of Shorewood Hills, alone; we need to work in concert with the City.

We are anxious to enter into discussions with the City concerning the flooding problem. We ask that you direct the City's Engineering Department to meet with our Village Administrator, Tom Popp, and our engineers, to begin the process of finding a solution to the flooding problem. We ask that the discussions begin not later than March 1, inasmuch as the threat of additional flooding will soon come with spring and summer rains.

Please advise, as soon as possible, as to the City's willingness to begin a cooperative effort, on a priority basis, to address the flooding problem which I have described. We value the strong ties which we have had with the City of Madison, and we look forward to working with our neighbor to address this substantial and mutual problem.

Thank you.

Very truly yours,

Gard Strother
Village President

GBS:gs
cc: Mr. Tom Popp, Village Administrator

Response to Strother letter of 02/18/1997 03/05/1997

Department of Public Works
City Engineering Division
608 266 4751

City of Madison

Larry D. Nelson, P.E.
City Engineer

City-County Building, Room 115
210 Martin Luther King, Jr. Boulevard
Madison, Wisconsin 53710
608 264 9275 (FAX Number)
608 267 8677 (TDD/Device for Deaf)

Assistant City Engineer
Bernard J. Wendricks, P.E.

Principal Civil Engineers
Donald L. Fahrney, P.E.
David L. Benzschawel, P.E.
Michael R. Dailey, P.E.
Robert F. Phillips, P.E.

Operations Supervisor
Duane F. Sippola

March 5, 1997

Mr. Tom Popp
Village Administrator
Village of Shorewood
1008 Shorewood Blvd.
Madison, WI 53705

Dear Tom:

Mayor Soglin passed along President Strother's letter of February 18, 1997 regarding the flooding issue at the University Avenue and Midvale Boulevard intersection and his request that we evaluate the situation.

I pulled from storage records regarding this issue and had three copies made. (The Village probably has a complete file on this issue but I though it might expedite the situation if I generated the copies.) Two copies are attached and I expect you will want to share one with your engineer.

The reports indicate that the Village, Town of Madison, and the City cooperated in the construction of a major storm sewer to serve this area about forty years ago. Mead and Hunt was the engineer. I suspect that there are agreements on file regarding the construction of the 1950's and I shall obtain copies of those as well.

Approximate 311 acres of the Village and 1,680 acres of the city are drained by this facility .

Apparently, in the mid-sixties, it was determined that the storm sewer did not meet the needs of

1680 84.4% Madison
311 15.6% Village
1991

our communities and there was interest in increasing the storm sewer capacity. This review was prompted by plans to reconstruct University Avenue.

One alternative was to construct a 6.5 foot diameter tunnel to provide existing capacity beneath the Black Hawk Golf Course to discharge in Lake Mendota. I understand that the Village did not support the concept, but I have not been able to locate any correspondence to confirm that.

I suggest that we meet and review the situation after you have had a chance to review these materials.

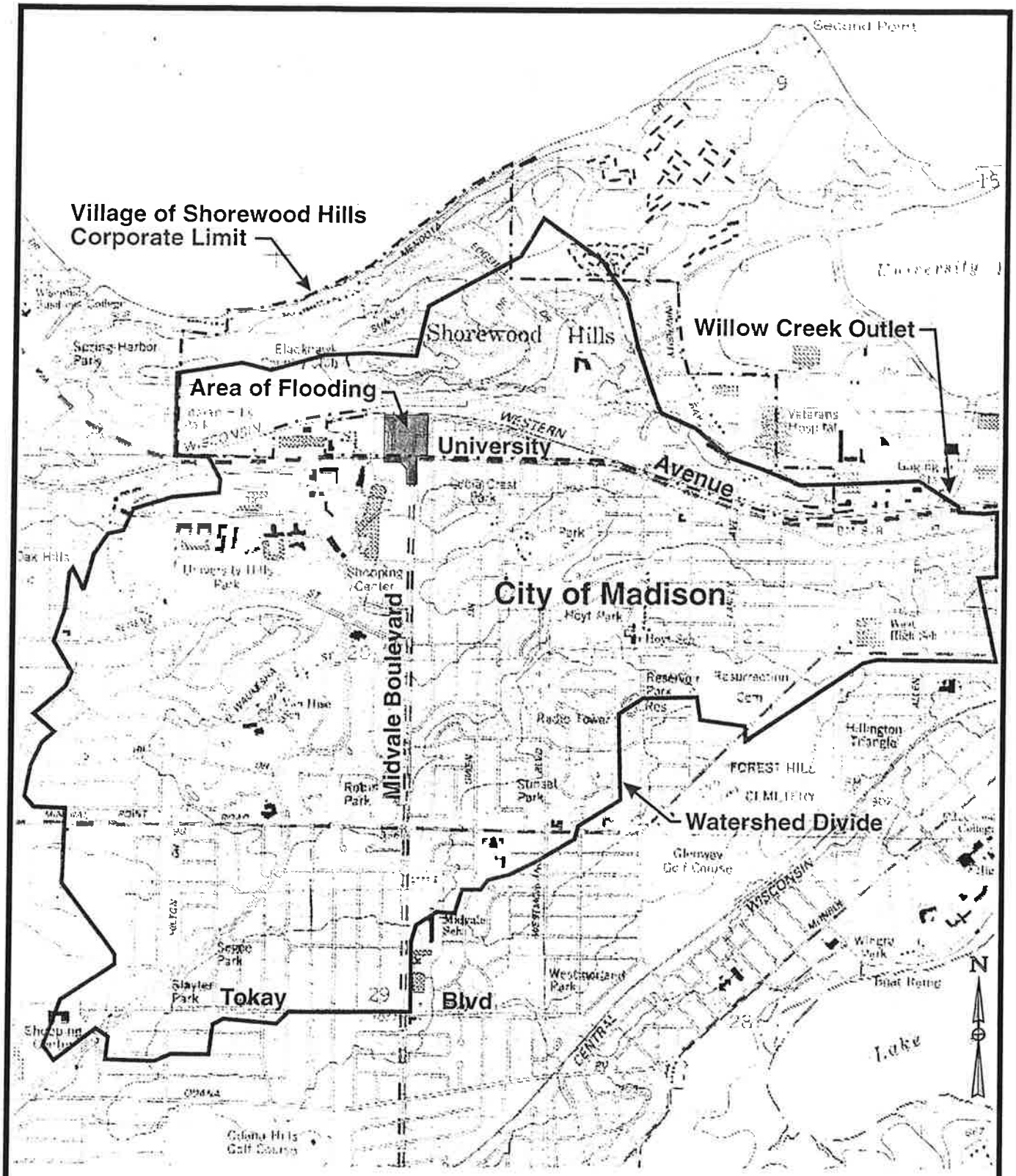
Sincerely,

Larry D. Nelson

cc. Mayor Soglin
Jane Richardson, Mayoral Assistant
Mike Dailey, Principal Engineer

Attachments

Strand Study (Map of Willow Creek Watershed, etc) 10/17/1997



Source: USGS Madison West, WI Topographic Quadrangle
(7.5 Minute Series)
Scale: 1" = 2000'

Figure No. 1.02-1	Village of Shorewood Hills University Avenue / Midvale Boulevard Stormwater Management Study General Location Map	STRAND ASSOCIATES, INC.

STRAND STUDY 10/17/1997

The results of this study will serve as a guideline for Village of Shorewood Hills and City of Madison officials to evaluate how best to alleviate flooding conditions within the study area. The study area is found in Figure 1.02-1.

1.03 DESIGN CRITERIA

Traditionally, design of stormwater management facilities is on a "design storm" basis. A design storm is a theoretical storm event recurring at a statistically determined interval. Stormwater discharge from a storm up to and including the severity of the designated design storm will be managed by the proposed drainage facility. Storm events exceeding the design storm may exceed the capacity of the facility and must be managed through other means, such as overland flow.

The statistical basis for the analysis of storm events is the recurrence interval. The recurrence interval is defined as the average interval between the occurrence of a storm of a specified magnitude and an equal or larger storm. If a storm event has a recurrence interval of x years, then the probability of it being equaled or exceeded in any given year is 1/x. Therefore, a "one-hundred year storm" has a one in one-hundred, or one percent, chance of occurring in a given x year. The determination of the recurrence interval is based upon long-term precipitation data for the region. Therefore, on average, a one-hundred year storm will occur once in one hundred years. However, this does not imply that a one-hundred year storm cannot occur more than one time in a one-hundred year period, nor does it imply that a one-hundred year storm will definitely occur in a one-hundred year period.

Typically, municipal drainage networks consist of minor and major drainage systems. The minor system, consisting of facilities such as storm sewers, ditches, and roadway inlets is designed to carry nuisance flooding for convenience, health, and safety. A typical minor system would be for a design storm of a five- to ten-year return frequency. The major system, consisting of major drainageways, detention ponds, and overland flow routes, is typically designed to prevent structural damages and endangerment of human life. A typical major system design storm event is the one-hundred year recurrence interval.

The University/Midvale intersection is served by a series of culverts. Since the intersection is located in a large depression, there is no overland flow route available. Therefore, the drainage system must serve as both the major and minor flow route. For this reason, and because occurrence of a one-hundred year storm event under present conditions could cause significant flood damages, it is recommended that all drainage improvements be designed for a one-hundred year recurrence frequency.

2.01 OVERVIEW OF TRIBUTARY AREA

This study includes an investigation of the existing trunk line culvert system serving the University Avenue/Midvale Boulevard intersection. The limits of detailed hydraulic analysis of this system are approximately the Vernon Boulevard/Midvale Boulevard intersection to the culvert outlet at Willow Creek, which is east of Walnut Street and north of Campus Drive.

Municipality	Contributing Watershed Area (Ac)	Percentage of Total Watershed Area
Village of Shorewood Hills	321	16.4%
City of Madison	1631	83.6%
TOTAL	1952	100%

Table 2.01-1 Relative Contribution of Watershed Areas

The contributing watershed to this system includes approximately 1,952 acres to the outlet at Willow Creek. Approximately 1,180 acres of this area are directly tributary to the University Avenue/Midvale Boulevard intersection. Table 2.01-1 includes a breakdown of the relative portions of the watershed located in the Village of Shorewood Hills and the City of Madison.

2.02 WATERSHED SUBBASINS

For purposes of this study, the contributing watershed has been divided into several smaller subbasins. Basin divisions were selected with consideration of topography, homogeneity of land usage, and locations of major drainage systems. Descriptions of subbasin areas are included in this section.

A. Segoe Road Catchment

This 505 acre catchment includes tributary areas to the Segoe Road drainage system, and includes Subbasins 500-535, as identified in Figure 2.01-1. Included in this catchment are areas generally along Segoe Road, extending southerly to Tokay Boulevard, and northerly to approximately Regent Street. The area is primarily medium density residential, with moderately sloping terrain. The main drainage system serving this area consists of a box culvert in the median of Segoe Road ranging in size from seven-feet (wide) by 2.5-feet (high), to seven feet (wide) by four feet (high). This culvert discharges to the box culvert at Vernon Boulevard.

2.04 SOILS

The amount of stormwater runoff produced by a storm event is greatly impacted by the types of soil underlying the watershed. Soils consisting of a high percentage of sand and gravel will tend to absorb a higher percentage of stormwater than will soils having a high clay content. Therefore, relatively less stormwater runoff will occur in sandy areas.

According to the Dane County, Wisconsin Soils Survey, published by the U.S. Department of Agriculture in cooperation with the Research Division of the College of Agricultural and Life Sciences, University of Wisconsin, local soils are primarily silt loams. These soils are classified by the Soil Conservation Service in Hydrologic Soil Group B, meaning they are moderately well to well-drained soils with moderately fine to moderately coarse textures. Stormwater will typically infiltrate into these soils at a rate of 0.15 to 0.30 inches per hour.

2.05 PRECIPITATION DEPTHS

Potential sources of stormwater runoff include rainfall, snow melt, groundwater, or a combination of these. A review of precipitation records for the project area indicates that the highest potential for flooding results from intense rainstorm events. Therefore, for this study, stormwater runoff modeling was based strictly upon rainfall events.

Rainfall depths for the City of Madison were obtained from the publication *Rainfall Frequency of the Midwest* (Bulletin 71), by the Midwestern Climate Center. This document is an atlas of rainfall depths for various storm durations based upon several decades of data from a network of rainfall gauges. Rainfall depths for storm events of various durations and return frequencies are summarized in Table 2.05-1.

	Precipitation Depth (in)				
Frequency	30-min	1-Hour	3-Hour	6-Hour	24-hr
2-Year	1.03	1.31	1.78	2.09	2.78
5-Year	1.31	1.66	2.26	2.65	3.53
10-Year	1.55	1.97	2.69	3.15	4.20
50-Year	2.24	2.85	3.88	4.55	6.06
100-Year	2.61	3.32	4.52	5.30	7.06

Reference: Huff, Floyd A., and Angel, James R., Rainfall Frequency Atlas of the Midwest, Midwestern Climate Center, Bulletin 71, Table 9, 1992.

Table 2.05-1 Precipitation Data

Precipitation depths were distributed over various storm durations modeled using the First Quartile Huff Rainfall Distribution.

3.02 RESULTS OF HYDROLOGIC AND HYDRAULIC MODELING

A. Evaluation June 16-17, 1996 Storm Event

Major flooding of the study area last occurred on June 16 and 17, 1996. This consisted of two individual storm events. The first occurred between the hours of approximately 11 P.M. and 6 A.M. on June 16, during which time approximately 3.6 inches of precipitation fell. The second event occurred between the hours of approximately 6 P.M. and 8 P.M. on June 17, during which time approximately 2.9 inches of precipitation fell. Although the June 17 event was less severe than the morning event, a greater amount of flooding apparently occurred. This is likely due to the fact that the ground was saturated in the evening because of the morning event. Therefore, a greater portion of the evening rainfall became surface runoff, rather than infiltration, compared to the morning event. The rainfall pattern of the June 16-17 storm is shown in Figure 3.02-1.

Reports from Village of Shorewood staff and residents indicate that the University Avenue/Midvale Boulevard intersection was flooded with depths of up to three feet. The Kohl's parking lot experienced flooding depths in some locations of as much as four feet. Widespread basement and surface flooding occurred in the Garden Homes subdivision, just northwest of the intersection.

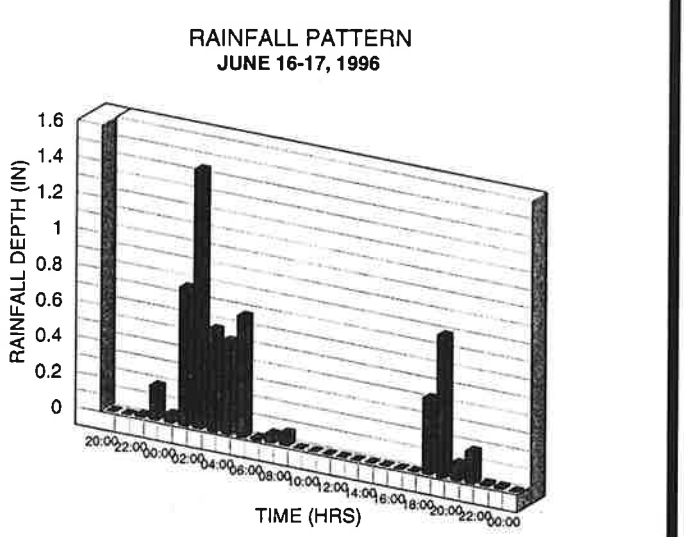


Figure 3.02-1 Rainfall Pattern

To determine the effectiveness of the hydrologic and hydraulic models for predicting peak discharges and volumes, the rain event of June 17, 1996, was modeled. Precipitation measured by recording rainfall gages at the Madison Airport and various sites at the University of Wisconsin was obtained and input to the HEC-1 model to generate inflow hydrographs. HEC-1 hydrographs were input to the EXTRAN model to simulate the performance of the existing culvert system. According to the EXTRAN model, approximately 17 acre-feet of stormwater discharged from the drainage system onto the surface between Junctions 2000 and 2400, which would cause inundation of the University/Midvale intersection, Kohl's parking lot, and Garden Homes subdivision. An approximation of the volume of stormwater actually stored in the study area based on observations of nearby residents indicates that approximately 20 acre-feet was stored.

The runoff hydrograph at the University/Midvale intersection estimated by the HEC-1 model is shown in Figure 3.02-2.

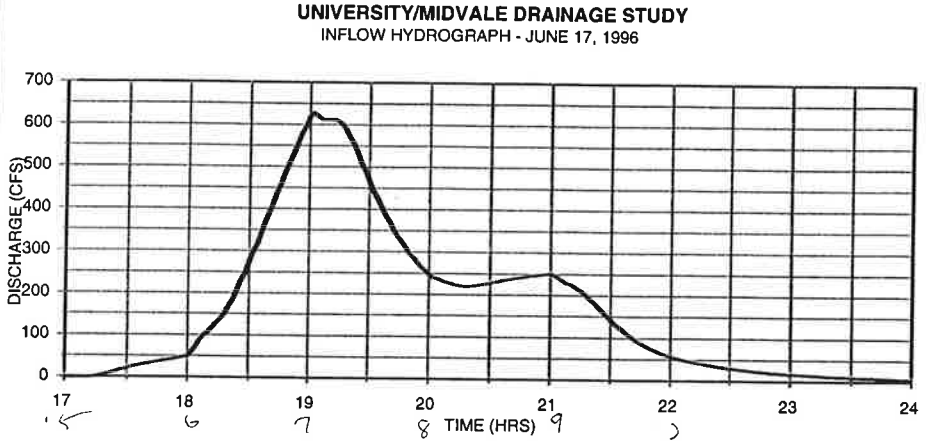


Figure 3.02-2 Inflow Hydrograph - June 17, 1996

Based upon these results, it appears that the model adequately simulates stormwater runoff from the watershed under average antecedent moisture conditions.

B. Stormwater Peak Discharges

Stormwater peak discharges to individual junctions in the existing culvert system were calculated using the HEC-1 computer program. A sensitivity analysis was performed in which 30-minute, 1-, 3-, 6-, 12-, and 24-hour storm durations were run to determine which storm duration produced the highest peak discharge at the University/Midvale intersection. Results of this analysis concluded that the 1-hour storm duration produces the highest peak discharges.

Location	Contributing Subbasins	Drainage Area (Ac)	Peak Q (CFS) 10-Year	50-Year	100-Year
Segoe Road Catchment	500-535	505	163	369	502
University Hills / Regent Catchment	300-310	164	45	158	221
Midvale South Catchment	400-485	346	163	368	498
University / Midvale Intersection	215, 230, 235, 240, 245, 250, 255, 300-500	1180	418	934	1,333

Table 3.02-1 Calculated Peak Discharges

A one-hour storm duration was modeled for return frequencies of 10-, 50-, and 100-years (i.e., the 10%, 2%, and 1% probability storms). Resulting peak discharges at various watershed locations are summarized in Table 3.02-1. Inflow hydrographs to the University/Midvale intersection for the 10-, 50-, and 100-year storm events are shown in Figure 3.02-3.

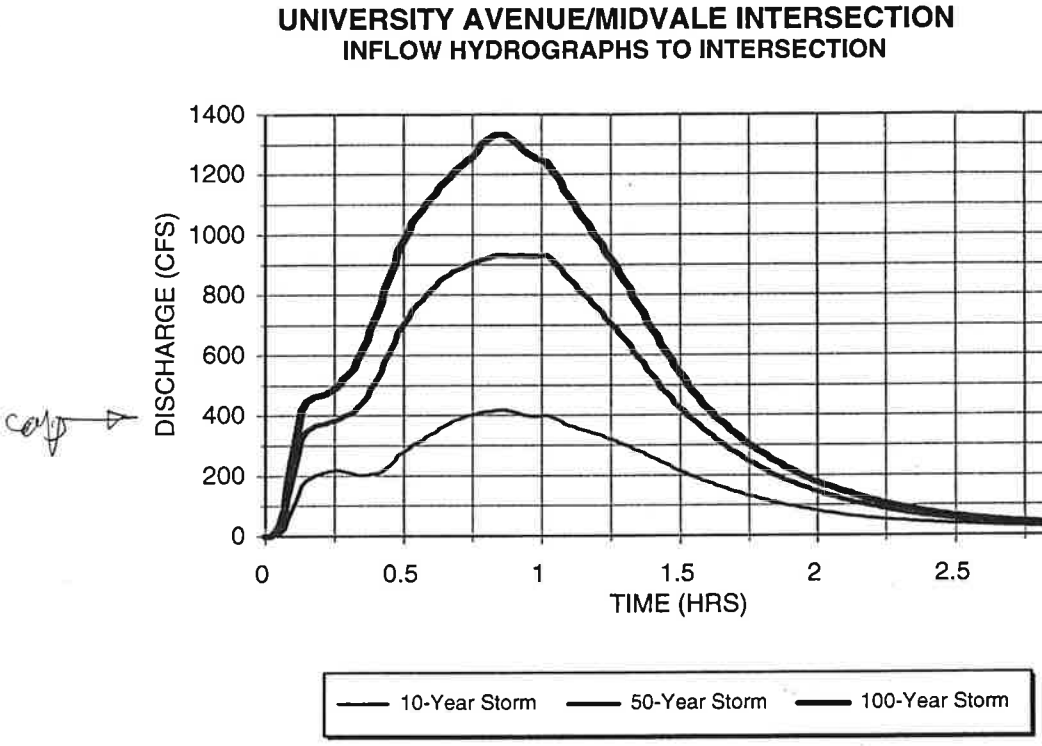


Figure 3.02-3 Inflow Hydrographs to Intersection

C. Existing Culvert Capacity

The EXTRAN model was used to evaluate culvert performance for existing conditions for the 10-year (10%), 50-year (2%), and 100-year (1%) storm events. Computer modeling results indicate that the existing culvert conduits downstream from the University/Midvale intersection have a hydraulic capacity of approximately 400 cfs, in comparison with a 100-year stormwater inflow peak of 1300 cfs. This indicates that the existing culvert capacity is only approximately thirty percent of the anticipated inflow to the culvert for a one hundred-year storm and less than the anticipated peak discharge for a ten-year year storm. Stormwater flows in excess of the existing culvert capacity overflow to the surface through manholes and inlets, inundating the Garden Homes subdivision, Kohl's parking lot area, and the University/Midvale intersection. In the event of a 100-year storm, computer models indicate that as much as 72

acre-feet of stormwater volume may overflow the drainage system. During the June 17, 1996 storm event, an estimated 20 acre-feet of stormwater overflowed the drainage system.

Capacities of individual culvert reaches, overflow volumes, and other relevant hydraulic data for the 10-, 50-, and 100-year storm event are summarized in Table 3.02-2.

			Conduit Discharge (cfs)				Surcharge at Upstream Junction (Acre-Feet)			
EXTRAN Conduit Number	Conduit Size/Type (RC Box)	Conduit Capacity (cfs)	10-Year	50-Year	100-Year	June, 1997	10-Year	50-Year	100-Year	June, 1996
200	12'x5'	511	347	535	535	530	0	12.7	32.6	0.1
210	12'x5'	531	372	541	541	541	0	1.4	2.5	0.0
220	12'x5'	643	382	403	403	403	0	12.2	14.9	7.0
230	12'x5'	634	350	384	433	358	2.6	12.0	15.0	8.2
240	12'x5'	32.4	361	498	576	395	0	3.9	6.7	1.4
250	12'x5'	317	364	486	553	376	0	0	0	0
260	15'x5'	369	466	606	636	472	0	0	0	0
270	15'x6'	555	536	637	719	565	0	0	0	0
280	15'x6'	490	501	637	719	441	10.6	35.8	49.2	20.7
290	12'x6'	622	501	510	513	506	0	0.2	0.1	.01
296	12'x4.5'	875	501	510	513	505	0	0	0	0

Table 3.02-2 Existing Culvert Performance

D. Analysis of Alternatives

To determine the effectiveness of various alternatives for relieving flooding in the study area, the existing conditions EXTRAN model was modified, as required. Modifications included addition of relief culverts of various sizes, installation of control structures, and modifications to inflow hydrographs for upstream stormwater detention alternatives. Results of these analyses form the basis for the discussion in Section 4.

WSJ 11/8/1997

Tunnel under golf course would keep residents dry

B[illegible]rry Adams
For the State Journal

SHOREWOOD HILLS — Residents in the Garden Homes subdivision may have a drier future. But it won't be cheap or without controversy.

Results of an engineering study recommend the construction of a $6.7 million drainage tunnel under the golf course at Blackhawk Country Club to Lake Mendota. The 2,300-foot-long tunnel, which would be 9 feet in diameter, would channel excess storm water away from the subdivision and the intersection of University Avenue and Midvale Boulevard during heavy rain storms.

For years the area has experienced flooding, including at least three occasions in the last 10 years. The latest flood occurred June 17, 1996.

The tunnel plan was one of 14 alternatives evaluated by the Madison engineering firm in a $30,000 joint study commissioned by the village of Shorewood Hills and the city of Madison.

"You basically bore a tunnel through the hill and then line the tunnel some way and that becomes a giant pipe," David Wolmutt, an engineer with Strand Associates, said.

The village and the city are expected to share the costs of the project but how much each will contribute has not been determined and will likely have to be negotiated.

The village and the city are expected to share the costs of the project but how much each will contribute has not been determined and will likely have to be negotiated.

City of Madison Engineer Larry Nelson said he would like the city and the village to split the cost of the project 50-50 even though 84 percent of the storm water that is causing the flooding problems originates in Madison.

"The village of Shorewood Hills has developed and wants to continue to develop on a flood plain," he said.

The area is also home to a Kohl's Food Store and some smaller shops. In addition, a developer is proposing to tear down the existing Kohl's store and the adjacent businesses replacing them with a $20 million building.

Village President Gard Strother is hopeful that any cost for the village could be paid through a tax incremental financing district fund. He also would like to see the city of Madison pay more than just 50 percent, considering where the water is coming from.

"I would hope they would recognize the need to contribute more than that," he said. "It's difficult for any municipality to absorb the cost of a multi-million [illegible]ar project but government is supposed to help citizens in a variety of ways."

But finding money for the project in the city budget could be difficult. The city has only $2.5 million per year for storm sewer repairs and is also contending with another serious flooding problem in the East Washington Avenue area near Blount and Dayton streets. That project is expected to cost more than $1 million to repair, said Greg Fries, an engineer with the city.

Please see **STUDY**, Page 5B

11/08/1997

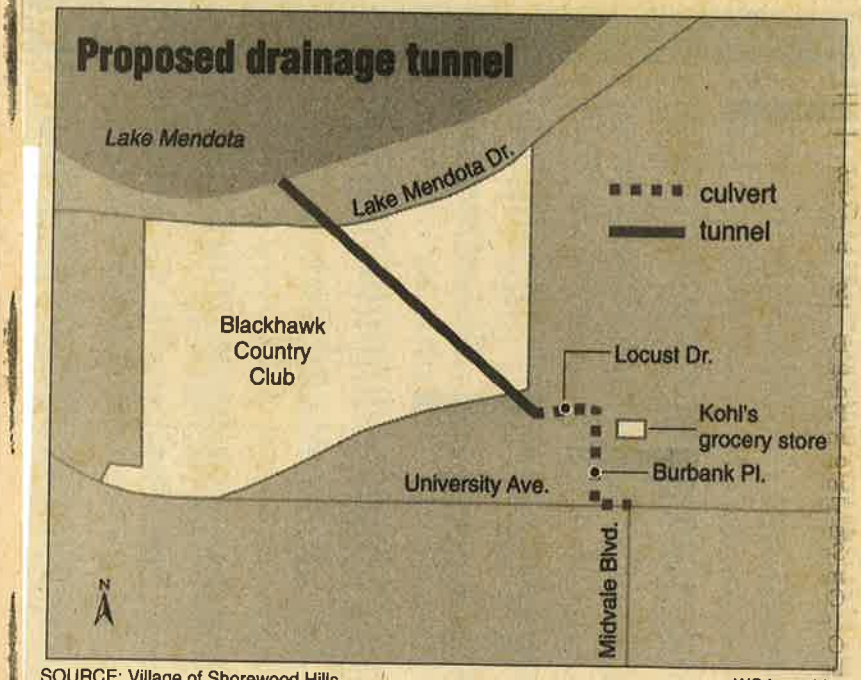
Of the 14 alternatives, the tunnel project, which still needs the approval of the Village Board and City Council, is the least expensive that addrEsses all of the flooding issues. The study by Strand Associates analyzed the drainage for almost 2,000 acres, of which 1,631 are in the city of Madison. The proposed tunnel system would be designed to carry "the entire excess peak discharge during a 100 year storm event."

Under the plan, a box culvert would be installed and run from the intersection of University Avenue and Midvale Boulevard, north on Burbank Place to Locust Drive and then connect with the huge tunnel.

The least expensive of the 14 proposals is a $1.9 million plan that would involve raising the homes and reconstructing foundations. However, that plan would not address flooding outside the subdivision.

The most costly proposal is a $23 million project that would build a smaller tunnel and be supported by a 30-foot-deep underground detention chamber 200 feet wide and 300 feet long and be constructed under the parking lot of the Kohl's Food Store.

If approved, Strother would like to see construction on the tunnel begin in the spring.



SOURCE: Village of Shorewood Hills

WSJ graphic

2/27/2001

Water tunnel is passageway to disaster, critics charge 2/27/01

Lisa Schuetz
Wisconsin State Journal

A proposed $7 million tunnel in Shorewood Hills that would carry rainwater to Lake Mendota will add to flooding problems, not solve them, opponents say.

The village of Shorewood Hills and the city of Madison are proposing to build the tunnel under Blackhawk Country Club. It will be the topic of an informational meeting at 7 tonight at the Shorewood Hills Village Hall.

The tunnel's purpose, said Shorewood Hills Village Administrator Tom Popp, is to carry flood waters away from residential neighborhoods near the intersection of University Avenue and Midvale Boulevard. Flooding has plagued the area for a decade, specifically in houses along Midvale Boulevard and in Shorewood's Garden Homes neighborhood west of the Kohl's store.

Sierra Club spokesman Brett Hulsey said the tunnel would potentially dump 20 million gallons of flood water into the lake in a short time, which would increase flooding problems for others. Hulsey is also a county supervisor representing District 19, an area that includes the Spring Harbor neighborhood where homes are often damaged in floods. He said his constituents are concerned about lake levels, especially after last year's high water.

"The people I heard from don't need any more flood water in their living rooms," Hulsey said. "I had a series of meetings last fall where people told me loud and clear: 'Stop dumping water into the lake.' "

City engineer Larry Nelson said adding water to the lake isn't a factor since much of the water in that area eventually ends up there anyway.

Hulsey said water that flows into the lakes through culverts is polluted and the lakes in Madison are already feeling the effects of pollution.

Several measures will be incorporated into the tunnel's structure to address that issue, said Dave Wolmutt of Strand Engineers, hired by the village to address the tunnel option as well as come up with other solutions, including a culvert at the outlet of the tunnel to trap sediment and debris.

Popp said money for the tunnel would come from both the village and the city, with the city paying more.

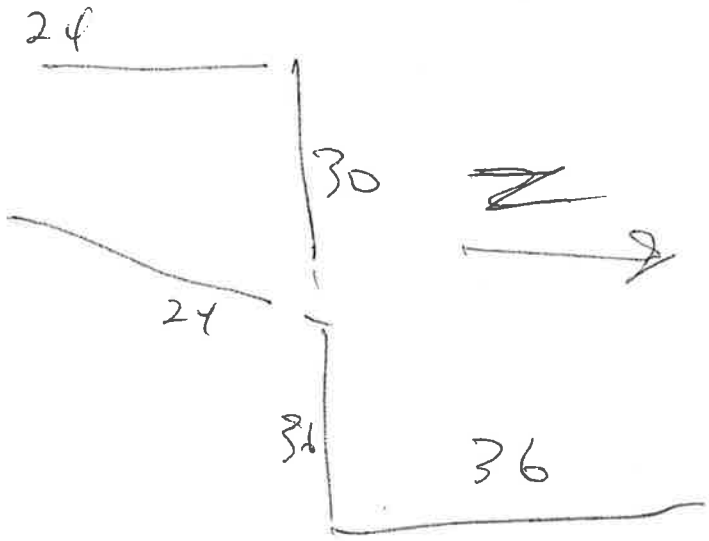
"It's not a 50-50 split, but the exact portion hasn't been decided yet," he said.

Some, if not all, of the village's portion would be paid from tax incremental financing dollars from the village's TIF district along University Avenue from the Kohl's store to the Shorewood Shopping Center, Popp said.

Part of that district is the $16 million Flad Development and Investment Corp. project under way at Midvale Boulevard and University Avenue. The development will include a Kohl's Food Emporium, Borders Book Shop & Café, Walgreens drugstore and Janet's Antiques.

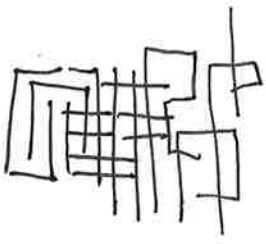
P FM M
70 70

P M FM M
50 70 90



1st floor
~~AH~~AI
Encl Prch ~~AD~~AE
Opn Prch ~~AE~~AF
ATT GAR ~~AG~~AC
DET GAR ~~AH~~AB

~~BLD~~
LSF * .45 − BLDG SF
= (C2 × .45) − D2



2250 + ((LSF − 5000) * .30)

= 2250 + ((C2 − 5000) * .30)

1136 Taylor St

07/25/2001

CAP TIMES E-mail: mccrea@madison.com
karyns@madison.com

07/25/2001

Tunnel cure for flooding rejected

By Kathryn Kingsbury
The Capital Times

SHOREWOOD HILLS – After months of research and discussion, an intergovernmental task force has settled on possible solutions to Shorewood Hills' frequent flooding problems.

The Storm Water and Lake Water Quality Task Force agreed to a plan Tuesday night that emphasizes flood-proofing flood-prone areas and increasing the ability of soil to absorb and filter storm water. The group, which is made up of nine representatives from Shorewood Hills, Madison, Dane County and the Department of Natural Resources, has been meeting since January.

Two of the task force's nine members dissented, saying they favored building a tunnel to carry water away from flooded areas.

"I'm not saying we want flood control as opposed to water quality," said Strand Associates engineer and task force member David Wolmutt. In 1997, his company proposed a $7 million, 9-foot-wide tunnel to divert water from the Hilldale Shopping Center area to Lake Mendota.

Last year, the board gave Strand $90,000 to go ahead with a design and apply for permits with the Department of Natural Resources, but it also agreed to look at alternatives after some citizens expressed concerns that the tunnel would carry pollutants into the lake.

"You're not going to get as much flood control from the water quality measures," he said.

The other dissenter, city engineer Larry Nelson, said that the ecological approach won't end flooding along University Avenue. Of the majority's recommendations, he said, "I am afraid that we are going to get people's enthusiasm up for something that will not necessarily deliver."

During a public comment period, Steve Hoff of Flad Development expressed disappointment in the task force's conclusions. His company is redeveloping the Kohl's shopping center near Hilldale Mall and he would like to see a storm water tunnel there.

"What you have to consider is that the people here are not affected by that flooding," he said. Businesses and homes near Hilldale bear the brunt of the floods, he said.

Not so, said task force member Sally Miley after the meeting. She lives near the lake in the city of Madison.

"We had to spend $6,000 last summer to repair flood damage to our home," she said, adding that a diversion tunnel would make flooding even worse by adding hundreds of thousands of gallons to Lake Mendota every time it storms.

She said that the ecological approach would reduce flooding across the board. "I just think this is a golden opportunity to try a whole new approach."

#'s

$1 \times 10^3 \frac{Kg}{m^3} \times 9.8 \frac{m}{s^2} \times 4$

$P = dgh$

62 ~~gallon~~

7.5 gals/□'

62 lbs/cubic foot = .43 lbs/□" × 12

5#/□"

144 sq in. .43

$15^2 \times 3.14 = 706$ □"

700 □"

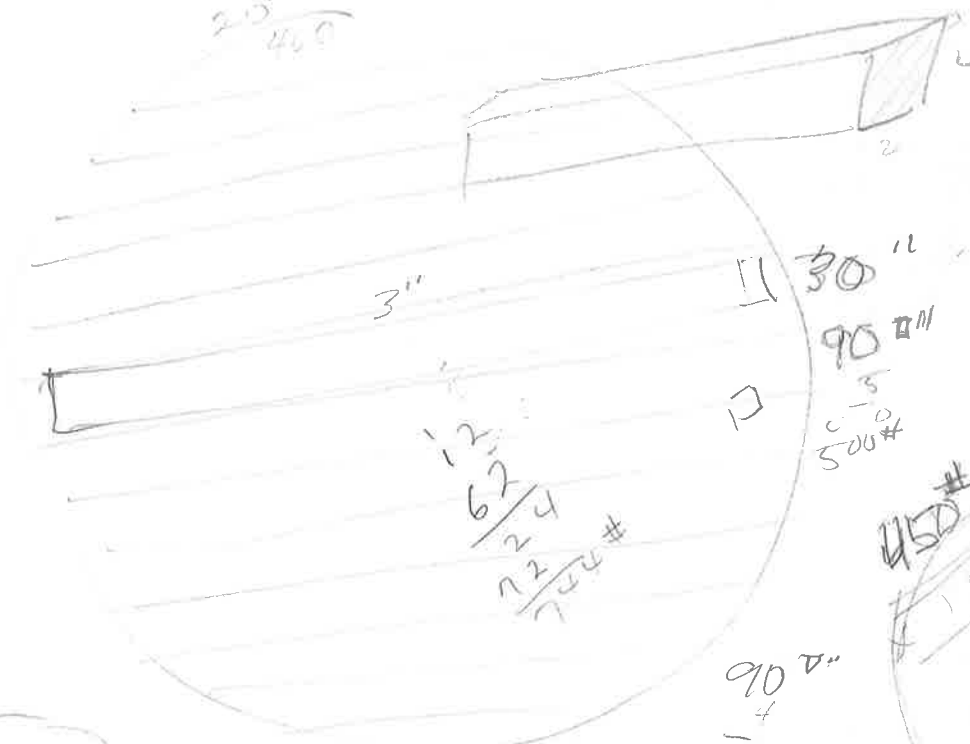
5□'

~~2 tons~~

30"

300#

5□'



30" 700□"

90□" 3100#

5

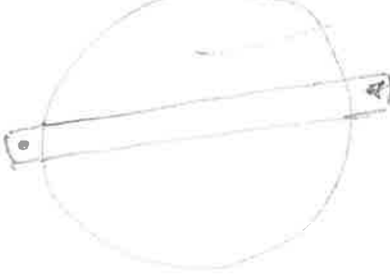
500#

90□"

4

360#

90 ×



drill each

1/4" bolt in glue

Letter from Janet Hoopes 08/20/2001

August 20, 2001

To: The Shorewood Hills Board of Trustees: President Peter Hans, Marilyn ~~Thomas~~ Townsend, Margaret Andreason, John Taylor, Tim Kritter, Mark Sundquist, Brian Joiner.

From: Janet H. Hoopes
3800 University Avenue
and 3810 University Avenue
Madison, WI 53705

Re: **Observations on the University/Midvale Flood 8/1/01**

Although I was not personally present at this flood at 4:30 a.m., I have talked with persons who were there and who reported the following:

The Commercial District.

1. The water in front of my shop at 3800 University Avenue came up to the third step. This is one step from the top, and considerably higher than this area has been until now. Cars were floating on University Avenue.

2. My landscaping was "roughed up," and much of the chopped granite was washed away, and will require additional cost to replace. My walk way showed undermining on the south side.

3. My daughter's car was parked just above the proposed inlet for the tunnel. Water came up above the floor and damaged some wiring and the vehicle did require many repairs. This inlet location was put in because the previous administration indicated that the tunnel would proceed to completion. If it does not, apparently we now have a sloping parking lot which could flood any cars left in it overnight.

4. I have not yet talked with other businesses on University Avenue; however, I would expect that the water levels for this flood were much higher there.

Garden Homes:

1. Although the water did not overtop the wall, according one Burbank Place resident who was up all night watching the flood, if it had rained another 30 minutes, the water would have breached the wall near the Benforado Home.

2. The water came over the foundation of my little house at 3810 University Avenue and flooded the basement.

3. The water came from the North and the West, rather than from the East and the South.

4. The water did not drain away quickly. My gravel driveway at 3810 was unusable for over a week. The gravel was suspended in water. Fanny Hicklin said she had standing water in her garage. The other backyards that I could see on Burbank Place also had standing water for a number of days.

Conclusions:

1. In storms that drop less than 4" of water in a very short time, the wall will hold back the water on University Avenue from flooding Garden Homes, provided the ground is not saturated.

2. In storms that drop more than 4" of water in a very short time, especially when the ground is saturated, the water will overtop the wall and add additional flood water to Garden Homes.

2. Without remediation, the water from the North and the West will continue to flood Garden Homes.

3. The wall has created a drainage problem for at least some properties in Garden Homes. The wall prevents water draining from Garden Homes to University Avenue, and thus causes ponding on some properties for longer periods than it did previous to the installation of the wall, thus potentially causing additional damage from this new problem.

4. Because of the wall, the Business Districts next to University Avenue and Midvale must cope with more flood waters, as well as the undermining of parking lots and destruction of landscaping.

Personal Observations and Predictions:

A final solution to the University Avenue/Midvale Avenue Flooding is still needed.

The "Watershed" approach may never be implemented because of the difficulty in obtaining permission from designated private property owners, and also because of the huge costs involved in utilizing some of these properties (such as the Velma Hamilton School, which is far above the road).

Garden Homes is not now "flood proofed." Furthermore, even if Garden Homes were diked off on all sides, a pumping system would still be required as a fail-safe measure. The cost of a pumping station is estimated at 2.2 million--roughly the cost to Shorewood of putting in the Tunnel. Even if the water is pumped from Garden Homes during flooding, where should it be pumped?

The University Avenue Business Community will have increased flooding and consequent damage because of the wall. In a really severe flood, say 50 year flood, the Business Community will be very badly damaged.

University Avenue will continue to flood, and this major artery will be closed to emergency vehicles.

Without an outlet for flood waters, the low lying properties along Columbia Road and Tally Ho Lane will almost certainly endure severe flooding in the 20 years ahead.

RE: GARDEN HOMES FLOOD PROOFING PROJECT 01/18/2002

APPLIED ECOLOGICAL SERVICES, INC. (AES)

17921 SMITH ROAD, P.O. BOX 256, BRODHEAD, WI 53520
PHONE: (608)897-8641 FAX: (608)897-8486
email: info@appliedeco.com

SPECIALISTS IN ENVIRONMENTAL MANAGEMENT AND RESEARCH

AGREEMENT FOR PROFESSIONAL/ECOLOGICAL SERVICES
for
Village of Shorewood Hills
Garden Homes Floodproofing Project (01-672)

THIS AGREEMENT is made and is effective as of this 18th day of January, 2002, between **Applied Ecological Services, Inc.** (Contractor), and **Village of Shorewood Hills** (Client) **810 Shorewood Blvd., Madison, Wisconsin 53705-2115**

WHEREAS, the Client desires to engage the Contractor to provide professional or other ecological services and

WHEREAS, the Contractor desires to furnish such services as outlined below, it is therefore agreed as follows:

1. During the term of this agreement the Contractor shall provide services as requested by **The Village of Shorewood Hills**. The services and advice will relate to work being done or planned by the **Village of Shorewood Hills, Wisconsin.**
2. Services to be provided and the fees due to Applied Ecological Services, Inc. (AES) in consideration for these services are itemized in the Garden Homes Floodproofing tasks as follows.
3. AES shall work with Strand Associates, Inc. (SAI) who will complete the hydrologic and hydraulic modeling required for the project and assist in the report preparation and public presentations. AES will serve as the lead company on a two-company project team to prepare an integrated project report and presentations.
4. AES shall serve as the lead firm to develop conceptual design of alternatives and shall work with Strand Associates who shall perform engineering analyses and modeling to test and design engineering plans.

GARDEN HOMES FLOODPROOFING PROJECT
SCOPE OF SERVICES

I. Applied Ecological Services Scope

Task 1. Information Gathering and Preparation of Base Map

The following data will be supplied by Shorewood Hills or, alternatively, will be acquired by AES for the project at additional cost.

- Contour maps prepared by the USGS or others with contour intervals of 2 feet. These maps are available for the entire study's watershed area in an ArcView compatible format and will be the base for the conceptual plans developed for each of the potential Stormwater Management Areas (SMA's) and the proposed floodwall around the floodprone areas of the Garden Homes area.

- Utility mapping in the vicinity of the potential SMA's. These maps will be used to define possible utility conflicts with the potential SMA alternatives. Invert and pipe size information shown on the storm sewer utility maps will be used to partially define the water storage elevation range in the potential SMA's.

- Maps and descriptions of legal easement encumbrances on and property boundary descriptions of the potential SMA sites.

- Available soils mapping of the potential SMA sites.

Task 2. Prepare SMA Preliminary Plans

AES will prepare preliminary plans for each potential SMA at a scale of 1"= 100'. These plans will show existing contour elevations obtained from existing mapping, locations and descriptions of existing utilities, existing easements and property boundaries as obtained from existing plats and records. Existing aerial mapping will be used as the base map for these plans. The SMA alternatives will be developed to maximize stormwater quality enhancement in addition to providing stormwater runoff rate control.

The SMA's for which conceptual plans will be developed include:

- The area north of the Blackhawk Bike Path for which regrading options will be developed which may allow a reconstructed Locust Drive to intercept and channel excess floodwater away from Maple Terrace.

- A multi-purpose detention/retention/water quality enhancement basin within the Blackhawk Golf Course. Contractor will meet with Golf Course representatives to define available construction areas, allowable water level fluctuations and ponding duration times.

- Existing larger impervious areas -- converted all or in part to pervious vegetated detention areas. This SMA alternatives set will define locations recommended to achieve 10%, 20% and 30% reductions in present impervious areas tributary to the Garden Homes flooding area.

- Rennebohm Park modifications -- to accept diversion routing from Hill Farms parking lots

- Underground Storage/Pumping alternatives

Additionally, proposed floodwall locations will be shown around the Garden Homes flood prone areas and individual home flood proofing options will be identified

Proposed storm system modifications will be conceptually shown with proposed grading, stormwater control locations, and proposed landscaping modifications on the concept plan. The plans will show the volume of detention provided; high and low water elevations proposed; locations and general descriptions of the stormwater treatment elements; and conceptual details of the control structures and connection locations to existing sewers.

AES will prepare an opinion of probable costs for each concept developed based on our past experience and the input and recommendations of other interested construction contractors.

Work Products: Preliminary plans for each potential SMA and a report describing the function and probable cost of each SMA alternative.

Task 3. Prepare Water Quality Analysis

AES will evaluate the water quality improvements provided by the potential SMA's by modeling the SMA's stormwater removal potential using P-8. A representative 10-year time period will be used for the model simulation.

Work Product: Water quality model for the watershed study area which evaluates and describes the potential SMA's water quality operation over an extended time period.

Task 4. Public Presentations and Final Report

AES shall prepare a public presentation (using PowerPoint slides) and attend two meetings to make presentations to the public. Additionally, AES shall prepare a final report for the completed work. This report will include the results of the hydrologic, hydraulic, and water quality modeling work, and preliminary plans at a scale of 1"=100 feet for each of the potential SMA's showing the existing and proposed contours, defined utility modifications, stormwater treatment elements, landscaping improvements and amenities. An opinion of probable cost for the preliminary plans will be included for each of potential SMA's.

Work Products: Ten copies of a final report describing the results of the completed work and providing a refined preliminary plan for each potential SMA, and an opinion of probable cost for each SMA.

AES Cost: *AES will provide the above services for a not-to-exceed cost (including fees and expenses) of $14,000.*

II. Strand Associates Scope

Task 1 –Alternatives Modeling

Strand Associates will develop computer models evaluating short-term, intermediate-term, and long-term solutions. This analysis will provide AES and the Village with the following information:

- Estimated capacities of existing storm sewers with consideration of existing City of Madison culvert conditions. This will identify targeted peak discharge reduction goals.

- The relative contribution of stormwater runoff from various upstream properties such as DOT, Department of Revenue, Walnut Grove Shopping Center, Pyresquare, and Blackhawk Golf Course. (*By quantifying the relative contribution from individual properties, alternative controls can be targeted to optimize effectiveness. Also, quantifiable data regarding relative contributions from individual properties will be useful in negotiations with off-site stakeholders.)*

- An estimate of the volume of floodwater entering Garden Homes from the west, compared to the volume of overflow from the University/Midvale intersection prior to flood wall construction. (*This is important because if this analysis demonstrates that the excess flood volume from the west can be impounded in streets and will not reach flood damage elevations, flood reduction alternatives can be focused accordingly.)*

SAI will model and evaluate the following alternatives:

- Existing conditions along Burbank and Maple Terrace with and without the floodwall in place. This will quantify the volume of floodwater which has been removed by construction of the floodwall.

- The impact of regrading the area north of the Blackhawk Bike Path so that excess runoff is maintained on the north side of the path until it reaches Locust Drive. This may allow the reconstructed Locust Drive to intercept and channel excess flows away from Maple Terrace.

- The impact of constructing a multipurpose detention basin along the Blackhawk Golf Course. The layout and conceptual configuration of the basin will be developed by AES. The SAI analysis will evaluate

potential impacts on downstream peak discharges and runoff volumes of the detention basin configuration developed by AES.

- The impact of diverting runoff southerly from the Hill Farms parking lots to a possible new detention basin in Rennebohm Park. The SAI analysis will estimate the potential flood volume and peak discharge reduction that could be achieved by diverting the Hill Farms parking lots in a southerly direction. Impacts on Garden Homes flooding will be quantified.

- The impact on constructing an underground chamber and pumping station to temporarily impound excess stormwater runoff from the west.

- The impact of arbitrary reductions in tributary impervious areas of 10, 20, and 30 percent. Potential reductions in peak discharge, volume of runoff, and depth in Garden Homes from each reduction alternative will be quantified.

Task 2 – Summary Report

SAI will summarize results of this analysis in the form of a brief report copied to the Village and AES. This analysis will include an overview of modeling methodology, assumptions, and results. It will also include a completed Alternatives Evaluation Matrix, similar to that previously provided in the SAI proposal to the Village. An existing conditions map, showing the locations of existing drainage facilities and drainage basin divides will be provided to AES in a hard copy and digital format. (Proposed conditions exhibits will be developed by AES.)

Task 3 - Coordination

SAI will attend two meetings with AES to present conclusions and recommendations to the Village Board and interested residents. SAI's primary role will be to provide support and answer questions regarding technical aspects of the project. AES will take the lead role in presenting recommendations and will develop meeting exhibits.

SAI Cost: *Services described in the SAI Scope above will be provided on an hourly rate basis for a limiting fee of $14,000.*

PROJECT SCHEDULE

Assuming an Authorization to Proceed by the Village no later than February 1, and based on our expectations of this process (if consensus is reached within a reasonable time), AES feels the following timeline is achievable and appropriate:

Task	Date Completed
AES Task 1	February 8
AES Task 2	March 1
AES Task 3	March 29
AES Task 4	April 12 (Final Report/Village Board Presentation) May 10 (Public Presentation)
SAI Task 1	March 1
SAI Task 2	March 29
SAI Task 3	(See AES Task 4)

CONDITIONS

1. Work shall be performed pursuant to the project schedule above.

2. The Contractor shall dedicate his best efforts to the project and shall render services to the best of his ability and in accordance with the level of care and skill ordinarily exercised by a person performing similar services under similar conditions.

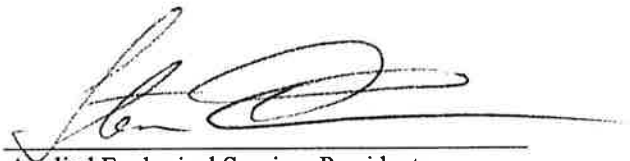
3. The Contractor shall act as an independent contractor and not as an agent or employee of the Client and shall not have the right or power to bind the Client to any contract or agreements with any third party. The relationship created by this agreement is that of a contract for services and nothing herein contained is intended to create the relationship of partnership, joint venture, or employment.

4. The Contractor shall not assign or subcontract any portion of the work without the written permission of the client.

5. Fees for services will be billed once each month and accounts are payable 30 days from the date of the invoice. A service charge of one and one-half percent of the invoice amount (18% annual rate) will be applied to late payment. The Contractor maintains and reserves any and all rights to liens as provided by the laws of the State of Wisconsin.

6. Additional work shall be arranged at the written request of the Client. The extent of such services and additional fees for rendering them shall be approved in writing by both parties.

7. The client may cancel the contract without cost within 10 days of the date of execution. Thereafter the Contractor shall be entitled to retain any amount due to any supplier including the Contractor, for materials ordered or secured for use in this project.



Shorewood Hills Village President

Applied Ecological Services President

date

17 JAN 02

date

Shorewood Hills Village Clerk

date

STRAND ENG'G AES 04/09/2002
RE: GARDEN HOMES FLOOD PROOFING PROJECT

STRAND ASSOCIATES, INC. ENGINEERS®

☐ Information Only
☒ Project Specific 1-778.001
☐ Policy Memo—File with

MEMORANDUM

DRAFT

TO: Steve Apfelbaum
FROM: Ann-Marie Kirsch
DATE: April 9, 2002
RE: Garden Homes Floodproofing Project

The purpose of this memo is to summarize results of a proposed conditions evaluation of flooding at Garden Homes in the Village of Shorewood Hills. Results of this analysis were compared to baseline conditions determined in the existing conditions modeling effort.

Goals of this analysis include:

1. Estimation of peak discharges and runoff volumes to Garden Homes from the contributing watershed after construction of detention/retention ponds at Blackhawk Golf Course.

2. Estimation of peak discharges and runoff volumes to Gardent Homes from the contributing watershed after construction of a detention pond at the Hill Farms Department of Transportation parking lot.

3. Estimation of the effect both flood mitigation proposals employed concurrently on flooding at Garden Homes.

4. Analysis of August 2, 2001 storm for existing and proposed conditions.

Detention at Blackhawk Golf Course

On April 4, Applied Ecological Services provided Strand Associates with an AutoCAD drawing showing proposed detention/retention ponds on Blackhawk Golf Course. The plans show 19 individual ponds located north of the railroad tracks. The plans also show the surface areas and the tributary drainage areas for each pond. Storage volume for each pond was estimated using a planimeter and contours shown on the AutoCAD drawing. Table 1 shows the storage volume and tributary drainage area for each pond.

The analysis of the golf course detention basins assumed that the entire runoff from the tributary area would drain to its detention basin. Also assumed was that any overflow would sheet flow to its original destination.

The existing conditions model has the golf course divided into three tributary area. AES further divided the area into 19 subbasins. To incorporate this information into the XP-SWMM model,

Subbasin	Tributary Area (ac)	Detention (ac-ft)
1	1.61	0.24
2	2.12	0.14
3	0.70	0.21
4	1.73	0.66
5	2.91	0.26
6	0.37	0.14
7	2.46	0.26
8	3.47	1.06
9	3.81	0.69
10	10.14	0.53
11	2.01	0.46
12	1.44	0.14
13	7.34	0.61
14	1.06	0.22
15	1.30	0.37
16	0.55	0.18
17	2.07	0.50
18	0.27	0.10
19	3.06	0.48
Total	48.42	7.25

Table 1. Subbasin Data

the runoff volume for the 100-year storm for the smaller subbasins was computed using SCS TR-55. The runoff volume was compared to the available storage in the proposed pond. If the available storage was greater than the runoff volume, the tributary area was subtracted from the area modeled in the XP-SWMM model. If proposed detention storage was not greater than the 100-year runoff volume, the excess flow from the area was either routed to a downstream pond with excess storage capacity or to the golf course outfall. On average, the proposed golf course detention ponds provided detention for approximately half of the runoff volume for the 100-year storm event.

Modeling results indicate that for the 100-year storm, the runoff volume in the Garden Homes area is reduced from 2.59 ac-ft to 1.15 ac-ft of water. This corresponds to a reduction in flood elevation. The model shows the existing flood elevation at Garden Homes of 40.39 ft (City of Madison datum) and a flood elevation of 39.80 ft if the detention ponds on the Golf Course are built as proposed.

Detention at Hill Farms State Office Building (WisDOT)

Plans provided by AES show a detention basin that is five feet deep in the northeast corner of the parking lot. The basin as shown is approximately 70 feet by 360 feet, which corresponds to a surface area of 0.58 acres.

A 5-foot deep detention basin will receive surface runoff from Subbasin Q as shown on Figure 1. To receive flow from Subbasin R as shown on Figure 1, Pipe 600 would have to be raised. The existing invert of Pipe 600 is greater than five feet below the surface of the parking lot. The existing pipe system does not surcharge enough to get flow into the detention basin from underground.

The upstream invert of pipe 611, which connects subbasin P to the state storm sewer system has a lower elevation than the proposed DOT detention basin. This pipe cannot be located to drain to the proposed detention basin. The runoff from subbasin P will continue to bypass the proposed detention basin.

Modeling the detention basin as proposed results in a reduction of runoff flooding volume to the Garden Homes area. The existing conditions model shows a flooding volume of 2.59 ac-feet of

water. The estimated flooding volume at Garden Homes with the proposed detention basin is 1.15 ac-ft of water. The peak flooding elevation at Garden Homes is estimated to be 39.81 feet.

Although the proposed detention basin reduces the volume of estimated downstream flooding, the detention volume is not fully realized. Modeling shows that the peak depth of water in the 5-foot detention basin is approximately 3 feet. Possible alternatives would be to either reduce the size of the detention basin in the northeast corner of the parking lot or to add another detention basin in the north parking lot. Multiple, smaller detention basins within the DOT/DOR complex could be employed using a concept similar to that used for the golf course detention basin design.

Detention at Blackhawk Golf Course and DOT Parking Lot

A third XP-SWMM model was designed to evaluate the impact of combined detention at Blackhawk Golf Course and the DOT parking lot. Model results show that the risk of flooding at Garden Homes is greatly reduced if both plans are used concurrently. The model shows no overland flow for the 100-year storm between Pyare Square and Garden Homes area. The peak elevation of flood water at Garden Homes is 38.71 feet, which is lower than flood damage elevation.

August 2, 2001 Storm

Hourly rainfall data was obtained from the State Climatologist's Office and rainfall data with a 5 minute interval was obtained from the USGS office in Middleton. This information was used to create a historical rainfall distribution to be used in the XP-SWMM model, to validate past observations by residents. This storm included 3.0 inches of rain in a two hour period. Model results from this storm closely matched the results from the 100-year storm models in XP-SWMM. Modeling results also matches observations by area residents.

When the historical rainfall data was used for the three proposed scenarios for detention, the results were similar to those from the 100-year event.

Summary

XP-SWMM modeling results show that both the detention on the golf course and detention at the DOT provide approximately equal levels of flooding protection for Garden Homes when employed individually. When the two concepts are used in conjunction, overland flow from Pyare Square to Garden Homes is largely eliminated and peak flood elevations are lower than elevations that will cause flood damage.

Runoff volumes and peak flood elevations are summarized below in Table 2.

	Existing	w/Floodwall	w/Floodwall &GC det.	w/Floodwall &DOTdet.	w/Floodwall & GC & DOTdet.
Volume of water from west	2.72	2.72	1.15	1.18	0 ac-ft
Volume of water from Kohls	6.82	0	0	0	0 ac-ft
Maximum stage at Burbank	41.72	40.39	39.8	39.81	38.71 ft
Maximum stage at Kohls	41.71	42.08	42.08	42.08	42.08 ft
Maximum storage volume at Burbank	7.29	0.88	0.90	0.90	0.10 ac-ft

Table 2. Flooding Summary

RE: GARDEN HOMES FLOOD PROOFING PROJECT 05/10/2002

APPLIED ECOLOGICAL SERVICES, INC.

17921 SMITH ROAD, P.O. BOX 256, BRODHEAD, WI 53520
PHONE: 608-897-8641, 608-897-8547 FAX 608-897-8486
Email: info@appliedeco.com

SPECIALISTS IN ENVIRONMENTAL MANAGEMENT AND RESEARCH

MEMORANDUM

TO: Mr. Perry Asher
Village of Shorewood Hills

FROM: Steven I. Apfelbaum

DATE: May 10, 2002

RE: Draft Report for Garden Homes flood proofing project (01-672)

Please consider the attached document as a draft report that provides an update on the direction and preliminary outcomes of the conceptual planning process for the referenced project. In short, the contract required Applied Ecological Services, Inc. in collaboration with Strand Associates, Inc. to develop conceptual stormwater management plans to assist in addressing flood damage reduction in the Garden Homes Neighborhood. In addition to design of concepts we were to test the potential flood damage reduction benefits of the concept.

Tasks completed include development of the conceptual plans and testing. Tasks yet to be completed include presentation to Council or others as requested by the Village, including a likely meeting with Department of Administration and the Golf Course administration.

This report provides an overview of the study results and status to date. The following has been completed:

1. An analysis of the existing hydrology of the tributary areas to the Garden Homes area was conducted. This identified that much of the stormwater tributary to Garden Homes originates at the Blackhawk Golf Course and the State Facilities owned by the Department of Administration (DOA). The DOA properties include the Hill Farms State Transportation Office Building and the vacant Department of Revenue Building. Computer modeling shows that for the 100-year storm approximately 38% of the runoff comes from the golf course and approximately 33% of the runoff comes from the DOA facilities. See Attachment 1 for more detail.

2. We conducted a field inspection of the tributary watershed area to Garden Homes. This visit clearly identified that the golf course and DOA parking lots presented the potential most important locations for stormwater management retrofits to address the rate at which runoff leaves these lands.

3. We prepared conceptual stormwater management plans to address each of these areas. The stormwater management alternatives were developed to maximize stormwater quality enhancement in addition to providing stormwater runoff rate control and volume management. The concepts developed under this planning project were to augment the previous floodwall protection strategy already installed along the south and east boundaries of the Garden Homes.

We specifically investigated the following areas and explored their integration in this conceptual stormwater management plan.

- The area north of the Blackhawk Bike Path for which regrading options will be developed which may allow a reconstructed Locust Drive to intercept and channel excess floodwater away from Maple Terrace.

- A multi-purpose detention/retention/water quality enhancement basin within the Blackhawk Golf Course. Contractor will meet with Golf Course representatives to define available construction areas, allowable water level fluctuations and ponding duration times.

- Existing larger impervious areas -- converted all or in part to pervious vegetated detention areas.

- On site detention either using surface or underground storage alternatives in the Department of Administration Lot should be explored.
  Records Center

Specifically, the plans included the creation of a series of infiltration swale and basin areas primarily within rough areas of the golf course, and a detention facility in the Hill Farm office building parking lot. Figure 1 identifies 18 shallow dry basins conceptually designed within the golf course, and one larger basin that, 1) would be carefully configured to not interrupt a landing zone within that fairway, and , 2) which may serve as a potential future feature in this specific fairway. This specific site, located at the lower area of the slope, could become either a water feature or be designed as a dry shallow basin.

All basins are designed with great flexibility as a part of the conceptual testing and are generally easily reconfigured. All have been located within playable rough areas, and even with installation of the conceptual basins, they shall continue to be playable except for a few days after major storm events, when the course is generally less playable, and lower areas are not easily playable.

In development of these concepts we have used general and some very specific design criteria as follows:

We wanted to avoid and minimize damage to the golf course landscaping. This project could be easily constructed in to avoid impact on golf course seasonal operations. No damage to fairways greens, paths, irrigation systems, and other infrastructure including water lines, and a 69 kV electrical line are anticipated with this flexible design. Before any further design and engineering is conducted, discussions with the golf course superintendent and architect will be required.

4. We modeled stormwater management plans to determine potential flood damage reduction in Garden Homes. Computer modeling indicates that peak flood elevations within Garden Homes can be reduced by approximately 1.70 feet from existing conditions (additional benefits above and beyond the benefits already provided by the floodwall along University Avenue and the Kohl's development). This reduction can be achieved if both stormwater detention on DOA property and infiltration/detention swales on the golf course are employed. If only detention on DOA property or only infiltration/detention on the golf course are used, flooding elevations would be reduced by approximately 0.60 feet from the existing condition.

This reduction in flood elevation corresponds to a reduction in floodwater volume flowing overland from the west. Approximately 2.72 ac-ft of water flows from the west under existing conditions during the critical flood events period of peak flow. This volume of runoff during this peak flood flow period is reduced to approximately 1.18 ac-ft when detention is provided on DOA property, and is reduced to 1.15 ac-ft when infiltration/detention is provided on the golf course. When stormwater management practices are used on both the golf course and DOA property, the computer model shows no overland flow from Pyare Square to Garden Homes.

5. We shared the conceptual plans with the Public Works Committee on 17 April 2002. This was done to solicit feedback on the conceptual plans, and have a discussion of how to proceed to discuss the conceptual plans with the Village Council, golf course, DOA, and others as requested by the Village.

Tasks to be completed:

6. Prepare an opinion of probable costs for each concept.

7. Prepare water quality analysis.

8. Public presentations and finalize report.

Summary

Based on the analysis of the conceptual designs, it appears that the design has the potential to provide significant flood water reductions within Garden Homes, and provide a significant reduction in flood peaks within the neighborhoods. The concept plans are believed to follow closely and honor the Technical Advisory Committee principles and recommendations.

Costs for the shallow scrapes are driven by the landscaping desires of the golf course in these locations and which can vary from approximately $4,000 per acre for replacement with playable lawns, to $2,500/acre for least expensive prairie grass and wildflower seedings, should they desire such plantings in rough areas used for this stormwater management purpose. They could also continue to have lawn in these areas.. Excavation and creation of the shallow scraped depressions and landsculpting on the down hill side of the scrape can vary from simply equaling the approximate value of the earth moving itself which to higher priced specialized land contouring and sculpting. Earth moving costs for such operations of this small scale are relatively inexpensive. Costs for repair of any golf course infrastructure can vary depending on

the nature of the infrastructure. Buried irrigation and water lines are relatively inexpensive to replace and report. Damage and impact to trees and shrubs has been attempted to be minimized with the conceptual layout. However, tree and shrubs plantings in some locations may be desirable.

The detention facility in the DOA lot, may take the form of a underground vault facility. This is required to be able to connect the detention to the very deeply buried stormwater drain pipe that conveys most water from the lot to the north and into and through the Garden Homes and railroad corridor area. Costs for this facility are being developed in consultation with the City of Madison, who have interest in developing this underground storage technique because of an articulated need for use of similar facilities in other locations.

Funding thoughts:

It is believed that funding for both locations can be financed by the Tax Increment Financing (TIF). TIF monies are believed to be useable for matching and challenging DOA involvement in this program. The DOA lot is soon in need of resurfacing and perhaps other improvements to repair slumps and cracks that are developed. It is likely that construction in this location can be done to assist DOA in site improvement..

ATTACHMENT 1. EXISTING CONDITIONS ENGINEERING ANALYSIS

STRAND ASSOCIATES, INC. ENGINEERS®

☐ Information Only

☐ Project Specific

☐ Policy Memo—File with

MEMORANDUM

TO: Steve Apfelbaum
FROM: Dave Wolmutt
DATE: May 10, 2002
RE: Garden Homes Floodproofing Project

The purpose of this memo is to summarize results of the existing conditions evaluation of flooding at Garden Homes in the Village of Shorewood Hills. Results of this analysis will establish baseline conditions for analysis of flood mitigation alternatives.

Goals of this analysis include:

1. Estimation of hydrologic parameters impacting stormwater runoff for the contributing watershed.

2. Estimation of peak discharges and runoff volumes to Garden Homes from the contributing watershed.

3. Estimation of the capacity of the existing drainage system.

4. Evaluation of the impact of the recently constructed floodwall along University Avenue.

Description of Tributary Area

Currently, an area of approximately 105 acres drains to Locust Drive and the Garden Homes subdivision from the area west of Midvale Boulevard. This area includes intensely developed parcels such as the Department of Transportation (Hill Farms), the vacant Department of Revenue building, the Walnut Grove Shopping Center, the Pyre Square Building, and McDonald's restaurant. The tributary area also includes a large portion of the Blackhawk Golf Course. Figure 1 shows existing drainage basin areas and the existing drainage system.

During major storm events, as most recently occurred in June 2000 and July 1996, stormwater runoff exceeded the capacity of the existing storm sewers and drained overland into the Garden Homes subdivision. Damage occurred to homes along Maple Terrace from the overland flow of water. Damage also occurred along Burbank and Maple Terrace from accumulated water from the western tributary area, and from overflow from the University/Midvale intersection.

Stormwater Runoff Volumes

Peak discharges and stormwater runoff volumes for each subbasin were estimated using the RUNOFF module of the XP-SWMM computer program. Input to the model included subbasin drainage area, impervious area, SCS curve numbers for pervious areas, times of concentration, hydrograph shape, and rainfall distribution. Impervious areas were measured from year 2000 aerial photography. Hydrologic parameters for each subbasin are summarized in Table 1.

Tributary Basin	Upstream Node	Contributing Area (ac)	Impervious Area (ac)	Impervious (%)	Pervious CN	Time of Conc. (min.)
A	6610	8.32	0.00	0.1	75	56.4
B	6610	38.03	0.59	1.5	75	42.0
C	6710	5.27	0.94	17.8	75	19.2
E	7200	9.3	3.65	39.3	61	19.8
F	6510	6.26	5.27	84.2	61	5.0
G	8310	1.68	1.49	88.9	61	5.0
H	8310	5.15	4.31	83.8	61	5.0
I	8305	0.3	0.10	32.5	61	13.2
J	8100	1.29	0.50	38.8	61	13.2
K	8200	0.73	0.28	38.0	61	13.2
L	6400	1.44	0.82	57.3	61	5.0
M	8000	2.08	1.01	48.5	61	13.8
N	8210	3.6	1.25	34.7	61	33.0
O	6300	5.43	3.60	66.3	61	5.0
P	6110	7.58	5.66	74.7	61	5.0
Q	6100	2.38	2.21	92.7	61	5.0
R	6000	5.9	5.12	86.9	61	5.0

Table 1. Hydrologic Parameters

Precipitation data was obtained from the publication "Rainfall Frequency Atlas of the Midwest" (Bulletin 71) by the Midwestern Climate Data Center. A critical duration analysis was performed using various storm durations to identify the storm duration producing the greatest amount of excess stormwater runoff. Based on this analysis, a 1-hour storm duration was determined to be critical. Rainfall was distributed over time using the Huff First Quartile precipitation distribution.

Modeling results indicate that approximately 14 acre-feet of stormwater drains to Garden Homes and Locust Drive from the watershed for a 100-year, 1-hour duration storm event. Greater volumes result from longer storm durations. However, peak discharges are lower, so a greater proportion of the volume is contained within the drainage system.

The two primary sources of runoff volume to Garden Homes and Locust Drive are the Blackhawk Golf Course and the Wisconsin Department of Transportation site. For a 100-year

storm event, the golf course is the source of the majority of stormwater runoff volume to Garden Homes (38%), while the DOT site accounts for approximately 23% of the total. For a 2-year storm event, runoff from the DOT site accounts for most of the runoff volume (34%), while the golf course accounts for a lesser proportion (21%). It appears that measures targeting flow reductions from these two locations will likely be most effective in reducing flow volume to Garden Homes and Locust Drive. Control of the 2-year storm from the DOT site would be most beneficial for smaller storm events and would provide the greatest water quality benefits. Control of the 100-year storm event from the golf course would be most beneficial from a water quantity standpoint. A breakdown of runoff volumes by property and subbasin is included in Table 2.

Source	Subbasin	Contributing Area Ac	Contributing Area % of Total	Impervious Area Ac	Impervious Area % of Total	Runoff Volume 100-Year Ac-Ft.	Runoff Volume 100-Year % of Total	Runoff Volume 10-Year Ac-Ft.	Runoff Volume 10-Year % of Total	Runoff Volume 2-Year Ac-Ft.	Runoff Volume 2-Year % of Total
Wisconsin DOT	P	7.58	7.24%	5.66	15.39%	0.56	3.97%	0.62	11.13%	0.30	12.48%
	Q	2.38	2.27%	2.21	6.00%	1.37	9.78%	0.30	5.28%	0.17	7.12%
	R	5.9	5.63%	5.12	13.92%	1.27	9.08%	0.64	11.47%	0.35	14.65%
Subtotal		15.86	15.14%	13.00	35.30%	3.20	22.82%	1.56	27.88%	0.82	34.25%
University/Segoe Rds.	O	5.43	5.18%	3.60	9.77%	0.86	6.17%	0.36	6.51%	0.16	6.70%
Department of Revenue	F	6.26	5.98%	5.27	14.31%	1.30	9.27%	0.64	11.45%	0.34	14.23%
	L	1.44	1.37%	0.82	2.24%	0.20	1.42%	0.08	1.38%	0.03	1.25%
Subtotal		7.7	7.35%	6.09	16.55%	1.50	10.69%	0.72	12.83%	0.37	15.48%
Golf Course	A	8.32	7.94%	0.00	0.00%	3.81	27.20%	0.25	4.54%	0.07	3.00%
	B	38.03	36.31%	0.59	1.60%	0.81	5.78%	1.20	21.49%	0.35	14.48%
Subtotal	C	5.27	5.03%	0.94	2.55%	0.64	4.54%	0.23	4.03%	0.08	3.29%
		51.62	49.28%	1.53	4.15%	5.26	37.56%	1.68	30.06%	0.50	20.77%
Walnut Grove/Pyre Square	G	1.68	1.60%	1.49	4.06%	1.06	7.57%	0.19	3.42%	0.11	4.45%
	H	5.15	4.92%	4.31	11.72%	0.37	2.64%	0.52	9.34%	0.28	11.53%
Subtotal		6.83	6.52%	5.81	15.78%	1.43	10.21%	0.71	12.76%	0.38	15.98%
Garden Homes/Locust Dr.	I	0.3	0.29%	0.10	0.26%	0.03	0.19%	0.01	0.14%	0.00	0.08%
	J	1.29	1.23%	0.50	1.36%	0.13	0.91%	0.04	0.72%	0.01	0.50%
	K	0.73	0.70%	0.28	0.76%	0.07	0.51%	0.02	0.39%	0.01	0.25%
	M	2.08	1.99%	1.01	2.75%	0.25	1.75%	0.09	1.56%	0.03	1.25%
	N	3.6	3.44%	1.25	3.40%	0.33	2.39%	0.10	1.77%	0.03	1.08%
Subtotal		8	7.64%	3.14	8.52%	0.81	5.75%	0.3	4.58%	0.08	3.16%
Other	E	9.3	8.88%	3.65	9.92%	0.95	6.77%	0.30	5.39%	0.09	3.66%
Total		104.74		36.82		14.01		5.59		2.40	

Table 2. Summary of Runoff Volumes

Existing Drainage System Capacity

Stormwater runoff from the state-owned facilities generally drains through a 36-inch storm sewer connected to the existing City of Madison box culvert under Locust Drive. The Walnut Grove Shopping Center and adjacent areas drain through a 24-inch storm sewer also connected to the box culvert. Garden Homes is served by a third, separate storm sewer also connected to the box culvert. The Garden Homes storm sewer system has a valve in place to minimize backflows from the box culvert.

The existing drainage system capacity was evaluated using the EXTRAN module of the XP-SWMM computer program. Model input included existing drainage conduit and channel information such as conduit size, type, length, inverts, roughness, and ground elevations. For each watershed, hydrographs for each subbasin computed by the RUNOFF module were routed through the system. These analyses estimated conduit capacities, maximum flows, surcharge levels, and stormwater volumes leaving the system at critical locations. The XP-SWMM model evaluated system capacities and impacts of improvement alternatives.

Results of the XP-SWMM analysis indicate that the most critical reach from the standpoint of pipe capacity is the DOT/DOR system. As indicated in Table 3, Conduits 660 and 670, 36-inch corrugated metal pipes, appear to have less than a 10-year peak discharge capacity downstream from the point where runoff from the golf course is collected. Excess flows surcharge the system and drain overland into the Garden Homes neighborhood. According to the XP-SWMM model, approximately 14 cfs discharges overland for a 10-year storm, and 41 cfs for a 100-year storm.

These results indicate that it may be possible to reduce the overflow to Garden Homes by increasing the capacity of the drainage system. This could be accomplished in one of the following ways:

1. Increasing the storm sewer capacity by lining or replacing conduits 660 and 670.

2. Adding additional inlets to collect surface overflow and direct it to Conduit 680.

3. Performing grading as practical to collect surface overflows and direct it to Locust Drive. Profile modifications to Locust Drive should be considered.

Impacts of Floodwall Construction

An analysis of flood depths in Garden Homes was performed to evaluate impacts of the floodwall that was constructed along University Avenue in 2001. The purpose of this floodwall is to prevent storm sewer overflows from the University/Midvale intersection and Kohl's site from entering the Garden Homes neighborhood.

According to the XP-SWMM model, construction of the floodwall will reduce the volume of stormwater runoff into Garden Homes by approximately 71% for a 100-year storm event. This

reduces the depth of ponding in Garden Homes by approximately 1.4 feet during the 1-hr, 100-year design storm event.

Summary

Construction of the floodwall along University Avenue will significantly reduce the volume of runoff to Garden Homes and lower ponding depths. However, additional measures are necessary to reduce overflows to Garden Homes from the west. The most effective measures may be those targeting stormwater runoff from the Wisconsin Department of Transportation site and Blackhawk Golf Course. Some possible alternatives are described below:

Department of Transportation Site

1. Construction of a detention or infiltration area around the downstream inlet (Node 6100) at the DOT site. Construction and maintenance issues would have to be coordinated with DOT facilities managers.

2. Construction of a new storm sewer cross connection along University Avenue diverting a portion of the DOT runoff to the University Avenue storm sewer. This is pending an analysis of the University Avenue storm sewer capacity.

3. Diversion of Subbasin R southerly to Rennebohm Park. This can be modeled, but may not be a viable alternative considering flooding in the vicinity of Rennebohm Park and areas downstream.

Blackhawk Golf Course

1. Construction of a detention or retention basin to intercept golf course runoff north of the railroad tracks.

Conveyance Alternatives

1. Alter the proposed Locust Drive profile to intercept surface overflows prior to entry into the Garden Homes neighborhood.

2. Improve the capacity of the existing DOT/DOR storm sewer downstream from the point where golf course runoff is collected.

3. Provide adequate inlet capacity to collect surface overflow and direct it to Conduit 680 in Locust Drive.

ATTACHMENT 2. EVALUATION OF POTENTIAL BENEFITS AND PERFORMANCE OF CONCEPTUAL STORMWATER MANAGEMENT PLAN

05/10/2002

STRAND ASSOCIATES, INC. ENGINEERS®

☐ Information Only

☒ Project Specific 1-778.001

☐ Policy Memo—File with

MEMORANDUM

TO: Steve Apfelbaum
FROM: Ann-Marie Kirsch
DATE: May 10, 2002
RE: Garden Homes Floodproofing Project

The purpose of this memo is to summarize results of a proposed conditions evaluation of flooding at Garden Homes in the Village of Shorewood Hills. Results of this analysis were compared to baseline conditions determined in the existing conditions modeling effort.

Goals of this analysis include:

1. Estimation of peak discharges and runoff volumes to Garden Homes from the contributing watershed after construction of detention/retention ponds at Blackhawk Golf Course.

2. Estimation of peak discharges and runoff volumes to Garden Homes from the contributing watershed after construction of a detention pond at the Hill Farms Department of Transportation parking lot.

3. Estimation of the effect both flood mitigation proposals employed concurrently on flooding at Garden Homes.

4. Analysis of August 2, 2001 storm for existing and proposed conditions.

Detention at Blackhawk Golf Course

On April 4, Applied Ecological Services provided Strand Associates with an AutoCAD drawing showing proposed detention/retention ponds on Blackhawk Golf Course. The plans show 19 individual ponds located north of the railroad tracks. The plans also show the surface areas and the tributary drainage areas for each pond. Storage volume for each pond was estimated using a planimeter and contours shown on the AutoCAD drawing. Table 1 shows the storage volume and tributary drainage area for each pond.

The analysis of the golf course detention basins assumed that the entire runoff from the tributary area would drain to its detention basin. Also assumed was that any overflow would sheet flow to its original destination.

Subbasin	Tributary Area (ac)	Detention (ac-ft)
1	1.61	0.24
2	2.12	0.14
3	0.70	0.21
4	1.73	0.66
5	2.91	0.26
6	0.37	0.14
7	2.46	0.26
8	3.47	1.06
9	3.81	0.69
10	10.14	0.53
11	2.01	0.46
12	1.44	0.14
13	7.34	0.61
14	1.06	0.22
15	1.30	0.37
16	0.55	0.18
17	2.07	0.50
18	0.27	0.10
19	3.06	0.48
Total	48.42	7.25

Table 1. Subbasin Data

The existing conditions model has the golf course divided into three tributary area. AES further divided the area into 19 subbasins. To incorporate this information into the XP-SWMM model, the runoff volume for the 100-year storm for the smaller subbasins was computed using SCS TR-55. The runoff volume was compared to the available storage in the proposed pond. If the available storage was greater than the runoff volume, the tributary area was subtracted from the area modeled in the XP-SWMM model. If proposed detention storage was not greater than the 100-year runoff volume, the excess flow from the area was either routed to a downstream pond with excess storage capacity or to the golf course outfall. On average, the proposed golf course detention ponds provided detention for approximately half of the runoff volume for the 100-year storm event.

Modeling results indicate that for the 100-year storm, the runoff volume in the Garden Homes area is reduced from 2.59 ac-ft to 1.15 ac-ft of water. This corresponds to a reduction in flood elevation. The model shows the existing flood elevation at Garden Homes of 40.39 ft (City of Madison datum) and a flood elevation of 39.80 ft if the detention ponds on the Golf Course are built as proposed.

Detention at Hill Farms State Office Building (WDOT)

Plans provided by AES show a detention basin that is five feet deep in the northeast corner of the parking lot. The basin as shown is approximately 70 feet by 360 feet, which corresponds to a surface area of 0.58 acres.

A 5-foot deep detention basin will receive surface runoff from Subbasin Q as shown on Figure 1. To receive flow from Subbasin R as shown on Figure 1, Pipe 600 would have to be raised. The existing invert of Pipe 600 is greater than five feet below the surface of the parking lot. The existing pipe system does not surcharge enough to get flow into the detention basin from underground.

The upstream invert of pipe 611, which connects subbasin P to the state storm sewer system has a lower elevation than the proposed DOT detention basin. This pipe cannot be located to drain to the proposed detention basin. The runoff from subbasin P will continue to bypass the proposed detention basin.

Modeling the detention basin as proposed results in a reduction of runoff flooding volume to the Garden Homes area. The existing conditions model shows a flooding volume of 2.59 ac-feet of water. The estimated flooding volume at Garden Homes with the proposed detention basin is 1.15 ac-ft of water. The peak flooding elevation at Garden Homes is estimated to be 39.81 feet.

Although the proposed detention basin reduces the volume of estimated downstream flooding, the detention volume is not fully realized. Modeling shows that the peak depth of water in the 5-foot detention basin is approximately 3 feet. Possible alternatives would be to either reduce the size of the detention basin in the northeast corner of the parking lot or to add another detention basin in the north parking lot. Multiple, smaller detention basins within the DOT/DOR complex could be employed using a concept similar to that used for the golf course detention basin design.

Detention at Blackhawk Golf Course and DOT Parking Lot

A third XP-SWMM model was designed to evaluate the impact of combined detention at Blackhawk Golf Course and the DOT parking lot. Model results show that the risk of flooding at Garden Homes is greatly reduced if both plans are used concurrently. The model shows no overland flow for the 100-year storm between Pyare Square and Garden Homes area. The peak elevation of flood water at Garden Homes is 38.71 feet, which is lower than flood damage elevation.

August 2, 2001 Storm

Hourly rainfall data was obtained from the State Climatologist's Office and rainfall data with a 5 minute interval was obtained from the USGS office in Middleton. This information was used to create a historical rainfall distribution to be used in the XP-SWMM model, to validate past observations by residents. This storm included 3.0 inches of rain in a two hour period. Model results from this storm closely matched the results from the 100-year storm models in XP-SWMM. Modeling results also matches observations by area residents.

When the historical rainfall data was used for the three proposed scenarios for detention, the results were similar to those from the 100-year event.

Summary

XP-SWMM modeling results show that both the detention on the golf course and detention at the DOT provide approximately equal levels of flooding protection for Garden Homes when employed individually. When the two concepts are used in conjunction, overland flow from Pyare Square to Garden Homes is largely eliminated and peak flood elevations are lower than elevations that will cause flood damage.

Runoff volumes and peak flood elevations are summarized below in Table 2.

	Existing	w/Floodwall	w/Floodwall &GC det.	w/Floodwall &DOTdet.	w/Floodwall & GC & DOTdet.	
Volume of water from west	2.72	2.72	1.15	1.18	0	ac-ft
Volume of water from Kohls	6.82	0	0	0	0	ac-ft
Maximum stage at Burbank	41.72	40.39	39.8	39.81	38.71	ft
Maximum stage at Kohls	41.71	42.08	42.08	42.08	42.08	ft
Maximum storage volume at Burbank	7.29	0.88	0.90	0.90	0.10	ac-ft

Table 2. Flooding Summary

Village of Shorewood Hills - Garden Homes

Exist

Table 3 - Conduit Discharge Data

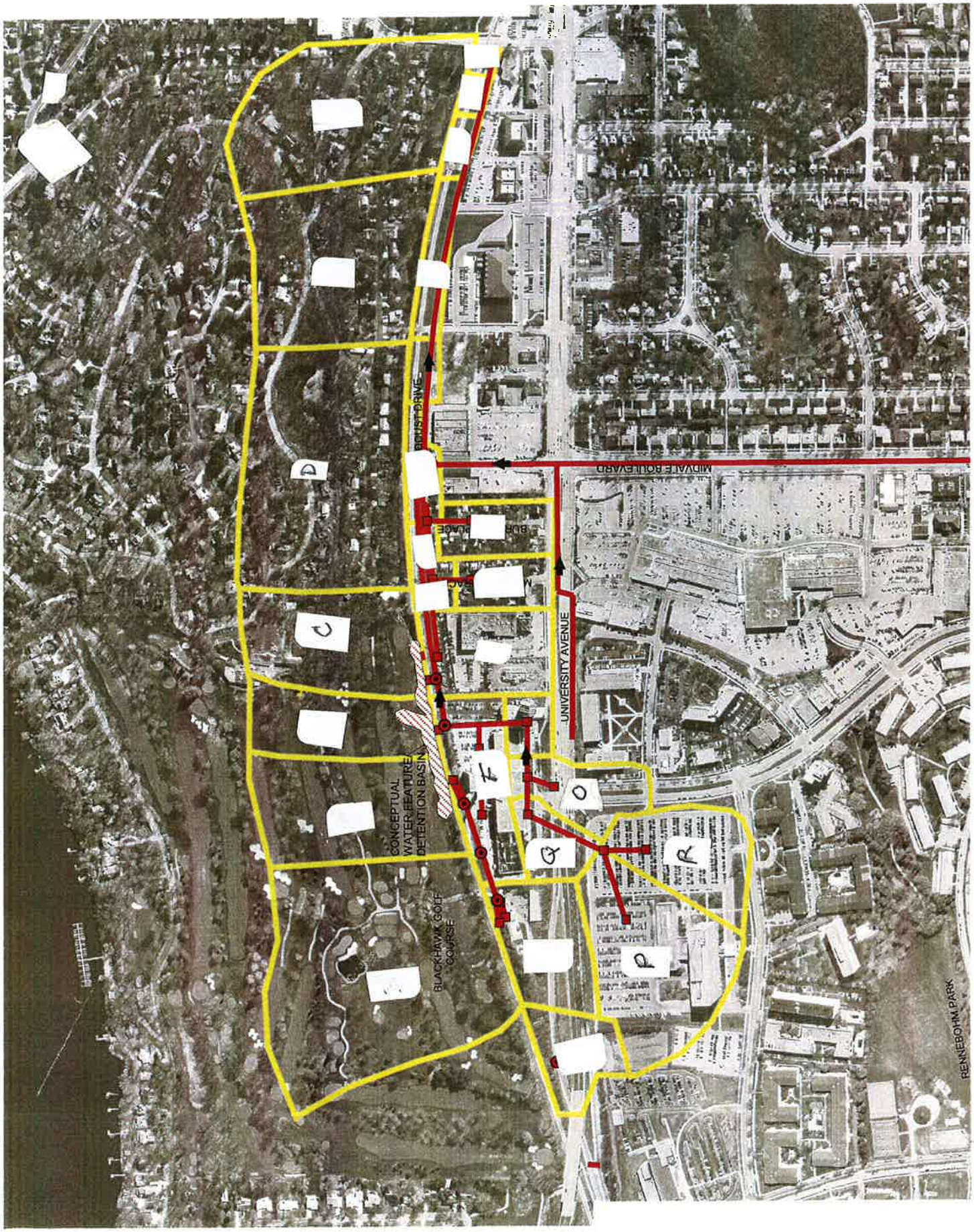
Conduit	Contributing Subbasins	Conduit type	Diameter (in)	Pipe Material	Pipe Slope %	Pipe Capacity (cfs)	Peak Discharge (cfs)	% of Capacity	Overflow (cfs)	Peak Discharge (cfs)	% of Capacity	Overflow (cfs)	Peak Discharge (cfs)	% of Capacity	Overflow (cfs)
DOT/DOR System															
600	R	Circular	21	Concrete	1.50	15.7	35.6	227%	1.5	17.0	108%		8.8	56%	
610	R,P	Circular	30	Concrete	5.99	81.5	74.0	91%		39.0	48%		19.9	24%	
611	P	Circular	24	Concrete	0.02	2.8	31.8	1135%		15.3	547%		7.1	255%	
620	P,Q,R	Circular	30	Concrete	1.27	37.6	71.4	190%	1.9	39.0	104%		19.9	53%	
630	L,P,Q,R	Circular	36	Concrete	3.32	98.7	86.7	88%		51.0	52%		23.5	24%	
640	L,P,Q,R	Circular	36	Concrete	1.50	66.4	91.6	138%		50.8	77%		24.1	36%	
650	F,L,P,Q,R	Circular	36	Concrete	1.62	79.0	78.8	100%	24	60.1	76%		32.3	41%	
651	F	Circular	18	Concrete	1.50	10.5	18.7	178%		16.3	155%		8.4	80%	
661	A,B,E	Circular	24	Concrete	12.68	59.7	46.2	77%		21.1	35%		6.5	11%	
671	C	Circular	21	Concrete	1.00	12.9	11.5	89%		3.9	31%		1.3	10%	
660	A,B,E,F,L,P,Q,R	Circular	36	Corr. Metal	1.13	38.5	67.9	176%	41	59.8	155%	0.1	32.4	84%	
670	A,B,C,E,F,L,P,Q,R	Circular	36	Corr. Metal	1.32	41.6	49.4	119%	41	47.4	114%	13.9	32.2	77%	
680	A,B,E,F,L,P,Q,R,I	Circular	36	Concrete	2.02	77.0	51.6	67%		52.3	68%		32.1	42%	
Bike Path Ditch															
720	E	Ditch	N/A	N/A	0.63	95.1	16.4	17%		5.3	6%		1.5	2%	
730	E	Circular	21	Concrete	1.12	13.6	10.8	80%		5.0	36%		1.4	10%	
740	E	Circular	21	Concrete	1.00	12.8	10.7	84%		5.0	39%		1.4	11%	
750	E	Circular	21	Concrete	0.20	5.8	10.7	185%		4.9	84%		1.4	24%	
760	E	Ditch	N/A	N/A	0.61	N/A	15.1			4.9			1.4		
Garden Homes System															
800	M	Circular	24	Concrete	0.25	9.2	19.7	214%		2.1	23%		0.5	6%	
810	M,J	Circular	24	Concrete	0.25	9.9	15.8	159%		4.8	48%		0.7	7%	
820	M,J,N,K	Circular	30	Concrete	0.09	10.0	26.1	261%		19.9	199%		1.0	10%	
821	N	Circular	27	Concrete	0.08	7.3	18.5	254%		12.5	171%		0.4	5%	
825	M,J,N,K	Circular	30	Concrete	0.14	14.4	26.1	181%		19.7	137%		1.0	7%	
Pyre Square/Walnut Grove System															
830	G,H,I	Circular	36	Concrete	2.73	89.6	50.0	56%		29.8	33%		9.4	11%	
830.5	G,H,I	Circular	33	Concrete	0.20	22.0	38.8	176%		30.5	139%		9.5	43%	
831	G,H	Circular	24	Concrete	0.20	8.2	38.0	464%	52	30.7	374%		9.5	116%	

380'

RE: GARDEN HOMES FLOODPROOFING STUDY
INITIAL VERSION OF SUB-BASIN MAP

AES, INC
&
STRAND ASSOCIATES

05/10/2002



Sept. 9, 2002 (as revised)

Village of Shorewood Hills - Garden Homes

Table 2 - Runoff Volumes

Source	Subbasin	Contributing Area Ac	Contributing Area % of Total	Impervious Area Ac	Impervious Area % of Total	Runoff Volume 100-Year Ac-Ft.	Runoff Volume 100-Year % of Total	Runoff Volume 10-Year Ac-Ft.	Runoff Volume 10-Year % of Total	Runoff Volume 2-Year Ac-Ft.	Runoff Volume 2-Year % of Total
Wisconsin DOT	P	7.58	11.99%	5.66	16.01%	1.37	13.75%	0.62	14.34%	0.30	14.61%
	Q	2.38	3.76%	2.21	6.24%	0.56	5.62%	0.30	6.80%	0.17	8.33%
	R	5.9	9.33%	5.12	14.48%	1.27	12.76%	0.64	14.77%	0.35	17.14%
Subtotal		15.86	25.09%	13.00	36.74%	3.20	32.14%	1.56	35.91%	0.82	40.07%
University/Segoe Rds.	O	5.43	8.59%	3.60	10.17%	0.86	8.67%	0.36	8.39%	0.16	7.84%
Department of Revenue	F	6.26	9.90%	5.27	14.90%	1.30	13.03%	0.64	14.75%	0.34	16.65%
	L	1.44	2.28%	0.82	2.33%	0.20	1.99%	0.08	1.77%	0.03	1.46%
Subtotal		7.7	12.18%	6.09	17.23%	1.50	15.03%	0.72	16.52%	0.37	18.11%
Golf Course	B-East	0	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%
	B-West*	0	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%
	C	10.1	15.98%	0.09	0.25%	1.21	12.15%	0.43	9.91%	0.15	7.30%
Subtotal		10.1	15.98%	0.09	0.25%	1.21	12.15%	0.43	9.91%	0.15	7.30%
Walnut Grove/Pyresquare	G	1.68	2.66%	1.49	4.23%	0.37	3.71%	0.19	4.40%	0.11	5.21%
	H	5.15	8.15%	4.31	12.20%	1.06	10.64%	0.52	12.03%	0.28	13.49%
Subtotal		6.83	10.80%	5.81	16.42%	1.43	14.36%	0.71	16.43%	0.38	18.70%
Garden Homes/Locust Dr.	I	0.3	0.47%	0.10	0.27%	0.03	0.27%	0.01	0.18%	0.00	0.10%
	J	1.29	2.04%	0.50	1.42%	0.13	1.29%	0.04	0.92%	0.01	0.58%
	K	0.73	1.15%	0.28	0.79%	0.07	0.72%	0.02	0.51%	0.01	0.29%
	M	2.08	3.29%	1.01	2.86%	0.25	2.47%	0.09	2.01%	0.03	1.46%
	N	3.6	5.69%	1.25	3.53%	0.33	3.36%	0.10	2.28%	0.03	1.27%
Subtotal		8	12.65%	3.14	8.87%	0.81	8.09%	0.3	5.90%	0.08	3.70%
Other	E	9.3	14.71%	3.65	10.32%	0.95	9.52%	0.30	6.94%	0.09	4.28%
Total		63.22		35.38		9.96		4.34		2.05	

* B-West does produce runoff for all storm events, but the runoff is contained in the depressional area on the Golf Course

09/09/2002

7/29/2003

July 29, 2003

William H. Thomas
3230 Tally Ho Lane
Madison, WI 53705

Re: Shorewood Hills Stormwater Comments

Dear Bill,

This letter is in response to your email dated July 29, 2003, concerning stormwater drainage to Garden Homes.

Golf Course Drainage

As noted in our previous correspondence, the drainage areas in the golf course area were refined based on survey data obtained for the berm project. Subbasin A drains to the west, to the Spring Harbor outfall, and runoff from this subbasin was removed from the current stormwater model.

Table 1 is the stage-storage relationship for the existing depressional area in Black Hawk Country Club, north of the railroad tracks. The existing overflow elevation is 902.81 feet, corresponding to a storage volume of 5.87 acre-feet. The proposed berm north of the railroad tracks will have an elevation of 904.0 feet, corresponding to a storage volume of 11.2 acre-feet.

Elevation (ft)	Delta H (ft)	Area (ac)	Avg. Area (ac)	Volume (ac-ft)	Sum Volume (ac-ft)
900		0.04			0
	1		0.85	0.85	
901		1.66			0.85
	1		2.17	2.17	
902		2.68			3.02
	1		3.34	3.34	
903		4.00			6.36
	1		4.805	4.81	
904		5.61			11.17

Table 1. Golf Course Stage-Storage Relationship

The revised table indicating no runoff from Subbasin B does not include the proposed berm on the golf course. Modeling indicates no runoff overflowing from Subbasin B under normal, unsaturated conditions for the 100-year storm. Based on computer modeling, the greatest flooding at Garden Homes occurs during the one-hour storm event. The runoff volume from Subbasin B for the 100-year, 1-hour storm is approximately 4.6 acre-feet. The runoff volume from Subbasin B for the 100-year, 24-hour SCS Type II distribution storm is 4.3 acre-feet.

Runoff from Subbasin B was also computed for fully saturated conditions, and the depressional area in the golf course begins to overflow for the 70-year, 24-hour storm, which produces 5.9 acre-feet of runoff. The 100-year, 24-hour storm under fully-saturated conditions produces approximately 6.3 acre-feet of stormwater runoff.

The drainage areas of Subbasin B and Subbasin C were adjusted based on survey data and contours obtained from the Fly Dane 2000 project. The revised drainage area for Subbasin B is 33.2 acres, and the revised drainage area for Subbasin C is 10.1 acres.

Conduit Discharge Data

The label for Subbasin O was inadvertently omitted from "Table 3 – Conduit Discharge Data" from our May 15, 2002, memo to Steve Apfelbaum. Subbasin O drains to Node 6300 and Link 630 in our XP-SWMM model. The flow from this subbasin is included in the peak flows for Links 630, 640, 650, 660, 670, 680, and all other affected downstream storm sewers.

The XP-SWMM model was revised to evaluate any impact of the revised invert at Node 6110. Increasing the slope to 0.7 percent does increase the pipe capacity, but has negligible effect on the peak flow through the pipe, since Conduit 611 is flowing under pressure. The pipe capacity increases to 15.6 cfs, and the peak flow changes to 32.5 cfs, changing the percent of capacity to 208%. Concerning overflow, Node 6110 was modeled as a storage node, similar to a detention basin. Any excess flow was modeled as impounded in the parking lot until the storm sewer system had the capacity to drain the impounded flow. The excess flow was not neglected.

If Conduit 610 is indeed a 24-inch storm sewer rather than a 30-inch storm sewer as indicated by City of Madison storm sewer mapping, modeling indicates little impact on flooding at Garden Homes. If Coduit 610 is 24-inch pipe, flow under University Avenue is slightly restricted, and flooding at Node 6110 is approximately 0.39 acre-feet rather than 0.11 acre-feet.

Sincerely,

(ANNE-MARIE KIRSCH, P.E., STRAND ASSOCIATES)

S:\@Sai\751--800\778\001\Wrd\WHThomasLetter072903.doc

07/30/2003

Village of Shorewood Hills Stormwater Committee
Minutes of meeting July 30, 2003

The meeting was properly posted.
It was held, beginning at 5:30 PM and ending at 7:15 PM in the region that experiences floods during severe rain events, beginning at the corner of Locust Drive and Maple Terrace.
In attendance were all Committee members: Anne Helsley, Carolyn Benforado, Bill Thomas, Sherrie Gruder and Brian Joiner (Chair)
Also in attendance were: David Wolmutt and David Liebl.
STRAND UW-EXTENSION

Brainstormed ideas:
(Note: in brainstorming all ideas are welcomed without evaluation)

- Much of the water from the Hill Farms buildings and parking lots (often referred to as the DOT) and the adjoining areas on University Avenue goes into a pipe that overflows in severe storm events. One idea would be to create a relief pipe that would divert this excess water to the golf course so it could be stored temporarily until the 5 x 12 culvert could take it downstream.
- Raise Locust Drive and make a ditch/ swale along the south side of the RR tracks
- Excavate Locust Drive and create a major holding area under the street
- Excavate an area on the north side of the RR tracks to create a swale to carry the water from the east end of the golf course down beside the tracks toward Highbury
- Install a neighborhood sump pump connected to a "force main"
- Install pervious pavement in all driveways
- Divert the DOT water toward Rennebohm Park and get it to infiltrate as agreed to in the MGE-UW COGEN plant proposal
- Create a holding area under a portion of the DOT lot to hold their stormwater
- Allow the DOT water to flow west toward Spring Harbor
- Remove one of the homes in Garden Homes and create a holding pond that would be otherwise dry
- Create a large basement under one of the homes and use it as a temporary holding area
- Raise the effected houses
- Install glass blocks in place of the basement windows in the effected houses
- Get the building inspector to make sure that the roof water on Walnut Grove does not overflow toward the adjacent houses on Maple Terrace as apparently happened several years ago
- Finish the curb on the Pyare Square parking lot in the area behind 842 Maple Terrace
- Put a "lip" around the elevated parking area behind Walnut Grove so the water goes down the appropriate drain and doesn't sheet out onto the Pyare Square parking lot

- Get water from the south of the RR tracks that is to the west of the golf course maintenance facility to flow onto the golf course and infiltrate there

Facts:

(These are believed to be true, but were not fully validated on the spot)

- There is still an estimated 2-3 acre feet of water that flows into the area from the west during a 100 year event
- It would cost about $40,000 to raise a house above the flood level
- Not all houses are effected by the flooding, especially now that the berm is in place preventing the water from the Midvale Avenue intersection from coming into this area
- In one of the 2000 floods, water up to a foot deep was flowing past several of the houses
- It does not appear that any main level floors are effected, only basements and garages
- It is illegal and inappropriate to create infiltration areas on bedrock – the water is not purified as it is when it drains trough soil and goes through cracks in the rocks directly into the groundwater

Question to explore:

- *How* do we get any work we want done on private properties – do we offer to do it, or make money available to the residents or owners to do it, or …?
- Can/ should the Village make it possible for residents or owners to acquire flood insurance?

Next steps:

- Get a list of the houses needing flood proofing (Carolyn & Ann)
- Focus the next meeting just on what we can do by September 30, when the TIF runs out, to flood proof homes and other property in the effected area (Brian)
- Schedule the next meeting of the Committee for August 4, 5, 6 or 7 (Brian)
- Invite residents and any other property owners to the next meeting (Brian)

William H. Thomas

From: "Ann-Marie Kirsch" <Ann-Marie.Kirsch@Strand.com>
To: <thomaw@tds.net>
Cc: "David Wolmutt" <David.Wolmutt@Strand.com>
Sent: Friday, August 01, 2003 8:35 AM
Subject: Re: Map (Fig. 1) and table (Table 1) Re: Ad Hoc Garden HomesStormwater Committee

Bill,

This email is in response to your earlier concerns regarding flooding issues in the Garden Homes area. I hope I have addressed all of your concerns. Please let me know if you have any other questions.

Golf Course Drainage

As noted in our previous correspondence, the drainage areas in the golf course area were refined based on survey data obtained for the berm project. Subbasin A drains to the west, to the Spring Harbor outfall, and runoff from this subbasin was removed from the current stormwater model.

Table 1 is the stage-storage relationship for the existing depressional area in Black Hawk Country Club, north of the railroad tracks. The existing overflow elevation is 902.81 feet, corresponding to a storage volume of 5.87 acre-feet. The proposed berm north of the railroad tracks will have an elevation of 904.0 feet, corresponding to a storage volume of 11.2 acre-feet.

L .20
E .95
O .86
3.20
P, Q, + R
5.21 A/F

Elevation (ft)	Delta H (ft)	Area (ac)	Avg. Area (ac)	Volume (ac-ft)	Sum Volume (ac-ft)
900		0.04		0	
1		0.85	0.85		
901		1.66	0.85		
1		2.17	2.17		
902		2.68	3.02		
1		3.34	3.34		
903		4.00	6.36		
1		4.805	4.81		
904		5.61	11.17		

11.17
-6.36
4.81 acre-feet surplus.

Table 1. Stage-Storage at Blackhawk Golf Course

The revised table indicating no runoff from Subbasin B does not include the proposed berm on the golf course. Modeling indicates no runoff overflowing from Subbasin B under normal, unsaturated conditions for the 100-year storm. Based on computer modeling, the greatest flooding at Garden Homes occurs during the one-hour storm event. The runoff volume from Subbasin B for the 100-year, 1-hour storm is approximately 4.6 acre-feet. The runoff volume from Subbasin B for the 100-year, 24-hour SCS Type II distribution storm is 4.3 acre-feet.

Runoff from Subbasin B was also computed for fully saturated conditions, and the depressional area in the golf course begins to overflow for the 70-year, 24-hour storm, which produces 5.9 acre-feet of

runoff. The 100-year, 24-hour storm under fully-saturated conditions produces approximately 6.3 acre-feet of stormwater runoff.

The drainage areas of Subbasin B and Subbasin C were adjusted based on survey data and contours obtained from the Fly Dane 2000 project. The revised drainage area for Subbasin B is 33.2 acres, and the revised drainage area for Subbasin C is 10.1 acres.

Conduit Discharge Data

The label for Subbasin O was inadvertently omitted from "Table 3 – Conduit Discharge Data" from our May 15, 2002, memo to Steve Apfelbaum. Subbasin O drains to Node 6300 and Link 630 in our XP-SWMM model. The flow from this subbasin is included in the peak flows for Links 630, 640, 650, 660, 670, 680, and all other affected downstream storm sewers.

The XP-SWMM model was revised to evaluate any impact of the revised invert at Node 6110. Increasing the slope to 0.7 percent does increase the pipe capacity, but has negligible effect on the peak flow through the pipe, since Conduit 611 is flowing under pressure. The pipe capacity increases to 15.6 cfs, and the peak flow changes to 32.5 cfs, changing the percent of capacity to 208%. Concerning overflow, Node 6110 was modeled as a storage node, similar to a detention basin. Any excess flow was modeled as impounded in the parking lot until the storm sewer system had the capacity to drain the impounded flow. The excess flow was not neglected.

If Conduit 610 is indeed a 24-inch storm sewer rather than a 30-inch storm sewer as indicated by City of Madison storm sewer mapping, modeling indicates little impact on flooding at Garden Homes. If Conduit 610 is 24-inch pipe, flow under University Avenue is slightly restricted, and flooding at Node 6110 is approximately 0.39 acre-feet rather than 0.11 acre-feet. However, flooding in the Garden Homes area is unaffected by the change in pipe diameter.

Ann-Marie E. Kirsch, P.E.
Strand Associates, Inc.
910 W. Wingra Drive
Madison, Wisconsin 53715
(608) 251-4843
Ann-Marie.Kirsch@strand.com

>>> "William H. Thomas" <thomaw@tds.net> 07/29/03 12:38AM >>>
Anne-Marie,

Thanks!

Dave Wolmutt sent me the Sept. 9, 2002 version of your Table 2 last March,
but it did not have a date on it. I did not know, until your e-mail of today, that the revised version of Table 2 assumed the completion of the
proposed berm. I assumed that it did not, but that's OK.

In putting together my 3-stage version of the Table, I decided to identify the runoff from Subbasins A and B in the first stage, then subtract it in the second stage. To do this, I used the numbers for Subbasin A just as they appeared in the original version of your Table 2. To get my numbers for Subbasin B, I adjusted the numbers from Subbasin B in your original Table 2 downward, by the amounts that the numbers for Subbasin C increased between your original Table 2 and your revised Table 2 (I did not have a revised map of the Subbasins; I just figured that the increases in the numbers for Subbasin C, between your original and revised versions of Table 2, corresponded with decreases in the numbers for Subbasin B).

The results of the 3rd stage of my Table 1 (for the 100-year storm event) assume that Subbasin B, upon completion of the planned berming, will have the capacity to accommodate, in addition to the 3.24 acre-feet of runoff from Subbasin B itself, the 5.21 acre-feet of runoff from Subbasins P, Q, R, O, L, and E, that is, a total of 8.45 acre-feet in the case of a 100-year storm event.

I estimated the detention capacity of Subbasin B with the help of a drawing labelled "Earthwork Quantity Estimate, Village of Shorewood Hills Garden Homes Floodproofing Project, Revised Date: 01/30/2003". I assume this document came from Strand Associates and that you are familiar with it. It appeared to me that, when the berming is complete, the "depressed" portion of Subbasin B, if sufficient stormwater were directed into it, would not overflow until the water within it rose to an elevation of 904 feet. I estimated the capacities of the contour intervals as follows:

Contour Interval	Capacity of Interval (Acre-feet)	Cumulative Capacity (Acre-feet)
900 - 901	.75	.75
901 - 902	2.00	2.75
902 - 903	3.10	5.85
903 - 904	4.35	10.20

You must have calculated the holding capacity of Subbasin B with the berming
in place, and I hope you will share that figure with me, because I am sure
your estimate will be more accurate than mine.

Regarding "Table 3 - Conduit Discharge Data":

I would be interested in the impact, on "Table 3 - Conduit Discharge Data",(from your memo of May 15, 2002, to Steve Apfelbaum), of your discovery of the fact that the runoff from Subbasins A and B did not or will
not be entering any stormwater conduits. Do you have a newer version of
Table 3 that reflects this fact?

I have some other questions and comments about Table 3. Some were included
in an e-mail to Dave Wolmutt last March.

1) Can you tell me why Table 3 makes no mention of Subbasin O, or of Conduit
631, into which it drains? According to Table 2, Subbasin O should be at
least as important, in terms of runoff volume (.86 acre-feet), as Subbasin P
(.56 acre-feet), in contributing to the flooding in Garden Homes.

2) In Table 3, Ann-Marie lists a slope of 0.02 % (.0002?) for Conduit 611.
She says (in her e-mail note) that this slope is estimated, because she did
not have the invert of Node 6110. I estimate a much steeper slope of .7 %
(.007) for Conduit 611, based on some elevations that I shot last November:
I measured an invert elevation of approximately 86.93' at Node 6110, putting
it 2.45' higher than the 84.48' invert at Node 6100, over a pipe length of
340'. (I was using a laser instrument designed for construction work, so my
measurement could be off by an inch or so.)

I suppose Anne-Marie's "Percent of Capacity" values (Table 3) would have
been different if she had used .007 rather than .0002 (or .002) for the
slope of Conduit 611. In any case, her figures indicate that the capacity of
this pipe would be far exceeded in any major storm event, even a 2-year
event. She did not provide any overflow cfs estimates in Table 3 to correspond with the overcapacity events for Conduit 611. What did she assume

happened to the overflow? That it backed up in the parking lot, and eventually flowed through Conduit 611? Or did she ignore the pipe capacity
limits in her calculations of the rate of flow through Conduit 611?

Incidentally, I have learned that the actual inside diameter of Conduit 610
(the one that crosses under University Avenue between DOT and DOR) is 24",
not 30" as recorded in City of Madison records and used in Table 3. Also,
Conduit 610 comes in two sections, which meet in a manhole/inlet at the
south shoulder of University Avenue. Whether these two sections have different slopes I don't know.

With appreciation,

Bill

----- Original Message -----
From: "Ann-Marie Kirsch" <Ann-Marie.Kirsch@Strand.com>
To: <thomaw@tds.net>
Cc: "David Wolmutt" <David.Wolmutt@Strand.com>
Sent: Monday, July 28, 2003 4:57 PM
Subject: Map (Fig. 1) and table (Table 1) Re: Ad Hoc Garden HomesStormwater
Committee

> Bill,
>
> Attached to this email is the revised table (Sept. 9, 2002) for runoff
> tributary to Garden Homes in Shorewood Hills. This table was revised
> based on detailed survey data obtained as part of the berm being built
> on the golf course. The detailed analysis showed that subbasin A and
> the west portion of subbasin B do not, in fact, drain to Garden Homes.
> Also the east portion of subbasin B is contained in the depressional
> area formed by the proposed berm.
>
> Please call with any questions.
>
> Ann-Marie
>
> Ann-Marie E. Kirsch, P.E.
> Strand Associates, Inc.
> 910 W. Wingra Drive
> Madison, Wisconsin 53715
> (608) 251-4843

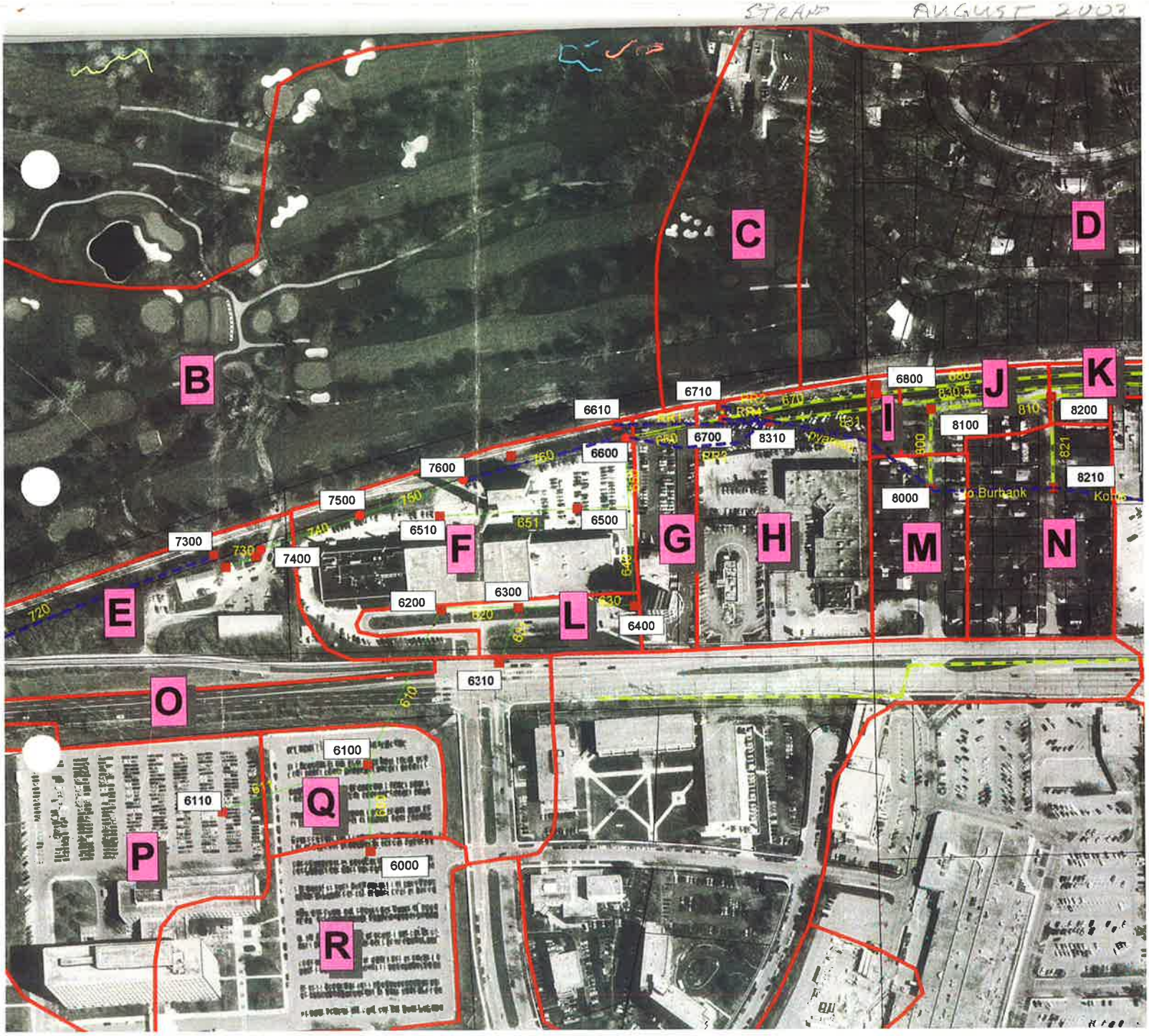
> Ann-Marie.Kirsch@strand.com
>
> >>> "William H. Thomas" <thomaw@tds.net> 07/28/03 04:31PM >>>
> Dear Members and Advisers of the Stormwater Committee,
>
> In anticipation of the first meeting of the Committee on Wednesday,
> July 30, I am, on my own initiative, sending you the following two
> documents (attached):
>
> 1. Figure 1: Photo Map of Storm Subbasins and Sewers (Garden Homes
> Tributary Area)
>
> 2. Table 1: Storm Water Sources and Volumes, Garden Homes
Tributary
> Area (this is a Microsoft Works spreadsheet).
>
> (If you have trouble opening these attachments, let me know)
>
> As noted thereon, these documents are based on documents produced by
> Strand Associates in the course of their work on the Garden Homes
> Floodproofing Project. With regard to the Photo Map, I have altered
the
> Strand's version only by plotting the location of a hypothetical dry
> detention area on the golf course, and also by plotting the location
of
> a hypothetical storm sewer I suggest for intercepting runoff from
> certain existing sewers during major storms and carrying it to said
dry
> detention area. With regard to the Table, I extracted and combined
data
> from two versions of the same table as produced by Strand
Associates,
> and expanded my version of the table to convey the impact, on storm
> sewer loads relevant to the flooding of Garden Homes, of
implementing
> the hypothetical dry detention area on the golf course.
>
> I look forward to talking with you!
>
>
> Bill Thomas
>
>
>

RE: GARDEN HOMES FLOOD PROOFING STUDY - STRAND, AUGUST 2003

LATER VERSION OF SUB-BASIN MAP

08/01/2003

STRAND AUGUST 2003



STRAND , 2002

Fall 2003

Table 1: Storm Water Runoff Sources and Volumes, Garden Homes Tributary Area*

Source	Subbasin	Contributing Area (Acres)	Runoff Volume 100-Year Storm (Acre-Feet)	Runoff Volume 10-Year Storm (Acre-Feet)	Runoff Volume 2-Year Storm (Acre-Feet)
Wisconsin DOT	P	7.58	1.37	0.62	0.30
	Q	2.38	0.56	0.30	0.17
	R	5.9	1.27	0.64	0.35
Subtotal		15.86	3.20	1.56	0.82
University/Segoe Rds.	O	5.43	0.86	0.36	0.16
Department of Revenue	F	6.26	1.30	0.64	0.34
	L	1.44	0.20	0.08	0.03
Subtotal		7.7	1.50	0.72	0.37
Golf Course	A	8.32	0.81	0.25	0.07
	B	33.2	3.24	1.00	0.28
	C	10.1	1.21	0.43	0.15
Subtotal		51.62	5.26	1.68	0.50
Walnut Grove/Pyaresquar	G	1.68	0.37	0.19	0.11
	H	5.15	1.06	0.52	0.28
Subtotal		6.83	1.43	0.71	0.38
Garden Homes/Locust Dr.	I	0.3	0.03	0.01	0.00
	J	1.29	0.13	0.04	0.01
	K	0.73	0.07	0.02	0.01
	M	2.08	0.25	0.09	0.03
	N	3.6	0.33	0.10	0.03
Subtotal		8	0.81	0.3	0.08
Other	E	9.3	0.95	0.30	0.09
Total Runoff			**14.01**	**5.59**	**2.40**
Total Runoff, reduced by portion not escaping Subbasins A & B, leaving Current Load on Storm Sewers:					
	A		-0.81	-0.25	-0.07
	B		-3.24	-1.00	-0.28
Current Load on Storm Sewers:			**9.96**	**4.34**	**2.05**
Current Load on Storm Sewers, reduced by volume that could be piped to Subbasin B and briefly detained th					
	P		-1.37	-0.62	-0.30
	Q		-0.56	-0.30	-0.17
	R		-1.27	-0.64	-0.35
	O		-0.86	-0.36	-0.16
	L		-0.20	-0.08	-0.03
	E		-0.95	-0.30	-0.09
Remaining Load on Storm Sewers:			**4.75**	**2.04**	**0.95**

* Derived, by Bill Thomas, from "Village of Shorewood Hills - Garden Homes, Table 2: Runoff Volumes", 2 versions, p
Wolmutt, Strand Associates, in connection with "Garden Homes Flood-proofing Project".

9-10-2003

(E-mail exchange (9/10/2003) re: Use of existing depression on BCC golf course to store stormwater destined for Garden Homes)

From: "Brian Joiner" <brianjoiner@mindspring.com>
To: "'David Wolmutt'" <David.Wolmutt@Strand.com>
Cc: "'Robert Ehlers'" <Robert.Ehlers@Strand.com>; "Bill Thomas" <thomaw@tds.net>; "Peter Hans" <phans@wbmi.com>
Sent: Wednesday, September 10, 2003 10:15 AM
Subject: RE: FW: Cost estimate of golf course storage of water fromwest

David and Rob,
We would like you to go ahead and do this work. Please feel free to contact Bill, Peter or me if you have any questions.
Brian

-----Original Message-----
From: David Wolmutt [mailto:David.Wolmutt@Strand.com]
Sent: Tuesday, September 09, 2003 4:13 PM
To: brianjoiner@mindspring.com
Cc: Robert Ehlers
Subject: Re: FW: Cost estimate of golf course storage of water fromwest

Brian-

'y estimate for the work you have requested is $2,000-$3,000. This 'ould include the following:

1. Develop two alternative concepts. We anticipate the first concept would involve rerouting the storm sewer from the DOT lots westerly around the DOR building (rather than the current easterly course) to the existing depression near the maintenance shed. The second concept would involve restricting flow through the existing 36" storm sewer north of Pyresquare/Walnut Grove and allowing it to surcharge onto the golf course. We will look at golf course regrading and storm sewer modifications necessary to accommodate this.

2. One field meeting to discuss possible modifications.

3. Development of a sketch depicting the conceptual modifications, along with an opinion of probable costs for the proposed work.

We note that this will be primarily a technical excercise. As discussed at the Stormwater Committee meeting, diversions onto the golf course may require extensive regrading and other architectural modifications of the golf course. Golf course staff may not be receptive to these modifications. Coordination with the golf course is not included in the fee above.

As far as completion schedule - We can complete this work by September 30. However, I am personally scheduled very heavily through the end of the month. Rob Ehlers is very familiar with these issues (as much or 'ore than me) and will be available to meet with you and complete this 'ork.

Hope this helps. Please call if you have any questions.

David K. Wolmutt
608-251-4843

>>> "Brian Joiner" <brianjoiner@mindspring.com> 09/09/03 11:21AM >>>
David

07/03/2009

(E-mail (03/07/2009) from Bill Thomas re: **Urgency of notifying Garden Homes residents of the risk they face from severe flooding, and of their eligibility for Federal flood insurance.**)

From: William H. Thomas <thomaw@tds.net>
To: kpfrantz@shorewood-hills.org
Cc: Brian Berquist <BrianB@tcengineers.net>, David Benforado <dbenforado@shorewood-hills.org>
Sent: Fri, 03 Jul 2009 15:03:03 -0400 (EDT)
Re: Floodplain zoning ordinance

Karl and Brian,

I gather from our earlier conversation, Karl, that residents of Garden Homes are eligible for Federal flood insurance, regardless of the fact that Garden Homes is not included in a designated Special Flood Hazard Area, on a Flood Insurance Rating Map.

I am reassured to see that Brian shares my belief that Garden Homes will "get water" on the occasion of a 100-year storm event. I wonder *how much* water he, in his professional opinion, thinks it might get? If he thinks it might get as much as I think it might get (see below), then I think it is incumbent upon the Village government to do the following things, with all deliberate speed:

1. Formally, and in writing, inform the property owners and residents of Garden Homes of the flooding risks that the Village's expert consultants believe that they face.

2. Advise the property owners and residents of Garden Homes, formally and in writing, (a) what actions the Village is prepared to take, in anticipation of a flood-causing storm, to minimize injury or loss to them, and (b) what preparations property owners and residents are advised to make immediately to minimize their risk of injury or loss in the event of a future flood, and (c) what actions property owners and residents should be prepared to take in the actual event of a flood.

3. Notify the property owners of Garden Homes that they are eligible for Federal flood insurance.

As to how much water Garden Homes might get:

The flood wall installed in 2001, at the south end of Burbank Place, was built to an elevation of 887.5 feet, or thereabouts. Although it was designed to keep floodwaters from University Avenue out of Garden Homes, it also created an impoundment area for any stormwater entering Garden Homes; that is, any stormwater that can't escape by way of its storm sewers, which drain into the 5' by 12' stormwater conduit which passes just to the east.

I estimate that this Garden Homes impoundment area covers about 3.5 acres; that is, if it were filled to the top of the flood wall (887 feet), 3.5 acres of land of the Garden Homes subdivision would be under water (out of a total of 5.7 acres). Of the 3.5 acres of land that would be flooded, 2.5 acres of them (by my estimate) lie below the elevation of 886 feet, meaning that, if the impoundment area were full, 2.5 acres of the land of Garden Homes would be under water by a foot or more. Some 18 houses stand on these 2.5 acres. Furthermore, by my estimate, some 1.7 of the acres enclosed in the impoundment area lie lower than 885 feet in elevation, meaning that this 1.7 acres of land, which contains 9 houses, would be under 2 or more feet of water if the impoundment area were filled to capacity.

Would a 100-year storm event fill the Garden Homes impoundment area to capacity? I think there is a very good chance it would. It is well known that major storms, such as those of June 16, 1996,and June 1, 2000, and even lesser storms, such as that of August 2, 2001, cause the 5' by 12' conduit to back up

and effectively block the storm sewers that normally drain Garden Homes. The larger storms cause flooding that persists for hours. Certainly a 100-year event would interfere with drainage from Garden Homes at least as much as these smaller storms have had, and the flooding would persist as long. With its storm sewers blocked, how full the impoundment area of Garden Homes would get would depend entirely upon how much runoff it could hold and how much runoff would converge on it. I estimate that 6.3 acre-feet of stormwater would be sufficient to fill the impoundment area (up to the 887-foot level set by the flood wall). Anne-Marie Kirsch, of Strand Associates, calculated, in 2003, that Garden Homes, in the event of a 100-year, 1-hour storm, would be the recipient of 9.96 acre-feet of runoff.

There is no reason, that I can think of, why the floodwaters delivered by a 100-year storm would not stick around for an hour or even longer, as has been the case with previous floods of Garden Homes. The longer the flooding persists, of course, the greater the risk of property damage. In this regard, it may turn out to be unfortunate that, in 2003, a number of homeowners, with Village encouragement and financial assistance, replaced their conventional basement windows with glass blocks in an effort to "flood-proof" them: flood experts, of course, tell us that basements that do not admit water are at a greater risk of having their walls fail, catastrophically, and in fact the occupants of houses with such basements are advised to evacuate in the event of a flood. I must also note that much of the estimated 9.96 acre-feet of runoff destined for Garden Homes in the event of a 100-year storm can be expected to arrive, by way of the Pyaresquare parking lot, in the form of a forceful torrent. Such a torrent swept into Garden Homes in the course of the flood of June 1, 2000, and succeeded in floating at least one car parked in a driveway on Maple Terrace to the point that it banged into a nearby house.

Regards, Bill

8/24/2010

(E-mail exchange re: **Impact of Univ. Ave rebuild on flood risk in Garden Homes**)

From: William Thomas
Sent: Tuesday, August 24, 2010 1:55 PM
To: Karl Frantz
Subject: U Avenue work, flooding in Garden Homes

Hi, Karl,

I could be wrong, but it appears to me that, after reconstruction, the elevation of the surface of University Avenue opposite the UW Credit Union building (that is, at the "hump" in University Avenue between Midvale and Shorewood Boulevard) will be higher than it was before reconstruction. Could you find out if that is the case?

The reason this concerns me is that the elevation of University Avenue at this point has implications for (a) whether Garden Homes gets flooded at all, and (b) how severely Garden Homes gets flooded.

This is because Garden Homes lies in a depression that will fill completely with water during heavy storms unless the storm sewers can empty this depression as fast as it is being filled. If the storm sewers can't keep up with the inflow into the depression, the height that the flood waters will reach is dictated by the elevation of the lowest point on its rim, which happens to be located at the highest point of the University Avenue "hump" I refer to above.

The elevation of the flood wall at the south end of Burbank Place was deliberately chosen with the elevation of the University Avenue "hump" in mind. If the hump is raised, and the flood wall is not raised to compensate for that fact, then the risk of flooding in Burbank Place will be increased. Even an inch will make a difference in whether Burbank Place gets flooded or not.

I would like to know what the engineers for the U Avenue reconstruction have to say about this.

From: Haidar, Munzer K
Sent: Wednesday, August 25, 2010 11:09 AM
To: 'Karl Frantz'; 'Eslick, Kevin' **Cc:** Haidar, Munzer K; Betzig, Bill; Saxby, Chris A

Subject: RE: U Avenue work, flooding in Garden Homes

Kevin,

We briefly looked at the plan and cross-sections. However, we need more information to be able to answer the question. Please give us field elevation and location of the flood wall in question or area. Need to know exact location & its critical elevation.

In general, the new storm sewer box will act as a temporary storage only until the whole system is connected to an outfall at Willow Creek about a mile to the east. Some benefits will result from the system upon completion of construction. Long term alleviating of flood will come when the whole system is in place and running.

We did some more investigation into this question. Here are the results:

From survey; the flow line of the north gutter at the "hump" Station 127+50 was 885.09 feet. The median flow line at the same Station 127+50 was 885.35 feet. The flood wall elevation at Garden Homes elevation is 887.38 feet.

Plan proposed elevation at the flow of the north gutter the "hump" Station 127+50 is 885.32. That is about 3" higher. Plan proposed elevation at the median flow at the "hump" Station 127+50 is 885.60. That is 3" higher.

However, the flood wall should remain to be 2.06 feet higher than the flow line of the gutter (887.38-885.32).

Let me know if you have any additional questions.

P.S. Please verify elevations by taking shots at these locations.

From: William Thomas <thomaw@tds.net>
To: kpfrantz@shorewood-hills.org
Sent: Mon, 30 Aug 2010 15:22:55 -0400 (EDT)
Subject: Re: U Avenue work, flooding in Garden Homes

My thanks to all who took the trouble to look into this. I didn't know that the elevation difference [between the top of the flood wall at Burbank and the "hump" in University Avenue] was over 2 feet. That's reassuring.
It appears, then, that, assuming we don't get a standing wave adjacent to the Burbank flood wall from water sweeping down University Avenue from the west encountering water already in the intersection (including extra water from the Hill Farms land and the Segoe intersection that from now on will be routed toward the Midvale/University Avenue intersection rather than, as has been the case up to now, routed north toward the railroad) Garden Homes will be no more likely to get flooded, by way of the flood wall, than it was before the U. Avenue reconstruction [?]