Existing Conditions and Recommendations

Civil and Site

Introduction

The Hall of Waters has a long and precarious history with water and flooding. The building is located adjacent to the East Fork Fishing River and currently has an earthen flood wall or levee which was built with the intent to protect the building from future flooding. While most rain should not cause flooding, the flood prevention measures (levee, drains, sump pumps) currently installed at the Hall of Waters are not adequately preventing water from entering into the basement as a good rain of only 2" to 4" will cause flooding in the basement and sub-basement.

SK Design Group, Inc. (SKDG) was responsible for the review of the existing conditions of the site and building and reviewed available documents pertaining to the site. The group discussed the current storm water management site issues; frequent flooding, fish in the basement with some flood events, major changes to the lower two floors of the Hall of Waters due to flooding, and multiple sump pumps in the basement. SKDG went to the basement again and looked at the drains, sump and pumps. The group also discussed televising and surveying all the exterior storm lines to accurately document their location and current condition status. The City of Excelsior Springs has distributed a PDF of a study for additional civil and site references which may indicate the outside storm inlets and piping system.

The Ground Floor Mezzanine flooded about 4" to 6" in the flood of 1993 and was an "extremely high" flood event as confirmed by Chad Birdsong, City of Excelsior Springs. The flap gate in the area inlet located in the ball field usually fills up with debris during a flood event and wedges the flap gate open a little which doesn't protect the Hall of Waters during a flooding event. Water then enters the 10" sump pump line back to the basement. A possible check valve in the line to stop flooding was discussed and needs to be studied. The group discussed the possibility of designing a system that drains the basement and is totally dry and functional during a catastrophic storm/flood event, including a dedicated emergency generator back up. The City of Excelsior Springs has confirmed that a FEMA Flood Map revision for this area was currently being studied but no documentation is currently available.

Storm Drainage Issues

The Hall of Waters is located adjacent to East Fork Fishing River. See Location Map Exhibit 1 and USGS Map Exhibit 2. The capacity of the East Fork Fishing River is limited and has flooded the Hall of Waters frequently since the building was constructed in 1936.
The current FEMA Flood Insurance Rate Map, for the City of Excelsior Springs, see Exhibit 3 , dated April 16, 2003 identifies the Southeast portion of the Hall of Waters building is located within the floodway. We have identified two cross section maps executed by FEMA. Section 'T' is highlighted in "Red" and Cross Section 'U' is highlighted in "Blue". Exhibit 4 identifies flood profiles and Exhibit 5 identifies Floodway Data. Both cross sections details and Base Flood Water- Surface Elevation. Based on this data and interviewing the City Staff the flooding conditions affecting the Hall of Waters will continue.

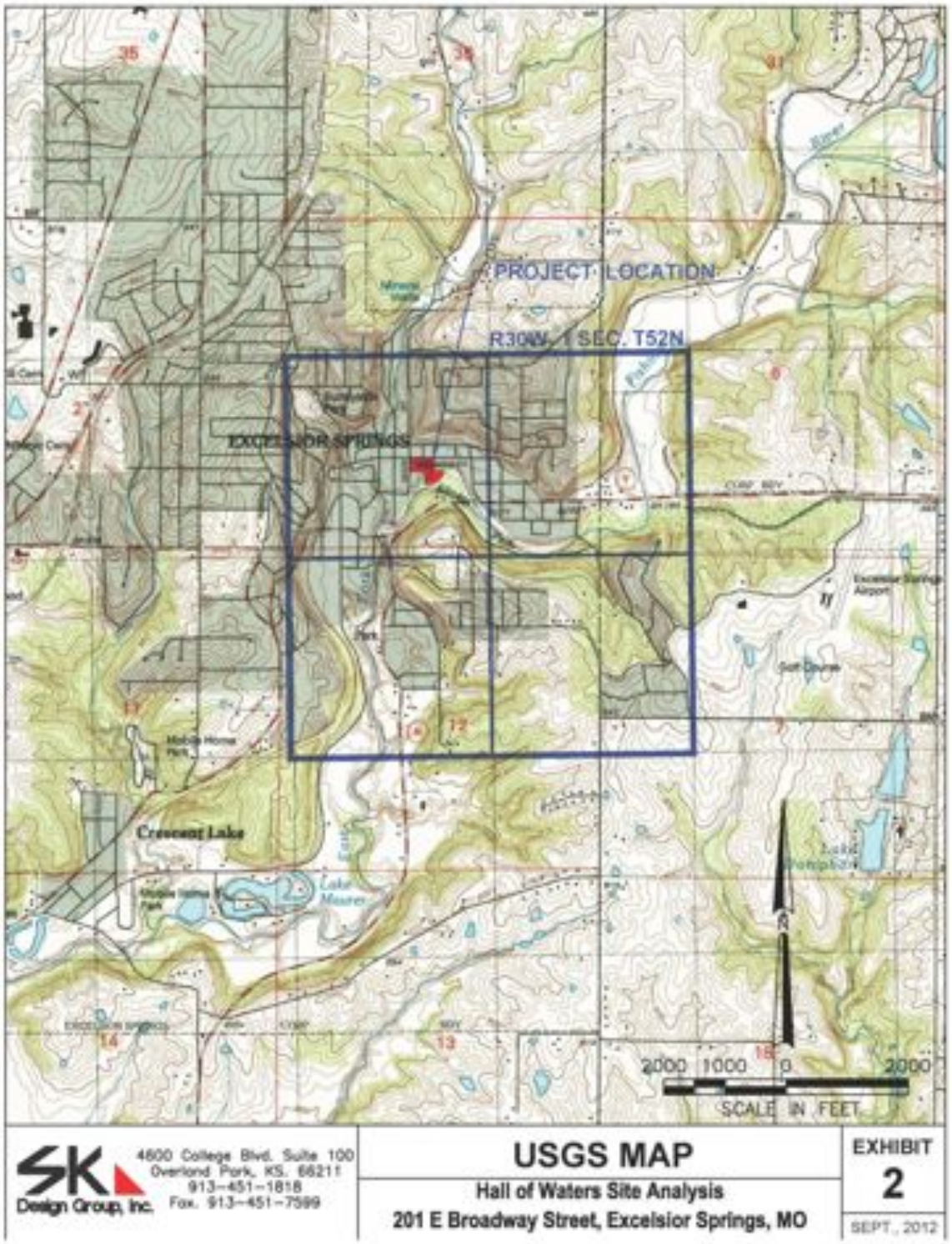
SK Design Group, Inc.
4600 College Blvd. Suite 100
Overland Park, KS. 66211
913-451-1818
Fax. 913-451-7599

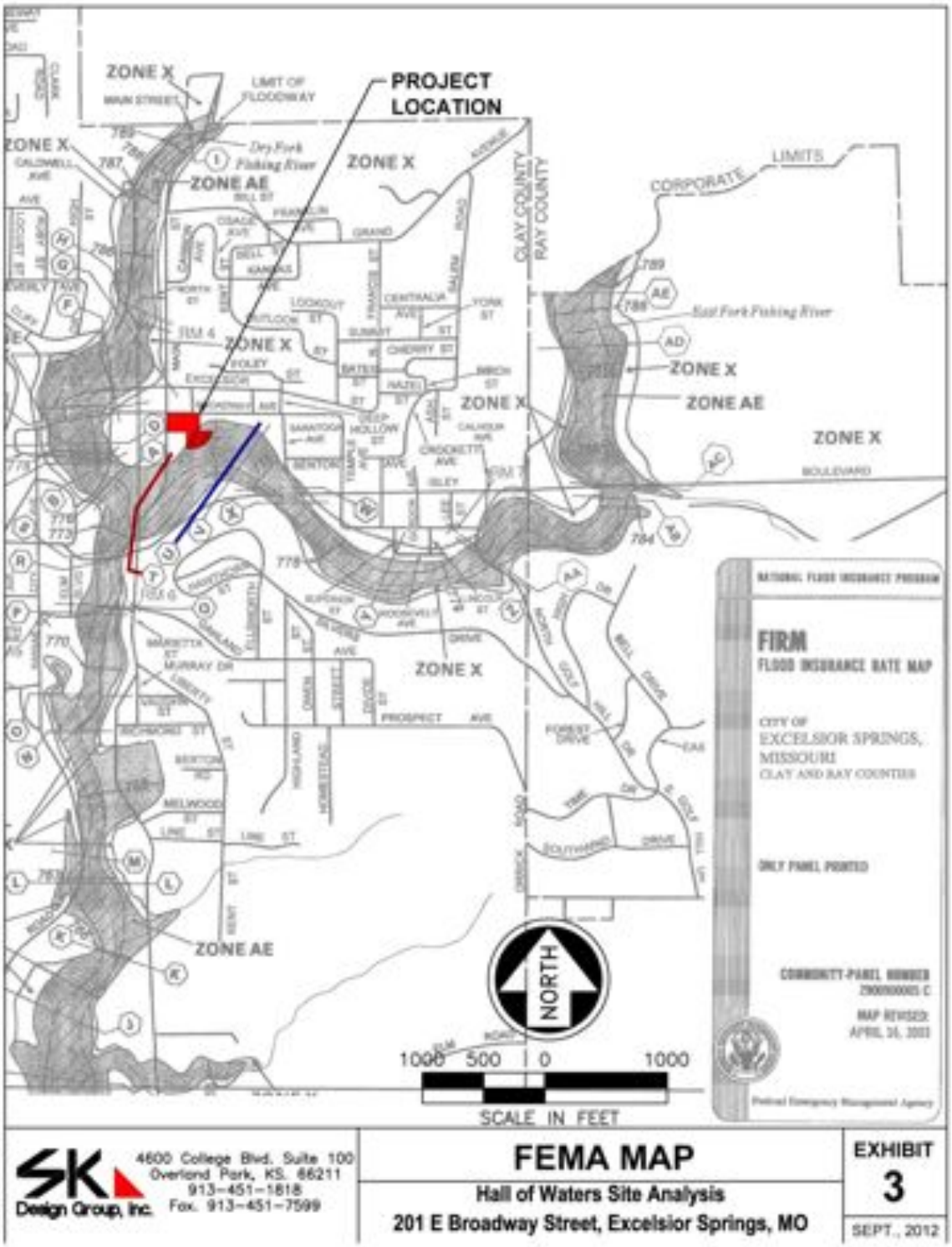
LOCATION MAP

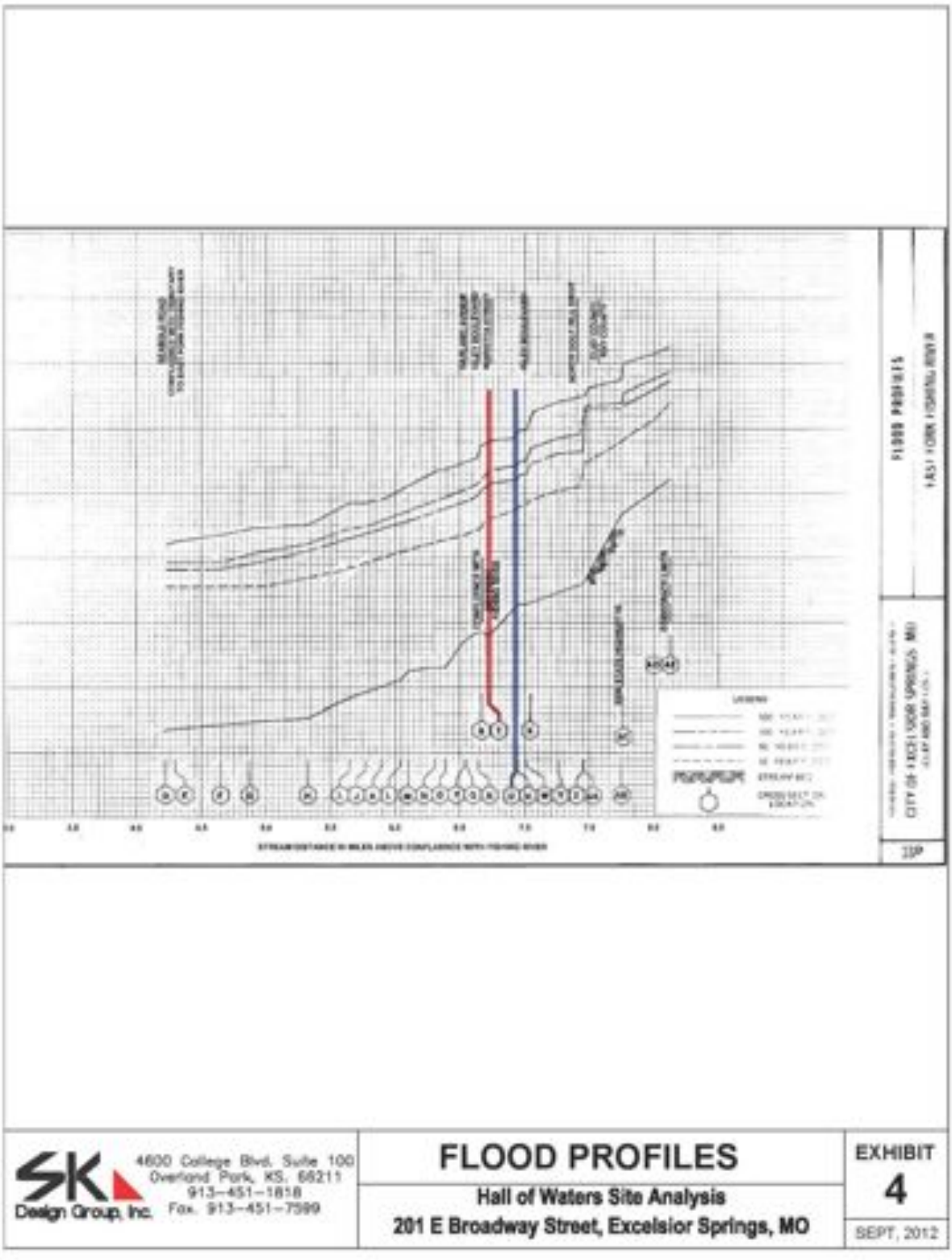
Hall of Waters Site Analysis
201 E Broadway Street, Excelsior Springs, MO

EXHIBIT 1

SEPT., 2012


PROJECT LOCATION
R30W, 1 SEC. T52N
EXCELSIOR SPRINGS
Crescent Lake
Lake Meyer
Excelsior Springs Airport
Golf Course
Mobile Home Park
Park
2000 1000 0 2000
SCALE IN FEET
N
SK Design Group, Inc.
4600 College Blvd. Suite 100
Overland Park, KS. 66211
913-451-1818
Fax. 913-451-7599
USGS MAP
Hall of Waters Site Analysis
201 E Broadway Street, Excelsior Springs, MO
EXHIBIT
2
SEPT., 2012


PROJECT LOCATION
ZONE X
ZONE AE
LIMIT OF FLOODWAY
Dry Fork Fishing River
East Fork Fishing River
CORPORATE LIMITS
CLAY COUNTY
RAY COUNTY
FIRM
FLOOD INSURANCE RATE MAP
CITY OF EXCELSIOR SPRINGS, MISSOURI
CLAY AND RAY COUNTIES
ONLY PANEL PRINTED
MAP REVISED: APRIL 16, 2003
NORTH
1000 500 0 1000
SCALE IN FEET
SK Design Group, Inc.
4600 College Blvd. Suite 100
Overland Park, KS. 66211
913-451-1818
Fax. 913-451-7599
FEMA MAP
Hall of Waters Site Analysis
201 E Broadway Street, Excelsior Springs, MO
EXHIBIT 3
SEPT., 2012


SK Design Group, Inc.
4600 College Blvd. Suite 100
Overland Park, KS. 66211
913-451-1818
Fax. 913-451-7599
FLOOD PROFILES
Hall of Waters Site Analysis
201 E Broadway Street, Excelsior Springs, MO
EXHIBIT
4
SEPT, 2012

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION			
CROSS SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
					(FEET NGVD)			
East Fork Fishing River								
A[1]	7,283[1]	1,156	7,161	2.3	748.9	748.8	749.3	0.5
B[1]	10,935[1]	259	4,589	3.6	755.9	755.9	756.9	1.0
C	10,439[1]	243	3,818	4.3	757.1	757.1	758.1	1.0
D	22,282[1]	270	4,450	3.7	759.3	759.3	760.3	1.0
E	6,39[1]	215	3,565	5.2	759.3	758.6	759.3	0.7
F	4,65[1]	357	3,818	4.8	759.6	759.6	760.6	1.0
G	6,87[1]	425	5,620	3.3	760.6	760.6	761.6	1.0
H	5,33[1]	139	3,677	4.8	762.1	762.1	762.8	0.7
I	5,65[1]	440	4,419	4.2	764.5	764.5	765.3	0.8
J	5,91[1]	237	3,656	4.9	764.9	764.9	765.5	0.6
K	5,89[1]	136	1,983	9.2	765.4	765.4	766.0	0.6
L	6,94[1]	429	5,181	3.5	766.8	766.8	767.5	0.7
M	6,10[1]	106	1,839	8.7	767.1	767.1	767.8	0.7
N	6,91[1]	138	2,385	7.7	768.9	768.9	769.6	0.9
O	6,39[1]	189	2,777	6.6	769.4	769.4	770.4	1.0
P	6,56[1]	130	3,475	5.4	770.5	770.3	771.3	1.0
Q	6,56[1]	80	1,934	9.8	770.7	770.7	771.3	0.6
R	6,46[1]	170	2,323	7.9	771.2	771.2	772.2	1.0
S	6,44[1]	190	2,719	6.8	772.5	772.5	773.5	1.0
T	6,73[1]	194	3,151	5.6	773.3	773.3	774.1	0.8
U	6,96[1]	197	1,531	11.4	774.1	774.1	774.9	0.8
V	6,85[1]	109	1,841	9.6	774.8	774.8	775.6	0.8
W	7,02[1]	95	1,576	11.3	775.0	775.0	775.9	0.9
X	7,04[1]	227	3,814	6.6	777.0	777.0	777.8	0.8
Y	7,26[1]	198	3,384	5.3	778.5	778.5	779.2	0.7
Z	7,45[1]	245	3,454	5.1	779.0	779.0	779.8	0.8
AA	7,55[1]	112	6,881	2.9	783.6	783.6	784.6	1.0
AB	9,75[1]	225	3,358	1.9	783.7	783.7	784.6	0.9

[1]Cross-sections above confluence with Fishing River
[2]Below confluence with East Fork Fishing River

TABLE

FEDERAL EMERGENCY MANAGEMENT AGENCY
CITY OF EXCELSIOR SPRINGS, MO
(CLAY CO.)

FLOODWAY DATA
EAST FORK FISHING RIVER

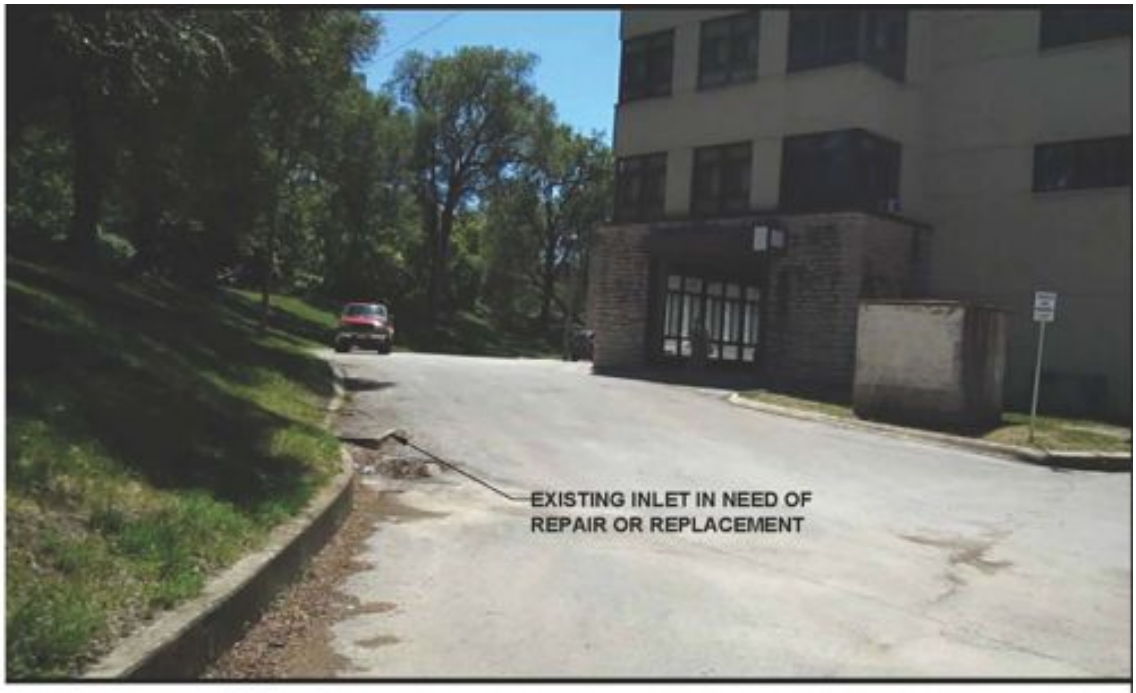
SK Design Group, Inc.
4600 College Blvd. Suite 100
Overland Park, KS. 66211
913-451-1818
Fax. 913-451-7599

FLOODWAY DATA
Hall of Waters Site Analysis
201 E Broadway Street, Excelsior Springs, MO

EXHIBIT 5
SEPT, 2012

Existing Berm, Existing Drainage Inlets and Exterior Door Openings
The Hall of Waters had a berm constructed along East Fork Fishing River to protect the property during flooding, see Exhibit 6. This berm was constructed in 1955. The condition of the berm is unknown. As shown in the pictures several trees were planted on and around the berm. The effect of the trees on the berm should be analyzed by a geotechnical engineer. Several existing inlets are in need of repair and or replacement.

During rain events, the City Staff have witnessed storm water exiting the inlets several inches high. Storm water also enters the building through exterior doors located along the east side of the Hall of Waters.



SK Design Group, Inc.
4600 College Blvd. Suite 100
Overland Park, KS. 66211
913-451-1818
Fax. 913-451-7599

FLOOD AT GARAGE
Hall of Waters Site Analysis
201 E Broadway Street, Excelsior Springs, MO

EXHIBIT 6
SEPT, 2012

Fig. 36 – Photographs of flood berm and various inlets around the building. (SKDG 2012)

Existing Flap Gate and Sump Pumps

The Hall of Waters Basement has several sump pumps, see Exhibit 7, that were installed to control flooding into the building. These exit the building through a 10" DIP (Ductile Iron Pipe) to a storm grate inlet in Siloam Park south easterly from the building, see Exhibit 8. This 10" DIP sump pump drain pipe has a flap gate located within the inlet.

As discussed with the City, this flap gate gets compromised and clogged during flood events which keeps the gate open and has allowed flood waters, debris as well as fish to enter the pipe from the East Fork Fishing River directly into the Hall of Waters basement.

EXISTING SUMP PUMPS IN BASEMENT

SK Design Group, Inc. 4600 College Blvd. Suite 100 Overland Park, KS. 66211 913-451-1818 Fax. 913-451-7599	**EXISTING SUMP PUMP** Hall of Waters Site Analysis 201 E Broadway Street, Excelsior Springs, MO	EXHIBIT 7 SEPT. 2012

EXISTING INLET WITH 10" DIP FLAP GATE

SK Design Group, Inc. 4600 College Blvd. Suite 100 Overland Park, KS. 66211 913-451-1818 Fax. 913-451-7599	**FLAP GATE** Hall of Waters Site Analysis 201 E Broadway Street, Excelsior Springs, MO	EXHIBIT 8 SEPT. 2012

The 1993 Flood
The City verified that the Hall of Waters main entry (First Floor) flooded about 4" to 6" above the floor during the 1993 flood. This is "extremely high." The three lower floors (Ground Floor Mezzanine, Ground Floor and the Basement) were completely flooded. The existing berm along East Fork Fishing River was in place as it is today. Refer to the Building History Section of this report for a timeline of previous known flood events at the Hall of Waters site.

Investigation
Upon discussion with the City, the City plans to TV all storm piping exiting the Hall of Waters and site storm drainage system to determine the existing condition and functionality.

Site Walls and Stairs
The Design Team observed the general conditions of the site walls, stairs and ramps that surround the Hall of Waters building. Most of these site features are original to the construction of the Hall of Waters site. These observations were used to obtain a general idea of the overall conditions. Based on this review, several specific locations were identified as having structural concerns in addition to general deterioration concerns.

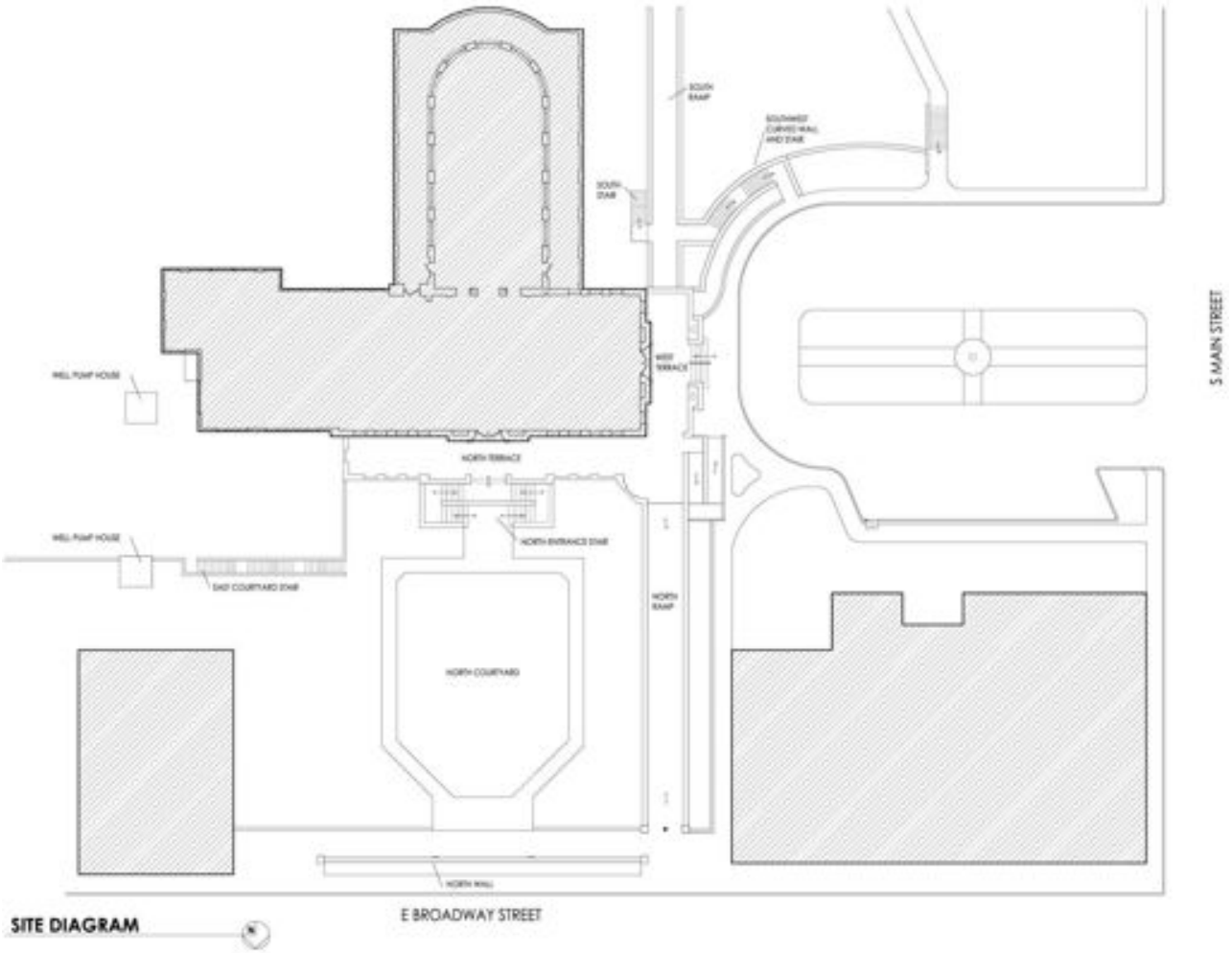


Fig. 37 Site Diagram (SRJA 2013)

General Site Stone Conditions
The stone site walls have large areas of organic and inorganic staining. The pitched stone faces have multiple areas of scaling. As a stone weathers the outer surface becomes more porous. When this occurs the stone becomes more susceptible to stains and further deteriorations.

Multiple colors of mortar were observed indicating that these walls have been partially re-pointed in the past. In some instances, the mortar has either separated from the stone or has cracked in the center portions. Additional mortar has flaked off which indicates a shallow surface applied repair was done during a previous project. The mortar is very hard and appears to have large aggregate.

In general, the capstones are performing adequately with some minor deterioration due to exposure. Several capstones exhibit cracking and delamination at the perimeters due to failed mortar joints. When a head joint fails, moisture can pool between the stones. When temperatures go below freezing, this pooled moisture expands and can exert force against the sharp edge of the capstones. As this repeated cycle continues, the edge of the stone becomes weak and forms a crack which eventually opens up and spalls the edge of stone. Also, open head joints allow water to pool within the stones below, with a similar effect to the stone walls below.

Site walls need to be periodically cleaned with a safe and gentle stone cleaner in order to remove the biological growth and atmospheric staining. Many of the walls need 100% repointing, while other require only spot re-pointing. Prior to repointing, a mortar sample should be sent to a qualified mortar testing laboratory and a full report should be made in order to document the aggregate and the type of mortar which is appropriate. This will assist in producing a good mortar match to the original historic mortar in composition, color, aggregate type and dispersion. All repointing joints should match the historic mortar joint profiling and tooling. All head (sky-ward facing) joints should be repointed, raked back and should have bond breaker tap and compatible sealants installed.

Southwest Curved Wall and Stair
The curved site wall (Figures 38 - 42) located to the south of the west entrance is experiencing settlement with rotation outward *(*Figure 42*)*. In addition, multiple attempts to repair the surface of the wall have been attempted over time. The retaining wall section that is rotating outward is closest to the main entrance. This outward rotation is more than a 1” displacement. In addition to the stone wall, the concrete stairs are deteriorated and exhibit spalling and cracking. They have also settled and are no longer plumb. The joint between the wall and the stair is wide open, allowing water to infiltration below the concrete stair, which will eventually undermine the stair.

Fig. 38 Southwest Curved Stair – Top Landing (SKDG 2012)


Fig. 39 Southwest Curved Stair. (SKDG 2012)


Fig. 40 Southwest Curved Stair. (SKDG12)

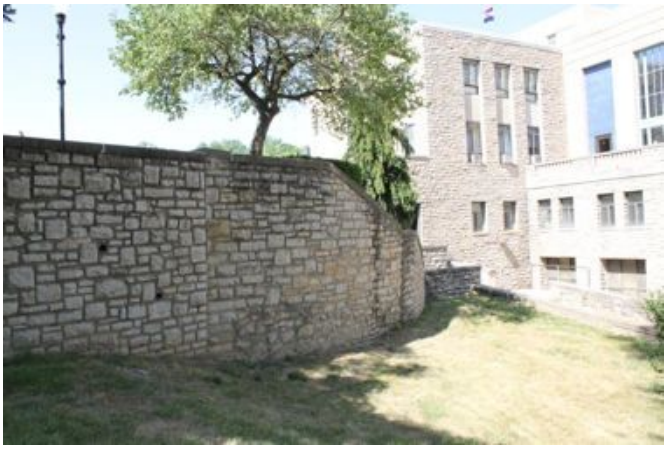


Fig. 41 Southwest Curved Stair (SKDG 2012)


Fig. 42 Southwest Curved Wall Crack Detail. (SKDG 2012)

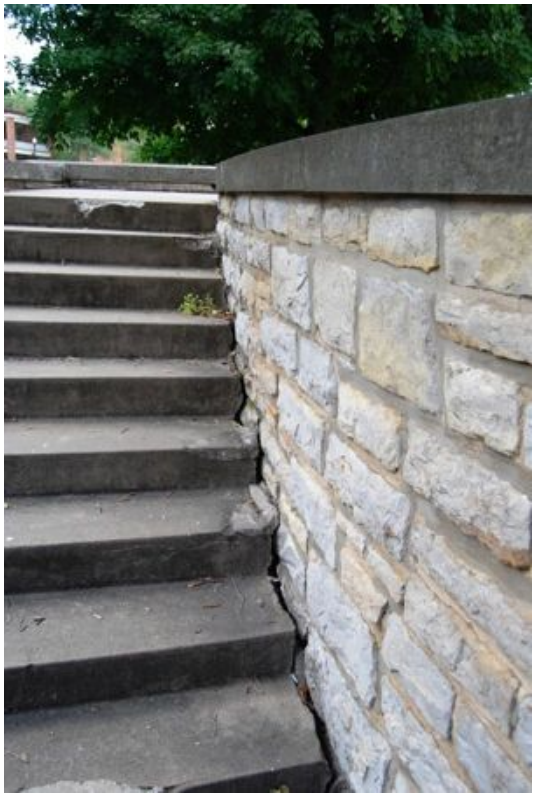


Fig. 43 Southwest Curved Stair (SKDG 2012)

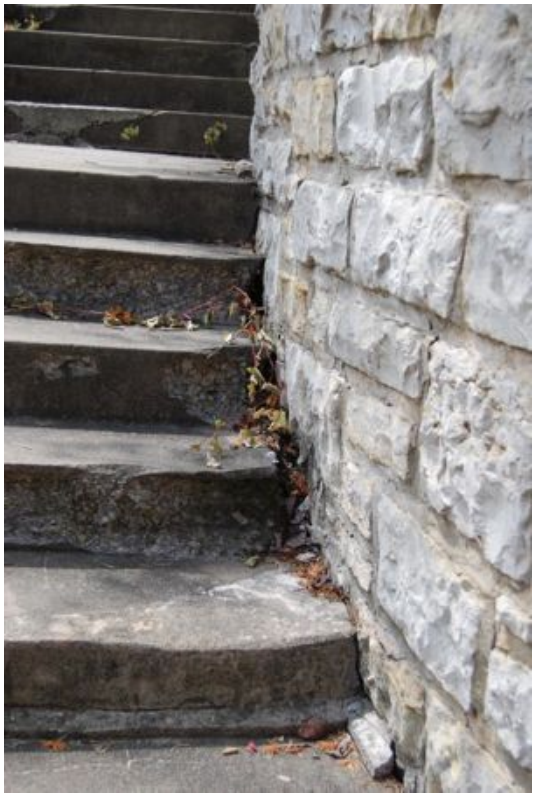


Fig. 44 Southwest Curved Stair (SKDG 2012)

In addition to the crack which appears in the curved stone wall, there is a stress/settlement in the south driveway. This crack in the concrete runs generally parallel to the existing stone wall drop-off area above. It appears that subsurface pressure and movement behind the wall is occurring. This may be due to the sub grade above the stone wall that is not being controlled. This would lead it to move in the path of least resistance.

South Stair and Ramp

At the base of the curved stair are the south ramp and stairs *(*Figures 45-47*)*. The ramp is concrete at the top landing and the remainder is gravel. The ramp walls appear to be stable; however, the concrete stairs, along with the outer wall for the extended landing, are in a state of failure. This wall is rotating outward causing the entire concrete stair and landing to slope downward away from the wall. The outer wall is more than 5 inches out of plumb. In addition, the wall and the stair combination have settled and are no longer plumb. The settlement appears to be in excess of 3 to 4 inches. In addition the concrete stair and landing is also experiencing excessive surface cracking from freeze thaw damage or possible corrosion. The concrete surface has multiple areas of scaling and de-bonding. The stair is no longer safe for use and should be closed until sufficient structural repairs and installation of new code-compliant guard and hand rails can be made.

Fig. 45 South Stair Landing – Note the Pipe Railing (SKDG 2012)

Fig. 46 South Stair and Ramp (SKDG 2012)

Fig. 47 Ramp Wall, Landing and South Stair with Settlement (SKDG 2012)

North Ramp

The north ramp is original to the construction of the Hall of Waters and is therefore a significant historic feature. The ramp extends from Broadway Street approximately 110 feet and lands at the intersection of the North and West Terraces. The ramp slopes gradually, though it has not been evaluated to verify it meets current ADA slope requirements, which is 1:12 grade, or 1" of rise per 12" of travel distance. The ramp is in fair condition. The side walls are constructed of pitched stone and are topped with capstones. The stone walls are very long and do not contain any expansion joints. The walls both tend to slope outwards slightly towards the tops of the wall, especially near the middle of the length of the wall. The walls also bow slightly. The walkway surface is concrete that is in fair to poor condition. The thickness of the concrete slab in unknown at this time. The upper North and West Terraces were found, during a previous

study, to have had multiple layers of concrete poured on top. These additional concrete toppers led engineers to determine that the structural system of the terraces were approximately 50% over capacity. At the top of the ramp, as it intersects the North and West Terraces, the concrete was approximately 16" thick total. It is unknown what the original top elevation of the concrete was, but it was likely at least 4"-5" below its present height. This additional concrete weight on the foundation, coupled with the fact that there is no expansion joint along the ramp edges, has likely led to the bowing and sloping walls. Further investigation is warranted in order to determine the best solution for future ramp repairs, which may include removing some of the topping concrete down to its original height, in order to reduce weight.

Fig. 48 North Ramp Bowed Wall (SKDG 2012)

Fig. 49 North Ramp from Broadway Street

Fig. 50 North Ramp West Wall (SKDG 2012)

North Courtyard

The North Courtyard is slightly sunken below the adjacent Broadway Street. The Courtyard serves as the main park space in front of the Hall of Waters Building and the space is considered to be among the most important historic site features. A series of spring houses associated with Siloam and Sulpho Saline Springs once stood on this site. The original Siloam Spring pump is still located in a subterranean basement below the North Courtyard. The stone walls adjacent to the North Courtyard include the stone wall adjacent to Broadway Street, the North Ramp and the North Terrace and North Terrace Stairs. These walls are in fair condition. The capstone at the west end of the Broadway Stone Retaining Wall is missing a large section

that requires replacement. The remainder of the wall is in fair condition, requiring only typical maintenance. The western portion of the North Terrace stone wall was repaired and repointed in 2009 as part of an emergency wall repair project. The east portion of the wall still requires complete restoration and a thorough inspection and scope of work should be prepared for this work.

Fig. 51 North Courtyard – The red arrow points to the Broadway Stone Retaining Wall (SKDG 2012)

Fig. 52 Broadway Retaining Wall (SKDG 2012)

North Entrance Stair

The North Entrance Stair is accessed from the North Courtyard and leads to the North Terrace. This grand stair is original to the construction of the Hall of Waters and is considered to be one of its most significant exterior features. The walls surrounding the symmetrical stair are in fair condition, requiring 100% repointing, some stone repairs and some patching. The walls have copper staining below the decorative post-mounted entrance lights. The walls also have staining which needs to be cleaned. The capstones require repointing and sealant installation.

The concrete stairs are deteriorating and the aggregate is becoming exposed. Plants are growing in the cracks between the stairs and the walls. These plants need to be removed and a new sealant joint installed in order to prevent water and dirt from accumulating in the joints and causing freeze thaw damage to the stairs and the stone walls. The stairs need new handrails, as well.

Fig. 53 North Entrance Stair (SKDG 2012)

Fig. 54 North Entrance Stair Detail (SKDG 2012)

Fig. 55 North Entrance Stair Detail. (SKDG 2012)

East Courtyard Stair and Retaining Wall

Along the east edge of the North Courtyard, an original concrete stair leads to the lower parking lot. The stair and east side of the Courtyard are retained by a tall concrete wall. The wall is in overall fair condition. There are some minor cracks that should be repaired as soon as possible to prevent further freeze thaw damage. The concrete stair is in very poor condition. The stair is cracked and has settled. Therefore, the stair is out of plumb and is dangerous. This is exaggerated by the fact that the stair has no handrail. This stair should be closed to public use until it can be reconstructed and a new handrail is installed.

Fig. 56 East Courtyard Stair and Retaining Wall – From the Base of the Stair. (SKDG 2012)

Fig. 57 East Courtyard Retaining Wall (SKDG 2012)

Fig. 58 East Courtyard Stair and Retaining Wall. Note the vertical crack in the wall near the corner. (SKDG 2012)

Miscellaneous Site Walls, Stairs and Features

Additional stone site walls, stairs and features not specifically discussed above occur throughout the site. These features are as important to the overall historic cultural landscape as some of the more major features. These include stone retaining walls and stairs to the west of the main building, paving surrounding the lower level at the Hall of Springs and the well pump house located to the east of the building.

Fig. 59 Stone Retaining Wall West of Building (SKDG 2012)

Fig. 60 Stone Retaining Wall and Concrete Stair West of Building. (SKDG 2012)

Fig. 61 Well Pump House East of the Building. (SKDG 2012)

If repairing the crack in the southwest stair and retaining wall is not an option, further investigation and borings are needed with analysis by a geotechnical engineer. City plans on what improvements and storm system were constructed in this general drive area should be reviewed and understood. Repairs may include a new retaining wall (sub surface) as well as extensive dedicated under drainage/dewatering system in order to save the stone wall. Pinning the existing stone wall back to the new retaining wall in order to stabilize it could be studied. It may take a retaining wall dedicated to stabilize and return the existing stone wall back to where it needs to be and then construct another retaining wall back away from the improved stone wall (a few feet) that would transfer the existing sub grade loads and totally protect the existing stone wall in the future.

It would be desirable to completely remove and replace the concrete stair in its entirety, as it is too deteriorated to patch. A new stair should be constructed to closely replicate the existing stair. Also, a new period-appropriate railing should be installed.

Civil Treatment Recommendations

At this time, it is recommended that a drainage study be performed to determine extent and expected frequency of flooding from East Fork Fishing River and to study possible channel improvements to prevent or alleviate flooding. Please note that any channel improvements or work within the floodway area would require a FEMA map revision. The study should also include a topographic survey of the site and its storm drainage facilities to determine the capacity and effectiveness of the site facilities to handle localized storm events. Options for

building flood proofing and optional uses for lower floor, flood prone areas, should also be considered within the study.

These future studies may include one or all of the following items:

- **Updated Survey**
  An updated topographic survey must be completed and provided to consultants in AutoCAD electronic format.
- **Study A**
  We recommend that a comprehensive water shed drainage study be contracted, (Macro) to determine the extent of storm flows coming from upstream and downstream capacity, constraints, etc. FEMA Maps are constantly going through a “Map Revision” however adoption takes years. This study would gather all available data as well as interview the City and US Corps of Engineers.
- **Study B**
  We recommend a comprehensive Site Drainage Study, (Micro) to determine the extent of storm flows coming into the site & building. This study would gather all available data as well as interview the City Staff. Flooding is frequent. A comprehensive site topographic survey is required for this study.
- **Study C**
  Determine if closing off and filling in the lower two floors (Basement and Ground Floor) of the Hall of Waters is a possibility. This would require relocating all remaining mechanical, electrical and plumbing building support equipment currently installed in these spaces. This would also result in a significant change to the overall building programming and use and would likely be viewed as an adverse effect to the overall building, as this would impact the pool and other historically-important areas within the building.
- **Study D**
  Determine if another flood wall closer to the building can be constructed with dedicated grinder pumps on dedicated power supplies that drain above a 500 yr storm event to protect the Historic Building.
- **Study E**
  Introduce other ideas not yet discovered.