



AGENDA

COMMISSION ON STORM WATER ISSUES MEETING

October 5, 2021 at 6:30 p.m.

Heman Park Community Center

975 Pennsylvania Ave., University City, Missouri 63130

- 1. MEETING CALLED TO ORDER**
- 2. ROLL CALL**
- 3. APPROVAL OF AGENDA**
- 4. APPROVAL OF MINUTES** – See Attachment #1 for Draft Minutes (September 7, 2021)
- 5. CITIZEN PARTICIPATION**
- 6. NEW BUSINESS**
 - a. St. Louis Regional Hazard Mitigation Plan Jurisdiction Questionnaire (See Attachment #2)
 - b. MSD Operations, Maintenance and Construction Improvements (OMCI) Tax Reimbursement Program – Update for 2022 year upcoming start and 2021 year-end (See Attachment #3)
- 7. OLD BUSINESS**
 - a. Floodproofing Survey – Update and Discussion
 - b. Relief Map Project – Update (See Attachment #4)
 - c. US Army Corps of Engineers Upper River Des Peres Flood Risk Management Draft General Reevaluation Report – Update to Commission (See Attachment #5)
 - d. Flooding Early Warning System – Update
- 8. SUBCOMMITTEE REPORTS**
 - a. Flood Early Warning System
 - b. Communications
- 9. MISCELLANEOUS BUSINESS**
 - a. Conditional Letter of Map Revision (CLOMR) for Market at Olive - Additional Information (See Attachment #6)
- 10. COUNCIL LIAISON COMMENTS**
- 11. ADJOURNMENT**

Please call (314) 505-8572 or email salpaslan@ucitymo.org to confirm your attendance.



Storm Water Task Force
6801 Delmar Boulevard, University City, Missouri 63130,
Phone: (314) 505-8560, Fax: (314) 862-0694

ATTACHMENT #1

Draft: MINUTES OF THE STORMWATER COMMISSION
September 7, 2021

1. **Call to Order.** The *fifteenth* meeting of the Stormwater Commission (Commission) was called to order at 6:36 PM by Chair Todd Thompson.
2. **Attendance-Roll Call.** The following Commission members were present in person at the Heman Park Community Center: Garry Aronberg, Bob Criss, Mark Holly, Eric Karch, Todd Thompson, Eric Stein. Also in attendance were Tim Cusick, Councilman, Sinan Alpaslan, Director of Public Works, John Mulligan, City Attorney.
3. **Agenda.** The following agenda was **accepted** (Holly, Aronberg): Roll Call; Approval of Agenda; Approval of Minutes; Citizen Participation; New Business; Old Business – Floodproofing Survey, Relief Map, USACE Upper River Des Peres Flood Risk Management Draft General Reevaluation Report- Update, Flood Early Warning System; Subcommittee Reports – FEWS, Communications; Miscellaneous Business – Conditional letter of Map Revision – Info, Request Form for Citizen Communication; Council Liaison Comments; Adjournment.
4. **Minutes.** The minutes of the August 3, 2021, Commission meetings were accepted by voice vote with correction of Chriss to Criss in Item 4 (Messrs. Holly, Criss).
5. **Citizen Comments.** There were no citizen comments.

New Business. No new business was discussed.

6. Old Business and Subcommittee Reports.

- Floodproofing survey connected with the USACE flood mitigation study
 - Corps can't give us owner names within study area for a survey unless OMB reviews and approves the survey. To avoid bureaucracy and risk of losing funding, our survey cannot mention Corps study.
 - Recent investigation of cost of a City-wide survey is \$10,000 to \$15,000 for mail including the return envelopes.
 - **Motion:** The Stormwater Commission advises the Council that University City should object to USACE and OMB not allowing University City to survey the community about participation in buyouts and floodproofing (Stein and Chriss). Motion passed by voice.
 - We can identify the addresses ourselves; Corps address data is unnecessary.
- The Commissioners want to have public meetings on flood problems.
- USACE Mitigation Study
 - Several of the commissioners stated that the cost and extent of mitigation is unreasonably high.
 - City Manager will meet with the USACE District Engineer to encourage continued closer cooperation with University City to make the mitigation alternatives realistic.
 - Mr. Sinan discussed Corps-provided funding for stormwater and flooding mitigation: Congress, Missouri Healthy Watershed Fund, Section 319 grants, BRIC, sales tax. An East-West gateway regional resolution and region-wide plan can be used as basis for grant applications. **Mr. Alpaslan**



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will contact E-W Gateway Coordinating Council to begin the process of using the EW Gateway resolution, questionnaire, and plan. Resolution is a component of many grant applications.

- USACE indicated that Fed share of mitigation will be limited to 65 percent of TCP cost.
- 3-D Map. Mr. Holly reported on the 3-D relief map: Blocks have been printed. Artists are preparing to paint the 3-D map.
- Early warning system. Foundation has been installed for the pole for third rainfall gage. The pole will be installed in Olivette. Olivette staff have been very helpful and cooperative.
- Communications
 - OMCI application for Lewis Park inlets has been submitted to MSD.
 - 7500 Amherst residents have identified significant erosion of a nearby creek. The erosion is very close to a house.
 - The owner of 7103-05 Amherst has asked for City to help to reduce nearby street flooding. The City has advised the owner to contact MSD. The City will clear debris in an emergency situation from nearby inlets.
 - A application for a CLOMR has been submitted for a branch of River Des Peres at Olive at McKnight. It appears not to impact more than the applicant's property.

7. Miscellaneous Business. None

8. Council Cusick Comments.

- Demolition of old buildings near at Olive / 170 continues for the Novus Development.
- A QuickTrip is proposed for the northeast corner of Olive and North & South Road
- There is an opening on the Stormwater Commission.

9. Adjournment was at 8:25 by motion (Messrs. Holly and Karch). Passed by voice vote.

Intended Attachments:

Agenda

Minutes Preparation. Minutes were prepared by Garry Aronberg.

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RESOLUTION NO. 2019-17

ST. LOUIS REGIONAL HAZARD MITIGATION PLAN ADOPTION

A RESOLUTION OF THE CITY COUNCIL OF UNIVERSITY CITY ADOPTING THE ST. LOUIS REGIONAL HAZARD MITIGATION PLAN

WHEREAS, the City Council recognizes the threat that natural hazards pose to people and property within University City; and

WHEREAS, University City has participated in the preparation of a multi-hazard mitigation plan, hereby known as the St. Louis Regional Hazard Mitigation Plan, hereafter referred to as the *Plan*, in accordance with the Disaster Mitigation Act of 2000; and

WHEREAS, the *Plan* identifies mitigation goals and actions to reduce or eliminate long-term risk to people and property in University City from the impacts of future hazards and disasters; and


WHEREAS, the City Council recognizes that land use policies have a major impact on whether people and property are exposed to natural hazards, the City Council will endeavor to integrate the *Plan* into the comprehensive planning process; and

WHEREAS, adoption by the City Council demonstrates their commitment to hazard mitigation and achieving the goals outlined in the Plan

NOW THEREFORE, BE IT RESOLVED BY THE CITY OF UNIVERSITY CITY, in the State of Missouri, THAT:


The City of University City hereby adopts the final FEMA-approved plan.

Adopted this 25th day of November 2019.



Terry Crow, Mayor

ATTEST:



LaRette Reese, City Clerk





EAST-WEST GATEWAY Council of Governments

Creating Solutions Across Jurisdictional Boundaries

St. Louis Regional Hazard Mitigation Plan Jurisdiction Questionnaire

Thank you for filling out the information below. Not only does your contribution help East West Gateway Council of Governments develop and maintain the St. Louis Regional Hazard Mitigation Plan, but it is also a critical step in ensuring your jurisdiction is eligible to apply for hazard mitigation grants.

Date:

Please fill out the questions below as completely as possible.

Name	<input type="text"/>
Title	<input type="text"/>
City/School District/Special District	<input type="text"/>

<i>Has your jurisdiction flooded in the past?</i>	Yes	No	What years?
<i>What rivers/creeks border or run through your jurisdiction?</i>	Please list:		
<i>Do you allow construction/development in your flood zone(s)?</i>	Yes	No	Explanation if needed:
<i>How many critical facilities are in your flood zone(s)?</i>	Critical facilities = Schools, hospitals, government buildings, railroads, bridges, highways		Number:
<i>Has your jurisdiction experienced repetitive losses due to flooding?</i>	Yes	No	What years?

<i>What are your jurisdiction's development trends over the next 5 years?</i>	Example: anticipate 5% growth, stay the same, or decrease by 3%, etc.		Why? (Example, new housing development, loss of major employer, etc.)	
<i>Does your jurisdiction have any sinkholes?</i>	Yes	No	How many?	
<i>Does your jurisdiction sit behind any levees?</i>	Yes	No	How many?	
<i>Are there any critical facilities behind the levees?</i>	Yes	No	How many?	
<i>Is your jurisdiction located downstream/below any high hazard potential dam*?</i>	Yes	No	How many?	
<i>Are there any critical facilities below the high hazard potential dam(s)?</i>	Yes	No	How many?	
<i>Does your jurisdiction have any critical facilities in an earthquake liquefaction area?[Earthquake liquefaction areas are frequently the same as flood zones.]</i>	Yes	No	How many?	
<i>Has your jurisdiction completed any hazard mitigation activities/projects in the last 5 years?</i>	Yes	No	What projects?	Budget?
<i>Does your jurisdiction plan to apply for hazard mitigation grant funds in the next 5 years, and if so, what kind of projects?</i>	Yes	No	What projects?	Approximate cost?

<p><i>How will your jurisdiction incorporate the St. Louis Regional Hazard Mitigation Plan into your existing plans?</i></p>	<p>Example: Emergency Operations Plan, Capital Improvement Plan, Master Plan, etc.</p>	<p>Please list which plans (must include at least one plan)</p>	
<p><i>Please list your jurisdiction's emergency capabilities</i></p>	<p>Example: 35 firefighters, 26 police officers</p>		
<p><i>Please list your jurisdiction's emergency powers</i></p>	<p>Example: ability to declare emergency, ability to order evacuation, ability to declare curfew, etc.</p>		
<p><i>For cities: please provide the year of your jurisdiction's adopted building codes (if not all same year, please list each code with year)</i></p>	<p>(Building, plumbing, mechanical, electrical, fire codes)</p>		
<p><i>For cities/counties: please provide the year you anticipate adopting newer or current building codes and the code year.</i></p>	<p>Example, in 2023 City will adopt the 2021 International Building Code (IBC).</p>		
<p><i>For school districts: please list what, if any, student and family education is provided for earthquakes</i></p>			
<p><i>Please provide your jurisdiction's property tax valuation/assessment for the most current year.</i></p>	<p>Valuation:</p>	<p>Year:</p>	
<p><i>Please list any mitigation strategies or additions to the St. Louis Regional Hazard Mitigation Plan that you would like considered for adoption in plan amendments or future plans.</i></p>			

*High hazard potential dams are those dams that should there be a failure, there is risk to human life. For a complete list of high hazard potential dams, see the St. Louis Regional Hazard Mitigation Plan, Appendix C.

Thank you for providing the above information! It is a key part in making your jurisdiction eligible for hazard mitigation grant funding and helps East West Gateway maintain and update the St. Louis Regional Hazard Mitigation Plan

If you have any questions, please email hazardmit@ewgateway.org.



September 27, 2021

RE: Request for Intent to Participate in Reimbursement Program for Project Funding from Operations, Maintenance, and Construction Improvement (OMCI) Taxing Subdistricts

Dear Public Officials:

In 2022 the Metropolitan St. Louis Sewer District (MSD) is again offering a grant program in certain OMCI subdistricts for local agencies to use up to a 50% share of OMCI subdistrict revenue from their municipality, for their own stormwater purposes.

Included with this letter is a Municipal Certification of Intent to Participate form for each OMCI subdistrict in which your municipality is located. Like the form provided last year, this form identifies the OMCI subdistrict and the fiscal year 2022 revenue allocation for which the municipality is eligible. It also indicates the municipality's remaining balance for the 2021 allocation and the total allocation available.

At this time, you only need to identify the municipality's interest in participating in the grant reimbursement program for 2022 as there is not yet a need to identify the specific uses for the 2022 funding. **Please review and return the form by October 15, 2021. Failure to respond by November 1, 2021 will forfeit the municipality's allocation** for fiscal year 2022 funding.

If the municipality believes they may apply for a reimbursable project in 2022, then further guidance on the grant application process will be provided in a subsequent transmittal before the end of this year. Multiple applications can be submitted to fully use the allocation; however, the stormwater use must be within the OMCI boundary from which the reimbursement is requested. Additionally, the annual fund allocations must be utilized by the municipality within five years or the unutilized portion more than five years old will be forfeited from the remaining balance.

MSD will use the balance of the OMCI funds, not allocated for grants, for the design and construction of MSD identified stormwater capital projects within the OMCI.

If you have further questions, they can be addressed to Jeff Riepe, Engineering Program Planning Stormwater Team Lead, at 314-768-6271, JRIEPE@stlmsd.com. MSD thanks you for your support of our programs. We look forward to working with you to address stormwater issues within our community.

Sincerely,

A handwritten signature in black ink, appearing to read 'Richard L. Unverferth'.

Richard L. Unverferth, PE
Director of Engineering

Attachments: Municipal Certification of Intent to Participate

**University City Branch of RDP OMCI Reimbursements Program
2022 Municipal Certification of Intent to Participate**



Municipality: City of University City

Fiscal Year 2022 Allocation:	\$195,759
<u>Unencumbered Allocation from FY 2021</u>	<u>\$179,193</u>
Total Allocation Available:	\$374,952

In 2022 the Metropolitan St. Louis Sewer District plans to allocate **University City Branch of RDP** taxing subdistrict revenue to municipalities to reimburse them for costs incurred for eligible stormwater projects. Eligible stormwater expenditures may include the following: storm sewer and inlet construction; drainage improvements; streambank stabilization and erosion control projects; clearing under bridges or clearing detention basins; stormwater planning or engineering costs; and other stormwater related expenses as determined appropriate by the District. Activities for MS4 permit compliance and routine maintenance are not considered eligible. Your municipality's allocation is indicated above, and options are listed below.

Last year the **City of University City** chose option **A** from the selections below.

Please indicate your choice for 2022, and sign and return this form no later than October 15, 2021.

Failure to respond by November 1, 2021 will forfeit your municipality's allocation this fiscal year.

Official Contact for Reimbursement Program: Name: _____

Title: _____

E-mail: _____

Phone: _____

Choose One:

- (A)** City of University City will participate in the reimbursements program this fiscal year and will submit an application for stormwater reimbursement when requested.
- City of University City will participate in the reimbursements program this fiscal year; however, does not anticipate applying for funding before Dec. 31, 2022. We understand that, if the program continues, allocations can only be reserved up to five years before being forfeited. (if this box is checked, please check one box below)
 - (B1)** Please reserve our allocation this fiscal year for future reimbursement to the City of University City for stormwater purposes
 - (B2)** Please reserve our allocation this fiscal year for a project we will select for MSD to deliver once the City of University City has adequate funding for construction of the project. We understand that this project will have to be identified by Dec. 31, 2022.
- (C)** City of University City will not participate in the reimbursements program this fiscal year. Our allocation is forfeited and will be used by MSD for other stormwater purposes.

Signature: _____ Title: _____

Printed Name: _____ Date: _____

Return completed form to: Jeff Riepe, MSD, 2350 Market Street, St. Louis, MO 63103, or jriepe@stlmsd.com

Deer Creek OMCI Reimbursements Program
2022 Municipal Certification of Intent to Participate



Municipality: City of University City

Fiscal Year 2022 Allocation:	\$33,534
<u>Unencumbered Allocation from FY 2021</u>	<u>\$32,998</u>
Total Allocation Available:	\$66,532

In 2022 the Metropolitan St. Louis Sewer District plans to allocate **Deer Creek** taxing subdistrict revenue to municipalities to reimburse them for costs incurred for eligible stormwater projects. Eligible stormwater expenditures may include the following: storm sewer and inlet construction; drainage improvements; streambank stabilization and erosion control projects; clearing under bridges or clearing detention basins; stormwater planning or engineering costs; and other stormwater related expenses as determined appropriate by the District. Activities for MS4 permit compliance and routine maintenance are not considered eligible. Your municipality's allocation is indicated above, and options are listed below.

Last year the **City of University City** chose option **A** from the selections below.

Please indicate your choice for 2022, and sign and return this form no later than October 15, 2021.

Failure to respond by November 1, 2021 will forfeit your municipality's allocation this fiscal year.

Official Contact for Reimbursement Program: Name: _____

Title: _____

E-mail: _____

Phone: _____

Choose One:

- (A)** City of University City will participate in the reimbursements program this fiscal year and will submit an application for stormwater reimbursement when requested.
- City of University City will participate in the reimbursements program this fiscal year; however, does not anticipate applying for funding before Dec. 31, 2022. We understand that, if the program continues, allocations can only be reserved up to five years before being forfeited. (if this box is checked, please check one box below)
 - (B1)** Please reserve our allocation this fiscal year for future reimbursement to the City of University City for stormwater purposes
 - (B2)** Please reserve our allocation this fiscal year for a project we will select for MSD to deliver once the City of University City has adequate funding for construction of the project. We understand that this project will have to be identified by Dec. 31, 2022.
- (C)** City of University City will not participate in the reimbursements program this fiscal year. Our allocation is forfeited and will be used by MSD for other stormwater purposes.

Signature: _____ Title: _____

Printed Name: _____ Date: _____

Return completed form to: Jeff Riepe, MSD, 2350 Market Street, St. Louis, MO 63103, or jriepe@stlmsd.com

MSD OMCI TAX REIMBURSEMENT PROGRAM

THE FOLLOWING ATTACHMENTS ARE INFORMATION FOR THE MSD OMCI PROGRAM APPLICATION WORK IN THE CURRENT PROGRAM YEAR:

- 1) DELMAR BLVD. DRAINAGE IMPROVEMENTS AT LEWIS PARK – APPLICATION SUBMITTED IN 2ND QUARTER AND ADDITIONAL INFORMATION REQUIRED BY MSD WITHOUT APPROVAL
- 2) 1300 WALDRON DRAINAGE OF NATURAL SPRING DISCHARGE – APPLICATION IN PIPELINE TO BE SUBMITTED IN 4TH QUARTER

LEWIS PARK DRAINAGE IMPROVEMENTS



314-842-4033 (tel.)
314-842-5957 (fax)
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FENTON, MISSOURI 63026

THE PROFESSIONAL'S SEAL AFFIXED TO THIS SHEET APPLIES ONLY TO ITEMS ON THIS SHEET. ALL DRAWINGS OR OTHER DOCUMENTS NOT EXHIBITING THE SEAL SHALL NOT BE CONSIDERED PREPARED BY THIS PROFESSIONAL.

UNIVERSITY CITY, MISSOURI
LEWIS PARK DRAINAGE IMPROVEMENTS
CONCEPTUAL PLANS

CONCEPTUAL PLANS	DATE	REVISION	
DWN. BY:	KJW	APP'D. BY:	MDS
DATE:	5/4/21	SCALE:	1" = 30'
PROJ. NO.:	SC20-1188	DWG. NO.:	C-1

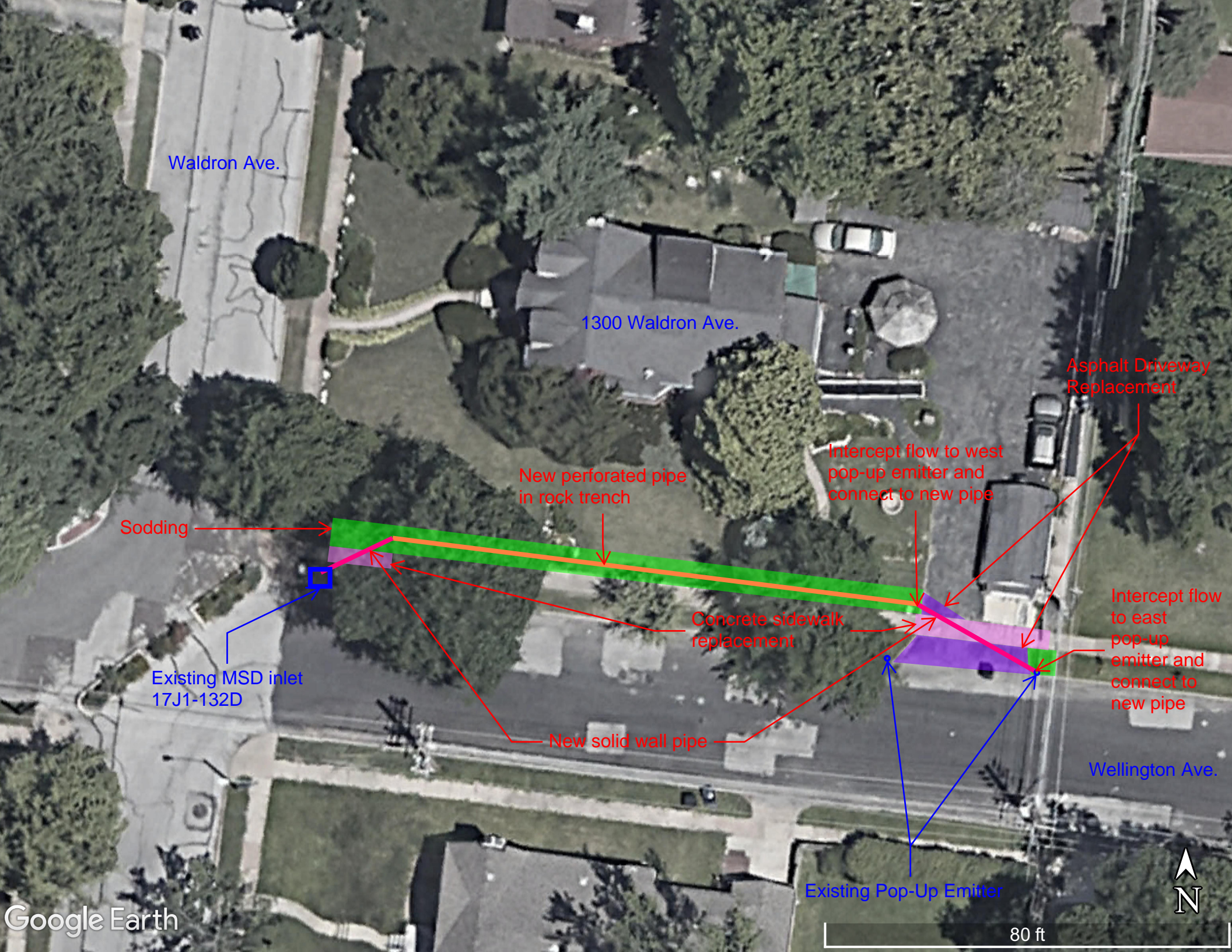
Drawing name: I:\SC20-1188 University City Engineering Services\AUTOCAD DRAWINGS\BASE - LEWIS PARK DRAINAGE.dwg Tab: Layout1 Plotted on: May 12, 2021 - 12:42pm Plotted by: kwelf



**UNIVERSITY CITY, MISSOURI
LEWIS PARK
DRAINAGE IMPROVEMENTS
PRELIMINARY CONSTRUCTION COST
ESTIMATE**

Bid No.	Description	Unit	Quantity	Unit Cost	Extended Cost
1	Mobilization	LS	1	\$30,000.00	\$30,000.00
2	Traffic Control	LS	1.0	\$7,000.00	\$7,000.00
3	Clearing and Grubbing	AC	0.5	\$15,000.00	\$7,500.00
4	Removal of Improvements	LS	1	\$15,000.00	\$15,000.00
5	Earthwork	STA	7.5	\$1,000.00	\$7,500.00
6	Silt Fencing	LF	750	\$2.00	\$1,500.00
7	Inlet Check	EA	4	\$200.00	\$800.00
8	12" Storm Sewer	LF	735	\$70.00	\$51,450.00
9	48" Dia. Manholes	EA	4	\$3,000.00	\$12,000.00
10	Curb Inlet	EA	2	\$3,000.00	\$6,000.00
11	Utility Cut Pavement Repair, 8"	LF	100	\$12.00	\$1,200.00
12	Concrete Vertical Curb, 6"	LF	225	\$30.00	\$6,750.00
13	Concrete Sidewalk, 4"	SF	3,810	\$5.00	\$19,050.00
14	Detectable Warning	SF	28	\$40.00	\$1,120.00
15	Seeding and Strawing	AC	0.5	\$20,000.00	\$10,000.00
16	Rock Excavation Allowance	CY	75	\$250.00	\$18,750.00
Total Construction Costs					\$195,620.00
Contingency 10%					\$19,562.00
Engineering and Surveying 15%					\$32,277.30
Construction Inspection					\$16,138.65
Total Project Cost					\$263,597.95

SAY = \$264,000.00



Waldron Ave.

1300 Waldron Ave.

Asphalt Driveway Replacement

Intercept flow to west pop-up emitter and connect to new pipe

Sodding

New perforated pipe in rock trench

Concrete sidewalk replacement

Intercept flow to east pop-up emitter and connect to new pipe

Existing MSD inlet 17J1-132D

New solid wall pipe

Existing Pop-Up Emitter

Wellington Ave.





FRAGILE
HANDLE WITH CARE
DO NOT DROPPED
DO NOT TILT
DO NOT STACK
DO NOT EXPOSE TO MOISTURE
DO NOT EXPOSE TO EXTREME TEMPERATURES

THE HOME DEPOT

EXTRA LARGE



River Des Peres GRR Technical Meeting 9/13/21

Attendees: Janet Buchanan, Matt Hartman, Matt Jones, Jordan Lucas, Joel Asunskis, Evan Hill, Terrence Ollis, Paige Scott (USACE); Jeff Riepe (MSD); Eric Karch, Todd Thompson (University City Commission on Storm Water Issues); Sinan Alpaslan (University City)

Minutes:

Update from Commission on Storm Water meeting

- Eric Karch - Thanks for responses to the questions – haven't heard back from Commission but think team answered them well/satisfactorily
- Remaining issue is the survey and whether or not we can/should proceed
- If the TSP will be updated with some assumed percentages, maybe that supersedes the need for a survey, but still want feedback from citizenry

Survey

- Matt Jones – apologize for the issue on this; reached out to another district & to Karen McHugh, State Floodplain Manager, with questions about the logistics of the survey (eg whether surveys will be printed and mailed, or emailed, etc.).
- **Due out: Matt Jones – set up call or correspondence with Karen McHugh, State Floodplain Manager and Sinan, Eric Karch, and Eric Stein re survey**

Real Estate Capability Checklist

- Matt J – this will be needed as part of the Real Estate plan for the report
- Sinan – sent back to Matt a while back, 8/20/21
- **Due out: Sinan – forward Matt Jones the Real Estate Capability Checklist again**

Agency Technical Review (ATR)

- ATR comments received on costs; Paige – no update on responses
- Jordan – seems cost reviewer and Michelle K comfortable not making all changes to the report/doing additional work to incorporate; wait to hear from Karen
- **Due out: Janet – follow up with Karen about making changes to current draft report based on updated costs**
- Matt H – Civil re Geotech – addressed everything they're asking for. Question – is there OMRRR for floodproofing? Or is it installed then homeowner takes care of it? Jordan – study he's seen, the homeowner takes care of it. Matt H – will assume no change to current assumption

Updated costs/benefits for structural alternatives

- Jordan – since TSP milestone meeting, have received revised revisions incl cost, econ, real estate, as a result of refinement that was planned, or from ATR review. Right now, have updated numbers for structural alternatives; don't have revised nonstructural yet.
- Shared numbers; these will change before the Agency Decision Milestone (ADM). No big changes in terms of final #s. Still positive net benefits for DBs and U-12 with DBs; BCR now a little higher (1.09; used to be 1.0). Levee cost is greater so that's less feasible than before.
- DB3 ruled out – benefits not able to exceed costs. DB3 alone not incrementally justified. Presents problems when looking at DB3 and 4 combination
- Updated RE costs have been included, with contingency added

- U-12 still in play; BCR 1.09 and minimizes residual risk among the remaining viable structural alternatives; however still not very competitive in terms of net benefits
- If City/Commission indicate interest in this alternative moving forward for LPP, or if other alternatives become less viable, team can spend the considerable time/effort to update the U-12 costs (currently based on inflation update from designs in 1988 report)
 - o Joel – concern with that is, looking at original plates, they said “work done by others”
 - o Eric Karch – appreciate level of effort to update cost; but appreciate question on level of detail used in previous estimate; is there suspicion that bridges weren’t included. Todd – seconded
 - o Janet – believe both channel and bridge modifications were included; can have Jordan or Matt H check on that
 - o **Due out: Jordan/Matt H – check the assumption on whether bridge modifications in U-12 were included in the cost estimates**
 - o **Due out: Janet – send Jordan/Matt H link to 1988 report with plates**
 - o Joel has the plates on paper too if digital files are hard to read

Nonstructural analysis update

- For elevation of residential structures, previously used 3+ feet flood depth to include 7 structures; now using 2+ feet, which includes 15 structures. (not with the updated H&H, numbers will change). Plan to elevate those structures to the 100 year event so those individuals will receive a benefit
- Not planning to floodproof residential structures any more; not generally recommended, FEMA doesn’t recognize it as a benefit that reduces flood insurance. Instead, for structures where the basement has flooding 1ft below the first floor or higher (-1 to 0 feet relative to the first floor), fill the basement. Would be 60 residential structures
- Nonresidential structures – dry floodproofing of any structure that has 0 to 3 feet of flooding relative to the first floor; dry floodproofing is effective up to 3 feet. Excluding structures with damage below first floor, as the cutoff
- Recommend acquisitions for structures that meet criteria just mentioned, but the cost to meet that treatment exceeds cost of buyout. This is unchanged from the previous criteria used for nonstructural analysis
- Eric Karch – confirming what he heard; around 100 structures total (compared to 500 previously). What about residential structures with minor flooding in the basement, i.e. not as high as -1 ft from first floor.
 - o Jordan – unfortunately a cutoff point has to be set somewhere; in this analysis those structures didn’t make the cut; we try to balance cost with inclusivity – as more structures are included, the project becomes less justified re net benefits
- Jeff Riepe – for structures with basement flooding, does it matter whether it’s an open walkout basement or in ground?
 - o Jordan – that’s not a part of our criteria yet; we don’t have data on which basements are walkout; think it would be difficult to determine and would be a consideration for the implementation phase (after the study)
 - o Sinan & Jeff – also don’t have that information

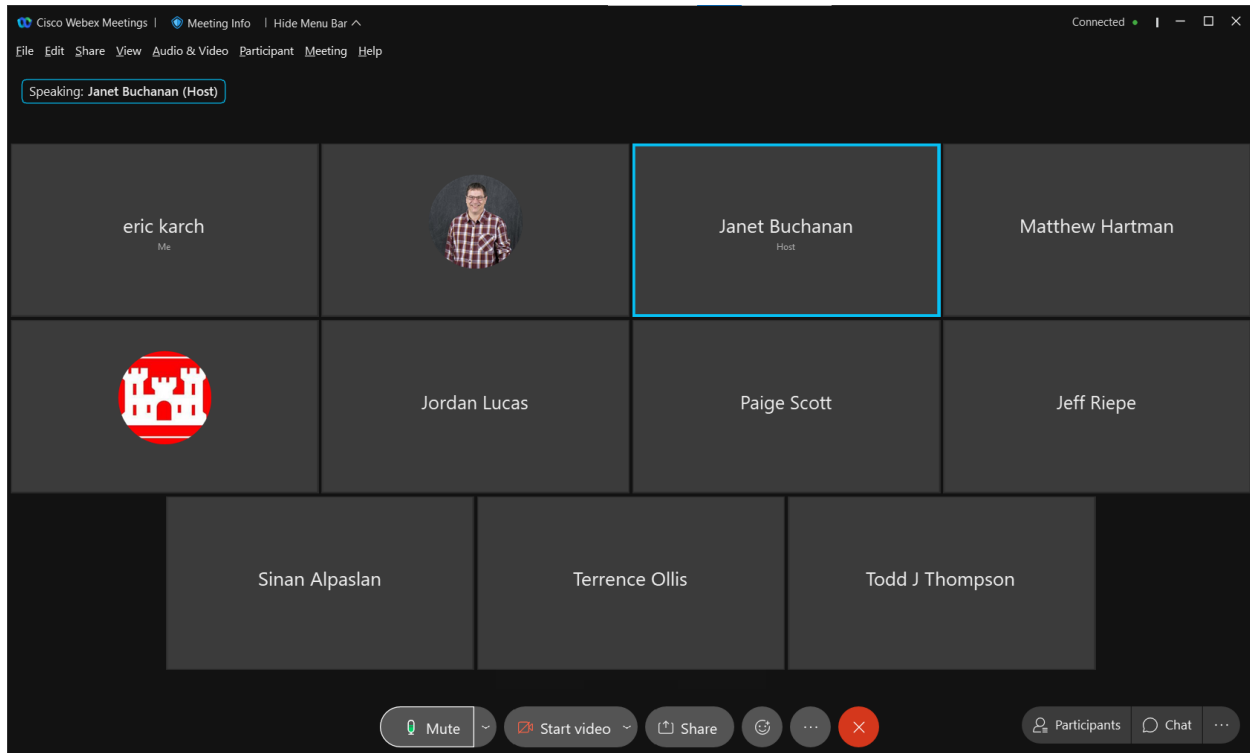
Upcoming meetings

- Matt Jones – will be on vacation starting next Tues thru October 2. If emailing him, copy Janet
- Next Technical meeting in 2 weeks. Should have revised benefits estimates for nonstructural, but maybe not costs; waiting for those

Due outs:

- Sinan – forward Matt Jones the Real Estate Capability Checklist again
- Jordan/Matt H – check the assumption on whether bridge modifications in U-12 were included in the cost estimates
- Matt Jones – set up call or correspondence with Karen McHugh, State Floodplain Manager and Sinan, Eric Karch, and Eric Stein re survey
- Janet – follow up with Karen about making changes to current draft report based on updated costs
- Janet – send Jordan/Matt H link to 1988 report with plates

USACE technical meeting 9/13/2021



1. Survey – Matt Jones considering running that thru SEMA (Karen McHugh), and he will follow up with City/Commission on this. One question is if printed, who would pay. I indicated the City and the Commission are aware that there would be a cost.
2. Cost benefit table updated though still not final (except nonstructural option)
 - a. No change in order of Net Annual Benefits
 - b. Row 13 & 14 are key
 - c. U12 is the originally authorized plan (1988) w/ detention basins added. Still in play as an alternative. It has the lowest BCR (excluding levee), but has lowest residual risk. Joel asked how is bridge widening accounted for in this. Joel noted that the original plates (circa 1988) had a note stating that for bridges, “work done by others.” Jordan’s team not sure how/whether cost of bridge replacements (i.e. widening) was included in the 1988 estimate, but that the current U12 estimate is simply a re-indexed, inflation-adjusted update to the original U12 project. Jordan will research the original U12 study and report back on how/whether cost of bridges was addressed.
 - d. Levee is ruled out – even less feasible than before
 - e. DB3 alone is ruled out; not incrementally justified
 - f. DB4 alone – BCR increased, so even better.
 - g. DB3&4 together – works out as justified, but since DB3 alone is not justified, the combination may also be ruled out. Corps is not clear on this, but will report back.

A	B	C	D	E	F	G	H	I
3a	3b		2		4			
Detention Basins 3 and 4		Detention Basin 4		U12 w/ Detention Basins 3 and 4		Levee 2a w/ Detention Basins 3 and 4		
Total Project Costs	Total Project Costs		Total Project Costs		Total Project Costs		Total Project Costs	
First Cost	\$ 48,939,000	First Cost	\$ 9,066,000	First Cost	\$ 64,156,000	First Cost	\$ 95,254,000	
Interest During Construction	\$ 1,857,000	Interest During Construction	\$ 227,000	Interest During Construction	\$ 2,434,000	Interest During Construction	\$ 4,860,000	
Total Investment Cost	\$ 50,796,000	Total Investment Cost	\$ 9,293,000	Total Investment Cost	\$ 66,590,000	Total Investment Cost	\$ 100,114,000	
Estimated Annual Costs	Estimated Annual Costs		Estimated Annual Costs		Estimated Annual Costs		Estimated Annual Costs	
Annualized Project Costs	\$ 1,791,000	Annualized Project Costs	\$ 328,000	Annualized Project Costs	\$ 2,348,000	Annualized Project Costs	\$ 3,530,000	
Annual OMRR&R	\$ 20,000	Annual OMRR&R	\$ 10,000	Annual OMRR&R	\$ 20,000	Annual OMRR&R	\$ 20,000	
Total Annual Costs	\$ 1,811,000	Total Annual Costs	\$ 338,000	Total Annual Costs	\$ 2,368,000	Total Annual Costs	\$ 3,550,000	
Average Annual Benefits	Average Annual Benefits		Average Annual Benefits		Average Annual Benefits		Average Annual Benefits	
Total Annual Benefits	\$ 2,355,680	Total Annual Benefits	\$ 1,182,350	Total Annual Benefits	\$ 2,575,840	Total Annual Benefits	\$ 2,939,000	
Net Annual Benefits	\$ 544,680	Net Annual Benefits	\$ 844,350	Net Annual Benefits	\$ 207,840	Net Annual Benefits	\$ (611,000)	
Benefit to Cost Ratio	1.30	Benefit to Cost Ratio	3.50	Benefit to Cost Ratio	1.09	Benefit to Cost Ratio	0.83	
Residual Risk	\$ 2,620,000	Residual Risk	\$ 3,793,000	Residual Risk	\$ 2,400,000	Residual Risk	\$ 2,036,000	

	Real Estate Costs	Construction Costs	Project First Cost
Detention Basin 3	\$ 19,874,400	\$ 19,998,748	\$ 39,873,148
Detention Basin 4	\$ 1,565,000	\$ 7,500,590	\$ 9,065,590
Levee 2a	\$ 11,294,000	\$ 35,021,005	\$ 46,315,005
U12		\$ 15,216,800	\$ 15,216,800

3. Non structural option – Cost benefit table not yet available; planning for more info in 2 weeks.

However, Corps has new strategy on how to apply nonstructural.

a. Effect of new strategy is reduction from 500 to ~100 structures

i. elevation – previously triggered where flooding reaches 3 feet or more above the first floor; changing to 2 feet or more; doubles eligible structures from 7 to 15

ii. floodproofing

1. residential - no longer considering floodproofing since FEMA does not recognize for flood insurance. Instead, nonstructural option now simply fills-in basements. Criteria is where flooding reaches 1 foot below first floor or more (-1 to 0 feet relative to the first floor), until elevation kicks in.

a. ~60 structures are eligible

b. Does not differentiate between walk-out basements versus non-walkout.

2. non-residential – floodproofing still being considered. Criteria is flooding above the first floor and up to 3 feet above first floor (0 to 3 feet of flooding relative to the first floor)

a. ~25 structures are eligible

3. Flooding not meeting these criteria is considered minor, and doesn't make the cut. The nonstructural option no longer addresses flooding for these homes. For perspective, in a 7-foot high basement this would include flooding almost to the ceiling.

4. Acquisition

a. Criteria is flooding more than 3 feet above first floor and where a structure meets one of previous criteria but the cost to implement exceeds cost of a buyout.

b. option to buyout all in 25-year floodplain did not have reasonable BCR; Corps will re-evaluate 5 or 10-year in future design phase

Commissioners,

I view myself as an amateur on this commission regarding some of the technical issues that we consider, but I believe that I have some degree of expertise in flood warning systems and *practical* residential floodproofing methods. Given the latter, and given that I experience the flooding that is the subject of the USACE's non-structural plan, I would like to comment on the new plan described in the Sep. 13 team meeting minutes from Eric K. These are my current thoughts but they can be altered if it turns out I am misunderstanding something about the new plan, or if someone can provide an argument that alters my thinking. I presume the new plan will be the subject of a discussion at our October 5 meeting.

I assume that the ~100 structures (~77 residential) identified as eligible for mitigation by the corps are appropriate and are probably many of the problem properties that have flooded in the past, but I argue that this plan does little to actually help many (most?) of them. I base this conclusion on the following:

1. This plan offers nothing to mitigate any basement flooding that occurs when the flood level is less than -1 foot relative to the main floor. But basement window and walkout stair thresholds are lower than that level in most houses, typically ~3 feet below main floor level, so this will eliminate these homes from any kind of mitigation. It does not take 7 feet of water in a basement to ruin the mechanical systems (HVAC, water heater, maybe electrical circuits) so there is little distinction in the disruption and cost between a 7 foot flood and something considerably less. It is not, in reality, "minor".
2. For those who do qualify for mitigation of basement flooding, the only remedy offered is to fill in the basement. For a homeowner who suffers repeated, severe basement flooding, this might be worth considering, especially if it would reduce NFIP premiums. But for infrequent basement flooding due to a foot or two of water around the foundation for around 60 minutes every few years, this is overkill. Simply denying entry through windows and eliminating any walkout stairwell would be a more appropriate measure. This measure would also be appropriate to those homes discussed in #1 above. It is unfortunate that FEMA's dogmatic response to this kind of "dry floodproofing" measure for residential structures (but not commercial) has discouraged the corps from incorporating it in their plan. Granted, there could be some homes where this is not advisable due to foundation problems, but for the millions of dollars this project will cost, it seems like a small portion of that could be used to pay for a professional evaluation of the affected properties to see which could benefit, rather than simply eliminating it as an option. And granted that it does not reduce NFIP premiums (but neither does filling in basements unless the main floor is 1 foot above the 100 year FEMA level). What it does do is allow keeping the basement and provide effective mitigation from flooding. Why not give homeowners a choice? As a textbook example of why it is misguided to eliminate this kind of measure, consider the house at 1035 Groby Rd. That house has about 1 foot of foundation exposed and the ground around the foundation slopes away. That was just about the depth of water on the house for 30 minutes in the Aug 2020 flood. But the house has window wells and thus the basement seriously flooded. The owner has since installed metal barriers around the window wells to prevent this from happening again (see photo). How can this type of simple and inexpensive measure not be included in a plan because it is classified as "dry

floodproofing”? My house might be another example. Its basement has only flooded once in the 41 years we have lived here. Had there been watertight basement windows and no walkout stairwell, it would not have happened. The foundation specialist I consulted before installing glass block windows and closing the stairwell assured me that my foundation was in excellent shape and had essentially converted to limestone over its 80 year lifetime of having a two story, full-masonry house compressing it. But FEMA dogma, which the corps has accepted, says that I should not prevent entry to my basement by 1-2 feet of flood water on my foundation from a ~60 minute, infrequent event because doing so might collapse my foundation?? Where is the common sense in ruling out such simple and relatively inexpensive measures because occasional misapplications have caused structural damage?

3. This plan does nothing to help those who experience water levels of up to +2 feet relative to the main floor, which would almost certainly result in main floor flooding of up to 2 feet. There were a number of homes that experienced such flooding in 2008. Slab houses would receive no remediation. For those with a basement, remediation consists of filling in the basement. This is not much of a remediation when you consider that most of the expense of repair is going to be for the main floor flooding. To put it another way, the deal that would be offered to those having basements and who are subject to main floor flooding of up to 2 feet would be lose the advantages of a basement, lose space upstairs for the elevated mechanicals, and lose home value, while allowing the upstairs to flood. Really!?
4. The properties that this plan would actually help are those in the 3 feet and over category. Elevation or acquisition is perfectly appropriate but there are only ~17 of these.

In summary, there is no mitigation offered to many who experience serious basement flooding. For those who do qualify for mitigation, only one extreme remedy is offered while ignoring a viable, simpler alternative. And no remedy is offered for most cases of main floor flooding. The plan currently proposed does not serve our citizens well. We would be better to look at structural alternatives. I look forward to discussing this at the next meeting.

Regards,
Eric S
9/24/2021



1035 Groby Rd – Note metal window barriers, open on top to admit light

From: [Eric Karch](#)
To: [Bob Criss](#)
Cc: [Eric Stein](#); [Todd Thompson](#); [Garry Aronberg](#); [Mark Holly](#); [Tim Cusick](#); [Sinan Alpaslan](#); [John F Mulligan](#)
Subject: Re: USACE's revised non-structural plan
Date: Sunday, September 26, 2021 9:07:57 AM

CAUTION: This email originated from outside your organization. Exercise caution when opening attachments or clicking links, especially from unknown senders.

Stein's comments make sense, though I do have one correction to offer. Item #4 says the Corps' plan really helps those with 3+ feet flooding. That number is actually 2+ feet. After re-reading the Corps' minutes ("RdP Technical Alternatives mtg 2021-09-13 minutes.docx"), it seems my notes were in error. However, this does not invalidate Stein's other comments.

1. Regarding the homes with only a foot or two of water in the basement: I think addressing these homes would require a locally preferred plan. I do see value in "denying entry through windows and eliminating any walkout stairwell" as Stein suggests. The issue may come down to City endorsement (i.e. liability) of such measures. Perhaps there's a way that the project could provide dollars "to pay for a professional evaluation of the affected properties to see which could benefit," and flat reimbursement to cover all/part of the installation of the measures as long as the property owner signed a voluntary waiver that absolved the City of liability?

2. Regarding the homes with up to 2 feet of main floor flooding: I think it's worth asking the Corps whether this 2+ feet over the main floor criteria indeed applies to the main floor and not the "First Floor" which is a FEMA-specific term that often refers to the basement. Assuming it does refer to the main floor, I also think it's worth asking if they considered extending elevation criteria to all structures with main floor flooding and whether this yields a positive BCR. It would be good to know how many properties fit this criteria, but I have a guess-timate of 275. We do know that the Corps' current 25-year flood extents are nearly the same as the current FEMA map 100-year flood extents, and that the 2013 USACE Economic Update indicated there were 275 structures within the 100-year flood extents. While we do not have actual surveyed first floor elevation data, the 2013 study also estimated first floor elevations (see quoted passage below), and I think we should request that data from the Corps to support our assessment. I suspect that will require a FOIA. I'm not sure we need that info before the GRR report is finished, but at least during final design.

Page 7 Section 4.2 of the 2013 economic update says "The data provided by the assessor's office was already classified, valued, and mapped in GIS. A windshield survey was performed for each of the 820 structures in the AOI. The information collected during the windshield survey was used to identify the first floor elevations, construction materials, and use of each structure. This data was used as input for the Marshall and Swift (M&S) Residential and Commercial Estimator programs. These programs combine the field information with depreciation tables to estimate the depreciated replacement value (DRV) for each structure."

On Fri, Sep 24, 2021 at 7:07 PM Bob Criss <criss@wustl.edu> wrote:

Thanks Eric, very good arguments. I remain skeptical that the Corps will deliver anything of value to UCity. BTW, I was interviewed on Donnybrook Next Up a few weeks ago; I mostly did OK but a major goof is that I did not get a plug in for flood proofing, when I had a very fat opening. This show is filmed on the fly, with no questions provided in advance, nor editing after, but I missed the ball on this and a few other issues. All the best, Bob

Bob Criss
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Phone: (314) 935-7441
FAX (314) 935-7361
Email: criss@wustl.edu
<https://eps.wustl.edu/people/robert-e-criss>

On Sep 24, 2021, at 2:32 PM, Eric Stein <emstein1114@yahoo.com> wrote:

Commissioners,

Please see the first attachment for my comments on the USACE's new non-structural plan as described in the Sep.13 team meeting minutes distributed by Eric K. I am also attaching those minutes for your convenience should you wish to refer to them again.

See you Oct. 5.

Eric S

<Comments on USACE plan.docx><RdP Technical Alternatives mtg 2021-09-13 minutes.docx><20210913_EJK_Notes_USACE_Meeting.docx>

River Des Peres GRR Technical Meeting 9/27/21

Attendees:

Evan Hill, Rachel Steiger, Jordan Lucas, Lara Anderson, Janet Buchanan, Paige Scott, Terrence Ollis (USACE), Jeff Riepe (MSD), Sinan Alpaslan (University City), Todd Thompson, Eric Karch (University City Commission on Storm Water Issues)

Minutes:

New nonstructural analysis:

- Updates to costs and benefits made for nonstructural-only alternative, to get to the updated NED plan (plan with maximized net annual benefits)
- Recap of criteria for the nonstructural-only alternative:
 - o Residential with flooding 2+ feet above first floor → elevation
 - o Residential with -1 to 0 ft flooding relative to the first floor → filled basement
 - o Nonresidential flooding up to 3 feet above first floor → dry floodproofing
 - o Any that have cost of treatment exceeding buyout cost → acquisition
- DB4 and nonstructural-only alternative are neck and neck in terms of net benefits
- Jordan will send these costs to Paige to verify; still expect some revisions to these including revised floodproofing cost estimates; expect more certainty in cost estimates in next couple of weeks
 - o **Due out: Jordan – send updated analysis numbers to Paige to verify**
 - o With cost estimate changes, number of structures for acquisition may change
- Think it's likely that the NED Plan will be DB4 plus nonstructural; will do that analysis next
 - o **Due out: Jordan – do analysis for DB4 plus nonstructural plan**
- Looking under the hood of the nonstructural alternative: received guidance from the USACE Flood Risk Management Planning Center of Expertise (FRM-PCX); they want to see more plan formulation for nonstructural plans; they asked to break down study area into smaller subsections/reaches.
 - o Previously had looked at 25-yr event, 50-yr event, and 100-yr event
 - o Now want to know which event maximizes benefits in each reach
 - o Looked at 10-yr, 25-yr, and 50-yr event this time (to see upper and lower bound around 25-yr which had highest benefit last time)
- 20 reaches identified; different events maximize benefits in each reach so this can also be called the “mixed plan”
- Some reaches don't have positive net annual benefits with nonstructural treatments; No Action is recommended for these
- Looked at structure counts and types of measures by reach
- In the 50-year aggregation, total of 199 structures
- In the mixed plan, total of 119 structures; 39 structures acquired, 37 basements filled, and 43 floodproofed
- Elevation was not cost effective for any structures in any of the aggregations; the cost went up and properties previously IDed for elevation would be cheaper to acquire

Questions about the new nonstructural analysis

- Eric Karch – Commission was wondering about the new threshold for elevation, 2+ feet of water above the first floor (main floor) [for residential]. Concern about houses with water 0-2ft above the main floor. How to explain why these homes not included?
 - o Jordan – residential structures with 0-2 ft flooding on the main floor are unfortunately not eligible for any nonstructural treatment due to cost; elevation is prohibitively costly for these; an awkward position where nonstructural measures aren't feasible from a cost benefit perspective. I.e. alternative 7 from previous analysis (elevation only) had negative net benefits, was not justified. We're trying to protect as many people as we can while being efficient with our costs; if we elevate every structure, we couldn't justify the project
 - o Eric – trying to look out for what's best for the community, want the most people to be helped. Need to help people understand why those with 0-2 feet, still vulnerable, not helped; hard to explain
 - o Jordan – can find how many structures being talked about
 - o **Due out: Jordan – find out how many residential structures with 0-2 ft flooding in each event/plan**
- Eric – the 2013 economic update looked at a 5-year event as the trigger for acquisition; had 97 structures with BCR 1.5. Can you look at 5-yr event and update the 2013 analysis?
 - o Jordan – yes, can do that; already planning to look at an acquisitions-only plan for structures damaged in the 5- or 10-year event for comparison. Think will look at 100-year event as well
- Janet – if needed, can make adjustments to the maximized NED plan/mixed plan to make it the LPP
- Todd – is it correct that the criteria are based on a reasonable budget that allows us to have a project, vs any other objective? The 2 foot or 1 foot above main floor can sound arbitrary.
 - o Jordan - The 2 feet was geared toward inclusivity, trying to protect more people, balanced with cost efficiency – a two tiered approach
 - o Todd – think incumbent to identify how those criteria were established; people out of the range will feel left out
- Sinan – will USACE take this new analysis to the vertical team? They previously mentioned continued visibility on changing TSP
 - o Jordan – yes. Revisions made are in response to guidance from vertical team, and this group; [will take new analysis to vertical team, likely in an In Progress Review IPR meeting]
- Todd – what was the breakdown methodology of dividing the area into reaches?
 - o Jordan – method was based on extensive discussion with the FRM-PCX. Structure groupings included criteria such as political jurisdiction (U City, Overland, Olivette, St Louis); residential vs nonresidential; historic structures; and other criteria. Idea was to break it up in a way that facilitates plan formulation
 - o **Due out: Jordan – write up methodology of how reaches were identified/delineated (incl. criteria)**
- Eric – there aren't too many structures in reaches 1-3, which are outside U City; appropriate to limit to U City limits?
 - o Jordan – that's a choice the team can make
 - o Janet – can check on whether we can remove reaches 1, 2, and 20 as part of NED plan or as a separate alternative

- **Due out: Janet – check with Monique and Michelle on guidance for removing reaches based on political boundaries**
- Todd – by including them now, shows that the study wasn't just limited to U City limits, it suggests it was more comprehensive look at the area
- Janet – real estate considerations for U City for properties outside city limits?
- Terrence – disclaimer that this is a high level answer, but, U City or its contractor would generally be responsible for requiring the lands, easements, rights of way etc.

Survey

- Eric – Batting around changing the questions; will share final questions as a heads up
- Timing – will need time to work with SEMA to issue the survey; Commission and city will use feedback to help make the decision about an LPP. (Know Corps can't use results in study.)
 - 2 months from now to ADM seems a bit pressed
- **Due out: Janet / Matt J – look at schedule/timeframe to walk back from ADM; consider pushing ADM**

Commission meeting

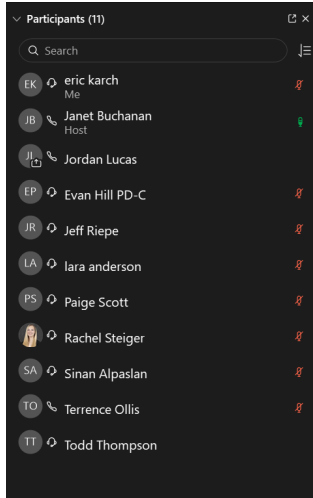
- Commission will meet on October 5th (next week)
- Janet – can attend and/or have others attend if it would be helpful
- Eric – think not for now; will let you know if that changes

Next technical meeting

- **Due out: Janet – set up next technical meeting in 2 weeks**

Due outs:

- Jordan – send updated analysis numbers to Paige to verify
- Jordan – do analysis for DB4 plus nonstructural plan
- Jordan – find out how many residential structures with 0-2 ft flooding in each event/plan
- Jordan – write up methodology of how reaches were identified/delineated (incl. criteria)
- Janet – check with Monique and Michelle on guidance for removing reaches based on political boundaries
- Janet – set up next technical meeting in 2 weeks
- Janet / Matt J – look at schedule/timeframe to walk back from ADM; consider pushing ADM



Survey

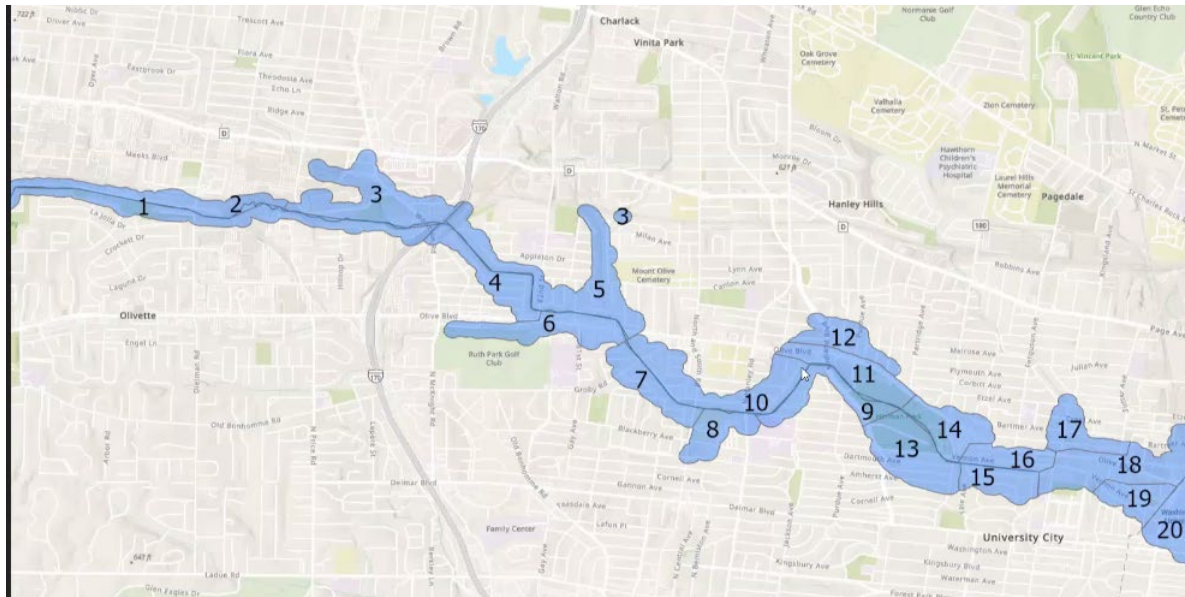
- USACE wants to know our decision by late Nov ADM meeting
- Eric indicated we need at least another month to issue survey, process results and make a decision. Another factor in timeline is fact that nonstructural criteria are still changing and the schedule needs to allow time for nonstructural option to be made final and allow City/Commission to make our decisions prior to finalizing TSP
- USACE indicated late November timeline is looking less reasonable and will likely push it back

Updates to costs & benefits for nonstructural-only alternative to get updated NED plan

Detention Basins 3 and 4		Detention Basin 4		U12 w/ Detention Basins 3 and 4		Nonstructural Only	
Total Project Costs		Total Project Costs		Total Project Costs		Total Project Costs	
First Cost	\$ 48,939,000	First Cost	\$ 9,066,000	First Cost	\$ 64,156,000	First Cost	\$ 20,121,000
Interest During Construction	\$ 1,857,000	Interest During Construction	\$ 227,000	Interest During Construction	\$ 2,434,000	Interest During Construction	\$ 505,000
Total Investment Cost	\$ 50,796,000	Total Investment Cost	\$ 9,293,000	Total Investment Cost	\$ 66,590,000	Total Investment Cost	\$ 20,626,000
Estimated Annual Costs		Estimated Annual Costs		Estimated Annual Costs		Estimated Annual Costs	
Annualized Project Costs	\$ 1,791,000	Annualized Project Costs	\$ 328,000	Annualized Project Costs	\$ 2,348,000	Annualized Project Costs	\$ 727,000
Annual OMRR&R	\$ 20,000	Annual OMRR&R	\$ 10,000	Annual OMRR&R	\$ 30,000	Annual OMRR&R	\$ -
Total Annual Costs	\$ 1,811,000	Total Annual Costs	\$ 338,000	Total Annual Costs	\$ 2,378,000	Total Annual Costs	\$ 727,000
Average Annual Benefits		Average Annual Benefits		Average Annual Benefits		Average Annual Benefits	
Total Annual Benefits	\$ 2,436,000	Total Annual Benefits	\$ 1,222,000	Total Annual Benefits	\$ 2,734,000	Total Annual Benefits	\$ 1,531,000
Net Annual Benefits	\$ 625,000	Net Annual Benefits	\$ 884,000	Net Annual Benefits	\$ 356,000	Net Annual Benefits	\$ 804,000
Benefit to Cost Ratio	1.35	Benefit to Cost Ratio	3.62	Benefit to Cost Ratio	1.15	Benefit to Cost Ratio	2.11
Residual Risk	\$ 2,716,000	Residual Risk	\$ 3,930,000	Residual Risk	\$ 2,418,000	Residual Risk	\$ 3,621,000

Nonstructural

- Previously looked at 25 year event
- Vertical team suggested breaking into reaches, then for each reach, decide which probability event maximizes benefits (map of reaches below)
 - o Reach limits based on attributes including political jurisdiction (Olivette, U City, St Louis City), residential vs business, economic criteria
 - o Some question as to whether the Olivette and St Louis City (reaches 1, 2, 3, and 20) structures should be a part of the study



Reach	Nonstructural Plan		Economic Development Benefits			
	Annual Exceedance Probability Aggregation	with Maximum Net National Annual Damages Reduced	Annual Project First Cost	Net Annual Benefits	Benefit-Cost Ratio	
1	No Action	\$0.00	\$0.00	\$0.00	-	
2	50-Year	\$25.12	\$8.04	\$17.08	3.13	
3	50-Year	\$253.56	\$16.08	\$237.48	15.77	
4	50-Year	\$12.03	\$8.59	\$3.44	1.40	
5	50-Year	\$183.67	\$142.51	\$41.16	1.29	
6	10-Year	\$9.71	\$8.04	\$1.67	1.21	
7	No Action	\$0.00	0	\$0.00	-	
8	No Action	\$0.00	0	\$0.00	-	
9	No Action	\$0.00	0	\$0.00	-	
10	10-Year	\$61.70	\$55.45	\$6.25	1.11	
11	50-Year	\$192.67	\$78.15	\$114.52	2.47	
12	50-Year	\$34.87	\$26.28	\$8.59	1.33	
13	No Action	\$0.00	0	\$0.00	-	
14	50-Year	\$171.92	\$85.19	\$86.73	2.02	
15	50-Year	\$155.39	\$139.92	\$15.47	1.11	
16	No Action	\$0.00	0	\$0.00	-	
17	No Action	\$0.00	0	\$0.00	-	
18	50-Year	\$160.08	\$101.03	\$59.05	1.58	
19	No Action	\$0.00	0	\$0.00	-	
20	50-Year	\$270.31	\$40.19	\$230.12	6.73	
Total		\$1,531.03	\$709.46	\$821.57	2.16	

Which of 10-, 25-, 50-year aggregations yields best NAB. Here are some examples of results of analysis

- Reach 2, there was no change in the different frequency storms
- Reach 4 – 50 year is best NAB
- Reach 6 – 10 year is best NAB
- Reach 13 – never has good NAB, so no action

Average Annual Project First Cost (Thousands)				Benefit Cost Ratios				Net Annual Benefits (Thousands)						
Reach	No Action	10-Year Aggregation	25-Year Aggregation	50-Year Aggregation	Reach	No Action	10-Year Aggregation	25-Year Aggregation	50-Year Aggregation	Reach	No Action	10-Year Aggregation	25-Year Aggregation	50-Year Aggregation
1	\$0.00	\$0.00	\$0.00	\$0.00	1	\$ -	-	-	-	1	\$0.00	\$0.00	\$0.00	\$0.00
2	\$0.00	\$8.04	\$8.04	\$8.04	2	\$ -	3.13	3.13	3.13	2	\$0.00	\$17.08	\$17.08	\$17.08
3	\$0.00	\$8.04	\$16.08	\$16.08	3	\$ -	21.10	13.77	15.77	3	\$0.00	\$161.57	\$237.48	\$237.48
4	\$0.00	\$22.96	\$35.92	\$35.92	4	\$ -	1.05	1.18	1.40	4	\$0.00	\$1.04	\$5.42	\$8.44
5	\$0.00	\$49.36	\$123.60	\$142.51	5	\$ -	1.13	1.30	1.25	5	\$0.00	\$6.64	\$37.07	\$41.16
6	\$0.00	\$8.04	\$13.45	\$16.84	6	\$ -	1.21	1.09	1.06	6	\$0.00	\$1.67	\$1.25	\$1.06
7	\$0.00	\$0.00	\$6.55	\$21.85	7	\$ -	-	0.41	0.49	7	\$0.00	\$0.00	(\$3.89)	(\$11.06)
8	\$0.00	\$0.00	\$0.00	\$0.00	8	\$ -	-	-	-	8	\$0.00	\$0.00	\$0.00	\$0.00
9	\$0.00	\$2.77	\$2.72	\$0.56	9	\$ -	0.86	0.86	0.99	9	\$0.00	(\$0.40)	(\$0.37)	(\$0.03)
10	\$0.00	\$55.45	\$63.05	\$70.08	10	\$ -	1.11	1.00	1.06	10	\$0.00	\$6.25	\$0.08	\$4.21
11	\$0.00	\$22.15	\$44.04	\$61.15	11	\$ -	3.15	2.71	2.47	11	\$0.00	\$69.09	\$85.36	\$114.52
12	\$0.00	\$22.00	\$15.62	\$26.28	12	\$ -	-	1.47	1.33	12	\$0.00	\$0.00	\$7.29	\$8.59
13	\$0.00	\$138.87	\$260.62	\$319.67	13	\$ -	0.61	0.41	0.49	13	\$0.00	(\$54.10)	(\$154.94)	(\$194.51)
14	\$0.00	\$32.15	\$85.19	\$85.19	14	\$ -	2.18	2.02	2.02	14	\$0.00	\$38.06	\$86.73	\$86.73
15	\$0.00	\$38.86	\$101.96	\$139.92	15	\$ -	0.82	1.12	1.11	15	\$0.00	(\$6.08)	\$12.18	\$15.47
16	\$0.00	\$5.17	\$52.96	\$97.39	16	\$ -	0.81	0.84	0.79	16	\$0.00	(\$0.98)	(\$8.26)	(\$20.72)
17	\$0.00	\$0.00	\$0.00	\$1.91	17	\$ -	-	-	0.11	17	\$0.00	\$0.00	\$0.00	(\$1.32)
18	\$0.00	\$12.61	\$84.99	\$101.03	18	\$ -	1.01	1.62	1.38	18	\$0.00	\$0.09	\$52.86	\$59.05
19	\$0.00	\$28.11	\$101.49	\$98.49	19	\$ -	0.65	0.46	0.44	19	\$0.00	(\$8.38)	(\$54.89)	(\$53.12)
20	\$0.00	\$0.00	\$40.19	\$40.19	20	\$ -	-	6.73	6.73	20	\$0.00	\$0.00	\$230.12	\$230.12
Total	\$0.00	\$433.18	\$1,046.42	\$1,273.76	Total	\$ -	1.53	1.50	1.42	Total	\$0.00	\$231.55	\$527.80	\$538.16

Total Project First Cost (Thousands)				
Reach	No Action	10-Year Aggregation	25-Year Aggregation	50-Year Aggregation
1	\$0.00	\$0.00	\$0.00	\$0.00
2	\$0.00	\$227.98	\$227.98	\$227.98
3	\$0.00	\$227.98	\$455.96	\$455.96
4	\$0.00	\$639.91	\$451.52	\$241.64
5	\$0.00	\$1,399.90	\$3,305.51	\$4,041.87
6	\$0.00	\$227.98	\$381.46	\$477.51
7	\$0.00	\$0.00	\$185.77	\$619.78
8	\$0.00	\$0.00	\$0.00	\$0.00
9	\$0.00	\$78.38	\$177.68	\$177.68
10	\$0.00	\$1,572.57	\$1,786.32	\$1,587.70
11	\$0.00	\$811.92	\$1,332.60	\$2,216.54
12	\$0.00	\$0.00	\$442.94	\$745.43
13	\$0.00	\$3,938.77	\$7,391.70	\$9,086.55
14	\$0.00	\$911.92	\$2,416.23	\$2,416.23
15	\$0.00	\$960.32	\$2,891.70	\$3,956.38

Top left table = Results by reach of pure benefits without costs

Eric pointed out that since they are now looking at a range of frequency storms, wouldn't it be prudent to look at the 5-year event, which was the recommended event from the 2013 Economic Update. Corps responded they will, but that a full buyout was already looked at and was not viable due to costs of buyouts. They also pointed to the next set of tables, specifically Net Annual Benefits (Thousands), which shows that there was a reduction in benefits from the 25-year to the 10-year, so there will be no increase in benefit for a 5-year event.

Structure counts and types by reach; in no case does elevation work out; cost to acquire always better than elevate; mixed plan is selected for TSP. Structures with 0 to 2 feet flooding above main floor are not provided with any remediation. Not filling basements for structures with flooding on main floor. Are filling basements for water at -1 to 0 feet with respect to the main floor.

They are using first floor to mean the main floor, acknowledging that FEMA use of first floor can mean basement)

	10-Year				25-Year				50-Year				Mixed Plan			
	Elevation	Floodproof	Fill Basement	Acquisition	Elevation	Floodproof	Fill Basement	Acquisition	Elevation	Floodproof	Fill Basement	Acquisition	Elevation	Floodproof	Fill Basement	Acquisition
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	0	1	0	0	0	1	0	0	0	1	0	0	0	1	0	0
3	0	1	0	0	0	2	0	0	0	2	0	0	0	2	0	0
4	0	0	9	0	0	6	0	0	0	4	0	0	0	0	4	0
5	0	0	11	2	0	0	11	10	0	0	11	12	0	0	11	12
6	0	1	0	0	0	1	2	0	0	1	3	0	0	1	0	0
7	0	0	0	0	0	0	2	0	0	0	5	1	0	0	0	0
8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9	0	0	1	0	0	0	1	0	0	0	2	0	0	0	0	0
10	0	0	7	4	0	0	8	5	0	0	7	6	0	0	7	4
11	0	4	0	0	0	6	0	1	0	9	0	1	0	9	0	1
12	0	0	0	0	0	2	1	0	0	4	1	0	0	4	1	0
13	0	14	5	1	0	26	4	5	0	32	7	5	0	0	0	0
14	0	4	0	0	0	9	0	2	0	9	0	2	0	9	0	2
15	0	0	10	0	0	0	9	11	0	0	6	18	0	0	6	18
16	0	0	2	0	0	2	4	5	0	3	3	11	0	0	0	0
17	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
18	0	1	0	1	0	10	0	1	0	12	5	1	0	12	5	1
19	0	3	0	0	0	9	6	0	0	9	0	0	0	9	0	0
20	0	0	0	0	0	5	0	0	0	5	0	0	0	0	0	0
Total	0	29	45	8	0	71	55	41	0	83	58	58	0	43	37	39
		Total		82		Total		167		Total		199		Total		119