

# **REPORT 1**

## **SUMMARY RECOMMENDATIONS, CENTRAL ARLINGTON HEIGHTS WATERSHED**

### **1.0 INTRODUCTION/BACKGROUND**

This report summarizes a study of feasible options to address chronic flooding in the watershed known as the Central Arlington Heights watershed. This flooding problem has posed challenges to the City of Fort Worth, as all previous solutions identified were extremely expensive and beyond the reasonable funding capacity of the city's storm water utility. The previous solutions were based on application of traditional engineering approaches to a specified design criteria, and the Feasible Options study seeks to identify additional measures using more innovative and alternative approaches that do not necessarily recognize a specific criteria.

The fundamental purpose of the study is to identify options to the previous recommendations for further consideration by the engineering team engaged by the city for the Central Arlington Heights watershed (Freese & Nichols). It is based upon a strong engagement with the project stakeholders and general public, along with a high level analysis of potential measures and analyses. This approach allows for a swifter identification and public vetting of potential measures without getting mired in a time consuming and expensive modeling exercise.

The Feasible Options Study has identified measures that can be implemented immediately to address, to some degree, the chronic flooding in the Central Arlington Heights watershed. It has also identified options that could be implemented to provide more meaningful reductions. However, the Feasible Options Study only conducted a reconnaissance level analysis of these measures. Before implementation, appropriate engineering analysis and design is necessary to properly evaluate and implement the flood reduction measures. Therefore, the recommendations presented herein are stated as Near-Term, Mid-Term, and Long-Term. Near-Term recommendations require no further study, and should be implemented as resources allow; Mid-Term recommendations require some less detailed analysis prior to final design and/or coordination with the timing of other measures; and Long-Term recommendations require additional analysis which will be completed by the City as they complete their ongoing Feasibility Study for the watershed.

This summary report presents an overview of the findings. A more detailed report (Report 3) has been prepared that provides documentation of the analyses supporting the conclusions.

### **2.0 NEAR-TERM RECOMMENDATIONS**

The following recommendations assist in providing a measure of relief to chronic flooding, and should be implemented now:

**2.1 Install underground detention modules in Western Avenue right-of-way in conjunction with scheduled street re-construction project.** The City has plans to reconstruct Western Avenue between Bryce Avenue and El Campo Avenue, and presents an opportunity to install underground detention as described in Recommendation No. 3.2. This recommendation calls for the installation of underground detention in conjunction with this project, as presented in Recommendation No. 3.2, as a demonstration project.

**2.2 Install underground detention modules in Ashland Avenue right-of-way in conjunction with scheduled water and sewer project.** The City has plans to replace sanitary sewer and water lines in the right-of-way of Ashland Boulevard between Bryce

Avenue and El Campo Avenue, and presents an opportunity to install underground detention as described in Recommendation No. 3.2. This recommendation calls for the installation of underground detention in conjunction with this project, as presented in Recommendation No. 3.2, as a demonstration project.

**2.3 Acquire available properties near Hulen Street and Bryce Avenue and install interim detention storage.** This recommendation represents the immediate implementation of Recommendation No. 3.1. Some properties in this area have been listed for sale, and any such properties should be acquired by the City in anticipation of a future detention basin. In the interim period, before full implementation of Recommendation No. 3, a small detention basin or bioretention/rain garden should be installed and maintained.

**2.4 Acquire flood prone residences on a voluntary basis, and develop and implement secondary use plan.** This recommendation calls for the city to, if approached by the property owner, purchase chronically flood prone homes within the area designated on the following exhibit. Eligibility for a voluntary acquisition would have to be determined, but it should emphasize acquisition of homes that have a history of being impacted by flooding. The city should work with the community to develop an acceptable secondary use plan for these properties, and should see to it that the residual property is maintained in a manner that meets the community's expectations. The secondary use plan can consider the following options (or other options identified by the city and/or stakeholders):

- *Bioretention/Rain Gardens* – Bioretention, also known as rain gardens, calls for the installation of native vegetation in lower areas with the goal of providing storage of excess rainwater. The native vegetation results in a lower maintenance demand and also facilitates the absorption of runoff.
- *Maintenance Agreements* – These are agreements between the city and another party (typically adjacent landowners, but potentially others or the neighborhood association) where the party agrees to maintain the property and is given the opportunity to utilize the property (often as an extension of their lawn). Acceptable uses would include landscaping or temporary amenities (swings, benches). Unacceptable uses would include structures or fences.
- *Lease Agreements* – These are agreements between the city and another party (typically adjacent landowners, but potentially others or the neighborhood association) where the party leases the property from the City for a nominal amount. The lessee would be responsible for the maintenance, and have the ability to use the property for more potential uses than with a maintenance agreement. They may not construct permanent structures, but they may install temporary structures and fences. The party would exercise care, custody, and control of the property.
- *Community Garden* – The residual property could be established as a community garden. This would likely be managed by the Neighborhood Association through a lease agreement or a maintenance agreement. The idea is that willing residents could secure a small plot for a vegetable garden. The area would likely be fenced and secured.
- *Pocket Parks* – The residual properties could be developed by the city and/or the neighborhood association as small pocket parks, providing a public amenity for the community. The pocket parks may have active recreation elements such as playground equipment, or they may have more passive elements such as landscaping, picnic tables, and park benches.

This is just a short list of potential secondary uses. If contiguous properties are acquired, the opportunity for secondary uses increases.

### **3.0 MID-TERM RECOMMENDATIONS**

The following recommendations would provide an incremental amount of flood reduction, but require schedule coordination with initiatives by others and/or the negotiation of legal agreements, along with some less detailed analysis prior to final design.

**3.1 Acquire land and construct surface detention basins near Bryce Avenue and Hulen Street.** This alternative evaluated the benefits of acquiring commercial and multi-family residential properties near the intersection of Hulen Street and Bryce Avenue. Once acquired, surface detention would be constructed on the properties in a manner that would fit aesthetically into the community. Drainage structures will be installed to divert excess runoff that currently collects along Bryce Avenue (before overflows head south down the alley between Western Avenue and Hulen Street). These structures will divert excess flow into the detention basin. This alternative will require aggressive excavation since these properties are higher in elevation, and therefore this alternative is less cost effective. This alternative could be supplemented by underground detention or surface detention in the Walgreens parking lot.

**3.2 Install underground detention modules in city rights-of-way in conjunction with street re-construction projects.** This initiative calls for the installation of underground detention in street rights-of-way. A major cost of such installations is repaving, therefore the underground detention should be installed in tandem with city street reconstruction projects. Within public right-of-way, it is recommended that underground detention consist of reinforced concrete box structures, and not the pre-manufactured storage modules provided by vendors. As street construction is scheduled, each project should be evaluated for suitability for underground storage. It is noted that this recommendation is most suitable in lower areas of streets, and will not be suitable in “upland” areas.

**3.3 Install underground detention at Stripling Middle School and South Hi Mount Elementary schools.** Alternative 4.1.1 calls for detention at Stripling Middle School and South Hi Mount Elementary schools, and includes storm sewer diversions to divert excess runoff to the detention area. The diversion is a major contributor to the cost and concerns regarding “constructability” of Alternative 4.1.1. This alternative calls for the installation of the same detention described in Alternative 4.1.1, but without the diversion. The resultant measure will reduce flooding in the local areas around the schools. It will also serve as a demonstration of the use of the manufactured underground storage modules.

### **4.0 LONG-TERM RECOMMENDATIONS**

The following long term recommendations would provide meaningful reduction, but additional study and stakeholder coordination is necessary before moving forward. The additional study is necessary to ensure that the plans are “constructable”, cost-effective, and acceptable.

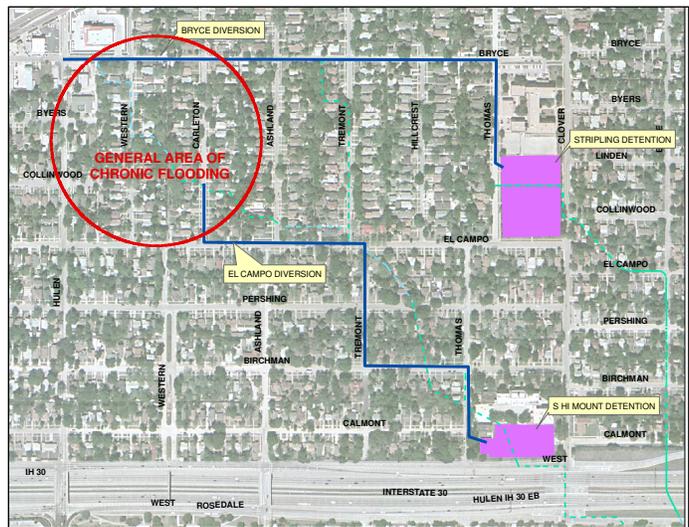
**4.1 Construct meaningful detention storage in the watershed that alleviates flooding in the vicinity of Bryce Avenue and El Campo Avenue.** Without a substantial project to increase overall drainage capacity to the Trinity River (all options for which were shown to be economically infeasible), the only structural means to achieve substantial flood reduction is by constructing designated floodwater storage facilities in the

watershed. Drainage infrastructure would be constructed, as necessary, to direct excess runoff from flood prone areas to the designated storage areas.

Two specific detention alternatives were identified in the Feasible Options Study. At this time, Alternative 4.1.1, below, is recommended for further study. Furthermore, it is recommended that Alternative 4.1.2 be “shelved” due to the lack of community support. These two are described below:

**4.1.1 Divert Flow to FWISD Detention Sites.** This alternative concept is shown below. The two Fort Worth Independent School District (FWISD) campuses provide open space that can be utilized for detention. At Stripling, the storage could take the form of underground storage and/or surface detention; while at South Hi Mount, the storage would take the form of underground detention. While surface detention is substantially more cost effective, the Stripling proposal calls for the utilization of the athletic field inside of the existing track – a use that may not be acceptable to the FWISD (although the field could continue to be utilized – it would just be lowered by about eight feet with a slope along the sides that could be used for spectators).

In order to be effective at reducing flows in the most flood prone areas, it is necessary to construct a new diversion storm sewer along Bryce Avenue to direct flow to the basin. This storm sewer will have to gravity flow against natural grade, requiring a very deep storm sewer in some locations. Construction would likely require tunneling and could therefore become very costly. Another diversion storm sewer, partially along El Campo Avenue, will be required to divert flows to the South Hi Mount detention area.



During the Feasible Options Study, a pre-engineering analysis was conducted. It is estimated that approximately 30 acre-feet of storage could be provided in the two detention areas, along with the necessary diversion pipes, for an approximate cost of \$12 million (the cost of acquiring an easement from the school district is uncertain). In addition, uncertainties about the construction of the diversion could result in costs that are prohibitively expensive. The resultant level of service would be increased from about a one-year event to a five-year event. Additional engineering level study is necessary to confirm and refine the feasibility, cost, and level of service calculations.

In presentations to stakeholders and the general public, this alternative was well received and supported. However, it will require the support of the FWISD. As of yet, the City has had no formal conversations with FWISD officials about this.

**4.1.2 Construct greenway detention on approximately 15 acquired residential properties along Western Avenue, Carleton Avenue, and Ashland Avenue.** This alternative concept is shown below. It considers the acquisition of approximately 15 properties that are most prone to chronic flooding. These homes will be relocated and/or removed, and the remaining property will be used to provide surface detention. The detention will be constructed along a greenway designed by landscape architects to provide a community amenity, and the community would be engaged to assist in determining the most desired amenities. The storage area would be maintained by the City of Fort Worth.

During the Feasible Options Study, a pre-engineering analysis was conducted. It is estimated that approximately 15 acre-feet of storage volume could be provided in four detention cells. These cells would be connected by a new pipe, and the downstream cell would gravity outfall into the existing trunkline. Since the detention cells would be in the natural low areas, there



would be no need to divert flows to the basin. The total cost would depend upon the ultimate configuration of the detention cells, but it is estimated that the detention storage, including the cost of acquiring the homes, would cost approximately \$6 million. The resultant level of service would be increased from about a one-year event to a five-year year event. It should be noted that this level of service is achieved partially via detention and partially by removing the most flood prone properties, and therefore the benefits from the project are substantially enhanced by the removing the most flood prone properties. Additional engineering level study is necessary to confirm and refine the feasibility, cost, and level of service calculations. However, initial analysis indicates that this is easily the most cost-effective method of reducing damages from chronic flooding in the Central Arlington Heights watershed.

In presentations to stakeholders and the general public, this alternative was not well received. Most stakeholders opposed mandatory acquisition of properties by the City. Among those subject to chronic flooding, there was both support and opposition to this plan. As such, this alternative is not recommended at this time, and will only move forward if it becomes implementable after a sufficient number of voluntary acquisitions.

As noted in the presentation of these two alternatives, additional study at a higher level of detail is necessary before moving forward with either of these alternatives. Furthermore, these two alternatives are not mutually exclusive, and it would be reasonable to implement both of these plans. Due to community sentiment, Alternative 4.1.1 is recommended at this time, while Alternative 4.1.2 is not recommended.

## 5.0 THE PLANNING PROCESS

This Feasible Options Study was necessary to identify solutions that are (1) effective at reducing flooding, (2) affordable and economically sound, and (3) acceptable to the public. In fact, to be considered feasible, plans must recognize each of these and strive to strike the appropriate balance between them. Each of these three items is presented and discussed in the following section.

**5.1 Effectiveness.** In order to reduce damages flooding, it is necessary to either (1) increase the ability of the drainage system to move runoff from the neighborhood to the river (conveyance); (2) provide storage areas for excess runoff (detention); (3) decrease the amount of runoff by increasing absorption (rain barrels, pervious pavements); (4) acquire and remove flood prone property (buyout); and/or (5) cope with the flooding (flood insurance, floodproofing). These approaches are not mutually exclusive, and some use of each may be applied. Some of these are more effective than others, and it is important to identify meaningful measures that are effective in reducing flood damages.

Furthermore, there are aspects of particular plans that may hinder construction, and therefore these plans may be considered to lack “constructability”. It is important for plans to not only be effective, but to be relatively “constructable”.

**5.2 Affordability.** The economic viability of solutions is important. Not only should plans be affordable, but they must have appropriate value. In terms of affordability, the City has limited funds to address flooding citywide. The cost of any solutions to flooding in the Central Arlington Heights watershed must be affordable within the context of the City’s overall capital budget capacity.

Plans must also provide appropriate value. Studies indicate that 58 homes are subject to flooding from an event expected to occur only once every one-hundred years. Many of these homes are also subject to more frequent flooding. In total, it is estimated that the net present value of flooding in the Central Arlington Heights is between \$10 million and \$15 million. Solutions should be in appropriate scale with this estimated cost of flooding.

**5.3 Acceptability.** Another facet of feasibility is acceptability by stakeholders, who are those most impacted by the proposed solutions to flooding. A number of community meetings were held in order to ascertain the desires and objections of the stakeholders, and to attempt to gain consensus regarding proposed projects.

The section above lists presents three different elements to feasibility. The fundamental challenge is that these three are often in conflict and in tension. Past studies identified plans that are effective and acceptable, but that are not affordable. There are other solutions that are effective and affordable, but not acceptable. And there is a whole universe of projects that are acceptable and affordable, but just do not provide meaningful reduction in flooding.

The City has a fundamental responsibility to its Storm Water Utility rate payers to be stewards of public money, and therefore there a desire to identify the most cost effective solutions. In situations where the city recommends and implements solutions that are not the most cost effective, it is necessary to (1) present a compelling rationale for pursuing alternative plans, and (2) continue to identify plans that are otherwise affordable and economically viable.

Report 5 contains expanded information regarding recommendations for future Feasibility Planning studies.

## 6.0 ACTION ITEMS

The following actions are recommended with respect to the Central Arlington Heights watershed:

- 6.1 Initiate/continue coordination and communication with the Fort Worth Independent School District and commercial property interests near the Hulen/Bryce intersection.** Recommendations presented in this report consider the utilization of the campuses of Stripling Middle School and South Hi Mount Elementary School, as well as existing properties near the Hulen/Bryce intersection. As such, it is important to establish a long running dialogue and communication with these parties. It should be noted that the city has engaged each of these.
- 6.2 Install underground detention in conjunction with Western Avenue repaving and the Ashland Avenue sanitary sewer and water replacement.** These city projects are scheduled in the near term, and present an opportunity to install underground detention as a demonstration of this approach. These projects need to be analyzed, and suitable locations for detention must be defined.
- 6.3 Prove up feasibility of storm drain diversions to school sites.** This study involves a reconnaissance level evaluation of the suitability of the storm drain diversions presented as Recommendation No. 4.1.1. However, additional evaluation at a greater level of detail is necessary to ensure that this alternative is feasible. This should include engineering analysis, schematics, and the verification and refinement of costs and benefits.
- 6.4 Coordinate within the City to identify and implement detention opportunities with other City projects.** Besides the two projects identified in Action Item 6.1, there are likely other opportunities within the Central Arlington Heights watershed (and citywide) where the timing of City projects presents opportunities for flood mitigation.
- 6.5 Complete engineering design of recommended measures, and initiative construction as funding and priorities permit.** All measures require, to some extent, pre-construction engineering and design. These designs should be completed in anticipation of funding in order to expedite implementation and to provide a basis for decision making and project programming.
- 6.6 Ongoing.** The city should continue stakeholder and community engagements, continue its commitment to maintenance of existing infrastructure and assets, and remain forward looking at opportunistic. Opportunities and partnerships should be pursued as they become available.