

HUITT-ZOLLARS, INC.

# NCTCOG Blue-Green-Grey Inlet Floatables Filter Project for the City of Allen

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## Summary Report

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Prepared for:



**North Central Texas  
Council of Governments**

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## 1 Project Background

The City of Allen population has grown to exceed 100,000 people per the 2020 census. Therefore, the city must now meet Phase II Level 4 Texas Commission of Environmental Quality (TCEQ) stormwater permitting requirements by 2024. These requirements include the implementation of infrastructure to reduce discharge of floatables and the collection of floatables in at least two locations within the city limits. The predominant source of debris and floatables entering the city's storm sewer systems via transportation corridors is curb inlets. The City of Allen currently utilizes a proprietary inlet filter system during construction of inlets to collect sediment and floatables, however no post construction collection activity is currently implemented.

Through the North Central Texas Council of Governments (NCTCOG) Blue-Green-Grey grant, this project was funded to develop an innovative solution to develop non-proprietary inlet floatables collection filters to assist the City of Allen in meeting TCEQ stormwater permitting requirements. The goals of Inlet Floatables Filter and collection system are:

- Be compatible with various types of inlet structures for use in City, State, and Federal projects.
- Serve as a permanent and effective mode of removal of floatables and first flush debris while being compatible with existing inlet structures.
- Allow the inlet to continue to meet hydraulic capacity requirements if located within street pavement and does not have significant impact of the hydraulic efficiency.
- Ensure ease of maintenance and ability to install in heavy traffic corridors.
- Provide additional sediment filtration during construction will be included in the design.

The details are standardized so that they can be incorporated for use by other city, state, and federal entities, including those entities that may need to meet Phase II Level 4 TCEQ requirements, and when working with other private and public entities such as TxDOT. The City's goal is to incorporate this system into their community to alleviate stormwater pollution and meet TCEQ permitting requirements.

## 2 Project Summary

### 2.1 Data Analysis and Literature Review

A data analysis and literature review report was created to discuss the different Best Management Practices (BMPs) implemented across the United States and describe the current conditions of the City of Allen. Additionally, the current solution the City of Allen uses for inlet filtration, the P2 filter, was reviewed. While these filters effectively remove floatables and sediment, they are only used during the construction phase and not as a permanent filter. The goal of the Inlet Floatables Filter design is to successfully filter floatables from stormwater runoff post-construction and prevent sediment from entering the stormwater system during inlet construction. Since Inlet Floatables Filters are not a standard practice in North Texas, most of the literature analyzed described different systems and methods to achieve floatables removal

and water quality benefits. One important finding was the configuration of the LittaTrap and StormSack filters; the removable filter basket will greatly increase the ease of maintenance of the floatables filters. Increasing the grate opening size from those specified in the proprietary designs will allow for the removal of floatables without having a significant impact on the hydraulic capacity of the inlets. Furthermore, the addition of a detachable fines filter for construction, similar to those found in the literature review, will allow the City of Allen to meet construction environmental standards as well. Upon completing a site visit of the City's P2 filters in use and getting feedback from maintenance staff on the maintenance process, further research on sediment filter materials was conducted. Based on this research, the material recommended for the attachable sediment filter should consist of a hard, durable high-density polyethylene, meeting the sediment filtration needs while ensuring ease of maintenance. Due to the effectiveness of floatable removal and ease of maintenance, the concept of a removable filter basket for permanent floatable removal with the option of an additional sediment filter for construction was implemented for the Inlet Floatables Filters.

The Inlet Floatables Filters were designed to reduce the presence of floatables within and being discharged by the City of Allen's storm drain system. The design includes an additional temporary HDPE fines filter to capture sediment during construction per current City practices. City of Allen GIS data and construction details were analyzed to develop the filter system to best fit the City's current and future needs. Historical information was also analyzed to establish the increase of floatable waste.

## **2.2 Allen ISD STEAM Center Involvement**

Two workshops were conducted with students at Allen Independent School District's STEAM Center, one in December and one in April. The first workshop served as an opportunity to introduce the students to the various aspects of the project; permitting requirements, considerations and challenges, the design process, etc. It also included an opportunity for the students to review proprietary solutions and conceptualize a design of their own. Components from various student submitted designs were implemented in the final design provided; these components included the slanted baskets for ease of drainage and handles for ease of removal, among others. The second workshop included an overview of the finalized design and an opportunity for the students to brainstorm potential challenges as well as potential locations for implementation. Feedback received from students at the second workshop was considered in the location recommendations included, examples of student recommendations pictured below.

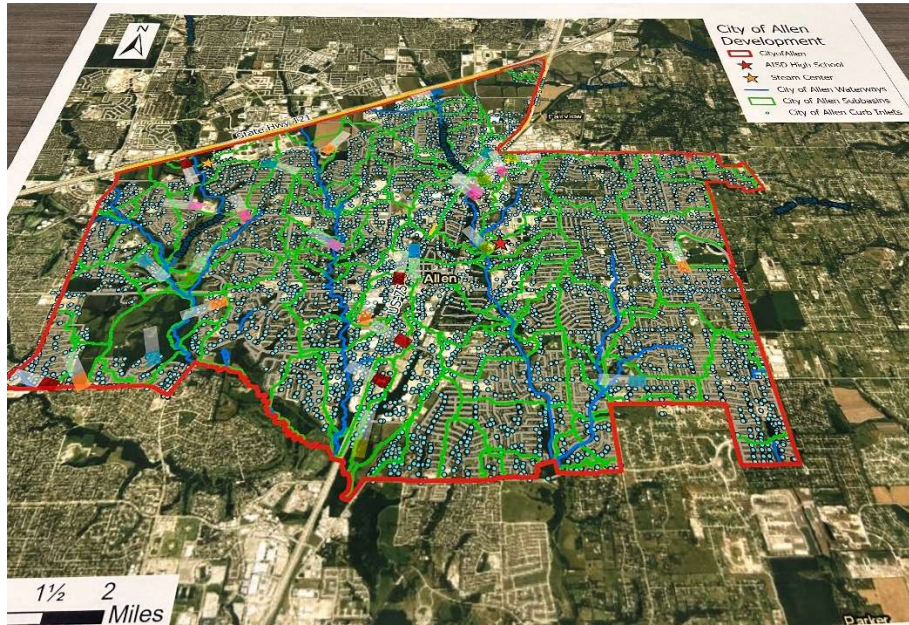


Figure 1: STEAM CENTER Student Filter Location Recommendations

### 2.3 Standard Details and Specifications

During the design phase various, standard details and specifications were created for the City of Allen. The size of the system will vary with different inlet types; therefore, various configurations were included to ensure that the proper filter baskets will be installed for the varying inlet types. The configurations are modular, which allows designers to use the configuration with the proper inlet type and dimensions to determine the proper filter dimensions and quantities. Volumes for floatables and sediment collection for the various inlet configurations are summarized in the table below.

Inlet Type	Basket Volume (CF)	Sediment Filter Volume (CF)
Allen Curb (based off 10' inlet design)	10.07	3.35
TxDOT Curb (based off 15' inlet design)	6.25	2.64
Grate (based off 2 grate inlet design)	3.16	1.96
Allen WYE (based off 3'x3' inlet design)	2.92	2.05
TxDOT PAZD (based off 3'x3' inlet design)	4.26	2.88

Table 1: Basket and Sediment Filter Capacities

Standard details and specifications were created to be compatible with inlet standards from the City of Allen and the Texas Department of Transportation. The details created are for the construction of the Inlet Floatables Filters in existing and future inlet structures. The specifications include all the information needed to construct and implement the system, including material requirements and construction methods.

The following details were created:

- Inlet Floatables Filter Plan View
- Inlet Floatables Filter Profile
- Inlet Floatables Filter Cross Section
- Inlet Floatables Filter 3D View
- Inlet Sediment Filter Detail
- Inlet Floatables Filter Support Bar
- General Notes for Inlet Floatables Filter Maintenance

The following specifications were created:

- Inlet Floatables Filter Components
- Inlet Floatables Filter Hydraulic Efficiency

## **2.4 Location Recommendations**

The Inlet Floatables Filters need to be installed at two locations within the city limits to meet the Phase II Level 4 Texas Commission of Environmental Quality (TCEQ) stormwater permitting requirements. Factors that were considered when determining locations for recommendation were ease of access for maintenance, high traffic area for higher floatables concentration, and inlet compatibility with design. The two top recommended locations are at the Allen ISD STEAM Center along Ridgeview Dr and at Allen ISD High School along North Greenville Avenue as pictured in the figure below.

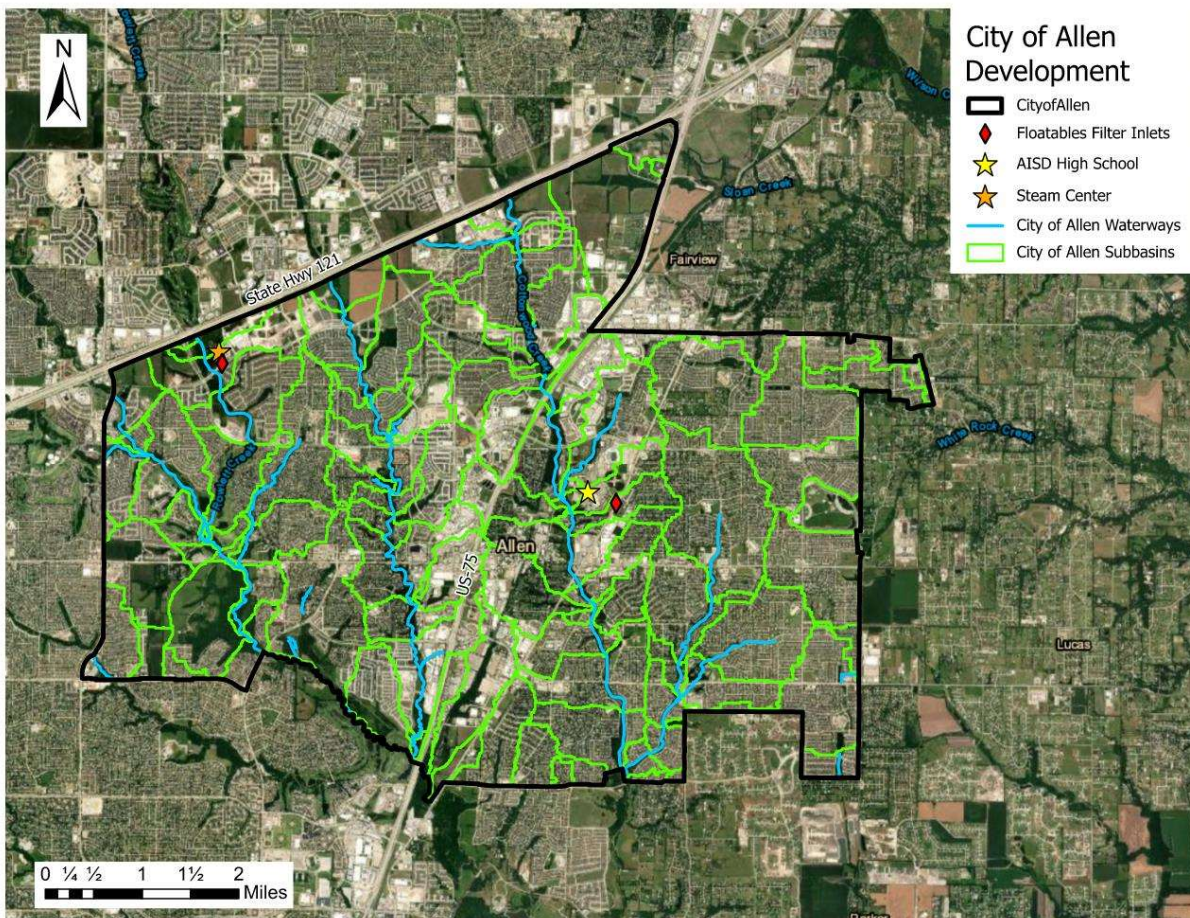


Figure 2: City of Allen Floatables Inlet Filters Location Recommendations

### 3 Moving Forward

The next step is for the City of Allen to conduct a pilot program at the two recommended locations to be approved by the city. Though the details created were predominantly related to curb inlets, the design is customizable and can be retrofit to various inlet types. For instance, grate and wye inlets are currently in use in the City of Allen stormwater system. There have been multiple discussions with the City of Allen about potential locations across the city where this system could be implemented, all of which would be optimal sites.

### 4 Lessons Learned

There were multiple design challenges faced during the development of the BMP. First, the BMPs are quite varied across the country. A benefit of learning about the different BMPs was that best practices could be implemented into the new Inlet Floatables Filter design. The size of filtration grate opening was altered from the LittaTrap and StormSack designs to allow for easier

maintenance for the City of Allen. Another necessity when trying to incorporate best practices from other BMPs is to confirm that the design would not compromise the hydraulic capacity of the inlet. After deciding on the composition of the permanent filter structure and sediment filter, the challenge was finding reasonably priced material sources near the City of Allen.

One of the most difficult challenges was making the system applicable regardless of inlet structure type. The goal was that Inlet Floatables Filter would be a customizable system that could be implemented on any existing or newly constructed inlet. However, that means that every system installed will be uniquely dependent on the location. Therefore, the design had to be flexible so that it would not negatively affect existing infrastructure while also serving the purpose of filtering the urban stormwater runoff.

## 5 Summary

The Blue-Green-Grey grant allowed for the design of an Inlet Floatables Filter that improves the stormwater quality entering the stormwater system and then creeks throughout the City. The system can be implemented all over the city or North Texas in various inlet types. Due to the system's scalability and affordability, implementing the Inlet Floatables Filters at two locations could counteract the runoff pollution problems associated with the growth and development of the city.



## 6 References

City of Allen. *Standard Construction Details – Storm Drainage*.

City of Allen. *Standard Construction Details – Water*.

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Fabco Industries. *StormSack – Geotextile catch basin insert stormwater filter for trash and debris capture*.

Federal Highway Administration. *Standard Specifications for Construction of Roads and Bridges on Federal Highway Projects*.

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NCTCOG - Integrated Stormwater Management. *iSWM Hydraulic Technical Manual*.

Texas Commission on Environmental Quality. *Stormwater permitting requirements for Phase II (small) MS4s*.