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COVER PAGE

Innovation Study Title: Stream Corridor Restoration & Open channel Master Plan Implementation

Category: Sustainability

Jurisdiction Name: City of Mission Hills, KS

City/County Manager: Courtney Christensen

Population: 3500

Submit Innovation Study for an Alliance Innovation Award **Yes [ ]** **No [ ]**
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Stream Corridor Restoration and Open Channel Master Plan Implementation

A natural feature of Mission Hills is six miles of streamway that meander throughout the City contributing to its unique, countryside community character despite the fact that it is in the heart of the Kansas City metropolitan area. A study of the stream corridor, revealed that exposed sanitary sewer crossings, stagnant pools, and failing stream channels walls were putting the open channel system at risk in the City of Mission Hills, Kansas. While none of the corridor was categorized as being in disrepair, it was determined that resources should be allocated to protect the riparian corridor so that the City would not be forced to underground and pipe the creek and its tributaries. Prior to entering the City of Mission Hills the water from the creek goes through a series of underground pipes, concrete culverts, and man-made channels, and when it finally enters Mission Hills, it has a high velocity resulting in erosion and sediment deposit in addition to not having been cleaned at all resulting in detrimental effects on the City's stream corridor. To keep the stream corridor naturalistic, the City of Mission Hills had to take steps to protect the vegetation and habitat from the chemicals entering the streamway and the flash flooding that resulted in sediment deposit and erosion. But how do you do that in a City that is known for its well-manicured lawns and magnificent landscaping?

In 2008, after three years of working with Black & Veatch and Patti Banks Associates and several public hearings, the Planning Commission and the Park Board adopted an Open Channel Master Plan to encourage high water quality, stream stability and preservation of community character over the long term within the city's stream corridors. The Open Channel Master Plan educates property owners on the importance of stream buffers and how they can preserve or create them on their property, provides information to help homeowners ensure that chemicals used in lawn maintenance do not harm water quality, explains how impervious surface can be replaced with pervious surface to reduce runoff, and develops guidelines for wall construction along community streams. Since the implementation of the Master Plan in 2008, the city has completed three stormwater projects to demonstrate the guidelines described in Open Channel Master Plan to residents—the restoration of Peetwood Park, Hiawassee Park, and Willow Lake.

The three restoration demonstration projects have implemented innovative approaches to stormwater modeling and bioengineering to mitigate channel degradation, restore stream bank stability, improve water quality, and protect adjacent property and infrastructure as well as vegetation and aquatic life.

Hiawassee Park. Hiawassee Park was one of the areas that suffered from severe erosion to the point where sewer lines were being exposed. The City worked with the Park Board to design a planting plan that was to be implemented in three phases with appropriate vegetation to stabilize the creek bank. The project is still in its implementation phase, and the City is struggling with the growth of the plants and eradicating the invasive grasses and weeds that hinder the growth of the desired plants. However, within a three-year period, erosion has already ceased in the area.

Peetwood Park. The Open Channel Master Plan showed where Brush Creek would be in 50 years if left to its own devices. Instead of stabilizing the creek in its current place, the Peetwood Park project relocated the centerline of the creek, creating a natural, meandering

channel pattern, in order to reduce sediment deposit and erosion and implemented plantings and stack stone walls in accordance with the Open Channel Master Plan. As with Hiawassee Park, erosion and sediment deposit has stopped. Following a water quality test, it was determined that the water quality has improved slightly.

Peetwood Park is also an arboretum and the erosion and sediment deposit was destroying the trees. Traditional tree wells hold water and drown trees in flood situations, so the City experimented with two types of tree wells—a stack stone tree well and a stone and mortar tree well with pervious concrete serving as the mortar. As far as the City could tell, this is the first time pervious concrete has been used in this manner. After a year and a half, both of the experimental tree wells are working equally well to drain the water and the trees are doing better in the experimental tree wells than in the traditional tree wells. From experience, the City knows that stack stone will outlast stone and mortar, but the life expectancy for the stone and mortar with pervious concrete is yet to be seen. However, it does offer residents the opportunity for a more formal looking tree well, if that is what they desire.

Willow Lake. The Willow Lake Restoration project is not an active channel but applies the same principles and guidelines of the Open Channel Master Plan to an urban pond suffering from erosion and decay. The lake was filling up with biomatter causing the lake to become shallow, and during warm weather the aquatic life in the lake would perish. Additionally, there was a pollution problem from debris from the open creek channel and direct runoff from the roadway being deposited into the lake, making it uninhabitable for most aquatic life and vegetation. The first experimental technique used on the Willow Lake project was a wetland forebay that cleans the water that comes directly off of the roadway through a series of plants and cascading rocks as well as a wetland bench that was designed around the lake with layers of plantings that are appropriate for different water levels to improve the water quality. The second experimental technique used was a baffle box, an engineered structure that is used to catch the trash and slow the water flow, dumping the trash and sediment before it enters the lake. Thirdly, an aeration system was installed on the bottom of the lake that is intended to break up the biomatter to avoid having to dredge the lake. Within three-months of planting the wetland bench, dragonflies, herons, and mallard ducks returned to this natural habitat. Since its completion in 2010, the water quality of Willow Lake has improved slightly, which is encouraging as the project has not even been completed for a year. The amount of biomatter will be measured in September to determine if the aeration system is working.

Bioengineering is a sustainable way to preserve and maintain the naturalistic stream corridors throughout the city and improve the water quality, but it requires commitment and patience from the city and its citizenry. The timing of the plantings is very difficult, as rain events are unpredictable, and the city must budget for and be prepared to replant the entire area or portions of it (potentially several times). The first five years, the project will require a lot of maintenance in order to eradicate grasses and weeds that hinder the growth of the desired plantings. However, unlike a stone and mortar wall that begins to deteriorate the day it is installed, the bioengineering continues to improve over time and after the first five years becomes self-maintaining.

Ninety-four percent of the stream corridor is privately owned in the City of Mission Hills. The most important outcome of the Open Channel Master Plan has been the residents' dedication to the long-term sustainability, maintenance and preservation of their open channel system despite the increase in impervious surface and pollution that is so detrimental to it. Property owners are becoming more conscientious of what they are doing next to the creek, and the City has seen an increase in stream buffer zones and the removal of stone wall channels. The citizens of Mission Hills want to protect the stream corridor and want the water to be cleaner when it leaves Mission Hills than it was when it entered.

It is recommended that this presentation be a mobile tour as it is a case in environmental innovation, and the best way to demonstrate what the City has done is take participants on a tour of Hiawassee Park, Peetwood Park, and Willow Lake. The project location is within 10 minutes of the conference center. However, this presentation could also be done through PowerPoint and handouts.