GREENBRIAR ELEMENTARY SCHOOL
WATER QUALITY IMPROVEMENTS
PROJECT

For

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY
IGIG ASSISTANCE AGREEMENT
NUMBER 1108

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Prepared for:

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1.0 Introduction

Northbrook School District 28 (NSD 28) has completed a significant addition and renovation of Greenbriar Elementary School, a 360 student elementary school located in Northbrook, Illinois. As part of the project, NSD 28 has incorporated innovative storm water management strategies targeting runoff pollutants identified in the North Branch Chicago River Watershed-based Plan and the Stage 1 TMDL Report. The school replaced the existing parking lot with permeable pavers, installed green roofs on portions of the addition, constructed rain gardens with native vegetation, and build a dry detention basin with an area of native plantings. By doing these things, NSD 28 created an outdoor learning environment that will be used in the curriculum for their students and by the Village and community to teach about nonpoint source pollution and the benefits responsible redevelopment can have in their watershed

The mission of NSD 28 is to "educate students to be self-directed learners, collaborative workers, complex thinkers, quality producers, and community contributors." As part of that mission for the Greenbriar Elementary School, the School District decided to incorporate sustainable design elements into the school building and site which could be used to educate the faculty, students, and community about conservation and responsible building practices. Construction began June 1, 2011 and the project was completed August 24, 2012.

Through the Illinois Environmental Protection Agency's IGIG grant program, NSD has been able to implement the best management practices shown in Figure 1, and has begun to educate their students and community about water quality and sustainable development.

PERMEABLE PAVERS
RAIN GARDEN
RAIN GARDEN
NEW ADDITION
EXISTING BUILDING
GREEN ROOFS
RAIN GARDEN
DRY DETENTION
NATIVE PLANTS
NORTHBROOK DISTRICT 28
Wight
GREENBRIAR SCHOOL ADDITIONS & ALTERATIONS
Site Plan
Green Initiatives

Figure - 1

2.0 Project Description

2.1 Best Management Practices

Rain Gardens

2 Rain Gardens installed totaling 14,943 sf
Installed Cost: $52,400.00

The primary purpose of rain gardens is to infiltrate rainwater, reduce runoff, provide opportunities for groundwater recharge, decrease downstream flooding to control the erosion of stream banks, and facilitate pollutant removal.

Rain gardens have been installed adjacent the perimeter of the building for the elementary school to reduce stormwater and pollutant runoff, and to work in conjunction with the green roofs to treat the stormwater runoff from the building. Rain gardens have been shown to decrease stormwater runoff by up to 15% and effectively remove significant quantities of total suspended solids, nitrite, phosphate, phosphorus, and oil and grease. Surface runoff temperatures are decreased significantly. Rain gardens have been shown to remove up to 83% of total suspended solids, and between 40% and 60% of nutrients and metals.

The quantity of pollutants removed by the rain gardens is estimated for each pollutant listed:

BOD	16 lbs/year
COD	80 lbs/year
TSS	858 lbs/year
Total Nitrogen	1 lbs/year

Permeable Pavement

Installed 31,478 sf
Installed Cost: $304,900.00

The primary purpose of utilizing permeable pavers is to infiltrate rainwater, reduce runoff, eliminate problems with standing water, provide opportunities for groundwater recharge, decrease downstream flooding to control the erosion of stream banks, facilitate pollutant removal, and provide a more aesthetically pleasing site.

Permeable pavers have been installed for the bus drop-off/pick-up, staff and visitor parking for the elementary school to reduce stormwater and pollutant runoff. Permeable pavers have been shown to decrease stormwater runoff by 90% when used in conjunction with a swale. Permeable paver systems have also been shown to be very effective at removing total suspended solids, nitrite, phosphate, phosphorus, metals, BOD, and ammonium. Surface runoff temperatures are decreased by 3 to 5 degrees compared to asphalt. Permeable pavers have been shown to remove up to 91% of total suspended solids, and between 75% and 92% for metals.

The quantity of pollutants removed by the permeable pavers is estimated for each pollutant listed:

COD	279 lbs/year
TSS	1,295 lbs/year
Zinc	1 lbs/year
Total Nitrogen	10 lbs/year
Total Phosphorus	1 lbs/year

Green Roofs

2 Green Roofs installed totaling 2,921 sf
Installed Cost: $68,727.00

The primary purpose of the green roof is to reduce runoff, absorb heat, improve water quality, and facilitate pollutant removal.

The vegetated green roof will help decrease the buildings impact to the urban heat island affect, provide a great learning opportunity for the community and students, and aid the treatment train in the removal of pollutants.

The quantity of pollutants removed by the green roofs is estimated for each pollutant listed:

COD	2 lbs/year
TSS	22 lbs/year

Dry Bottom Detention Basin with Native Plantings

Installed 5,000 sf
Installed Cost Native Plantings Only: $11,760.00

The primary purpose of the dry detention basin is to reduce runoff and serve as a "last line of defense" in removing pollutants prior to leaving the site.

The dry bottom detention basin by itself is a very poor BMP, but as part of a greater "treatment train" it can serve as a last line of defense. Dry bottom detention basins have been shown to remove significant amounts of TSS, nutrients, and metals.

The quantity of pollutants removed by the dry detention basin is estimated for each pollutant listed:

BOD	84 lbs/year
COD	384 lbs/year
TSS	4,554 lbs/year
Lead	1 lbs/year
Zinc	1 lbs/year
Total Nitrogen	20 lbs/year
Total Phosphorus	2 lbs/year

2.1 Installation Costs

	Installed Quantity	Installed Cost	Estimated Quantity	Estimated Cost
PERMEABLE PAVERS	31,478 SF	$ 304,900.00	32,600 SF	$ 243,050.00
RAIN GARDENS	14,943 SF	$52,400.00	15,000 SF	$ 87,730.00
GREEN ROOFS	2,921 SF	$ 68,727.00	2,600 SF	$ 57,200.00
DETENTION BASIN	5,000 SF	$11,760.00	2,500 SF	$15,000
BMP SIGNAGE		$ 0.00		$ 32,900.00
TOTAL COST		**$437,787.00**		**$ 435,880.00**
75% IEPA FUNDING				**$326,910.00**
25% RECIPIENT MATCH				**$108,970.00**

The original budget total of $435,880.00 provided $326,910.00 (75%) is IGIG funds, while NSD 28 provided $108,970.00 (25%) local match. The final installed cost for the project is $437,787.00. The IGIG assistance amount remained at $326,910.00 (74.6%), while NSD 28 provided $110,877 (25.4%).

3.0 Information, Outreach, and Education

Although the BMPs, such as the permeable pavers, rain gardens, bioswales, dry bottom detention basin, vegetated buffer strips, and green roofs, will serve as an outward gesture of NSD 28's commitment to conservation and environmental stewardship, additional measures have been implemented to educate the public.

The School District has employed the following strategies to inform and educate the public about nonpoint source pollution, BMPs, and what they can do to improve water quality in their community.

3.1 Passive Outreach

1. *BMP Signage*
   - Six permanent interpretive signs have been placed in prominent BMP locations at the project site. Pictures of the signs are provided in the photographic documentation.
   -

3.2 Active Outreach

2. *Ongoing Student Education*
   - The students who attend the school are being educated about the sustainable site applications and BMPs implemented, and the purpose and benefits they provide.
   -

4.0 Project Evaluation

The project has been a huge success, and is generating a lot of interest in the educational community and in Northbrook. Wight & Company has been receiving many inquiries into the BMPs installed and about grants that were received. The water quality and educational goals are being met, and the benefits to the special needs students attending the school are immeasurable.

The load reduction worksheets are attached in TAB 3 demonstrating the expected pollutant removal rates. The total anticipated annual pollutant removal is summarized in the following table:

BOD	100 lbs/year
COD	745 lbs/year
TSS	6,729 lbs/year
Lead	1 lbs/year
Zinc	2 lbs/year
Total Nitrogen	31 lbs/year
Total Phosphorus	3 lbs/year

Photographic Documentation

View Looking South - Detention Basin Prior to Final Seeding

View Looking South – Native Plantings in Detention Basin

View Looking South – Rain Garden Along Eastside of Building Prior to Plantings

View Looking North – Rain Garden Along Eastside of Building after Initial Native Plantings

View Looking North – Rain Garden Along Eastside of Building following year Native Plantings

View Looking South – Rain Garden Along Eastside of Building Following Year Native Plantings

View Looking East – Rain Garden Along Northside of Building Following Initial Plantings

View Looking West – Rain Garden Along Northside of Building Following Initial Plantings

View looking northeast – Preparation of Sub-Base for Permeable Paver Parking lot

View looking northeast – Placing Permeable Concrete Pavers

View Looking North – Permeable Concrete Paver Parking Lot

View Looking Northwest – West Area Extensive Green Roof

View Looking East – West Area Semi-Intensive Green Roof (Area of Taller Plant Species)

View Looking Northwest – East Area Extensive Green Roof