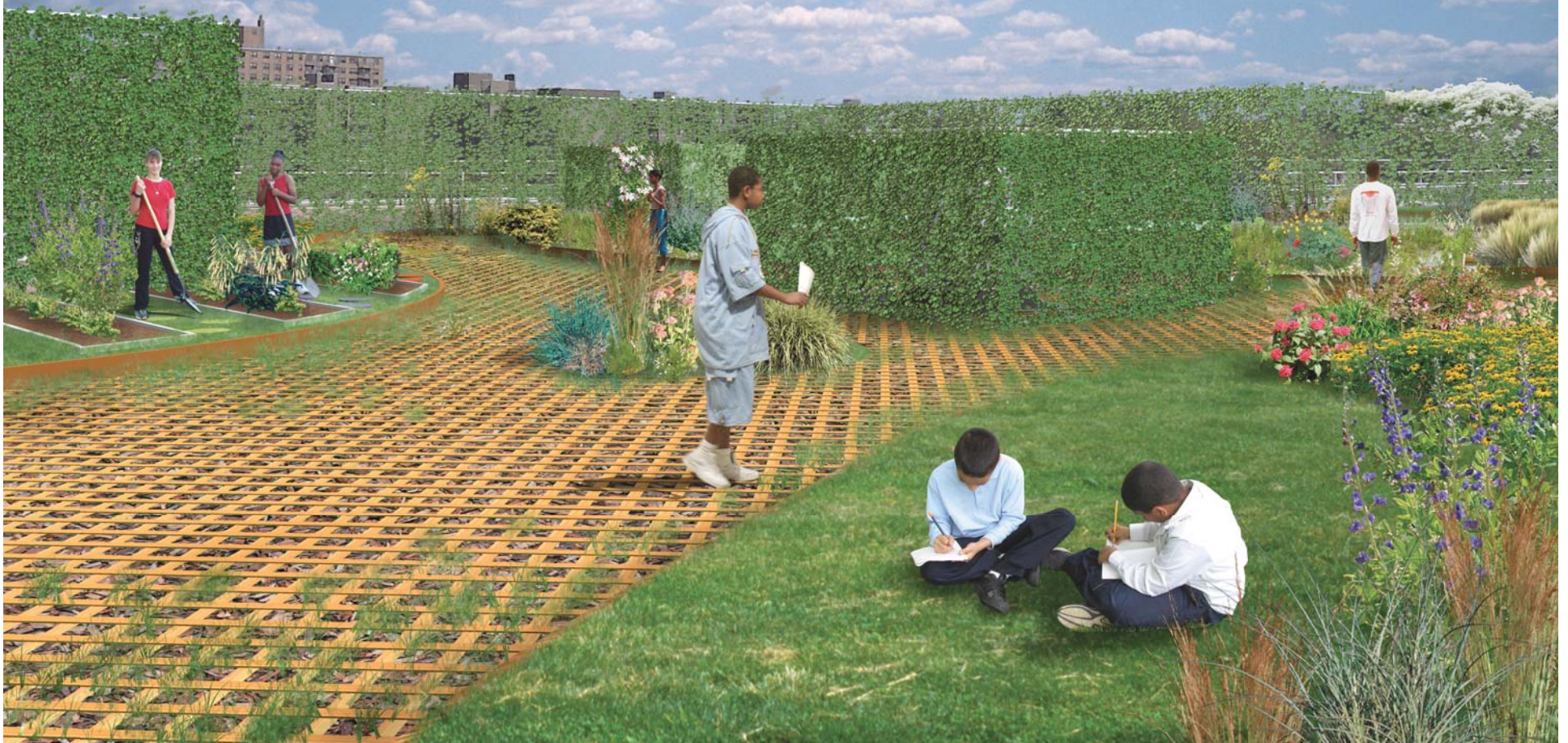


# THE STEVENSON GREEN ROOF A LIVING LABORATORY

A proposal by a public-private  
partnership to bring new opportunities for  
learning and stewardship to the Bronx





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## THE STEVENSON GREEN ROOF PROJECT: WHAT IS IT?

### FROM GREY TO GREEN

The Stevenson Green Roof will cover an area of roughly 40,000 square feet (just under an acre), partitioned into sections for maximum research and educational impact. It will be designed as a suite of classrooms, with designated spaces for teaching and outdoor experiments.



*The Stevenson Campus roof today*

*The Stevenson Green Roof project will transform the barren concrete roof of a building housing six schools into a living laboratory for hands on learning.*

- *Improved View for Area Residents*
- *Opportunity for Collaborative Project-based Learning*
- *Habitat for Migratory Birds and Insects*
- *Natural Air Purification*
- *Increased Roof Life*
- *Experimental Planting Beds*



*The Stevenson Campus Green Roof*

## PROJECT RATIONALE

Internationally, the U.S. is falling behind in science and mathematics education. In urban areas such as the Bronx, graduation rates are appallingly low and public schools are losing the community engagement that once made them neighborhood anchors. The cost of maintaining an inventory of aging school buildings is skyrocketing, even as buildings fall further behind standards in our more environmentally-conscious age.

Now, in New York City, opportunities present themselves:

- Student performance in New York City's growing cohort of small schools has reached high levels, as evidenced by increased graduation rates of in 2006;
- In October of 2005, Mayor Bloomberg signed "Local Law 86" which mandates the development of healthier, more efficient public spaces;
- This January, the School Construction Authority will implement enhanced Green Guidelines for new school buildings; and
- Green Technologies are growing easier to adopt, deploy and maintain in new and existing buildings.

The Stevenson Green Roof Consortium was formed to capitalize on these opportunities. The Consortium seeks to install a green roof on the Stevenson Campus building in the Soundview section of the Bronx. This roof will be one of the largest-ever monitored green roofs built in New York City and among the most innovative. In addition to the usual benefits that accrue from green roofs (reduction in summer air-conditioning costs and the cooling of ambient air), this project will bring unique advantages. Designed in collaboration with the schools of the Stevenson Campus to be a Living Laboratory, the roof will provide “green classrooms” that students and teachers will manage “hands-on,” leading to authentic learning in math and science. Backed by a leading scientific organization, the roof will be fully instrumented to support advances in the environmental sciences and green design that can directly benefit New York City school construction. New building technologies developed specifically for this project and backed by leading manufacturers and installers that greatly simplify installation and maintenance of green roofs will be made available to the city while insuring long term roof performance.

This exciting project is being spearheaded by an exceptional team of professionals—educators and educational advocates, architectural and landscaping designers, engineers and scientists, as well as community-based organizations. At this stage, over \$1,100,000 has been committed in pro bono goods and services and, maintenance, for the life of the green roof, has been secured as well.

In summary, the Stevenson Green Roof will bring enriched learning opportunities to the Stevenson Campus’s six high schools, a point of focus for enhanced community relationships, and an exciting model for the greening of New York City schools, pointing the way towards reduced operating costs and environmental/energy stewardship throughout the Department of Education’s inventory of aging buildings.

## OPPORTUNITIES FOR GREEN LEARNING



*The Stevenson Campus offers significant opportunities for green learning. The Green Roof is uniquely designed to take advantage of these opportunities.*

### STUDENT ACHIEVEMENT / CHALLENGES

#### Credit Accumulation in Math and Science

Student data for the Stevenson Campus schools indicates that a large proportion of students are off-track in Math and Science by the time they enter their fourth year of high school. To be considered on track, students must accumulate at least three credits in Math and three credits in Science by the end of 11th grade.

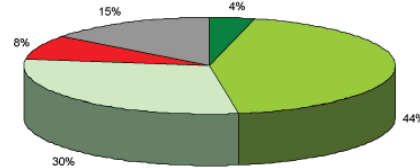
Students in cohort 07 who have accumulated less than 3 credits	Math 17%	Science 13%
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In other words, of the 247 students who are expected to graduate in 2007, 41 are off-track in Math and 33 students are off-track in Science. \* Based on December 2006 data.

#### Math and Science Regents Exams

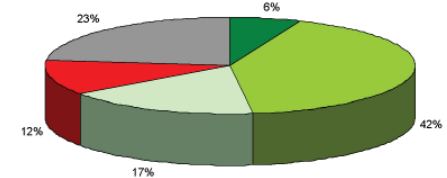
The Science Regents exams are designed to be taken by 9th graders. Yet, most students on the Stevenson Campus take at least two years of Life Sciences before taking the Living Environment Regents exam. 35% of the current seniors at Stevenson small schools have either not taken or failed a Science exam. 23% of the current seniors at Stevenson small schools have either failed the Math Regents exam or not taken it. \* Based on December 2006 data.

Stevenson School Math Regents



■ Students with a grade of 85 or above (4)   
 ■ Students with a grade of 65 to 84 (3)  
■ Students with a grade of 55 to 64 (2)   
 ■ Students who took the exam and failed (1)  
■ Students who have not taken the exam

Stevenson School Science Regents



■ Students with a grade of 85 or above (4)   
 ■ Students with a grade of 65 to 84 (3)  
■ Students with a grade of 55 to 64 (2)   
 ■ Students who took the exam and failed (1)  
■ Students who have not taken the exam





### GREEN LEARNING OPPORTUNITIES

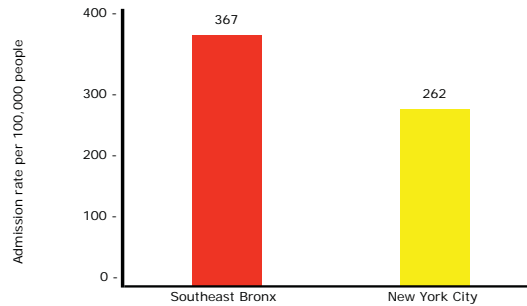
The Green Roof project can advance student learning in a variety of ways. Students will:

- Enhance problem solving abilities through authentic project-based learning in science and mathematics;
- Develop scientific habits of mind by conducting scientific inquiries in a living lab;
- Engage in hands-on experiments with plants and with data collection instruments;
- Make connections to the community while conducting surveys and analyzing data.

*When asked how the green roof would make a difference for students, Liz Brown, a Science teacher at Bronx Guild said it would give them an opportunity to do “hands-on work in Science.” The green roof will close the gap between classroom knowledge and real world applications for kinesthetic, visual and naturalist learners. At Brooklyn Academy of Science and Engineering (BASE), 97 percent of students passed the New York State Earth Science Regents after participating in a field study curriculum developed in partnership with staff scientists at the Brooklyn Botanic Garden.*

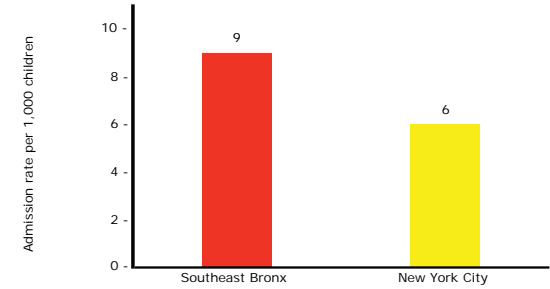
# COMMUNITY CHALLENGES

Asthma was among the leading causes of adult hospitalization in the Southeast Bronx in 2001, 40% higher than in New York City



Source: *The Health of the Southeast Bronx*. New York City Department of Health and Mental Hygiene. <http://www.nyc.gov/html/doh/html/data/data/shtml>

Asthma was a leading cause of missed school days and hospitalizations for children 14 years and younger in 2001



Source: *The Health of the Southeast Bronx*. New York City Department of Health and Mental Hygiene. <http://www.nyc.gov/html/doh/html/data/data/shtml>

*Opportunities for green science abound at the Stevenson Campus. The Green Roof will contribute to easing the neighborhood's severe environmental problems. And it will give scientists the data they need to design more environmentally beneficial green roofs.*

### Environmental Hazards: Stevenson Campus, the Bronx and NYS

#### Cancer Risks from Hazardous Air Pollutants (added cancer risk per million)



#### Density of Pollution Sources (criteria air pollutant facilities per square mile)



Source: Comparative Report Census Tract 001600 in Bronx County. Scorecard: The Pollution Information Site. [http://www.scorecard.org/community/ej-report.tcl?census\\_tract=36005001600#risk](http://www.scorecard.org/community/ej-report.tcl?census_tract=36005001600#risk)

*The density of pollution sources around the Stevenson campus is much greater than the rest of the Bronx and New York State.*

*People of color are subject to a greater environmental burden than whites.*

### Distribution of Environmental Burdens in the Bronx by Ethnicity

#### Releases of Toxic Chemicals (indicator of chemical releases)



#### Cancer Risks from Hazardous Air Pollutants (added risk per 1,000,000)



#### Facilities Emitting Criteria Air Pollutants (facilities per square mile)



*People of color represent 94% of the population in the immediate area around Stevenson campus: 77% of the population in the Bronx; and 31% of the population in New York State.*

Source: Summary Report: Bronx County. Scorecard: The Pollution Information Site. [http://www.scorecard.org/community/ej-summary.tcl?fips\\_county\\_code=36005&backlink=cap-co#compare](http://www.scorecard.org/community/ej-summary.tcl?fips_county_code=36005&backlink=cap-co#compare)

## OPPORTUNITIES FOR GREEN SCIENCE

*It was raining, but the 5th graders at St. Simon Stock begged me to take them to the roof. When we opened the big yellow double doors, the first boy out shouted “It smells like Puerto Rico!” “What do you mean?” “You know, the smell leaves make in the rain. I never get to smell that smell in the Bronx.” What better way to start an inpromptu lesson on decomposition of plant matter!*



\* Source: Rosenzweig, C., S. Gaffin, and L. Parshall (Eds.) 2006. Green Roofs in the New York Metropolitan Region: Research Report. Columbia University Center for Climate Systems Research and NASA Goddard Institute for Space Studies. New York. 59 pages. <http://ccsr.columbia.edu/cig/greenroofs/index.html>

### GREEN SCIENCE OPPORTUNITIES

#### **Biodiversity and wildlife value of green roofs**

- Green roof can conserve and restore endangered habitats, especially in urban areas.
- Native plantings can attract beautiful birds and butterflies, giving them much-needed micro-habitat on their migratory paths.
- Flora and fauna can be monitored and researched by students in an experiential learning setting.

#### **Green roofs and water management**

- Green roofs can retain and detain stormwater, and prevent it from ever reaching the sewer system.
- The vast majority of the surfaces in urban areas are impervious (paved over or roofed.)
- This imperviousness is a significant disruption to the natural hydrologic cycle. Instead of replenishing the local water table, stormwater along with non-point source pollution, enters the sewer system.
- In New York City, we have a combined sewer system, and with as little as one-tenth of an inch of rain, the system overflows, spewing 40 billion gallons of untreated waste annually into our surrounding waterways. 20% of this total (8 billion gallons) is raw sewage. [Source: Ascher, Kate. 2005. The Works: Anatomy of a City. New York: The Penguin Press.]

#### **Green roofs and air pollution**

- Green roof vegetation can filter out fine airborne particles, settling on leaves and stems until the next rain. During rain events, the particles are captured and remediated by the soil.
- Green roofs can trap heavy metals such as cadmium, copper, lead, and zinc, and prevent these metals from contaminating the water supply.
- Less pollution leads to a healthier population.

#### **Green roofs and urban heat island effect**

- Green roof vegetation is natural air conditioning.
- You will never burn your feet stepping on grass, but don't try walking on the adjacent asphalt during a heat wave. Vegetation is the reason Central Park and Soundview Park are the most comfortable places to be in Manhattan and the Bronx during a heat wave. Green roofs can provide the same cooling for buildings.
- Many heat wave related deaths occur on the top floor of buildings, just below the roof.
- Due to the heat-trapping quality of impervious (paved and roofed) surfaces, summer temperatures can be up to 7.2°F hotter in NYC than in surrounding areas. \*
- As heat increases, energy demand increases, increasing pollution generated from energy production.
- As heat increases, air quality declines (ozone levels rise) and public health declines. Is it any wonder there are so many asthmatics in urban areas?

## OPPORTUNITIES FOR GREEN BUILDING

*Can the performance of green roofs be dramatically improved at the same time that installation and maintenance are greatly eased?*

Based on an Inverted Roof Membrane Assembly (IRMA), Joe Hagerman and the designers at Rafael Viñoly Architects developed a new system that uses the building's insulation to protect the roof membrane and structure. This is achieved by using strong, long-lasting, and waterproof industrial Foamglas™ insulation in a new configuration that allows typical roof construction to be drastically simplified.

- It ensures that the roof's long-term thermal performance will not be compromised by leaks or water-logged soil;
- Its modular design makes installation quicker, easier, and cheaper;
- It allows easy inspection of the roof for potential leaks, without (as with other roofs) having to destroy and discard large quantities of soil and roofing.

### INCREASED ROOF LIFE

When covered with soil and vegetation, roof is less vulnerable to heat exposure and ultraviolet radiation from the sun, reducing the aging impacts on the roof. A typical roof membrane absorbs solar radiation in the daytime, causing a rise in surface temperature. At night, the absorbed heat is reradiated, causing a drop in surface temperature. This thermal stress negatively impacts the long-term performance of the membrane. The freeze/thaw cycle also causes expansions and contractions; ultimately resulting in cracks and leaks. Research shows that temperature fluctuations are much less extreme on green roofs, in all seasons and weather. Green roofs also absorb much storm water that tends to pool on regular roofs. Avoiding that pooling reduces leakages, and reduces wear and tear.

### INSULATION AND ENERGY EFFICIENCY

Energy consumption is reduced in five distinct ways.

- Direct shading of the roof (up to 90% reduction in solar gains). An experiment in Toronto showed a 25% reduction in summer cooling requirements in a one-story green roofed building;
- Evaporative cooling from the plants and the growing medium;
- Additional insulation values from both the plants and the growing medium;
- Thermal mass effects of the growing medium;
- Green roofs also save money by reducing size of HVAC equipment required.

### GREEN BUILDING ASSESSMENT AND PUBLIC RELATIONS

Green roofs can attain LEED points for reducing urban heat island effect and for storm water management. It can also contribute to a reduction in energy consumption. (LEED Certification will not be a factor in this project, but as per Local Law 86 of 2005, all SCA projects—new buildings or retrofits—above \$2 million will require compliance to LEED equivalency.)

*Like many aging buildings, Stevenson Campus presents significant opportunities for improvements through green design. The Stevenson Green Roof utilizes innovative technologies to make the most of these improvements.*

## THE GREEN ROOF A LOGICAL SOLUTION

Portions of the roof will include: experimental planting beds for students; including specific areas for native and non-native plants; open areas for class discussions; regulated areas for research; “cool roof” areas for comparative study; and storage areas for tools and equipment, including chairs.

*The Stevenson Green Roof is a unique and innovative design that will provide unmatched learning opportunities for students and teachers while enhancing the local environment, aiding science, and adding value to the Stevenson Campus.*



## THE STEVENSON GREEN ROOF: QUESTIONS AND ANSWERS

*The Stevenson Green Roof combines green learning, science, and building in a single innovative proposal representing a gift of over one million dollars in value to the children of the Bronx, the Department of Education, the School Construction Authority, and the City of New York. Before accepting this gift, prudent city officials will expect answers to fundamental questions about its feasibility, cost, and prospects for success.*

### HOW WILL THE GREEN ROOF AFFECT THE BUILDING'S STABILITY AND SAFETY?

The Green Roof will be completely safe and will not affect the building's stability in any way. Using the original construction drawings, supplemented by on-site inspection, senior engineers at Rafael Vinoly Architects have exhaustively studied the building's structural capacity. The strength of each beam and slab, and its resistance to various load factors, was individually calculated. The results were submitted to peer review by outside engineers. The analysis concluded that, using a conservative value for concrete strength and considering a live load of 60 psf, all structures affected by the Green Roof verify using the load factors from the current ACI 318-2005 provisions. This demonstrates that the structure is capable of sustaining the added weight of the Green Roof, including soil, plants, and rainwater, plus students and teachers, with no risk to the building's stability, safety, longevity, or occupants. The report will be made available to all interested officials.

### HOW WILL THE SAFETY OF STUDENTS AND TEACHERS ON THE ROOF BE ASSURED?

To ensure the safety of learners, and in accordance with New York City building code, the portion of the roof accessible to students and teachers will be enclosed with a ten-foot-high fence. In addition, roof access will be controlled by limiting entry points to two locked stairways plus a lift for wheelchairs, by providing security cameras, and by establishing campus-wide protocols for teacher supervision of students in green roof learning spaces. When the project is fully implemented a Green Roof Coordinator will be responsible for coordinating these components of the security program.

### HOW WILL THE GREEN ROOF AFFECT THE BUILDING'S EXISTING ROOF?

The Green Roof will not increase the risk of leaks and may decrease it. Before the Green Roof is installed, the existing roof will be thoroughly inspected and all existing weaknesses remediated by Tremco Roofing, a nationally known roofing contractor. Next, the Green Roof will be installed on top of the existing roof membrane. It will not affect its performance and may, by handling run-off more efficiently and by shielding the roof membrane from ultraviolet radiation and rapid temperature changes, extend its life. The Green Roof has been specially designed to facilitate easy and inexpensive access to the underlying roof membrane when repairs should become necessary.

## WHO WILL PAY FOR THE GREEN ROOF?

This project will be delivered to the Department of Education and the School Construction Authority at no cost. A diverse team of nationally-known leaders is partnering to design, construct, and program the roof. The services provided to the City at no cost include architectural, engineering, and landscape design, curriculum development, consulting services in biology, soil science, and climate science, roof inspection and remediation, construction management, and all contracting and construction. Pro bono commitments of goods include all roofing materials, insulation, and soil. Together, these goods and services are valued at over \$1 million. The partners are committed to securing all remaining components, including scientific equipment, plants, and fencing, at no charge to the city.

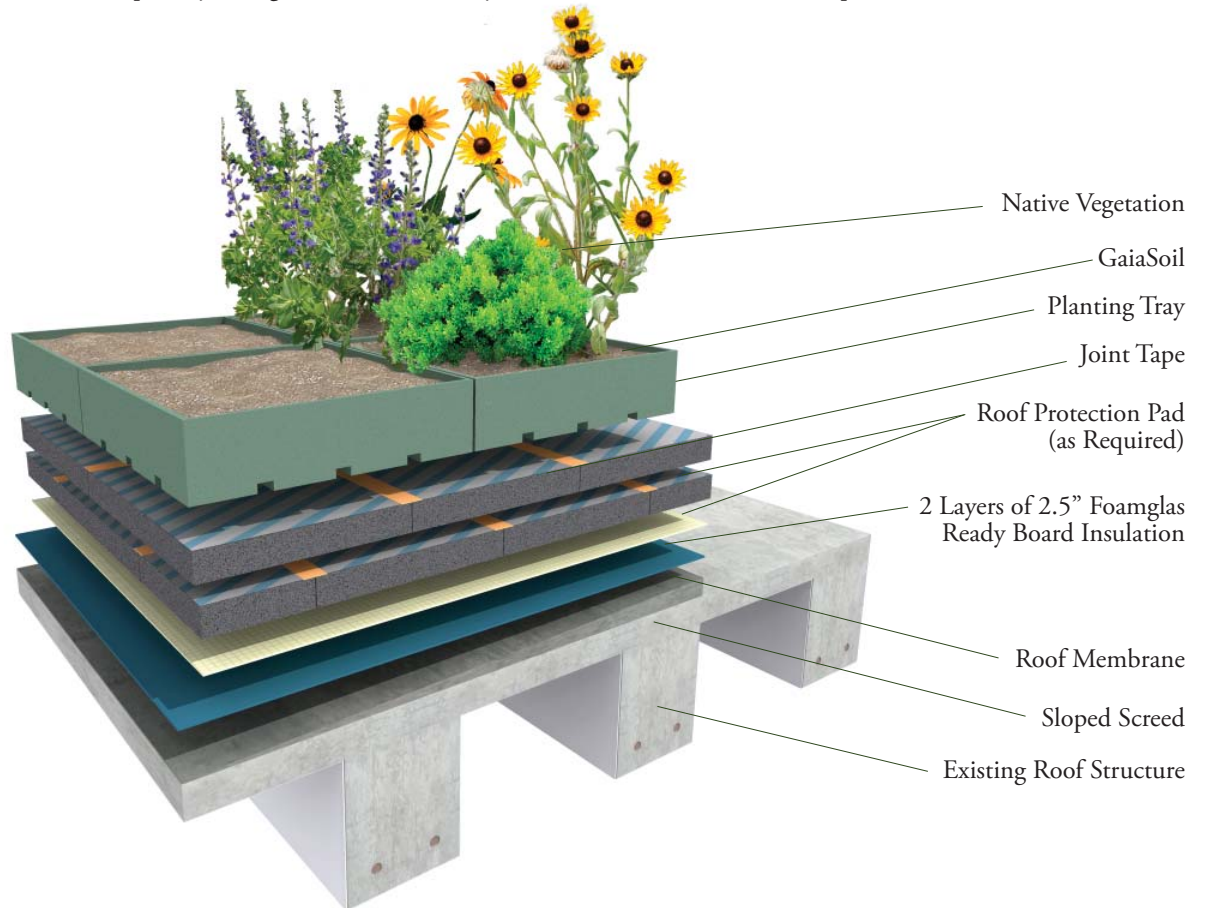
	per	unit	unit cost				%	
<b>DESIGN</b>	Initial Roof Consultation			\$	0.10	\$	5,000.00	
	Schematic Design			\$	0.15	\$	7,500.00	
	Design Development/Engineering			\$	1.50	\$	75,000.00	
	<b>DESIGN SERVICES</b>			\$	<b>1.75</b>	\$	<b>87,500.00</b>	8%
<b>ROOF REPAIR</b>	Roof Inspection	1.00	\$ 1.500		1.50	\$	75,000.00	
	Roof Repair	1.00	\$ 2.000		2.00	\$	100,000.00	
	<b>ROOF REPAIR</b>				<b>3.50</b>	\$	<b>175,000.00</b>	16%
<b>SOIL MEDIUM</b>	Native Vegetation	1.00	\$ 1.250		1.25	\$	62,500.00	
	Soil	3.00	\$ 0.500		1.50	\$	75,000.00	
	Geotextile	1.00	\$ 0.500		0.50	\$	25,000.00	
	Expanded Shale	1.00	\$ 0.750		0.75	\$	37,500.00	
<b>ROOF DELIVERY</b>	Vegatation Container	1.00	\$ 3.000		3.00	\$	150,000.00	
	Water Retention Pan	1.00	\$ 3.000		3.00	\$	150,000.00	
	ReadyBoard	2.00	\$ 1.500		3.00	\$	150,000.00	
	<b>SUBTOTAL</b>				<b>13.00</b>	\$	<b>650,000.00</b>	58%
<b>INSTALLATION</b>		33%			4.29	\$	214,500.00	19%
	<b>TOTAL</b>			\$	<b>22.54</b>	\$	<b>1,127,000.00</b>	100%
<b>\$15-22/SF</b>								

Monitoring Equipment <http://www.specmeters.com/>

Basic Weather Station	1	\$	1,750.00	\$	1,750.00
Correlate with LGA	1	\$	-	\$	-
Soil Moisture Sensors	10	\$	55.00	\$	550.00
Thermocouples	30	\$	41.00	\$	1,230.00
Flow Meter	1	\$	750.00	\$	750.00
Data logger	1	\$	750.00	\$	750.00
				\$	<b>5,030.00</b>

## WHAT MAKES THE DESIGN OF THE STEVENSON GREEN ROOF SPECIAL?

The Stevenson Green Roof utilizes an innovative design based on the incorporation of FOAMGLAS®, a product manufactured by Pittsburgh Corning. FOAMGLAS® is a cellular foamed solid consisting of expanded glass which does not wick up or retain water, thus making it an ideal insulator for wet environments. FOAMGLAS® has already been used by the School Construction Authority at projects including PS 89 and PS 14 and has been tested and certified to adhere to New York City and State approvals (NYC Department of Buildings, MEA #138-81-M for piping, equipment, walls and ceilings, and NYS Uniform Fire Prevention and Building Code DOS 07200-890201-2013). Its incorporation in the Stevenson Green Roof facilities the construction of a green roof on an existing school building and has been specially configured to facilitate easy installation, maintenance, and repair.



*Note: this system needs no roof insulation ballast, and the roof membrane can be easily inspected by un-installing the modular pieces of the system.*



## HOW WILL THE GREEN ROOF BE MAINTAINED?

The Green Roof is designed to need little maintenance beyond the routine attention already given to the roof. Starting in fall, 2007, however, the Stevenson Campus will create a staff position of Green Roof Coordinator to oversee necessary maintenance while coordinating curricular use of the roof. In addition, activities such as weeding and watering will be provided by Green Teens or a program modeled on it. Green Teens is designed to provide Bronx youth with environmental job training. It was founded by a teacher who is now at the High School for Community Research and Learning, one of the schools at Stevenson Campus.

## WHO WILL USE THE GREEN ROOF?

All schools within the Stevenson Campus will have access to the learning environments provided by the Green Roof. Development of math and science curricula, led by the Salvadori Center with participation of all interested Stevenson Campus teachers, began in the fall of 2006. The Salvadori Center is committed to maintaining its relationship with Stevenson Campus and, beyond curriculum development, will assist with implementation of new curricula and expansion to fields beyond science and math.

In addition to the Stevenson Schools, the scientific data collected by instruments on the roof will be made available over an internet connection to any schools interested in using it, as well as to scientists through the coordination of the Federation of American Scientists.

The Stevenson Schools have also invited Soundview Health Clinic and its clients to use the Green Roof, thus enabling the campus to further its effectiveness as a community center delivering services beyond education. Soundview Health Clinic is considering using the roof for activities including Lamaze classes and support groups for chronic diseases.

Finally, hundreds of windows look out onto the Stevenson roof, currently an expanse of bare concrete. The Green Roof will not only be a neighborhood amenity but also a showcase highlighting the creativity of Stevenson Campus teachers and students.

## CAN THE STEVENSON MODEL BE REPLICATED?

By using pre- and post-documentation (involving student learning, curriculum development, teacher and school usage, community involvement, health data and building performance) the Green Roof at Stevenson can serve as a pilot model for the introduction of Green Roofs to schools throughout New York City.

As the first study examining the performance of a large-scale Green Roof in an urban setting, the Stevenson Green Roof will significantly enhance green science. The data collected through flow meters, thermocouples and air quality monitors, will be studied and made widely available to scientists through the Federation of American Scientists as well as to the students and teachers on the Stevenson Campus.

The Roof will be the incubator for the next generation of green roof design and engineering, as well. The Hagerman system pioneered here has the potential to gain broad acceptance for green roofs by simplifying their design, installation and maintenance, and enhancing their durability. Most importantly, it has the potential to lower their cost. The backing of Pittsburgh Corning and Tremco assures that these innovations will reach the next generation of green roofs.

The Stevenson Green Roof will demonstrate that green design is a feasible option for communities of all socio-economic size and will encourage the adoption of green roofs throughout the city and beyond by demonstrating how a green roof gives a school an identity, a focus, and a open platform for students to engage with the science, math, and the physical world around them. The potential benefits that would accrue from many green roofs – cooler summer temperatures and, hence, lower summer electric usage, as well as cleaner air and water – far outstrip the sum of benefits from individual green projects. The whole would be much more than the sum of its parts.

## WHO ARE THE PARTNERS BEHIND THE STEVENSON GREEN ROOF?



**THE STEVENSON CAMPUS** The Adlai Stevenson Campus, located at 1980 Lafayette Avenue in the Bronx, is comprised of Stevenson High School, a large academic comprehensive high school, and five smaller New Century High Schools: the Bronx Guild HS, Gateway School for Environmental Research and Technology, High School for Community Research and Learning, Millennium Art Academy and Pablo Neruda Academy for Architecture and World Studies. The Campus is managed by a governing Council that includes the principals of all six high schools. Its mission is to enhance

the lives of the broader East Bronx community by implementing a cooperative-style environment that offers GED, vocational training, ESL, and Advanced Placement classes; arts and athletic opportunities; physical and mental health care; daycare for children of campus employees; and a senior center. The Stevenson Campus is the host of the Green Roof. The project is being refined in close coordination with the Council, with teachers and students involved at every step in the architectural and curriculum design processes.



**GILBANE** One of the nation's oldest builders, Gilbane Building Company was founded in 1873 by William Gilbane as a family-run carpentry and general contracting shop in Providence, Rhode Island. Today, fourth generation members of the Gilbane family

lead the company. Gilbane celebrated its 130th anniversary in 2003. A pioneer in delivery systems, Gilbane is one of the leading Construction Managers both locally and nationally, and offers a wide range of services from the earliest planning stages of a project to completion. The firm offers Program and Project Management, Design Build, and General Contracting services. The company is currently ranked sixth among the top 50 domestic general building contractors by Engineering News Record as well as the nation's leading builder of education facilities in four of the last five years. Building Design & Construction magazine ranks Gilbane the fourth among the nations top Construction Managers. Gilbane operates offices around the country and employs in excess of 1800 people. Gilbane's local offices include New York City and Albany, New York. Having managed a multitude of Green Roof projects in Educational Facilities across the country, Gilbane brings the experience, expertise and commitment to this type construction. Examples of Gilbane's Green Roof experience includes the Ithaca College School of Business, Fairfield University Barone Campus Center, Penn State University Dickinson School of Law, University of Michigan Ross School of Business, University of Illinois Graduate School of Business, Arizona State University Interdisciplinary Science and Technology Building 1, City of New Haven Barnard PK-8 Magnet School, City of Philadelphia School of the Future, and University of Virginia School of Commerce.

*At the Stevenson Campus, national leaders in fields ranging from curriculum development through architectural design to roofing construction have come together to create something wonderful for students and teachers in the Bronx.*



**SALVADORI CENTER** In the spirit and practice of founder Mario Salvadori, the Salvadori Center teaches teachers to incorporate architectural and engineering concepts into all aspects of the curriculum: mathematics, science, social studies, and the visual and language arts. Working closely with teachers and students, the Salvadori Center is leading the curriculum development process, focusing on Green Roof applications in science and math as well as extensions to the arts and humanities. Building on its longstanding relationship with the Pablo Neruda Academy (as the school’s founding community-based partner), the Salvadori Center will expand its presence at Stevenson Campus following the installation of the roof.



**NEW VISIONS FOR PUBLIC SCHOOLS** New Visions for Public Schools has been a force for change for New York City public schools since 1989. New Visions seeks to develop solutions and make sustainable improvements within our schools by bringing together the Department of Education (DOE), schools, communities, universities, and businesses to improve student achievement. Working with the DOE and the community at large, New Visions is transforming failing large schools into communities of smaller schools that are centers of learning and achievement. New Visions is also interested in improving the sustainability of school buildings, promoting project-based learning pedagogy with “real life” application, and deepening the engagement between our campus buildings and the broader community. New Visions will take the lead, following installation, in collecting and analyzing data that will make it possible to track the project’s outcomes in terms of enhanced student performance.



**FEDERATION OF AMERICAN SCIENTISTS** The Federation of American Scientists (FAS) was formed in 1945 by atomic scientists from the Manhattan Project who felt that scientists, engineers and other innovators had an ethical obligation to bring their knowledge and experience to bear on critical national decisions, especially those pertaining to the technology they had unleashed - the Atomic Bomb. Endorsed by 67 Nobel Laureates in chemistry, economics, medicine and physics, FAS addresses a broad spectrum of issues in carrying out its mission to promote humanitarian uses of science and technology. FAS will provide scientific instrumentation and data collection to the Green Roof, developing the site as a premier location for Green Roof research in the urban environment.



**THE GAIA INSTITUTE** Based in the Bronx, the Gaia Institute works to couple ecological engineering and restoration with natural systems and human communities through research and development, education, design and construction. The Gaia Institute will be responsible for the Green Roof’s landscape design, including the selection and specification of soils, soil depths, and plants. Working closely with Rafael Viñoly Architects, the Salvadori Center, and the Stevenson Campus, Gaia will ensure that the landscape design is optimized not only for environmental performance in New York’s climate but also for teaching and research purposes.

**SOUNDVIEW HEALTH CLINIC** The Soundview Health Clinic has a twenty-seven year history of serving the community and currently attends to 27,000 patients at a clinic located a few blocks from the Stevenson Campus. In fall, 2006, the Soundview Health Center opened a satellite clinic at the Stevenson Campus to provide an on-site comprehensive medical and mental health program for students. The Soundview Health Clinic is participating in the Green Roof design process to ensure that its clients benefit from this environmental improvement.



**U.S. ENVIRONMENTAL PROTECTION AGENCY** Founded in 1970, the Environmental Protection Agency (EPA) is the federal agency tasked with protecting human health and the environment. Through its Encouraging Smart Growth program, the EPA helps communities build and develop in ways that promote environmental sustainability and quality of life. The Smart Growth program has a particular interest in green building strategies such as green roofs for their potential to remediate water and air quality. The EPA will provide technical support for scientific design, instrumentation and monitoring.



**TREMCO ROOFING** For over 75 years, Tremco Incorporated has been the leading innovator and provider of roofing and weatherproofing solutions. Tremco offers the most comprehensive roofing and weatherproofing solutions for new construction, roofing maintenance, replacement solutions, restoration and repair services, and roofing materials in the industry. Through their generous donation, Tremco will provide detailed roof inspection and repair of the roof underlayment before the green roof is installed.

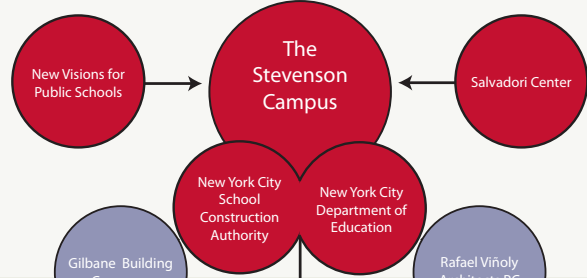


**PITTSBURGH CORNING** Founded in 1937, Pittsburgh Corning continues to develop innovative products for commercial, industrial and residential building applications. Pittsburgh Corning has provided technical support for the development of Joseph Hagerman's green roof system and will provide materials including FoamGlas™ pro bono for the Stevenson Green Roof.

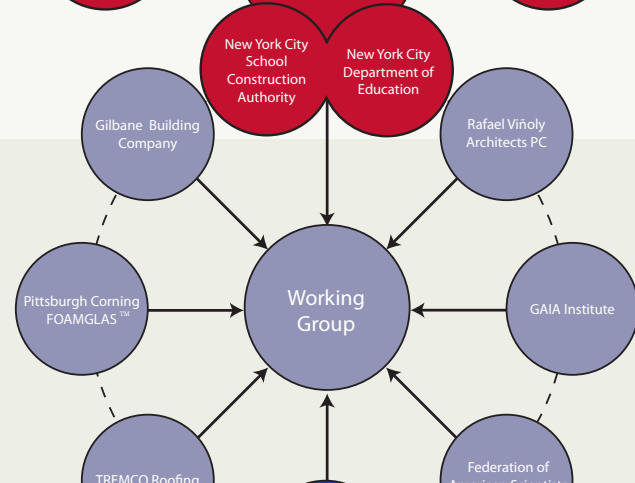
**RAFAEL VIÑOLY ARCHITECTS PC**

**RAFAEL VIÑOLY ARCHITECTS PC** is a critically acclaimed international practice with headquarters in New York and London, and site offices throughout the U.S. and abroad. Founded in 1983, the 170-person firm provides comprehensive services in building design, urban planning and interior design. RVA's contribution to the Stevenson Green Roof project began in the fall of 2005 when the firm selected Joseph Hagerman as the first annual RVA Research Fellow, with a one-year research stipend to develop the innovative green roof structural system that will be employed at Stevenson Campus. As the project architect, RVA will provide continuing pro bono services including architectural design, engineering analysis, graphic design and printing, research, project management and construction supervision.

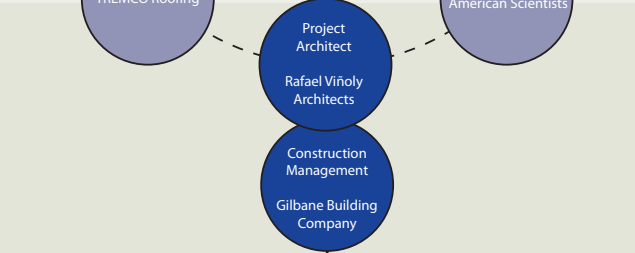
Education



Management



Implementation



<b>Roof Preparation</b> TREMCO Roofing	<b>Roof Insulation</b> Pittsburg Corning	<b>Tray Construction</b> Pittsburg Corning	<b>Soil and Plants</b> GAIA Institute
Mark Anderson Ralph Valesquez	Rob Henne Craig Mohr		Paul Mankiewicz Daniel Simon

Additional Resources			
Curriculum Development Leonisa Ardizzone Lorraine Whitman	Monitoring Equipment Joe Hagerman	Research/Development Ned Kaufman	Structural Analysis Carlos Soubie Ron Check
Coordination Adam Rubin	Graphics / Signage Emma Colby	Design/Visualization Lindsey Kosinski	Maintenance Steve Ritz

Subcontractors			
Plumbing	Electrical	Vertical Transportation	Irrigation
Plants	Fence Installation	Security	

# WHEN WILL THE GREEN ROOF BE INSTALLED?

STEVENS ON HIGH SCHOOL GREEN ROOF PROJECT			RAFAEL VINOLY ARCHITECTS																																																		
CONCEPT THROUGH INSTALLATION DESIGN DETAILED SCHEDULE - DRAFT			25-JAN-07																																																		
			2006															2007																																			
			OCTOBER				NOVEMBER				DECEMBER				JANUARY				FEBRUARY				MARCH				APRIL				MAY				JUNE				JULY				AUGUST				SEPTEMBER						
			2	9	16	23	30	6	13	20	27	4	11	18	25	1	8	15	22	29	5	12	19	26	5	12	19	26	2	9	16	23	30	7	14	21	28	4	11	18	25	2	9	16	23	30	5	12	19	26	3	10	17
DESCRIPTION	START	END																																																			
FUNDRAISING	ONGOING																																																				
CONCEPT DESIGN	02-OCT-06	01-DEC-06																																																			
SCHEMATIC DESIGN	04-DEC-06	12-JAN-07																																																			
DESIGN DEVELOPMENT	15-JAN-07	23-FEB-07																																																			
CONSTRUCTION DOCUMENTS	26-FEB-07	27-APR-07																																																			
CONSTRUCTION ADMINISTRATION	30-APR-07	29-JUN-07																																																			
INSTALLATION	2-JUL-07	30-AUG-07																																																			
PLANTING	02-APR-07	03-SEPT-07																																																			

STRUCTURAL ANALYSIS

LAST DAY OF SCHOOL  
JUNE 27TH, 2007

INSTALLATION COMPLETE  
AUGUST 30TH, 2007

FIRST DAY OF SCHOOL  
SEPTEMBER 4TH, 2007