

**THE CLEANUP WAR CHEST:
STATE BOND FINANCING FOR ENVIRONMENTAL INITIATIVES AND
BROWNFIELDS REDEVELOPMENT**

**GREG LEWIS, PRINCIPAL RESEARCHER
EVANS PAULL, EDITOR**

MARCH, 2009



Northeast Midwest Institute

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Preface

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This report represents NEMW work on two projects with two funding sources:

- Brownfields Research and Training – funded through a grant from the US Environmental Protection Agency;
- Financing Great Lakes Eco-system Restoration – funded by the Great Lakes Protection Fund.

The views represented in the report do not necessarily reflect the views of the funding agencies.

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SUMMARY

While many states have incentives for cleanup of contamination, only a few are regarded as funded at a level that approaches the vast need. Although there are notable exceptions, the well-funded programs tend to fall into one of two categories: income tax credit programs and programs that are funded through a bond issue or have a dedicated revenue source. This paper addresses those funded through bond issues. (Note NEMW tracks [State Brownfields Tax Credit](#) programs on the NEMW website.)

Generalizing about these bond funded programs is problematic because of the obvious: circumstances – political, financial, and administrative – vary widely from state to state. Nevertheless, a few observations are:

- Five of the programs reviewed (Michigan, Ohio, Pennsylvania, Massachusetts, and New York) placed brownfields funding in a larger context of environmental initiatives. By unifying brownfields with land conservation and other environmental programs, the message is that the state wants to accommodate growth but in existing developed areas, while also rectifying the environmental mistakes of the past.
 - California placed a new stream of funding for brownfields under the umbrella of affordable housing and smart growth projects with passage of the Housing and Emergency Trust Fund Act of 2006.
- Of the bond issues reviewed, about one-half were general obligation from general revenues, and about one-half used a dedicated funding source, such as a liquor sales tax (Ohio), municipal waste and tipping fee (Pennsylvania), real estate transfer taxes, environmental license plate fees, and bottle bill revenues (the latter three, New York);
- In order to fund brownfields financing incentives, no state relied exclusively on bond financing, although the bond financing was the “lion’s share” in Ohio, and, to a somewhat lesser degree, in Michigan.
- Cleanup of contaminated sediments ranks as a named use of funds in Michigan, and Wisconsin recently passed bond legislation specifically for the remediation of contaminated sediment. Other states assist water quality projects that are consistent with watershed plans, but it is unclear whether this could include sediment cleanup.

As programs have run low on funding the record on renewal is mostly positive. Pennsylvania renewed Grow Green in 2005. In July, 2008 the legislature in Ohio authorized a renewal of Clean Ohio subject to voter approval. In New York, where dedicated funding for the state’s Environmental Protection Fund was insufficient, in 2008 the state assembly revamped the bottle tax and pumped an extra \$100 million annually into the fund. On the other hand, environmental and brownfields advocates in economically-struggling Michigan failed to get Clean Michigan on the ballot for 2008, and most of the Clean Michigan programs are out of funding as of the publication of this report. Still the overall record is positive: the combination of environmental and conservation initiatives have, on the one hand, with brownfields and redevelopment programs, on the other, had proven appeal for both legislators and voters.

Aside from reviewing the programs funded through these bond issues, NEMW also reviewed an intriguing source of revenue for future bond issues - an impervious surface tax. An impervious surface tax has been adopted in Raleigh, North Carolina and has been considered by the State of

Maryland, as well as other localities. The tax can be a strong smart growth tool because it can raise revenues for brownfields, redevelopment, and environmental purposes, while also providing a *disincentive* for sprawl development.

Table 1, on the following page, summarizes the six largest environmental initiatives that have been funded through state bond bills.

Table 1. Summary of largest (legislature and voter approved) state environmental bond issues

| State Environmental Bond Issues – Summary Chart | | | | | | | |
|---|-----------------------|---|---------------------------|--|---------------------------------|--------------------------|---|
| | Clean Michigan | Clean Ohio | NY Clean Air-Clean Water | NY Environmental Protection Fund | PA Grow Greener II | MA Environ. Bond | California Housing and Emergency Trust Fund Act |
| <i>Year/amount</i> | 1997 \$675 million | 2000 \$400 mill. 2008 proposal for \$200 million | 1996 \$1.75 billion | 1992 | 2005 \$625 million | 2002 \$707 million | 2006 Brownfields portion \$850 million |
| <i>Repayment source</i> | General funds | 2000 - Liquor sales tax 2008 – General Obligation | General funds | Real Estate Transfer Tax, Bluebird License Plate program, and (added in 2008) Bottle bill revenues | Municipal waste and tipping fee | General Funds | General funds |
| <i>Uses of funds:</i> | | | | | | | |
| Brownfields | • | • | • | | • | | • |
| Urban redev't/ waterfront revital'n/ historic preservat'n | • | • | • | • | • | • | • |
| Watershed protection/ rivers and lakes cleanup | • | • | • | | • | • | |
| Farmland and forest preservatio n | | | • | • | • | • | |
| Trails and parks | | • | • | • | • | • | |
| Lead paint | • | | | | | • | |
| Habitat and fish hatchery protection | | | | | • | • | |
| Air quality | • | | | | | • | |
| Solid waste | • | | | | | • | |

BACKGROUND

A number of states have passed large-scale bond issues that have financed major environmental initiatives. The activities funded have generally included preservation of natural areas, brownfields/urban redevelopment, urban trails and green spaces, and water quality initiatives, such as watershed restoration. By linking these four activities, states are outlining a new vision of how their states should grow: by strengthening existing communities, rather than allowing development to spread across the countryside. Brownfields redevelopment and ecosystem restoration is properly placed as a cornerstone for this new kind of vision.

With the increase in awareness of abandoned or underutilized industrial sites posing a threat of environmental contamination all fifty states have now developed voluntary cleanup programs designed to expedite the remediation of brownfield sites. Along with creating voluntary cleanup programs many states have made notable financial commitments to cleaning up the environmental blight associated with the legacy of America's industrial past. In the Northeast and Midwest, the region of the country perhaps most impacted by abandoned industrial facilities, several states have passed environmental bond initiatives with significant dollars directly focused on reclaiming brownfields. In an attempt to highlight a few of the most successful bond backed brownfield remediation campaigns, the first section of this report discusses the largest voter passed environmental bond issues of Michigan, Massachusetts, Ohio, New York, and Pennsylvania. This document also discusses the significant brownfields relevant bond issues of California (Housing and Emergency Trust Fund Act) and Wisconsin (Contaminated Sediments Program).

Voters in these states were asked to make a financial commitment to the environment and to the recycling of blighted land. The success of each program at the polls signifies that the general population not only cares about the environment and the cleanup of past industrial mistakes, but that the citizenry understand the valuable link between environmental restoration efforts and economic revitalization of existing communities.

The following sections provide details about the uses of each major bond issue and breakdown use of allocations from each bond fund. Following the short narrative about each bond initiative, case study examples illustrate how the money is impacting individual communities. In addition, because of a long history of the use of environmental bonds, a section of this paper discusses brownfields financing and policies in New Jersey. New Jersey has not had a major, voter-passed environmental "brownfield" bond that is similar in scale to other bond initiatives mentioned in this report in recent years. However, this report includes section on New Jersey because the state's nearly fifty year history of bond financed environmental projects marks a notable commitment to open space preservation and the remediation/reuse of abandoned industrial land.

The two funding sources for this report – an EPA Brownfields Research and Training Grant and a grant from the Great Lakes Protection Fund (GLPF) – have general interest in this topic, but, more specifically, they have interest in cleanup of contaminated land (EPA) and contaminated sediments (GLPF). The report thus covers the bond issues, generally, but focuses attention on these two areas.

MICHIGAN

In November 1998, Michigan citizens approved the \$675 million Clean Michigan Initiative Bond Fund. This bond, much like its predecessor, the Quality of Life Bond of 1988, provides the major operating capital for Michigan’s Department of Environmental Quality. Since the inception of the Clean Michigan Initiative, the bond has been the primary funding source behind the agency’s \$95 to \$100 million annual capacity. Roughly \$10 million per year is directed at funding Michigan’s brownfield grant and loan program— a system that provides a funding stream for cleanup activities initiated by local level agencies.

Of the original \$675 million, roughly one half (\$335 million) was allocated to aggressively pursue environmental cleanup and enhance the states already functioning brownfields redevelopment efforts. The remaining half of the fund addressed pollution control and mitigation, parks, waterfronts, and other environmental activities. In short, brownfields remediation and blight removal was the top priority of the bond, but the initiative fulfilled Michigan’s overall environmental commitment of “protecting and enhancing Michigan’s lakes, rivers, and streams; reclaiming and revitalizing local waterfronts; making critical state park improvements; enhancing local parks and recreational opportunities; pollution prevention; and protecting the public from lead hazards” (Michigan 2007).

Uses of the funds for environmental initiatives are indicated in the chart:

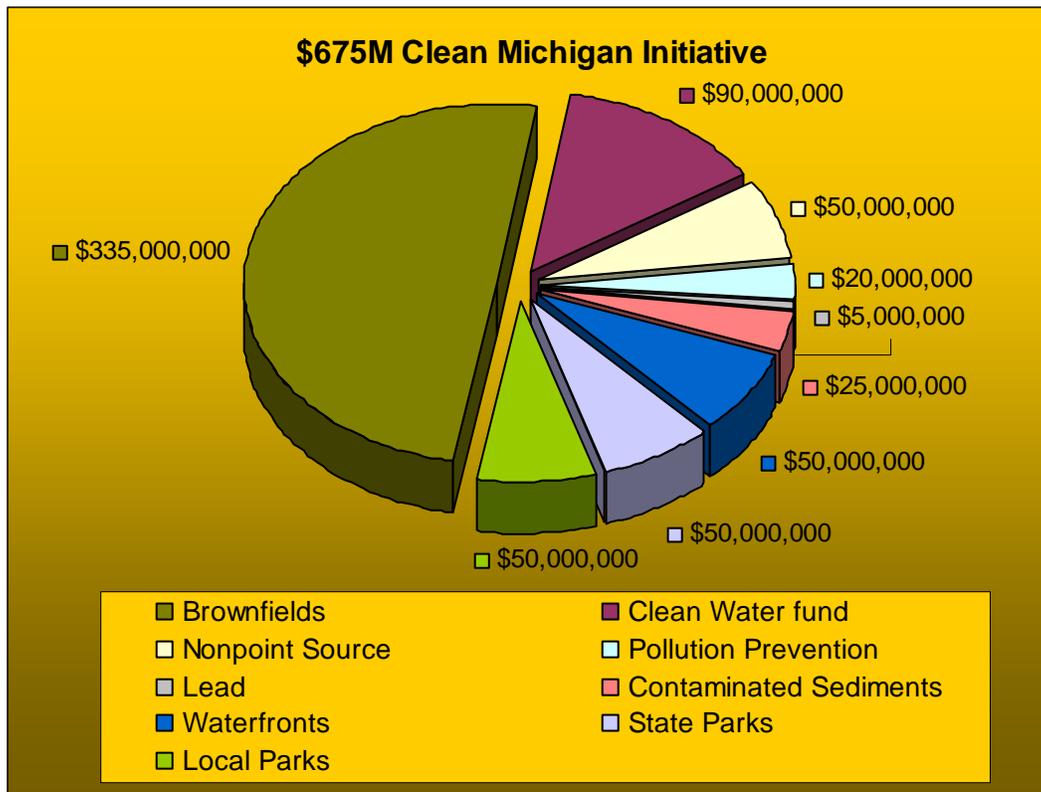


Figure 1. Use of funds of Clean Michigan Initiative 1998

Several of the state’s brownfields initiatives date back to Michigan’s Environmental Bond Fund of 1988, but the 1998 Clean Michigan Initiative Bond fund created and provide funding for the Brownfield Redevelopment Grant and Loan programs. These are the primary financial tool available to communities wishing to remediate and/or redevelop former industrial/commercial sites. The \$335 million in funding for brownfields from the Clean Michigan Initiative is broken in the table 2:

Table 2. Use of brownfields funding in Michigan

| \$335 Million of the Clean Michigan Initiative is dedicated to brownfields | |
|---|---|
| Amount | Allowable use of funds |
| \$155 million | Cleanup contaminated sites to promote redevelopment |
| \$93 million | Cleanup contaminated facilities that pose an imminent or substantial endangerment to the public health, safety, or welfare or to the environment |
| \$75 million | Provides grants and loans to local units of government for response activities at known or suspected contaminated properties with redevelopment potential |
| \$12 million | Provides grants to local units of government to assist with remedial costs at municipal solid waste landfills which are on, or nominated for, the federal National Priorities List (i.e., the Superfund list) |

Michigan’s brownfields program infuses statewide brownfield redevelopment efforts with state monies through five loan and grant sources. All five funding sources were created with the intention of funding community level remediation and revitalization. Potential applicants are local units of government, Brownfields Redevelopment Authorities, and/or other public bodies (such as state-funded schools and universities). Two of the programs were established as part of the 1988 Environmental Response Fund Bond and two of the programs were created by and provide funding directly out of the Clean Michigan Bond fund. The Revitalization Revolving Loan Fund generates new lending capital from paid loan obligations. All five funding sources are listed below:

- Brownfield Redevelopment Grants: Funded by 1998 Clean Michigan Initiative Bond
- Revitalization Revolving Loans: Funded by 1998 Clean Michigan Initiative Bond
- Site Reclamation Grants: Funded by 1988 Environmental Response Fund Bond
- Site Assessment Fund Grants: Funded by 1988 Environmental Response Fund Bond
- Revitalization Revolving Loan Fund: Funded by paid loan obligations

Through FY2006 \$482 million of the Clean Michigan Initiative had been used for a wide variety of environmental projects. Specific to brownfields, the Cleanup and Redevelopment Program had used \$230 million; the Brownfield Redevelopment Grant Program had used \$28 million and the Brownfield Redevelopment Loan Program was at \$15 million (Michigan 2006). With the strong financial support of the brownfields program, Michigan has emerged as a true national leader in the remediation and successful reuse of brownfields. Recent reports estimate that authorities statewide have spent more than \$900 million (from all sources) on roughly 1800 sites. These efforts have stimulated over \$3 billion of total investment and created more than 15,000 jobs (DEQ and EconomicDevelopment 2008).

Contact Person:

Susan Erickson, Chief, Environmental Stewardship Grants and Loans Unit
Administration Section, Environmental Science and Services Division
Department of Environmental Quality
517-241-8707, e-mail: ericksos@michigan.gov

Brownfield Redevelopment Authorities: Site Redevelopment in Michigan.

Two years before the Clean Michigan Initiative, in 1996, the Michigan Brownfield Redevelopment Financing Act (“Act 381”) was adopted to allow for the creation of Brownfields Redevelopment Authorities (BRAs). This legislation made it possible for boundaries to be drawn around a brownfield site and adjacent lands in order to create special taxing districts. These BRAs have taxing authority and the jurisdiction to acquire municipal redevelopment bonds.

To exercise its bonding authority, a BRA can generate revenue/repayment funds through tax increment financing (TIF)—a concept in which the property taxes within the BRA are frozen at pre-remediation levels. As improvements are made to the site, the increased property value generates higher tax revenues and the BRA is able to capture the increased tax increment in order to repay the bond. To help increase property values and generate TIF revenues, BRAs have the ability to use TIF backed bond funds to finance demolition, cleanup, and reuse activities on brownfield sites and adjacent land. Under Michigan law, properties eligible for a BRA are parcels that are “contaminated, blighted or functionally obsolete and parcels adjacent or contiguous to these parcels” (MichiganDEQ 2007).

Michigan –Brownfield Redevelopment Authority Case Study

According to the Michigan Department of Environmental Quality, there are 261 BRAs located throughout the state. The special brownfields districts have capitalized on various brownfields incentives to help fund hundreds of successful projects since the program’s inception in 1998. Although there are no comprehensive accounting measurements of impacts, Michigan authorities have seen tremendous private investment follow state grants and loans. For example, the City of Grand Haven is using a BRA and TIF-like financing for three projects:

- Grand Landing: The project is a \$70-million residential/mixed use redevelopment of a former tannery. A \$2-million cleanup has been financed through a \$1-million state grant and a \$1-million state loan to be paid back through BRA TIF;
- Challenge Shop: This \$11-million redevelopment for industrial/commercial/office use includes \$3.9 million in remediation/site preparation that the developer will recoup through the BRA TIF.
- City-owned property at Jackson Street and Beacon Boulevard: Plans call for a mixed-use development, projected at \$50 million in new private investment. The city is utilizing BRA tax capture to finance \$10.4 million in site/infrastructure work.

Addressing Contaminated Sediments: Remediation of Contaminated Lake and River Sediments Program

Clean Michigan is the only bond program reviewed that specifically earmarked funding for contaminated sediments - \$25 million. Following are three examples of the use of the Remediation of Contaminated Lake and River Sediments Program (MichiganDEQ 2007).

- Cannelton Industries in Chippewa County: \$600,000 of Clean Michigan funds were used for the state's portion of a cost-share agreement to remediate sediment contamination in the St. Mary's River and wetland resulting from tannery operations.
- Removal of contaminated sediments behind dam on St. Louis River in Gratiot County: \$1.5 million in Clean Michigan funds used for sediment removal and to address contamination resulting from the production of chemical compounds above the St. Louis dam. Proposed actions include lab analysis to determine the nature and extent of the contamination in the Pine River downstream of the St. Louis dam.
- Remediation of portions of the Shiawassee River in Livingston County: The manufacture of aluminum cast wheels left high levels of PCB in river sediments along the Shiawassee River. \$1,000,000 of Clean Michigan designated for sediment removal to protect public health and the environment.

More information can be found by reviewing the [Clean Michigan Initiative Consolidated Report FY2006](#).

Contact Information

Michael Alexander, Surface Water Assessment Section
 Water Bureau
 Department of Environmental Quality
 517-335-4189, e-mail: alexandm@michigan.gov

Future of Clean Michigan Fund

As of the publication of this report, the solvency of the massive bond issue was waning. In mid-May 2008, the Michigan Department of Environmental Quality put forward a \$1.3 billion environmental bond proposal; however, the proposal failed in the state legislature and will not be on the November, 2008 ballot. Michigan DEQ has indicated that the proposal will be revised and re-submitted in 2009. The 2008 DEQ proposal called for \$820 million to be used for the state's inventory of contaminated sites. Under the plan, site cleanup would be allocated \$550 million and \$150 million would go toward brownfields redevelopment. The brownfield grant and loan programs would receive \$100 million and the remaining \$20 million would support lead-paint abatement grants (Nixon 2008).

OHIO

The \$400 million Clean Ohio bond issue, which passed in November, 2000, gave the state the ability to issue \$200 million for brownfield redevelopment activities and \$200 million for preservation of green space. The program was authorized to issue \$100 million per year for four years. The chart below outlines the annual funding commitments.

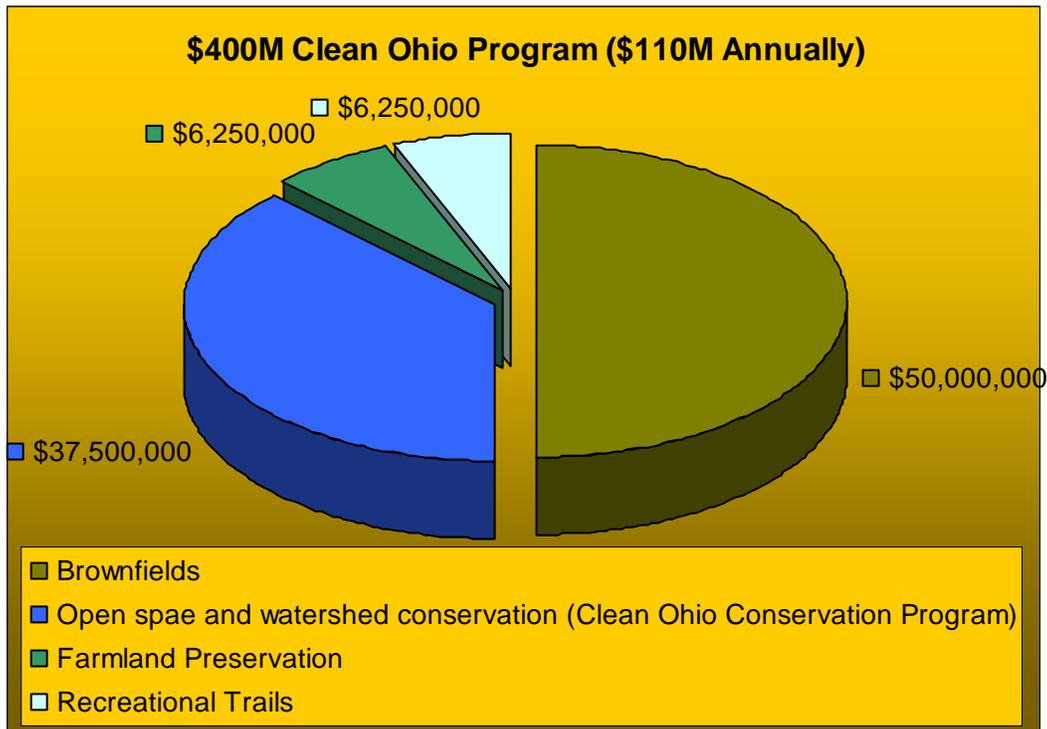


Figure 2. Use of Clean Ohio Bond Program 2000

Since its inception, the Clean Ohio Fund has invested \$138 million in brownfield site assessment and remediation. According to the Department of Development, that initial investment will generate \$1.3 billion in community and private investment into revitalization efforts over the next eight to ten years. The department estimates that through 2007, the state's investment into brownfields is generating a Return on Investment ratio of \$9.37 for every dollar spent. The majority of the bond repayment is the pledge from liquor sales in the state.

With the \$50 million provided annually, the bond issue established two brownfields programs:

Clean Ohio Revitalization Fund

The [Clean Ohio Revitalization Fund](#) (CORF) is the principle brownfields financing program. Clean Ohio/CORF channels all funding (including funds to private entities) through local governmental entities. Brownfields activities that are eligible under the program include:

- Environmental assessments, cleanup and remediation of hazardous substances and/or petroleum, and demolition.
- The maximum application request for a Phase I Environmental Assessment grant is \$8,000; and for a Phase I and Asbestos Survey is \$15,000;

- The maximum application request for a Phase II Environmental Assessment grant is \$300,000;
- The maximum application request for a Cleanup grant is \$750,000;

The Ohio Department of Development, through its Office of Urban Development, implements CORF in consultation with the Ohio Environmental Protection Agency(CleanOhio 2008).”

Clean Ohio Assistance Fund (COAF).

State law requires that the Clean Ohio Council devote 20% of the net proceeds deposited into the revitalization fund to provide grants to maintain and fund the Clean Ohio Assistance Fund (COAF). The money in COAF is utilized to pay for the cost of phase I and phase II environmental site assessments and cleanup and remediation efforts on brownfield sites located in areas where “little or no economic redevelopment potential exists” or “[Priority Investment Areas](#)” (OhioTreasurer 2006). This 20 percent set aside makes it possible for high unemployment and severely economically depressed inner-city and rural sites to benefit from cleanup activities that often take place only in more desirable real estate locations. Many Ohio communities have suffered disproportionate employment losses from industrial plant closings or downsizing and this provision ensures that the regions most impacted can still realize the health and environmental benefits of brownfield remediation (OhioTreasurer 2006).

Projects applying for either of the above funding sources must be approved by the Clean Ohio Council or, in some instances, the state’s Director of Development. The Clean Ohio Council consists of the Director of Development, or designee, the State Director of Environmental Protection, or designee, the Director of the Ohio Public Works Commission (a non-voting ex officio member), four members of the General Assembly and seven members appointed by the Governor’s office with the advice and consent of the state Senate.

Case Study of Clean Ohio Revitalization Fund

City of Cincinnati (Hamilton County) was awarded \$3 million for the revitalization of 18 acres of vacant industrial property for the MetroWest Commerce Park project. The property has been used for a variety of industrial purposes since 1870. Most recent, the site was being used for the reconditioning of waste drums. The committed end-users plan to lease/own 75,000 square feet of building space which will result in the immediate creation 32 new and 86 retained jobs. Eventually, the property is expected to attract a total of 400 jobs. Remedial plans include 14,700 tons of soil to be removed, bioremediation of groundwater, and asbestos abatement. CORF funds will be used for demolition, asbestos abatement, and remediation of soil and groundwater contamination. The total project cost for the MetroWest Commerce Park property is \$11,977,993.

Contaminated Sediments

Eligible sites/projects for the “Open Space and Watershed Protection” part of Clean Ohio are projects to protect or enhance riparian corridors and watershed protection measures. – this does not appear to include contaminated sediments.

Renewal of Clean Ohio

On July 30, 2008 the Governor signed a legislative initiative to renew Clean Ohio – the \$400 million bond bill will be on the November ballot for voter approval. The new proposal, similar to the previous program, will split the revenues, \$200 million to preserve wildlife habitat and farmland and provide recreational opportunities, and another \$200 million to clean up polluted industrial sites. The new proposal relies on general obligation bonds as the re-payment source.

Contact information:

Ohio Department of Development
Urban Development Division
Shane Mathey, Brownfield Specialist
Phone: 614-466-1235
E-mail: mmathey@odod.state.oh.us

Ohio EPA SABR Division
Dan Tjoelker, Brownfield Coordinator
Phone: 614-644-3750
E-mail: dan.tjoelker@epa.state.oh.us

NEW YORK

Marking the biggest financial commitment to the environment discussed in this report, the state of New York devoted \$1.75 billion in 1996 with the creation of the Clean Water/Clean Air Bond Act. Even though the fund was established years before New York's brownfields program, the Clean Water/Clean Air Bond Act authorizes \$200 million for the funding of the investigation and cleanup of Environmental Restoration Projects (New York 2007). The majority of this massive funding effort is dedicated to carrying out management plans for major water resources—for example; funds are available for municipal wastewater treatment improvement, pollution prevention, agricultural and nonagricultural nonpoint source abatement and control, and aquatic habitat restoration. The repayment of the Clean Water/Clean Air Bonds comes through the state's general fund.

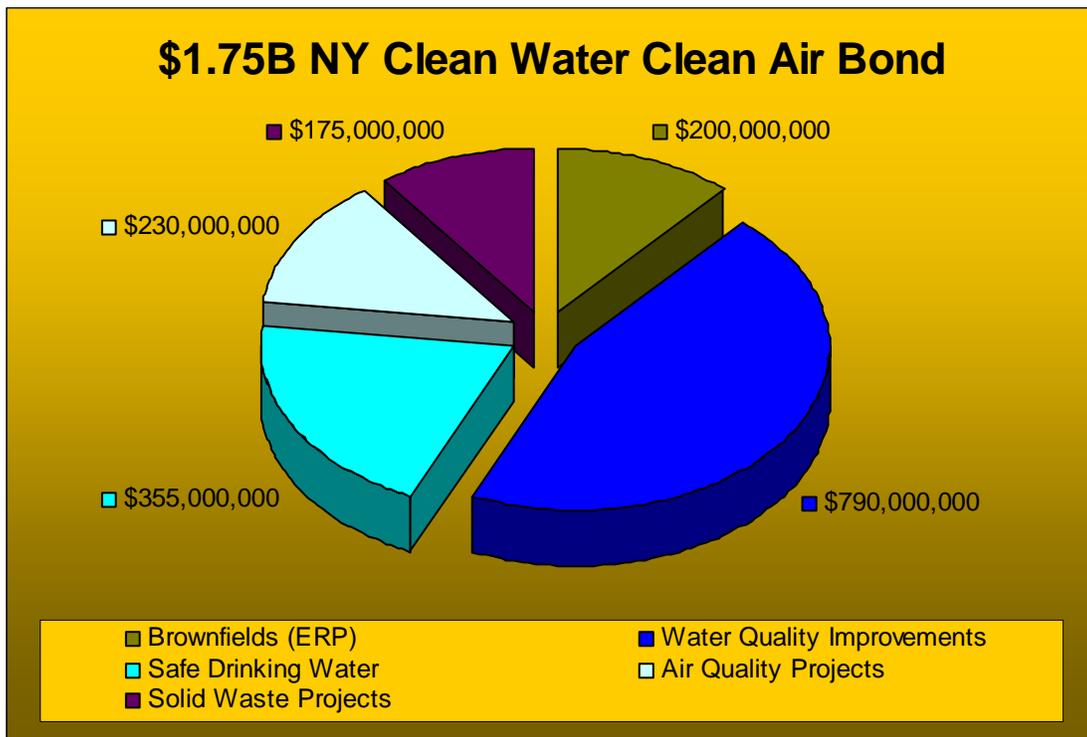


Figure 3. Use of New York's Clean Water Clean Air Bond 1996

Environmental Restoration Program (ERP)

The [Environmental Restoration Program](#) funds site assessment and cleanup activities by public agencies only on publicly owned sites. Public agencies (if not responsible for contamination) can receive up to 90 percent of eligible costs for on-site and up to 100 percent of eligible costs for off-site remedial activities. To date, more than \$162.2 million in Bond Act funding has been committed for 253 investigation and cleanup projects at brownfield sites throughout New York State. This funding includes 208 investigation projects totaling more than \$78.7 million and 45 remediation projects totaling more than \$83.4 million. According to officials at New York's Division Environmental Remediation, throughout the last year ERP funds have become very limited. As of the time of this report, state officials are conducting an internal review of projects

to determine the program's available funds. In addition, no legislative proposals for new funding for the ERP program are gaining traction.

Environmental Restoration Program Grants Case Studies:

A recent round of ERP grants (fall of 2007) in Erie and Franklin counties typify the type of project ERP dollars can fund:

- In Bombay, NY, the Franklin County Industrial Development Agency will use two ERP grants (\$234,000 and \$289,440) to help fund the investigation of environmental contamination at the Former Tru-Stitch Slipper Factory buildings and adjacent vacant lot. The first grant is for a 5.64 acre vacant lot and the second is for four parcels totaling 15.81 acres in size. The combined twenty-one acres encompass outbuildings and large warehouses (totaling roughly 30,000 square feet) used for the manufacturing of leather products. Investigations at the site will utilize ground-penetrating radar to analyze and assess drain areas, septic systems, and underground storage tanks. The investigation process or, "Human Health Exposure Assessment," will ensure proper disposal of the underground storage tanks and the remediation of any lurking health hazards.
- \$600,000 will be awarded to the City of Buffalo in Erie County for the investigation of environmental contamination at the site of a former brewery. The City of Buffalo acquired the property in November 2004 through tax foreclosure and, in May 2006, began demolishing the buildings on the site. During the demolition, the City's contractor found two 20,000-gallon underground storage tanks containing petroleum sludge contaminated with polychlorinated biphenyls (PCBs) and solvents. After cleaning of the tanks began in February 2007, workers found that one tank had leaked, contaminating the surrounding soil. Underground piping and a number of other areas on the property are also contaminated. Due to the obvious need for a complete site investigation and cleanup of the contamination, the City suspended its work and secured the site, then applied for state assistance through the ERP. The City would like to offer the property for redevelopment for commercial or light industrial use.

Contaminated Sediments

Water Quality Improvement Projects are eligible for \$790 million in funds to be used for municipal wastewater projects and include activities that "implement a watershed restoration plan." The water quality side of the program has been reported as having funded 250 projects. With respect to contaminated sediments, interpretation would be required to determine whether a sediment cleanup project helps implement a watershed protection plan.

Environmental Protection Fund and the Local Waterfront Revitalization Program

The Environmental Protection Fund (EPF) is not a bond program, but is of interest because of the use of dedicated revenues to fund a combination of environmental initiatives and redevelopment, in this case, waterfront redevelopment. EPF is funded through dedicated revenue sources: a percentage of transfer taxes and the "Bluebird License Plate" program. EPF was recently given a boost by the New York State Assembly which adopted a bottle bill, (A-8044), one element of which designates "unclaimed bottle deposits" as a dedicated revenue source for the EPF. Estimates are that this action will generate \$100 million annually for the EPF.

The program funds:

- The purchase of land to be included in the Forest Preserve, State Parks, the State Nature and Historical Preserve, State Historic Sites, and Unique Areas;
- Local governments and not-for-profit organizations to purchase park lands or historic resources;
- Non-point Water Pollution Control,
- Municipal Recycling,
- Community Forestry,
- Local Waterfront Revitalization Program (LWRP).

The LWRP annually awards 50/50 matching grants to local governments for numerous waterfront rejuvenation projects. In the 2008-2009 round of grants communities were awarding funding for the following categories:

- Visioning and development of local or regional revitalization strategies
- Completing or implementing a Local or Regional Waterfront Revitalization Program
- Preparing or implementing a local or regional watershed management plan
- Downtown and hamlet revitalization
- Urban waterfront redevelopment
- Creating a “Blueway” Trail
- Interpreting Waterfront Resources - New York State Coastal Resources Interpretive Program

Local Waterfront Revitalization Program Case Studies

Below are a few recent examples of how LWRP grants are improving waterfronts and riparian zones throughout New York:

- **City of New York:** *Planning, Design and Installation of Bronx River Stormwater Demonstration Projects* – The Department of Parks and Recreation, in collaboration with the Bronx River Alliance, was awarded \$71,052.00 to implement a series of stormwater demonstration projects. These include downspout disconnections, green roofs and rain gardens, to advance water quality improvement in the Bronx River. The work, which will include site identification; planning, installation, maintenance and monitoring of demonstration projects; and community education, will be based on recommendations of the Bronx River Watershed Management Plan. This will further work developed under a previous EPF award.
- **City of Binghamton:** *Design and Construction of Rock Bottom Dam Susquehanna River Access* - The City of Binghamton was awarded \$350,000.00 to design and construct access to the underutilized Rock Bottom Dam parcel. The work, viewed as a first phase in trail development along the Susquehanna River, will include construction of an access road from NYS Route 363, a parking area, sidewalk enhancements, and addition of a picnic area, landscaping, and improved riverfront access for fishing. This will further work developed under a previous EPF award.
- **City of Buffalo:** *Planning, Design and Construction of Buffalo River Greenway Segments* - The City of Buffalo was awarded \$390,100.00 to plan, design and construct

two waterfront revitalization projects, the Ohio Street Public Access and Hamburg Street Boat Launch. With the assistance of a Buffalo River Greenway Coordinator, the City will develop a Greenway Steering Committee to guide project work. These projects are intended to stimulate economic development by improving public access to the river and creating connections to the existing Olmsted Park System and Shoreline Trail.

Contact Information:

Central Office Phone Numbers

Division Director: Dale A. Desnoyers

Assistant Director: Salvatore Ervolina

Telephone: (518) 402-9706

Bureau of Program Management

Director: Donna Weigel (518) 402-9764

Bureau of Technical Support

Director: Andrew English (518) 402-9543

Remedial Bureau A (covering Regions 1 & 5)

Director: Chittibabu Vasudevan (518) 402-9625

Remedial Bureau B (covering Regions 2 & 4)

Director: Robert Cozzy (518) 402-9768

Remedial Bureau C (covering Regions 3 & 6)

Director: Robert Schick (518) 402-9662

Remedial Bureau D (covering Region 7)

Director: William Daigle (518) 402-9818

Remedial Bureau E (covering Regions 8 & 9)

Director: Robert Knizek (518) 402-9814

PENNSYLVANIA

The Growing Greener II Bond passed in 2005 and authorized \$625 million in spending consistent with environmentally conscious planning principles. Growing Greener II makes allocations to several state agencies that all have the opportunity to help with Brownfield remediation and/or site reuse. The Department of Community and Economic Development oversees \$50 million of the Growing Greener Funds. The Department of Conservation and Natural Resources puts \$217.5 million of the Growing Greener II money to work helping communities meet their “green” infrastructure needs—park rehabilitation and development, public access to waterfront, trails, and green corridors. The Department of Environmental Protection was “authorized to allocate \$230 million of clean up rivers; restore abandoned mines and contaminated industrial sites; and finance the development and deployment of advanced energy projects (GrowingGreener 2006).”

Pennsylvania’s hazardous site cleanup and funds for Growing Greener Bonds are primarily generated from a \$2.25 municipal waste fee and a \$4.00 tipping fee on trash.

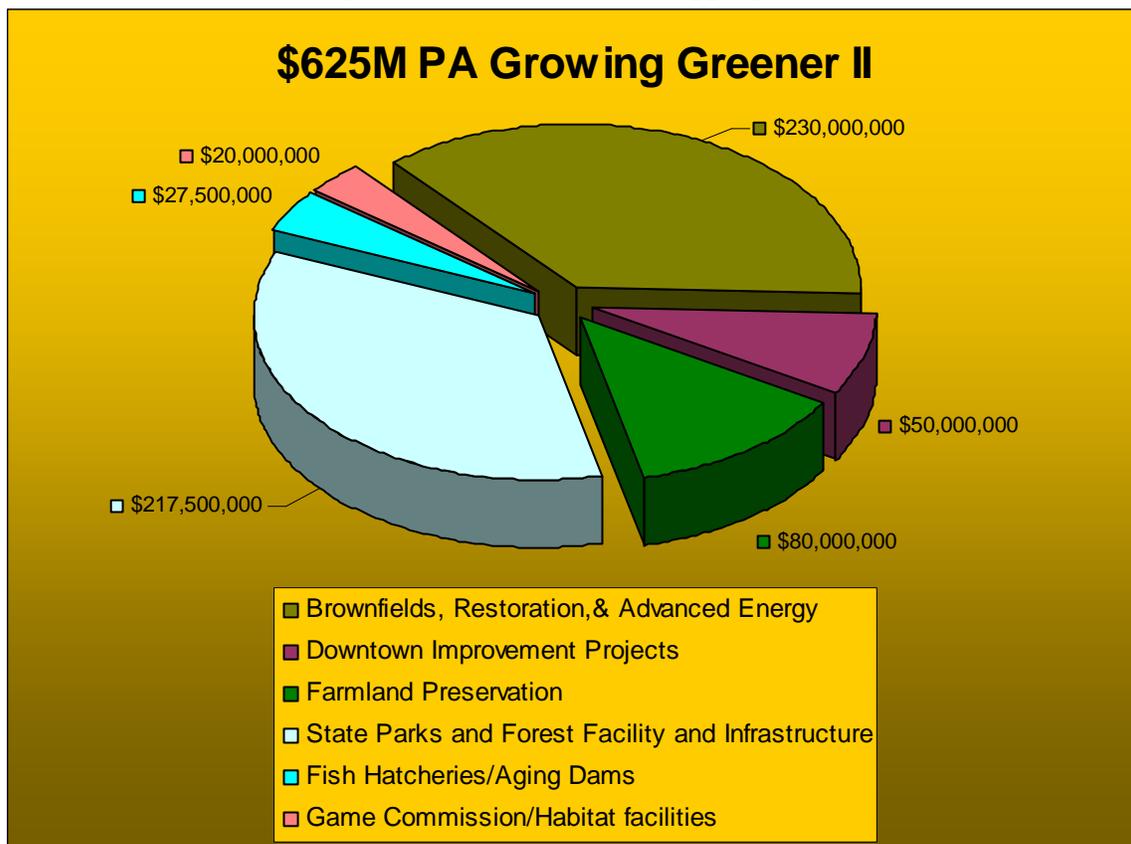


Figure 4. Use of Pennsylvania's Growing Greener II 2005

In the first full year of Growing Greener II, from July 17, 2005 through June 30, 2006, the Pennsylvania Department of Environmental Protection issued \$14,905,733.00 to 61 projects throughout the state. In the second year, July 1, 2006 through June 22, 2007, Pennsylvania increased Growing Greener II to 107 projects with grants totaling \$56,145,838.68. Recent examples of awarded projects include:

Growing Greener II Case Studies

The funds made available through the Growing Greener II Bond issue have an impact on a variety of former commercial and industrial sites. The program specifies \$230 million for “Brownfields, Restoration, and Advanced Energy projects.” The following examples highlight the variety of environmental work being accomplished through the bond initiative.

- **Brownfields:** The Manchester Citizens Corporation in Allegheny County was awarded \$275,000.00 to help redevelop the former American Electric Site. The project will be the largest recent development in the Manchester community and is intended to boost the local economy by the creation of 150 jobs over the next four years. The grant is to cover work plan development and remediation that will ultimately demonstrate compliance with Statewide Health Standards. The end-use of the property is residential development.
- **PA Energy Development Authority:** The City of Allentown, in Lehigh County, will benefit from \$517,045 of Growing Greener II funding for the Allentown Solar Photovoltaic Power Plant Installation. The grant will be used for the first phase of an installation of a solar photovoltaic (PV) array at the City of Allentown’s Bridgeworks facility, a brownfield industrial reuse building. The proposed size will be a 68 kW system, over a roof area of 5300 square feet, generating approximately 72,300 kWh per year. The ultimate goal is to utilize an area of 105,050 square feet that will generate 1344 kW of electricity with an estimated annual generation of 1433 MWh.
- **Watershed Protection:** Growing Greener II provided Villanova University in Delaware County \$69,483 to develop a RainGarden Cluster. The RainGarden reduce the first inch of stormwater run-off from an existing impervious site; effectively eliminating 85% yearly rainfall volume and removing 80% of yearly loading of surface NPS pollution. The project will create 4 configurations of raingarden BMPs for the study and analysis of different design principles referenced in the DEP’s draft Stormwater BMP Manual. The work will provide a much needed source of research and scientific field verification.
- **Re-mining Incentives:** Growing Greener II is funding the reclamation of the Babb Creek - Rattler Mine in Tioga County. A grant of \$557,796 will fund pollution mitigation from mine discharge. Plans call for the day-lighting of underground mine workings and alkaline amendments which will result in abatement of the contaminated discharge.

Contaminated Sediments

Grow Green II lists as eligible: projects that “implement a watershed restoration plan.” It is unclear whether the sediment remediation plans that have been prepared for Great Lakes Areas of Concern constitute “Watershed Restoration Plans.”

Contact Information

For information on brownfield redevelopment in Pennsylvania

www.newpa.com

www.growinggreener2.com

www.pennvest.state.pa.us

www.depweb.state.pa.us

MASSACHUSETTS

In 2002, under the direction of then Governor, Jane Swift, the Massachusetts Legislature unanimously passed a \$707 million Environmental Bond Bill. The bond was originally enacted as a three year financial mechanism designed to channel state funding to 76 environmental programs. Subsequent “Bond Patches” in 2004, 2006, and 2007 have maintained the state’s environmental commitment. Under the administration of current Governor Deval Patrick, a bill has been introduced to the state legislature that would nearly double size 2002 Environmental Bond to \$1.4 billion. Table 2 below, itemizes the use of the 2002 \$707 million bond. Several brownfields cleanup activities were funded by the bond (e.g., Environmental Remediation and Reuse was awarded \$6 million; Hazardous Waste Cleanup, \$34.48 million; Solid waste facilities-assessment, clean-up, closure, \$7.5 million).

Table 3. Use of Massachusetts Environmental Bond 2004

| | | | |
|--|------------|--|------------|
| BioReserves- acquisition and management | 9,000,000 | MDC properties- improvements and replacements | 26,101,500 |
| Stewardship- monitoring and enforcement | 3,000,000 | Boston Harbor Beaches-restoration and renovation | 23,650,000 |
| Forest Vision- private forest landowner program | 10,000,000 | Skating rinks, swimming pools, golf courses | 46,370,000 |
| Self-Help (s.11, c.132A) | 31,250,000 | Dam rehabilitation and reconstruction/Rolling stock | 19,780,000 |
| Urban Self-Help (c. 993, Acts of 1977) | 33,862,714 | Sanitary structures- renovation and reconstruction | 4,000,000 |
| State Urban Recreation Fund | 3,900,000 | Environmental remediation and reuse | 6,000,000 |
| Conservation Partnership Grant Program | 3,000,000 | Master plan implementation- Charles, Mystic, Neponset | 15,000,000 |
| Watershed Initiative (Wetlands Restoration) | 23,000,000 | Beaver Brook Flood Mitigation Project | 8,550,000 |
| Boat pumpout facilities- construction and improvements | 3,000,000 | Bridges and Parkways | 17,000,000 |
| Coastal resources monitoring, planning, coordination | 4,450,000 | Comm. Zoological Corp, Franklin & Stone Zoos | 16,000,000 |
| Underwater Archaeology | 1,000,000 | DFWELE land acquisition | 25,000,000 |
| Community Preservation- planning and analysis | 11,450,000 | DFWELE infrastructure and holdings | 12,000,000 |
| GIS MassGIS | 10,800,000 | New district facilities; Marine Fisheries Management Institute | 7,000,000 |
| EOEA infrastructure and holdings | 1,500,000 | Ecological restoration and management (NHESP) | 4,000,000 |
| Natural Resources Damage Trust | 1,500,000 | Upland habitat management program | 4,000,000 |
| Climate change planning; emissions reductions | 600,000 | River Restore Program (Riverways) | 4,625,000 |
| Environmental education | 1,600,000 | Coastal and inland boat launchings | 8,500,000 |
| Funds for emerald necklace muddy river restoration | 24,000,000 | Coastal and inland public access sites | 16,000,000 |
| Bike paths | 10,000,000 | Water quality monitoring; TMDLs; (circuit riders) | 12,500,000 |
| State piers | 3,000,000 | Statewide air monitoring | 3,850,000 |
| DEM land acquisition | 44,675,000 | Solid waste facilities- assessment, clean-up, closure | 7,500,000 |
| Forest and Parks System-capital improvements | 32,200,000 | Information systems development | 5,000,000 |
| Forestry Management | 1,400,000 | Hazardous waste clean-up | 34,480,000 |
| Equipment purchase and replacement | 5,000,000 | Senator William X. Wall experimental station | 5,000,000 |
| Environmental compliance | 4,000,000 | Aquifer Land Acquisition | 20,500,000 |
| Dam inspection and repair | 14,057,000 | APR program, Farm Viability Program | 62,680,000 |
| Lakes and ponds | 9,323,300 | Agro-environmental technology | 700,000 |
| Groundwater resource management | 2,000,000 | Agricultural Environmental Enhancement Program | 2,025,000 |
| Matching grants- | 7,185,000 | Aquaculture development | 1,558,000 |
| Resource management planning | 2,000,000 | Historic Preservation Grant Program | 4,000,000 |
| Parks college; resource management institute | 500,000 | | |
| Watershed Management Division infrastructure | 4,000,000 | | |
| MDC land acquisition/ Town Brook Basin, Quincy | 20,000,000 | | |

Funding the 1998 Massachusetts Brownfields Act

Even though the 2002 Environmental Bond Bill did line-item monies for the purpose of hazardous waste remediation and solid waste removal, the bulk of the State's brownfield program is not funded by the bond program. Instead, when a variety of brownfields programs were created in 1998, the legislature appropriated general revenue funding. The general fund-supported brownfields programs [listed below] continue to receive state appropriations.

- [Brownfields Redevelopment Access to Capital \(BRAC\)](#): Funding to purchase insurance for companies seeking to remediate contaminated properties against unanticipated environmental costs and defaults. The program was recapitalized under the 2003 Economic Stimulus Bill and appropriated \$6,000,000 under the state's 2003 Economic Stimulus Bill
- [Brownfields Redevelopment Fund](#): Funding for site assessment and cleanup. This fund was appropriated \$30,000,000 under the Massachusetts's 2006 economic stimulus package.
- [Brownfields Tax Credit](#): Provides a tax credit of up to 50% after a cleanup is completed, and 25% for a cleanup that uses an Activity and Use Limitation (AUL).(MassEconomy 2008)

Contact Information

MassDevelopment: Brownfields Redevelopment website:

http://www.massdevelopment.com/development/brownfields_intro.aspx

Telephone: 800.445.8030

CALIFORNIA

One of the more recent states to pass a statewide bond initiative with funds aimed directly at the remediation and reuse of brownfields is California. In November 2006, the California voters approved Proposition 1C, the Housing and Emergency Trust Fund Act of 2006 (SB 1689, Perata), which authorized the issuance of bonds in the amount of \$2.85 billion. The bond issue has two broad public purposes: to create affordable housing; and to promote smart growth by supporting brownfields, infill, and transit-oriented development.

Proceeds from the sale of the bonds are slated to fund existing affordable and support housing programs, including the Multifamily Housing Program, the Emergency Housing Assistance Program, the Farm worker Housing Grant Program, and the Down payment Assistance Program. In addition, Proposition 1C establishes funds totaling \$1.15 billion to promote three types of housing projects that have never before received public support in such a targeted way: 1) infill development 2) transit-oriented development (TOD), and 3) brownfield development. \$850 million is authorized by Prop 1C to be spent on the infill and brownfield programs, to be administered by the Department of Housing and Community Development (HCD) and the California Pollution Control Financing Authority (CPCFA) respectively, and an additional \$300 million is authorized for the TOD program, to be administered by HCD.

In 2007, the Legislature allocated \$60 million of these monies to CALReUSE for the purpose of “brownfield cleanup that promotes infill residential and mixed-used development, consistent with regional and local land use plans,” (CALReUSE 2008). The funds are to be distributed through grants and loans up to \$5 million for brownfield cleanup that produces residential and mixed use development in California’s infill areas to create housing opportunities for our working families. The \$60 million dollars provided makes this program is unprecedented when it comes to funding for brownfields site cleanup specifically for infill affordable and mixed use projects.

Loan and Grant Terms

- Financing available from \$50,000 to \$5 million for brownfield cleanup
- Grant and Loans
- Grant Eligibility: At least 15% of the Development Project must create affordable housing and meet the State’s density requirements.
- Loans: Interest Rate of Six Month LIBOR (2.98% as of 2/15/08) fixed for the term of the loan (no less than 2%).
- 6 years to cleanup the site and complete the Development Project

Project Criteria

- Development Project must create or promote residential or mixed use development.
- Be located in an Infill Area
- Be consistent with regional and local land use plans
- Must have a Cleanup Plan approved by an Oversight Agency prior to receiving funding

Current Projects

The first round of funding requests for the Prop 1C Remediation (Brownfield) Grant program are with the State's Strategic Partners for review. By the 20th of October [2008], Strategic Partners will pass on recommendations to the California Pollution Control Financing Authority (CPCFA) to approve funding of these vital programs for revitalization of brownfield projects throughout California. The following are the types of projects slated for funding recommendations in the next 60 days (the ultimate decision rests with the Board of the CPCFA):

1. A former rail yard in downtown Sacramento California with significant contamination and a mixed use redevelopment plan including new streets, transit stations, light rail, museum, open space, retail center and multi-family housing.
2. A former Navy Shipyard in San Francisco, California with mixed use, multi-family and single family homes. The affordable component of the housing development will exceed 30%.
3. Several multi-family apartment and townhouse developments with at least 15% affordable or senior supportive housing in Los Angeles, Stockton, Yuba City, San Jose and Oakland, CA
4. A former landfill in Carson, California slated for development as single and multi-family housing, theatre, hospitality, retail and open space.
5. An historic structure in Oakland, CA that will undergo historic rehabilitation and adaptive reuse including lead based paint and asbestos abatement and conversion to supportive housing for seniors in a revitalizing transit oriented neighborhood.
6. A former rail yard in Truckee, California slated for redevelopment as retail, hospitality and housing.

As of October 10, 2008, approximately 35 projects are in front of strategic partners for review. The total amount of funding request at this time exceeds \$100 million, while the project has set aside between \$55 and \$60 million to fund cleanups. The oversubscription of the program and the unparalleled popularity indicate the eventual success and hopefully the opportunity for the Office of Housing and Community Development to divert more funds to the program for a second round of funding (Nelson 2008).*

Contact Information

California officials work with strategic partners to review, score, and recommend program applications to the appropriate authority. The four Strategic Partners are listed below:

Statewide Strategic Partners

* Information in this section provided by Chris S. Nelson of SCS Engineers. See Nelson, C.S. in Sources

| | |
|--|---|
| <p>National Brownfields Association Michelle Pearce c/o SCS Engineers 3117 Fite Circle, Suite 108, Sacramento, CA 95827 (888) 708-0008 mpearce@scsengineers.com www.brownfieldassociation.org</p> | <p>Center for Creative Land Recycling Louisa Smythe, Program Coordinator 200 Pine Street, Suite 400 San Francisco, CA 94104 Tel: (415) 398-1080 Fax: (415) 398.5738 louisa.smythe@cclr.org www.cclr.org</p> |
|--|---|

Local Strategic Partners

| | |
|---|--|
| <p>Oakland Economic Development Agency Margot Prado, AICP Brownfields and Industrial Specialist 250 Frank H. Ogawa Plaza, 3rd Floor Oakland, CA 94612-2032 Tel: (510) 238-6766 Fax: (510) 238-2226</p> | <p>Targhee, Inc. – LA County Joan Greenwood, Project Manager 110 Pine Avenue, Suite 925 Long Beach, CA 90802 Tel: (562) 435-8080 Fax: (562) 590-8795 jvg@targheeinc.com www.targheeinc.com</p> |
|---|--|

For Applications or Questions:

To apply for funding, contact a Strategic Partner (contact information above) or CALReUSE staff at (916) 654-5610 or calreuse@treasurer.ca.gov. 3

California Pollution Control Financing Authority

Deana Carrillo, Program Manager
CALReUSE Program
915 Capitol Mall, Rm. 457
Sacramento, CA 95814
Tel: (916) 654-5610

NEW JERSEY

Unlike the other states reviewed in this report, New Jersey has not linked environmental issues and brownfields in a single state bond issue; however separate bond issues – the Green Acres Program on the environmental side and the Hazardous Waste Bond for brownfields – have succeeded in supplementing substantial state commitments of operating funds for environmental restoration and brownfields redevelopment purposes.

The state of New Jersey has long used major bond initiatives for environmental preservation and restoration projects. With the creation of the [Green Acres Program](#), New Jersey voters, from 1961 to 1995, overwhelmingly supported nine environmental bond issues totaling \$1.4 billion. The primary use of the funds was slated for land acquisition and park space development.

Even with its legacy of land preservation, New Jersey is designated as the most densely populated state in the union. In 2001 New Jersey planning officials estimated that only 12.5 percent of the state's metropolitan areas were undeveloped or unprotected. The scarcity of land had been the driving force behind a statewide growth plan. This plan, known as the New Jersey State Development and Redevelopment Plan, allocates state and local resources to protect undeveloped/unprotected land and encourage the redevelopment of brownfields and vacant lots in existing urban zones. Along with population density, a major impetus behind this growth initiative is the statewide inventory of roughly 23,000 potentially contaminated sites.

Several years before the State Development and Redevelopment Plan, New Jersey was aggressively addressing its large inventory of idle industrial facilities. Making it one of the oldest state-level brownfields initiatives in the country, New Jersey established a voluntary cleanup program in 1992. In the following year, the state legislature passed a bill allowing for the creation of a grants and loan fund for brownfields remediation activities. Partial funding for the grants and loans come from the state's \$75 million [Hazardous Waste Bond issue](#), also created in 1993. Private parties wishing to voluntarily perform brownfield remediation activities could qualify for loans of up to \$1million per year if they are unable to obtain private funding. Under the early program, the state issued over \$56 million in grants and loans.

Contact Information

Administrator of Brownfields Program at New Jersey Department of Environmental Protection:
Ken Kloo
609/292-1251
ken.kloo@dep.state.nj.us .

New Jersey Voluntary Cleanup Program:
Division of Remediation Support; Bureau of Risk Management, Initial Notice & Case Assignment
609-292-2943.

Link to additional contacts: <http://www.state.nj.us/dep/srp/brownfields/contacts.htm>

WISCONSIN

Contaminated Sediments Program: General Obligation Bond Funds

In 2007 the Wisconsin Department of Natural Resources increased general obligation bonding authority for contaminated sediment and aquatic/riparian restoration efforts from \$7 million to \$17 million dollars. The bond funds for the Contaminated Sediments Program were allocated to fund a portion of the costs of a project to remove contaminated sediment from Lake Michigan or Lake Superior. Specifically, the general obligation bonds are being used as Wisconsin's match to federal remediation funds made available through the Great Lakes Legacy Act.

Current Projects

The Department of Natural Resources (DNR) is working with the USEPA's [Great Lakes National Program Office \(GLNPO\)](#) to remediate and restore two sites that lie within the [Milwaukee Estuary Area of Concern](#) (AOC). Under the Legacy Act, the state is responsible for thirty-five percent of the cost of remediation/restoration efforts for projects within designated Areas of Concern. Wisconsin is using the 35/65 matching federal funds on two projects—the Kinnickinnic River (a tributary to the Milwaukee River) and the Lincoln Park Lagoon.

Case Study: The Kinnickinnic River Primarily situated in the city limits of Milwaukee (in the heart of the Milwaukee Estuary AOC) the Kinnickinnic River Environmental Restoration Project is an approximately 2000-foot long and 200-foot wide river-section with waters that discharge into Lake Michigan via the Federal navigation harbor at Milwaukee, Wisconsin. Between 1915 and 1936 the waterway had a navigable depth of 21 feet. In 2002, approximately 90 percent of the river had a depth of 0-10 feet. After decades of urban growth and development and lack of regulations prior to the mid 1970's, most of the sediments are laced with PCB and PAH contaminants.

After analyzing nearly a dozen project alternatives—including no action and five dredging alternatives combined with two disposal options—Wisconsin officials have elected to implement an aggressive restoration alternative. The restoration calls for dredging up to 170,000 cubic yards of contaminated sediments, approximately 90% of PCB mass in the project area. This dredging will create an 80-ft navigational channel of 20-24 feet deep (WisconsinDNR. 2008).

Contact Information

Wisconsin Department of Natural Resources
Greg Hill, Project Coordinator
Contaminated Sediments Program
608-267-9352
gregory.hill@dnr.state.wi.us

CONCLUSION AND RECOMMENDATIONS FOR FURTHER STUDY

The major environmental bond initiatives discussed in this document have brought brownfields redevelopment to the forefront in states most impacted by abandoned and idled commercial and industrial sites. Elected officials and voters of these states recognized the multi-tiered economic and public health benefits associated with brownfields redevelopment and overwhelmingly supported a financial commitment to the environment. As a result, long term health risks have been mitigated, there has been a resurgence of private investment into once downtrodden areas, and countless acres of undeveloped lands remain as green open space that will be enjoyed for future generations.

As the population of the United States grows, elected officials and planners must turn to the reuse of land rather than the development of greenfields. A recent study pertaining to brownfields found that the reuse of one acre of abandoned land preserves four and one half acres of greenfields (Deason, et al 2001); therefore, the hundreds of reuse projects financed with these large-scale bonds translate into the preservation of countless eco-systems, recreation areas, valuable open-space.

The obvious hurdle to recycling brownfields has been the cost (real or perceived) of environmental clean up. Several of the states described above are currently facing shortcomings in state budgets. Population shifts, changes in transportation modes, and a string of manufacturing plant closings in the Northeast and Midwest region have eroded state financial resources and increased the number of abandoned facilities. In challenging economic times, it becomes increasingly difficult to convey the importance of environmental projects and new proposals for state revenue collection often become politically impossible. Without a viable revenue stream, the types of bond initiatives described herein may be in jeopardy and additional research into possible bond repayment mechanisms needs further study. One possible avenue for a dedicated funding source is outlined below.

Concepts for Dedicated Funding of Future Environmental Bond Issues - Surcharge on Transfer Taxes in Waterfront Zones

In considering revenue sources for a future sediment cleanup bond issue, NEMW focused on ways to link sediment cleanup to potential sources of revenue that have the potential to grow, are currently untapped (in terms of a revenue stream for bond issues), and for which there is a justifiable rationale that relates to sediment cleanup. One potential source that meets these qualifications is a surcharge on transfer taxes in specified waterfront/riverfront zones. This concept is specifically designed to capitalize on the projected real estate trends cited in the [“Trend toward waterfront development section.”](#) The concept is based on the principle that those living on the water are immediate beneficiaries to sediment cleanup, because the cleanup will result in lifting beneficial use restrictions, and property values are likely to rise. By focusing on the transfer tax, the proposal does not affect property owners until they sell their land. The uses of the dedicated fund could also include land-side environmental improvements and brownfields redevelopment.

NEMW is unaware of any state where a transfer tax surcharge on waterfront development is part or all of the revenue stream for a state environmental bond.

Concepts for Dedicated Funding Future Environmental Bond Issues – Impermeable Surface Tax

A second concept for a future environmental bond issue is an impermeable surface tax. A bill was introduced in the 2007 session of the Maryland General Assembly proposing a new tax on the creation of new impervious surfaces (including rooftops, driveways, sidewalks, streets, etc.). The proposal outlined that impermeable surfaces would be taxed at a rate of 25 cents per square foot within state-designated growth areas and \$2 per square foot outside of the areas. It was projected to raise \$125 million in revenues that were planned to fund Chesapeake Bay restoration projects (Flores 2007).

Greensboro, North Carolina has already adopted impervious surface taxes to help pay for storm water management systems. Their tax averages \$2.44 per month per property and raises between \$6 and \$7 million in revenues, annually. At the county level, Anne Arundel County, Maryland has been reported as looking into creating a hard-surface tax.

An impervious surface tax, aside from the considerable potential to raise funding levels for vital projects, would also serve smart growth and climate change objectives – it would add to the cost of spread development patterns and reward compact development. Compact development has been shown to reduce vehicle miles traveled (and travel-related greenhouse gases) by 20 to 40 percent (Ewing, et al 2008).

An impervious surface tax would also serve water quality objectives. When impervious surfaces cover more than 10 percent of a watershed, rivers, creeks, and estuaries suffer severe biological degradation. Therefore, watersheds that are covered with less than 10 percent impervious surfaces should be protected, and urbanized watersheds with imperviousness of more than 10 percent should absorb the majority of growth (Beach 2002).

A potential tax on impervious surfaces creates a strong link between future environmental protection and the creation of a revenue stream to help pay for past environmental degradation. Many states are unable to develop large environmental bond issues because of lack of state funds for repayment. An impervious surface tax could be a viable solution for budget strapped regions of the country.

Conclusion

A significant share of population growth in North America can be absorbed by reusing former industrial and commercial land (Paull 2008). The decline of manufacturing has translated into less of a need for industrial land, but it takes a combination of incentives that favor brownfields and disincentives for greenfields development. This change in land-use patterns can be captured in order to both preserve open space and restore prosperity to the many cities suffering the ill-effects of brownfields.

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