GREEN TECHNOLOGY PARK @ WOODBRIDGE

CONCEPT PLAN AND IMPLEMENTATION STRATEGY

Prepared by:

Greener by Design
94 Church Street · Suite 301
New Brunswick, NJ 08901
Tel 732.253.7717 · Fax 732.253.7719
www.gbdtoday.com

Prepared for:

Township of Woodbridge, New Jersey
One Main Street
Woodbridge, NJ 07095
Tel 732.602.6015 · Fax 732.602.6016
Attention:
John E. McCormac, Mayor, Township of Woodbridge
Caroline Ehrlich, Executive Director, Redevelopment Agency

Submitted on:

April 29, 2010

CONTENTS

1.0 INTRODUCTION 1
1.1 Background 1
1.2 Objectives and Next Steps 2
1.3 Report Contents and Organization 2
2.0 Technical Assessment 4
2.1 Overall Green Technology Park Concept 4
2.2 Preliminary Alternative Development Themes for GTP@W 4
2.3 Preliminary Alternative Physical Development Concepts 8
2.4 Renewable Energy Potential for the GTP@W 11
2.5 Woodbridge Innovation Zone 15
3.0 Economic and Financial Assessment 18
3.1 Economic Feasibility Assessment 18
3.2 Green Technology Incubator Financial Feasibility Assessment 20
3.3 New Jersey Renewable Energy Portfolio Energy Certificates 20
3.4 Renewable Energy Alternatives Financial Feasibility Assessment 21
3.5 Financial Feasibility of Overall GTP@W 24
3.6 Financial Sourcing 24
4.0 Environmental Assessment 34
4.1 Environmental Constraints 34
4.2 Environmental Opportunities 40
4.3 Wetlands/Ecological Restoration Studies and Projects 43
4.4 Concept Plan for Centralized/Shared On-Site Environmental Infrastructure 47
4.5 Preliminary GTP@W Environmental Management System 48
4.6 Regional Evolutionary Approach to Achieving Industrial Symbiosis 48
5.0 Organizational Development 51
5.1 Financiers 51
5.2 Master Developers 51
5.3 Property Manager 53
5.4 Business Incubator 54
5.5 Woodbridge Innovation Zone 55
5.6 Green Jobs Training Center 56
5.7 Woodbridge Energy Institute (University Research Consortium) 58
5.8 GTP@W Tenants 58
5.9 Local Organizations 59
5.10 Government Agencies 60

6.0 Organizational Development and Stakeholder Outreach Action Plan 62
6.1 Communications Tools 62
6.2 Stakeholder Outreach Plan 63
7.0 Implementation Action Plan 65
7.1 Technical Development 65
7.2 Economic and Financial Development 65
7.3 Environmental Opportunities and Constraints 65
7.4 Organizational Development and Stakeholder Outreach 66

TABLES

Table 1: GTP@W Solar Potential 13
Table 2: Energy Savings per Acre of Geothermal Exchange Field 15
Table 3: Estimated Short- and Long-Term Job Creation for GTP@Woodbridge 19
Table 4: SREC Value Assumptions 21
Table 5: GTP@W Solar Potential 23
Table 6: Funding Opportunity Summary Table 32
Table 7: Properties Included in Preliminary Investigation 36
Table 8: Potential Developable Areas 38

FIGURES

Figure 1: Wind Energy Map of New Jersey 14
Figure 2: Potential Development Areas with 50' Buffer 39
Figure 3: Potential Development Areas with 100' Buffer 39

1.0 INTRODUCTION

1.1 Background

The Pennval Road Redevelopment Area is a 107-acre site in the Woodbridge proper section of the Township. In response to the physical and economic conditions in the area, the Town Council in November 2007 requested that the Planning Board evaluate the need to redevelop the site. The Planning Board published a redevelopment study in February 2008 resulting in a Council resolution designating the redevelopment area and resulting in a redevelopment plan in November 2008. The redevelopment plan recommends that the Redevelopment Area be comprehensively redeveloped as the Green Technology Park @ Woodbridge (GTP@W), including a sustainable energy and sustainable technology business incubator, industry cluster and related job training center.

Several types of green tenants would be attracted to locate in the park, according to the plan: renewable energy firms, energy efficiency industry, energy efficient building firms, energy efficient products businesses, energy research and consulting organizations, etc. (see Box 1 for examples of each category).

Box 1: Examples of Businesses Attracted to Green Technology Park @ Woodbridge

- Renewable energy firms - defined as those that generate energy from wind, solar, fuel cells, and biomass - that either directly generate renewable energy for the grid or local uses, or those that create products or services that serve direct renewable energy producer, such as power electronics companies that control, store, switch, and monitor power production and energy usage (either for the grid, as part of a manufacturing process, or for community or residential use)
- Energy efficiency industry, including a broad range of goods and services from architects and developers who assist in the construction of green buildings to the manufacturers of the components and materials required for energy efficiency
- Energy efficient building firms that design and/or construct energy-efficient residential, commercial, and industrial structures.
- Energy efficient transportation firms working to create more efficient fuels and transportation technologies (e.g. fuel cells, ethanol and biodiesel, etc.)
- Energy efficient industrial process firms that provide technological advancements to industrial equipment, processes, and system design such as eco-industrial design
- Energy efficient products and appliance businesses which manufacture or retail energy efficient products to consumers for household and commercial use (e.g. energy efficient lighting, insulation, heat pumps, etc.)
- Universities, businesses, and non-profits that engage in energy research and consulting

The park will promote green business development and create green jobs for residents of Woodbridge and the region that can access it via major regional transport corridors. The park's facilities and tenants will be supported by centralized/shared green energy and environmental management facilities and services, and the area's development will include restoring an important historical site and valuable ecological services provided by site soils, wetlands and floodplains. The GTP@W will serve as a model for green redevelopment criteria and processes in Woodbridge and beyond.

As it is currently envisioned, the innovativeness and scale of the proposed GTP@W will make it a very visible model of environmental and economic sustainability that will be a core element of Woodbridge Township's Sustainable Jersey program, and spur similar developments throughout New Jersey. In this way, the park will create significant positive sustainability impacts in many categories of Sustainable Jersey scoring, including Innovative Demonstration Projects, Local Economies and Green Jobs, Energy Efficiency, Green House Gas Reduction, Green Design, Natural Resources, Operations and Maintenance, Sustainability Planning, and Waste Reduction and Recycling. In 2009, Woodbridge Township was awarded first prize for garnering the greatest number of points during Sustainable Jersey's inaugural year. Implementation of the GTP@W will serve to further evolve the Township's sustainability mission.

1.2 Objectives and Next Steps

A redevelopment study and plan have been prepared for the GTP@W redevelopment site, and some discussions have been held with potential redevelopers and incubator operators. However, many critical path tasks remain to better define the project and prepare it for the next development phase. This work is especially crucial in an environment wherein developers have little access to pre-development finance. Moreover, although the majority of developers may be generally familiar with the concepts of sustainable development and green buildings, many may not yet be familiar with the integrated concept of a green technology park which includes green businesses/jobs in green buildings supported by green energy and environmental infrastructure. Thus, the pre-development work delineated here will increase the viability and marketability of the GTP@W, while also serving an educational function.

1.3 Report Contents and Organization

Woodbridge Township is using funds from its Energy Efficiency and Conservation Block Grant from the US Department of Energy to conduct this study. This report serves as a pre-feasibility study, implementation plan and communication strategy needed to better define, illustrate and communicate the green jobs, overall sustainability and financial advantages of the GTP@W to potential financiers, redevelopers, tenants, etc. Tools to communicate these advantages include brochures, prospectuses and RFIs/RFQs. These steps are on the immediate critical path toward realizing the GTP@W. The report consists of the following elements:

- Technical Assessment (Section 2.0)
- Economic and Financial Assessment (Section 3.0)
- Environmental Assessment (Section 4.0)
- Organizational Development (Section 5.0)
- Organizational Development and Stakeholder Outreach Action Plan (Section 6.0)
- Implementation Action Plan (Section 7.0)

2.0 TECHNICAL ASSESSMENT

The feasibility of various themes of GTP@W is dependent on two assessments: technical and financial. Section 2.0 examines the proposed technical themes for the incubator and full GTP@W development. Section 3.0 will analyze the financial feasibility of these themes in greater detail. It is important to note that technical and financial feasibility are considered in tandem to identify the most favorable development strategies. The feasibility of some strategies will be dependent on the eventual development patterns and tenants. As a result, some specific strategies may require re-assessment once a master developer and/or anchor tenants are identified.

2.1 Overall Green Technology Park Concept

Development of basic concept for sustainable energy infrastructure addressing all levels of the park's structure:

- Green theme of individual GTP@W tenants and their facilities design and management
- Green theme of overall GTP@W and its infrastructure design and management
- Green theme of GTP@W's role in anchoring the green theme of a Sustainable Woodbridge Innovation Zone and the Township as a whole

The focus will be on defining overall park infrastructure, and outlining initial guidelines and standards for selecting tenants and designing and operating individual tenant buildings.

2.2 Preliminary Alternative Development Themes for GTP@W

In addition to a general green or sustainable development theme or mission for GTP@W, there are several alternative "sustainability sub-sector" concentrations that the redeveloper could pursue in developing the Park. Preliminary alternatives proposed and elaborated here include:

- Sustainable energy
- Sustainable building
- Sustainable transport

These alternatives are not mutually exclusive; rather, multiple themes may be pursued over time and space:

- ***Time:*** It is anticipated that the initial development theme would be driven by the capabilities, experience and interests of the redeveloper and other stakeholders. The initial concept will then be influenced by market forces and by specifically what anchor tenant(s) are willing to commit to the Park. The anchor tenants will in turn influence the nature of subsequent tenants committing to the Park. The success stories and lessons learned from the initial mix of tenants, combined with market forces, will then drive the evolution of the mix of tenant sectors and industries over the longer term.

- ***Space:*** Rather than see the GTP@W as fixed in one location at the Pennval Road Redevelopment Area site, it is envisioned that the Park and its tenants will form networks and associations, both ad hoc and formal, with like industries and sectors in the greater Woodbridge region, and in either horizontal or vertical relationships. At a minimum, the GTP@W administration and the Township will work to facilitate these relationships and organizations. In addition, the Woodbridge Innovation Zone arrangement would provide a formal framework and incentives for such a development. This will help to diversify the tenant mix, maximize synergies and symbioses among Park tenants and between the Park tenants and their larger networks in the region, and thus maximize the sustainability of the GTP@W.

2.2.1 Sustainable Energy Theme

While one or more alternative themes may be pursued by the redeveloper, as described above, the sustainable energy theme is proposed here as a common component of all alternative development scenarios. For this reason, it is presented first and has received the most analysis of the alternative themes.

The GTP@W can serve as a center of excellence for green building in several ways:

- Utilizing the statewide Edison Innovation Zone[1] framework to link GTP@W's sustainable energy activities to the initiatives of the Woodbridge Sustainable Energy Consortium and Township's sustainable energy clusters.
- Developing the GTP@W such that it achieves substantial or full energy self-sufficiency, and possibly energy export capability, via onsite renewable energy generation and energy-efficient operation.
- Designing and constructing all GTP@W tenant and administration buildings as models of energy efficient operation and renewable energy generation, utilizing LEED or similar guides.
- Providing business incubator office, R&D/testing, full-scale manufacturing, and commercial exhibition spaces and services relevant to sustainable energy development.
- Committing, preferably an existing major national energy technology or development firm, e.g. Johnson Controls, Honeywell, CPV, Covanta or PSE&G as an anchor tenant for production of sustainable energy.
- Attracting a university or university consortium to locate their existing or new sustainable energy research center in the green business incubator at GTP@W.
- Incorporating sustainable energy courses into the curriculum offerings of the green jobs training institute at GTP@W.

[1] Edison innovation zones are a New Jersey state program. These programs are not in any way directly affiliated with Edison, NJ, one of Woodbridge's neighboring municipalities.

2.2.2 Sustainable Building Theme

Much of the State of New Jersey is already densely developed and many of its cities and towns, as well as their respective industrial areas and infrastructure, could be described as not only fully built out but aging, deteriorating and, in many cases, contaminated or suspected of being contaminated. Economic recovery and development in Woodbridge and the State, including attracting new business and creating new jobs as well as recovering existing businesses and jobs, is therefore a matter of re-visioning and redevelopment. To accomplish redevelopment in a sustainable and green way requires the implementation of leading edge/ new technologies and techniques for building and site decommissioning, decontamination, deconstruction, and materials recovery; for environmental cleanup, ecological restoration, and site redevelopment. In addition, in New Jersey, a significant portion of residential construction is in the expansion and remodeling of existing single-family detached homes, a scale at which it is difficult to introduce green construction materials and techniques. These factors present unique challenges for redevelopment and reconstruction along green lines, so there is a latent demand for specialized research and commercialization of green building construction materials and services GTP@W can fill. The GTP@W can serve as a center of excellence for green building in multiple ways:

- Providing business incubator office, R&D/testing, full-scale manufacturing, and commercial exhibition spaces and services relevant to construction materials and techniques.
- Designing and constructing all GTP@W tenant and park administration buildings as models of green construction utilizing LEED or similar standards as guidelines.
- Committing an existing major national green building materials manufacturing firm, e.g. BASF (building insulation), as an anchor tenant.
- Utilizing the statewide Edison Innovation Zone framework to link GTP@W's green building activities to the building and road materials recovery operations and R&D of Bayshore Recycling
- Attracting a university or university consortium to locate their existing or new green building research center in the green business incubator at GTP@W.
- Incorporating green building courses into the curriculum offerings of the green jobs training institute at GTP@W.

2.2.3 Sustainable Transport Theme

This theme is an appropriate one to consider for Woodbridge for several reasons. First, Woodbridge Township is unique in its location at the crossroads of several of the largest, busiest and most critical transport facilities in not only the State of New Jersey but in the country, including the Garden State Parkway and New Jersey Turnpike highways; Northeast Corridor Amtrak, New Jersey Transit and Conrail railways; Port of New York and New Jersey and Arthur Kill waterway; and planned Woodbridge River greenway for walking and bicycling. The foundation for a sustainable transport network already exists in Woodbridge, as evidenced by Woodbridge and Avenel train stations with commuter rail access to the region, Metropark station with service by commuter and intercity rail, a network of commuter shuttles, and a municipal commitment to fuel-efficient and alternative fuel vehicles.

Second, consistent with the transport intensive nature of the Woodbridge area, the majority of existing uses of the GTP@W site parcels are transport related, including freight container chassis repair and overhaul, storage pallet repair and manufacturing, and mobile modular classroom distribution (as well as the Township's automobile impound lot). The GTP@W can serve as a center of excellence for sustainable transport in several ways:

- As part of the sustainability and green theme of the GTP@W, it is proposed that all development scenarios include provision of pedestrian, bike, bus and auto links within the Park and from the Park to the existing regional transport facilities. This would include providing shuttle buses and/or an electric zip car link to mass transit stations, as well as convenient bike rental, storage and shower and changing facilities to encourage bicycle commuting from the mass transit stations to the park. Development of nature trails running along the river and connecting to the planned Woodbridge River Greenway is also envisioned.
- Redevelopment law will require the Township to facilitate relocation of these businesses anyway, so there is some logic in first trying to work with these tenants to determine if they could reconfigure their facilities and operations to be consistent with the GTP@W mission. One such existing tenant is already in discussions with the Township to clean up their site and reconfigure their operations to utilize their biomass wastes as a renewable fuel and sell the energy recovered to GTP@W.
- Committing an existing major sustainable transport manufacturing firm, e.g. a manufacturer of batteries for battery-powered cars, as an anchor tenant.
- Attracting a university or university consortium to locate their existing or new sustainable transport research center in the green business incubator at GTP@W.
- Incorporating sustainable transport courses into the curriculum offerings of the green jobs training institute at GTP@W.
- The maintenance, site support and security vehicles for the GTP@W complex should incorporate vehicles run on alternative fuels, such as electricity, propane and/or natural gas. Necessary infrastructure to support such vehicles, as well as perhaps others vehicles from tenant organizations should be installed at a central location on-site.

2.2.4 Other Possible Themes

In addition to the three main themes of sustainable energy, sustainable building construction, and sustainable transport, there are many other themes that could be applied in developing the GTP@W; the following are just a few more:

- Sustainable Industry – While the industrial sector clearly cross-cuts most of the other themes described here, sustainable industry, or "industrial ecology", could be considered as a stand-alone sector in light of the need to recover and strengthen New Jersey's industrial base and create green jobs. Industrial ecology and eco-industrial parks are defined and described in Section 4.6 *Regional Evolutionary Approach to Achieving Industrial Symbiosis*.
- Ecological Restoration – This would include especially wetlands and floodplains restoration and balancing same with existing development and associated flood and mosquito control

objectives as well as with competing uses of open space for more active recreation or more diversified habitat creation.

- Contaminated Site Cleanup and Waste Management – For many interrelated environmental, social and economic reasons, there continues to be a very significant need to clean up contaminated sites in the State, including brownfield sites with redevelopment potential. With resources being short relative to the demand, a venue and forum for collaborative R&D in the cleanup and waste management field is critical.

2.3 Preliminary Alternative Physical Development Concepts

To some extent, the choice of themes from among the alternatives described above, and their sequencing if multiple themes are selected, will affect the identification and elaboration of alternative development concepts for the GTP@W. However, there are several common elements among the alternative themes that can be used to formulate an overall physical development concept plan. The following subsections outline a phased approach to physical development of the GTP@W. While broad alternative directions remain possible for the later phases, the first phase is presented in more detail as a defining common basis for subsequent phases. Locations within the GTP@W for each phase will be set at a future point in the planning process.

2.3.1 GTP@W Main Administration and Green Incubator Complex (Phase 1)

Although it contains internal variations and sub-phases of its own, Phase 1 will generally be common to all of the alternative development scenarios. Phase 1 is envisioned to be a complex of three inter-linked high-performing buildings, with a high degree of self-sufficiency that can be built in phases depending on financing and tenant recruitment. To the extent that this building complex serves as a demonstration project, it is envisioned that green features would include a green roof and wall / terrace plantings with and planting compatible with and complementing the surrounding wetlands. While self-sufficiency of the built environment depends on function and scale – e.g., from a true sustainable ecologic viewpoint some buildings will be producers (energy, clean water, etc) and others consumers – this initial complex will be designed so as to be highly energy efficient and to accommodate renewable energy investments. These may or may not be designed with overcapacity to supply future park uses (depending on what is known about the development plan at that point). The complex will also exhibit superior indoor air quality and overall indoor environmental quality.

The concept proposed here calls for the three buildings of this complex to be designed to LEED Platinum standards. There are, however, other and even overlapping possibilities including the forthcoming ASHRAE 189.1 standard and the associated ASHRAE Building Energy Quotient labeling program for the designed and operating performance of all but low-rise residential buildings. In addition, the State of New Jersey recently adopted interim green building standards that must be met in order to receive certain kinds of grant assistance and expects to adopt final green building standards by December 2010. Currently, these standards require LEED or ICC-700-Silver certification with specific energy performance levels that otherwise exceed the requirements of Silver level certification.

The functions and tenants of the three buildings are envisioned below. The building ownership will depend on the particular project development and financing strategies pursued, yet to be developed.

Building One: GTP@W Administration (Phase 1A)

The first building would house the overall GTP@W administration and offices of GTP@W stakeholders, as follows:

- Central atrium lobby (passive solar) and exhibition space featuring a scale model of the GTP@W and sustainable energy technology, wetlands restoration, etc.
- Administrative and sales offices of the GTP@W property manager
- Administrative offices of the green business incubator, green jobs training center, energy institute, university research consortium, and any associations of green businesses
- Branch or representative offices of the NJ EDA and CAT, etc., as appropriate
- Office for the Woodbridge Sustainable Energy Consortium and Woodbridge Township Energy Coordinator
- A large meeting facility to accommodate conferences and meetings

Building Two: Green Incubator Offices and Green Job Training Classrooms (Phase 1B)

The second building would house primarily the green business incubator, based on the premise that small enterprises would need to be incubated before needing more extensive space for testing or manufacturing, and would include facilities typical of such incubators elsewhere in New Jersey, as follows:

- Office space for individual small enterprises
- Space for communal office equipment and office services
- Common meeting, networking and exhibiting spaces
- Office space for professional support services (legal, accounting, etc.)
- Flexible classroom and seminar spaces for green jobs training

Building Three: Green Incubator Laboratories and Testing Facilities (Phase 1C)

The third building would house enterprises that are further progressed and need specialized facilities and infrastructure to support the next phase of technology or product development, including:

- Space and infrastructure (IT, electrical, plumbing, ventilating) for laboratories and bench scale testing facilities and equipment
- Space and infrastructure for an environmental laboratory and associated field sampling and analysis equipment for the GTP@W environmental management office to use in monitoring environmental performance of GTP@W infrastructure, buildings and grounds
- Space for offices of enterprises associated with the above testing facilities

Space within this third building would be designed and allocated flexibly such that different kinds of enterprises could rent a given laboratory or testing space on a short-term basis, or

enterprises could lease such space for the longer term, either jointly with a connecting office space or in addition to an office already being leased in the second building. Similar green and flexible laboratory and testing facilities have been or are being developed at other business incubators in Camden and Newark, New Jersey.

This third building may need to be disconnected from the other two, because it will require very different kinds of HVAC systems, water and fire suppression and will use energy and water much more intensively than the other two buildings. Thus, the most likely scenario is for the other two buildings to produce surplus energy that can be shared with the third building. Also, there is a separate green building protocol for laboratory buildings, called LAB 21, which is more appropriate than the general LEED standard (which does not adequately assess sustainability of laboratory facilities).

Pilot Testing and Demonstration Facilities for Technology Scale-up (Phase 1D)

A portion of the site near the GTP@W Main Administration and Green Incubator Complex will be reserved for development of a series of one or more green and flexible large-scale technology pilot testing and demonstration facilities. These buildings will be built as demand is demonstrated from the GTP@W incubator offices and laboratories or from the full-scale manufacturing facilities located in GTP@W or elsewhere in the Woodbridge Innovation Zone who want to develop additional new products. Design flexibility will address the varying space and infrastructure needs of potential clients and their respective industries and technologies. Similar green and flexible pilot scale testing and demonstration facilities have been or are being developed at other locations in New Jersey.

Future Modifications, Expansions or Contractions (Phase 1E)

The administration and incubator complex would be designed so that, over time, depending on market forces, the buildings can be remodeled or expanded, or additional buildings constructed, or buildings deconstructed and their materials reused or recycled. For example, the green jobs training institute may expand and need their own building or the testing and laboratory facilities may need to be modified to service a particular enterprise or industry.

Subsequent Phases of GTP@W Development (Phases 2, 3…)

The nature and extent of subsequent phases of GTP@W development would depend on market forces, as well as the objectives, successes and lessons learned from Phase 1 developers, tenants and other stakeholders. Several alternatives are identified here for build-out of the balance of the GTP@W in support of one or more of the alternative sustainable development themes described earlier. All alternatives assume green building design and maximum renewable energy self-sufficiency. These alternatives can be considered either exclusively or in combination, and either concurrently or in phases; they include:

- Office and laboratory buildings providing primarily high-tech think tank, consulting, R&D and bench scale testing

- Light industrial buildings providing pilot scale testing and demonstration or light manufacturing assembly, e.g. of building climate control and monitoring instrumentation, etc.
- Warehouse/distribution facilities, e.g. for green building construction materials, as associated with industrial uses of the site
- Heavy manufacturing facilities, e.g. for automobile battery, solar panel or wind turbine manufacturing

2.4 Renewable Energy Potential for the GTP@W

2.4.1 Background

For new construction, the most economic investments in the GTP@W sustainability effort are in energy efficiency architectural design and construction. The green building design concepts will make the greatest contribution towards achieving sustainability goals by reducing future energy demands. On-site renewable energy and energy efficient generation technologies will complement efficiency measures by adding low impact energy to the GTP@W sustainability portfolio.

2.4.2 Combined Heat and Power (CHP)

Although Combined Heat and Power (CHP) systems do not qualify as 'renewable' energy, they simultaneously generate steam and electricity, which results in much greater total energy efficiency than electric-only generators. From a sustainability point of view, this efficient power generator would displace off-site coal-fired power generation in favor of on-site natural gas consumption in generating the power, as well as generate the heat with little or no additional fuel usage, thus reducing GTP@W's environmental footprint.

The biggest challenge in achieving this efficiency on a technically and economically viable scale is that the installation site must have a relatively constant demand for the steam generated. Either the steam's heat can be used (e.g. a large scale, 24-7 industrial laundry service that requires constant hot water and heated air) or the steam pressure can be used to power mechanical operations such as absorption chillers for cooling purposes. Without a large, constant thermal demand, a CHP project is not typically considered viable.

The total constant thermal load must be known before sizing a CHP system. This thermal load and resulting system size are critical to evaluating the economic and environmental benefits. Until these variables are fully understood, a preliminary CHP evaluation would not be meaningful.

2.4.3 Solar Photovoltaic (Solar PV)

Among the various renewable energy technologies reviewed to support the sustainability of the GTP@W, solar PV appears to be the best opportunity. Solar PV has a number of advantages that arguably make it the most ideal representation of renewable energy technology in the market today. It utilizes the most abundant source of energy on earth, converting the power of

sunlight directly into electricity. PV equipment has no moving parts and requires minimal maintenance. It generates solar electricity without producing emissions of greenhouse gases or other pollutants, and its operation is virtually silent.

However, solar PV is not without drawbacks. While it is an excellent renewable source of energy, it is not a dependable source of energy. PV generates no power during nighttime hours, and minimal power in cloudy conditions. More importantly, PV is very expensive to install; a PV system can cost 5 to 10 times as much as a natural gas fueled power plant of equal size. Partially offsetting this cost disadvantage is the fact that PV has no fuel cost associated with generating electricity. Combining this with current federal tax incentives and New Jersey's solar energy incentives can make solar PV a cost-competitive source of electric generation.

Further analysis of Solar PV installation costs and incentives is found in the *Financial Assessment*, Section 3.2.

Solar - Electric Generation

The most obvious direct benefit of solar PV systems is that they generate electricity on-site and result in reduced utility purchases. Enhancing this value is the fact that PV generation is highest during on-peak and summer hours, when electricity prices are at their highest. Further, New Jersey customers enjoy the benefit of "net-metering" which enables the customer to spin the electric meter backwards during times when generation exceeds demand.

To accurately determine the investment quality of a solar project, the size, installation cost, location, and electric usage pattern of the host site should all be considered. In order to provide a general estimate of the solar potential for the GTP@W, it is assumed that a variety of solar installation types will be utilized.

The foremost goal of the solar farm proposed is utilization of space that would not otherwise be suitable for development. For example, the current bulk standards specify no more than 80% coverage of any lot. Proper site planning should make 50 – 60 % of this otherwise undevelopable area available for solar installations. This could yield about 7 acres of distributed solar farm area, or approximately 1,400 kW-DC (kilowatts-direct current) of solar capacity in ground-mounted solar arrays. In addition, solar PV generation can occur in the developed areas, by installing PV panels over parking lots, walkways and on rooftops. It is estimated that 1,000 kW-DC or more of solar could co-occupy the spaces above walkways and parking while 9,600 kW-DC of PV capacity could be installed on rooftops. Though roof-mounted are 10% more expensive and parking canopy systems are 20% more expensive than ground-mounted solar installations, the strong financial support from New Jersey's renewable energy programs still results in economically viable projects with short payback periods.

The various ground-mount solar systems will produce a significant amount of electricity for the site while providing a very visible "green" statement. However, the lion's share of solar potential resides on the building rooftops. With a potential for 1,378,674 square feet of roof space in the fully developed GTP@W and using a conservative estimate that 70% of the total

rooftop space is available for solar, rooftop PV systems could yield nearly 10 megawatts of solar capacity.

The aggregate system sizes and expected output for these solar development areas are shown in Table 1 below.

Table 1: GTP@W Solar Potential

Installation Area	kW-DC Capacity	Estimated Installed Cost	kWh/Year
Solar Farm Areas on Otherwise Undevelopable Land	1,400	$6,300,000	7,560,000,000
Parking Canopies, Covered Walkways and Other Ground Mount Systems	1,000	$5,500,000	5,700,000,000
Rooftop Systems	9,600	$43,200,000	49,248,000,000
Total	12,000	$55,000,000	62,508,000,000

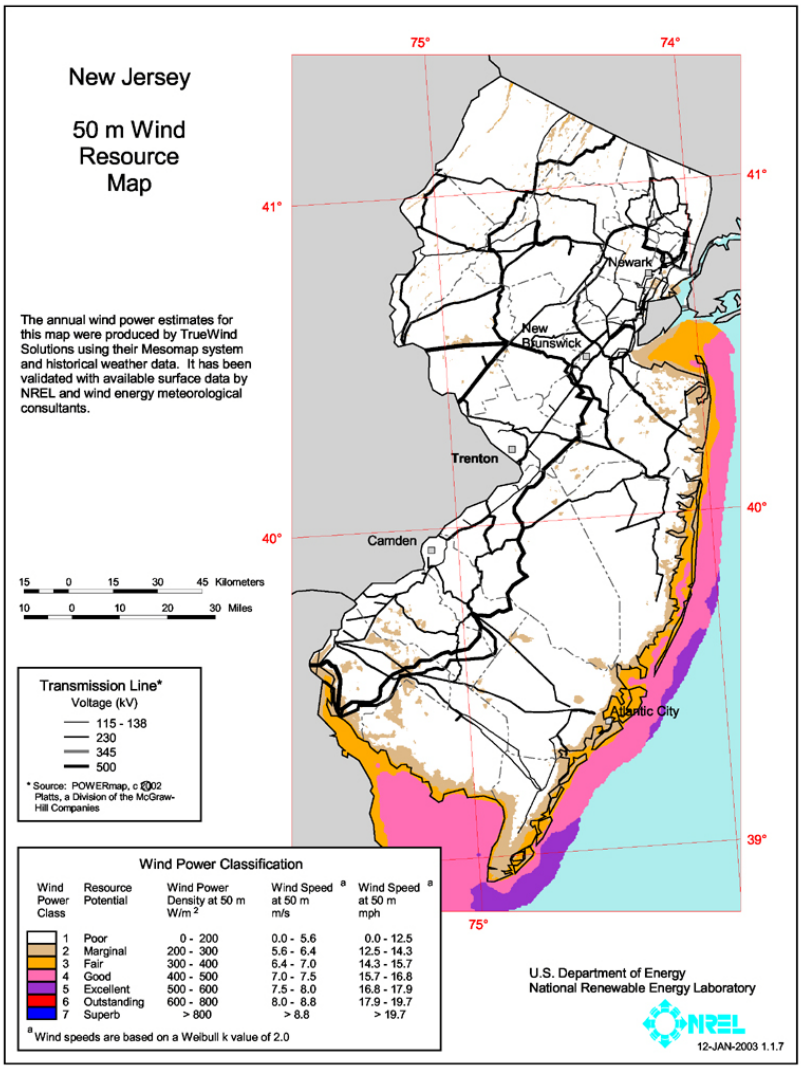
2.4.4 Wind Turbines

Wind turbines convert wind energy into electricity. They can be larger, ground-mounted installations or smaller, building-mounted installations.

Wind turbine projects are not recommended at this time. As shown in Figure 1, nearly all of New Jersey's wind energy is classified as "poor." Even with current federal tax-based and state rebate incentives for private sector ownership, wind turbine payback periods in most locations exceed 10 years.

Wind turbine energy opportunities can be reevaluated when either state and/or federal programs provide increased benefits to assist in improving overall economics.

Figure 1: Wind Energy Map of New Jersey



Source: U.S. DOE – National Renewable Energy Laboratory, 2003

2.4.5 Geothermal Exchange or Ground Source Heat Pump (GSHP)

Geothermal exchange systems take advantage of the earth's underground temperature, which remains relatively constant at 55 degree Fahrenheit year round. By drilling deep wells in open field areas and installing a heat-pump system, an installation site will have reduced heating and cooling energy demands, resulting in reduced energy costs and a lower environmental footprint. Because the GSHP displaces conventional heating and cooling equipment (for both air and water applications), there is less equipment to maintain and additional savings are realized through reduced operation and maintenance costs. Finally, the majority of GSHP system capital components have a much longer life expectancy than conventional systems.

For technical and financial reasons (financial to be discussed in greater detail in Section 3.4.3), the decision to pursue GSHP installations as part of GTP@W's sustainability plan should be made in conjunction with the first building's design and construction. Of specific note is GSHP's space requirements; the geothermal fields require large areas of land for construction and maintenance access to wells. From a space management perspective, ideal locations for these fields are under parking lots and under ground-mounted solar areas. Thus, it may be possible to realize increased value through synergistic land use entailing careful placement of geothermal, ground-based solar and parking lots.

To understand the rough area required by GSHP installations, a 1-acre field can displace approximately 104,000 kWh/year of electricity and 14,400 therms/year of natural gas. This estimate is based on recent feasibility analysis of a mixed use GSHP application (i.e. cooling and heating both air and water) located in Plainsboro, NJ and the mix of electric/natural gas savings will vary with system design as appropriate to the buildings' requirements. According to USGS data, the area encompassing both Plainsboro and Woodbridge has similar underground geology and should support very similar energy savings. As noted above, however, each GSHP installation has site-specific issues that need to be evaluated to determine its technical and economic feasibility.

Although these energy saving estimates can vary significantly based on the feasibility of each specific site, they provide an order-of-magnitude estimate of the energy savings potential. Table 2 illustrates a range of energy savings that GTP@W could realize if local geology supports the installation. The 10 acre value represents utilizing the area under proposed solar farm areas and some parking lot or open field areas. The 30 acre value is assumed to be the upper bound of available geothermal area. Because the GTP@W will have a mix of industrial, commercial, research and office buildings, a collaboration of geotechnical analysis and architectural design can maximize the economic benefits of GSHP by combining the lowest cost geo-development areas with building designs that can receive the most benefit.

Table 2: Energy Savings per Acre of Geothermal Exchange Field

Acres of Geothermal Fields	Electric Savings (kWh/year)	Natural Gas (therms/year)
10	1,300,000	180,000
30	3,900,000	540,000

2.5 Woodbridge Innovation Zone

As mentioned earlier, one of the functions of the GTP@W will be its role in anchoring a Woodbridge Innovation Zone and thus reinforcing the green re-branding of Woodbridge Township as a community dedicated to sustainable development. More specifically, rather than see the GTP@W as fixed in one location, it is envisioned that the Park and its tenants will form networks and associations, both ad hoc and formal, with like industries and sectors in the

greater Woodbridge region, and in either horizontal or vertical relationships. At a minimum, the GTP@W administration and the Township will work to facilitate these relationships and organizations. To provide a formal framework and incentives for such a development, however, it is further proposed that a Woodbridge Innovation Zone be created. Such an arrangement will help to diversify the tenant mix, maximize synergies and symbioses among Park tenants, and between the Park tenants proper and their larger networks in the region, and thus maximize the sustainability of the GTP@W.

The Woodbridge Innovation Zone would follow the Edison Innovation Zone[2] framework established statewide, and would involve stakeholders similar to existing Edison Innovation Zones throughout the state including: state government agencies such as the EDA, state universities, research institutions and related businesses. The existing zones include areas within the cities of Camden and Newark and the Greater New Brunswick Area.

These "technology neighborhoods" are designed to spur collaborative efforts and encourage the rapid transfer of discoveries from the laboratory to the marketplace. Enhanced financial incentives are available to eligible technology and life sciences businesses locating in these zones. Each zone also features a commercialization facility to provide specifically designed office and lab space for these early-stage growth companies.

2.5.1 Enhanced Financial Benefits

Technology and life sciences companies relocating within the Edison Innovation Zones are eligible for enhanced financial incentives through the EDA, including the Technology Tax Certificate Transfer Program and the Business Employment Incentive Program. More details are provided in Section 3.0, *Economic and Financial Assessment*.

2.5.2 World-Class Technology Facilities

Each of the Edison Innovation Zones in New Jersey will be anchored by state-of-the-art, commercialization centers. New Jersey EDA offers affordable and modern laboratory and production space and support services that are suited to meeting the facility needs of life sciences and technology businesses. More details are provided in Section 2.3, *Preliminary Alternative Physical Development Concepts*.

2.5.3 Enhanced Partnership Opportunities

Companies located within the zones will have access to enhanced partnership opportunities coordinated by the state. More details are provided in Section 5.0 *Organizational Development*. For example:

[2] Edison innovation zones are a New Jersey state program. These programs are not in any way directly affiliated with Edison, NJ, one of Woodbridge's neighboring municipalities.

- State-funded incubators provide small firms with a variety of services in a business- and technology-friendly environment.
- The commission will help strengthen relationships between university researchers and area high-tech business.
- Funding will be available for early "proof-of-concept" commercialization research at universities.
- Technical assistance will be provided to early-stage companies applying for SBIR grants.
- Access to research talent through Technology Fellowship Program
- Partnerships between industry and universities will provide industry researchers access to university labs and will place students in industrial labs.
- Collaborative research facilities, such as the new Stem Cell Institute will provide strategic cooperation.

Section 3.0, *Economic and Financial Assessment*, outlines the financial incentives that would be provided by the GWBEIZ. Section 4.0, *Environmental Assessment* describes how the GWBEIZ will facilitate at least limited industrial symbiosis on a regional scale. Section 5.0, *Organizational Development*, discusses how the GWBEIZ would function organizationally.

3.0 ECONOMIC AND FINANCIAL ASSESSMENT

The economic and financial analysis included in this section examines benefits and costs of the sustainable development themes proposed in the technical assessment (Section 2.0). Establishing the financial viability will help prioritize the strategies that will lead to the best outcome for all parties involved.

3.1 Economic Feasibility Assessment

3.1.1 Economic Justification for Designation of Pennval Road Redevelopment Area

The New Jersey Local Redevelopment and Housing Law gives municipalities the ability to designate redevelopment areas based on:

- Condition of improvements,
- lack of access to the site,
- inefficient land uses,
- condition of title, or
- fragmentation of ownership

A study was conducted in late 2007 and submitted in early 2008 to demonstrate the need for redevelopment in the designated area. Many of the sites were subject to more than one of the above conditions, justifying the designation of the area as a Redevelopment Area.

3.1.2 Local Economic Redevelopment Strategy

The proposed plan for the GTP@W in the Pennval Road Redevelopment Area will align the industries in the area more closely with the State of New Jersey's 2007 Economic Growth Strategy. The 2007 policy "identifies the state's six priorities for growth and articulates the specific action steps that state government will take, in partnership with the state's business, labor, education, and community leaders, to encourage and support the creation of jobs." The key economic growth priorities are:

- Market New Jersey for economic growth by partnering with the state's businesses and helping them to grow and prosper;
- Develop a world-class workforce by assisting the state's students and job seekers to obtain the skills and education needed in a competitive global economy;
- Promote sustainable growth with a particular emphasis on the state's cities and make strategic infrastructure investments to support economic growth while protecting the environment;
- Nurture the development of new technologies, and ensure that the state continues to be a leader in innovation;
- Encourage entrepreneurship and the growth of small, minority-owned, and women-owned businesses; and
- Enhance the global competitiveness of New Jersey's businesses.

The Green Technology Park at Woodbridge aims to improve the local economy in Woodbridge by addressing many of these priorities in a synergistic fashion. For example, the proposed incubator will allow companies developing new technologies to partner with educational institutions; training programs offered at the green technology park will make them more competitive by retraining workers for the green economy, and; development of innovative green products will give retrained works hands-on experience working with cutting edge technology.

3.1.3 Analysis of Jobs Created

In order to assess a key economic benefit of the proposed GTP@W development, a projection of the number of jobs to be created was made. This estimate includes jobs resulting from development of the park as well as long-term positions created by the Park's tenants.

Since the tenants of the park are unknown, the estimates in this section are based on a 50% split between manufacturing and office. The type of tenant affects the density of jobs in the park since floor space in offices will typically generate more positions than an equal area in a manufacturing facility.

Similarly, the actual developed area will affect the number of jobs; this area is dependent in turn on the outcome of ongoing environmental studies. As discussed in Section 4.1 *Environmental Constraints*, two initial scenarios will be evaluated; these involve 50-foot and 100-foot setbacks from waterways within the redevelopment area. Based on these potential development schemes, Table 3 shows the range of construction and long-term jobs created

Table 3: Estimated Short- and Long-Term Job Creation for GTP@Woodbridge

Scenario	Long-Term Jobs Created	Construction Jobs Created[3]
50' case	1300	2600
100' case	1150	2250

The incubator is an important component of the GTP@W, and is expected to provide approximately 100 jobs by itself, assuming development similar to the New Jersey Economic Development Authority's Camden Waterfront Technology Center and a 75% office use (with the remaining 25% manufacturing.) The development of the incubator will result in over 150 jobs in design, construction, and/or materials manufacturing[4].

[3] The construction jobs number may vary depending on the actual development phasing, type of development, and type of development created

[4] Based on White House report establishing $92,000 per job (http://www.whitehouse.gov/assets/documents/Job-Years_Revised5-8.pdf) and construction cost similar to Waterfront Tech Center in Camden, NJ

3.2 Green Technology Incubator Financial Feasibility Assessment

The financial feasibility of the proposed Woodbridge Green Technology Incubator will be assessed separately using funding from a federal earmark grant.

3.3 New Jersey Renewable Energy Portfolio Energy Certificates

As noted in Section 2.4 above, a distinguishing element of the GTP@W is the inclusion of renewable energy resources. These may include combined heat and power (CHP), solar photovoltaic, wind and geothermal exchange or ground source heat pump (GSHP) energy options. A key consideration in financing of renewable energy options is the New Jersey Renewable Portfolio Standard (RPS). The RPS establishes a market for Renewable Energy Certificates (RECs) that serves as a market tool generated by sustainable energy sources.

3.3.1 New Jersey Renewable Energy Certificates (RECs).

As part of New Jersey's Renewable Portfolio Standards (RPS), electricity suppliers are required to have an annually-increasing percentage of their retail sales generated by renewable sources. A specific quota for solar energy production in the RPS has created a special kind of REC, the Solar REC (SREC). Electric suppliers fulfill this obligation by purchasing RECs from the owners of renewable energy generating systems. One REC is created for every 1,000 kWh (1 MWh) of electricity generated. Although renewable energy systems generate electricity and RECs in tandem, the two are independent commodities and sold separately. The RPS, and creation of RECs, is intended to provide additional revenue flow and financial support for development of alternative energy production projects in New Jersey.

RECs are a tradable commodity in an emerging market and subject to some amount of risk. Some of this risk can be mitigated through REC sale contracts for the first three to five years. Of the four alternative energy solutions analyzed in this report, only two are eligible to produce RECs. Since CHP has not been identified as a class I or class II renewable source, it is ineligible for RECs even though it produces power available to the grid through net metering. GSHP is only a conservation method and does not produce energy; therefore it is not eligible for RECs.

3.3.2 Solar RECs

SRECs are a specific kind of REC, resulting from the RPS requirement that approximately 2.5% of all energy be generated by solar sources in 2026. While solar energy may be used to provide more than this portion of the total RPS (the total RPS in 2026 is 22.5%), other energy sources cannot be used to substitute for solar energy; therefore, SRECs trade in a parallel market to the overall REC market. Table 4 shows conservative SREC value assumptions that can be used in solar project economic and payback analysis.

Table 4: SREC Value Assumptions

Year	NJBPU* SACP* Value	SREC Values ($ per MWh)	
		NJBPU* – SREC* Market Forecast	5-Yr Contract (Followed by GbD Market Forecast[5])
2009	$711	$611	-
2010	$693	$593	*$450*
2011	$675	$575	*$450*
2012	$658	$558	*$450*
2013	$641	$541	*$450*
2014	$625	$525	*$450*
2015	$609	$509	$400
2016	$594	$494	$400
2017	tbd	tbd	$400
2018	tbd	tbd	$400
2019	tbd	tbd	$400
2020	tbd	tbd	$250
2021	tbd	tbd	$250
2022	tbd	tbd	$250
2023	tbd	tbd	$250
2024	tbd	tbd	$250

Definitions

NJBPU - New Jersey Board of Public Utilities

SACP - Solar Alternative Compliance Payment. If solar energy targets are not met, this is the penalty payment for each MW shortfall.

SREC - Solar Renewable Energy Credit. A tradable certificate used to satisfy compliance with NJ solar energy portfolio requirements.

3.4 Renewable Energy Alternatives Financial Feasibility Assessment

Section 2.4 examined the technical feasibility of renewable energy sources in the GTP@W development. This portion of the report addresses the financial viability of the same options described in Section 2.4: combined heat and power (CHP), solar photovoltaic (solar PV), wind power, and geothermal exchange/ground source heat pump (GSHP).

[5] 5-year term contract sale of SRECs is based on a recent survey of 2009-2013 contracts and current discussions with utilities on 5-year 2010-2014 contracts. The 5-year contract averages $450/SREC over its term. Beyond contract, SREC values set.

3.4.1 Combined Heat and Power (CHP)

Combined heat and power generates both electricity and steam simultaneously, resulting in higher efficiency than typical electricity or heat production systems alone. For facilities that utilize large amounts of electricity and a consistent, year-round heat load, significant energy savings can result from the combination of electricity and heat production. This, in turn, reduces energy costs while also increasing the reliability of energy through on-site (decentralized) production.

In addition to energy cost savings, federal tax incentives and New Jersey state rebates contribute to the capital recovery of CHP installations. Projects placed in service by 2016 are eligible for a 10% federal investment tax credit. Current New Jersey CHP incentives are equal to $450/kW of installed capacity. This is a production-based credit paid out over 4 years and can offset approximately 20-25% of the installation costs for a typical CHP system.

3.4.2 Solar Photovoltaic (PV)

Solar photovoltaic systems convert solar energy to electricity. The technical feasibility and potential capacity of solar photovoltaic was examined in Section 2.4.3. This section assesses the financial aspects of installation and operation of a solar photovoltaic system at the GTP@W.

Economics and Ownership Structure

The combination of federal tax incentives, revenue from SRECs and retail electric value makes solar PV an attractive investment. The payback period on large-scale projects such as these proposed for GTP@W is currently less than 5 years.

Solar - Federal Tax Incentives

Federal tax incentives that support solar PV include a 30% investment tax credit (ITC) and accelerated depreciation (Modified Accelerated Cost Recover System, or MACRS), both of which are critical to the economic viability of solar installations. Combined, the value of these two incentives contributes approximately half of the total installation costs.

The ownership structure of solar installations at GTP@W could be accomplished in two ways:

- Contract with a third party developer to provide the host site a power purchase agreement (PPA) with a price below utility costs; or
- Direct ownership by the corporate entities at GTP@W.

The primary advantage for option 1 is that GTP@W businesses would benefit from lower electricity costs without any capital investment. Option 2 has the potential for significantly greater economic value, but requires a substantial capital investment. Either option will bring solar to GTP@W and contribute to its sustainability efforts. Table 5 below shows the potential cost and capacity of the solar resources at GTP@W. The actual savings would be dependent upon the structure of the construction and purchase agreements.

Table 5: GTP@W Solar Potential

Installation Area	kW-DC Capacity	Estimated Installed Cost	kWh/Year
Solar Farm Areas on Otherwise Undevelopable Land	1,400	$6,300,000	7,560,000,000
Parking Canopies, Covered Walkways and Other Ground Mount Systems	1,000	$5,500,000	5,700,000,000
Rooftop Systems	9,600	$43,200,000	49,248,000,000
Total	12,000	$55,000,000	62,508,000,000

3.4.3 Wind Turbines

Section 2.4.4 outlined the technical constraints for wind turbines located on land. Given the combination of low wind potential and poor economic outcome, wind turbines are not recommended for development within GTP@W.

3.4.4 Ground Source Heat Pump (GSHP)

GSHP systems utilize the constant temperature of the earth to dramatically reduce the need for both heating fuel and electricity for cooling. By efficiently drawing heat from a series of wells in winter and expelling heat in summer, the long-term benefits of GSHP installations, in comparison to more common HVAC systems are typically reduced energy, maintenance and long-term capital costs. They do, however, require a larger up-front capital investment relative to conventional heating/cooling systems. Because of the complexities in geological variables and total system design, a GSHP installation requires a site-specific geotechnical study, a detailed system design and building energy modeling to determine the net efficiency and resulting payback period of the installation. As a very rough estimate, GSHP systems are 25% more expensive than a conventional design for the same building.

The incremental costs of integrating a GSHP into existing equipment can have a significant negative impact on the economic viability of a project. As a result, GSHP technology is best evaluated for new construction and where a thorough lifecycle benefit analysis can be completed, and for which a building will be adapted to GSHP use and benefit from the long-term savings of the choice to utilize a GSHP system. The decision to pursue GSHP installations as part of GTP@W's sustainability plan should be made in conjunction with the first building's design and construction.

For private sector developments, the payback of a GSHP system is supported by a 10% federal investment tax credit, a New Jersey state rebate and energy cost savings. If the local geology is favorable to an installation, the payback period can be approximately 5–10 years. As stated above, there are many complex variables that will impact a specific project's feasibility and payback period.

3.5 Financial Feasibility of Overall GTP@W

The following is the scope of work for a proposed financial feasibility assessment of the overall GTP@W project to be conducted by the selected Master Developer:

- Prepare a pro forma Total Capital Stack - Cost Budget, including: (1) land-related soft costs (i.e., environmental, engineering, approvals, capital carrying cost, etc., and (2) land-related hard costs (i.e., environmental approvals and clean-up, site work, relocation costs, etc.). Discuss various capital sources.
- Prepare a pro forma Budget for Operating Revenue, including as detailed as practical identification of revenues and expenses, cap rate, etc. Regarding any revenue gap, provide an assessment of available sources of grants, loans and other sources of revenue that could positively affect the capital cost budget and/or the operating budget.

3.6 Financial Sourcing

3.6.1 Project Financing Structure

In examining the redevelopment of the GTP@W it is important to break down the process into 3 areas of potential economic and financial assistance.

1) Pre development – There are a variety of funding programs available to support the clean up, restoration and enhancement of the site. Those funds include: planning assistance, clean up funds such as the Hazardous Discharge Site Remediation Fund, open space or greenway preservation funds such as Green Acres and infrastructure upgrades via programs like the NJ Environmental Infrastructure Trust (NJEIT). All of these will assist potential developers with the site preparation issues and land use issues associated with the pre development stages of the project.
2) Development - Given the variety of proposed uses and the location of the GTP@W, potential developers can expect a high level of support for the construction of the site. Local financial assistance through PILOT or other programs such as Revenue Allocation Districts (RADs) may be available. In addition, state programs from the NJ Economic Development Authority, Department of Transportation and Board of Public utilities could be applied to this project/ location. Lastly, federal incentives for this site have already been committed for phase 1 - planning and design - with the expectation of additional federal dollars to follow.
3) Operations and tenant support - New Jersey has some of the most aggressive energy and sustainability programs in the nation. Given the vision of the GTP@W the anticipated tenants, as well as the developer, can expect a variety of help including programs to reduce energy costs, tax incentives, research grants and incentives to hire and train employees. In addition, the partnership between the private sector tenants of the GTP@W and the academic and incubator tenants will help lend itself to a host of federal and state research or manufacturing grants.

The details of many of the programs mentioned are listed below, and summarized in Table 6 at the end of this section below. Due to reorganization of some agencies involved in financing

incubator projects, information in Table 6 pertaining to responsible organization and availability of incubator funds has been omitted for certain funding sources. Please refer to the full descriptions of these funding opportunities for further detail. Woodbridge and its partners in government have launched an aggressive plan to help recruit and keep companies at the GTP@W. Working together as a team approach, the members of the economic development team will help to customize a plan to guarantee the successful redevelopment of the site.

This plan will consider a preliminary menu of sustainability-related funding and financing options and incentives, including those for all phases of GTP@W development:

- Planning
- Design
- Construction
- Operation

And including those directed at all parties involved in GTP@W development:

- Redeveloper – Woodbridge Innovation Zone, urban economic zone, tax increment financing, tax credits
- Property/asset manager
- Business incubator manager
- Training center manager
- University consortium manager
- Energy institute manager
- Startup business tenants
- Industrial tenants

Currently, the township of Woodbridge is in the process of conducting phase 1 and phase 2 environmental analyses. The objective of this analysis is to establish a baseline of information necessary to understand the pre development costs associated with the cleanup and environmental remediation of the site.

The following sections provide details on the funding and financing opportunities available in the pre-development, development and operations and tenant support phases.

3.6.2 Pre-development Phase Financing Programs

Brownfields (HSDRF) Assessment and Cleanup Grants and Loans

The Hazardous Site Discharge Remediation Fund (HSDRF) is NJ DEP's brownfields assessment and cleanup fund. There is a $5 million per year cap on HSDRF monies available for assessment and cleanup of potentially contaminated sites throughout the Township (based on the original $3 million per year for HSDRF and an additional $2 million per year award resulting from NJ DEP's previous designation of a Brownfield Development Area (BDA).

Preliminary Assessments (PAs), Site Investigations (SIs) and Remedial Investigations (RIs) are paid 100% by the HSDRF. Site owners are responsible for actual cleanup, called Remedial Actions; however, there may be options by which the Township can be reimbursed for some portion of the actual cleanup costs that could be further explored with NJ DEP. In general, there are many different funding options made available to public entities and private entities, as described below.

PUBLIC ENTITIES

General Requirement. All public entity applicants must adopt an ordinance or resolution authorizing the submittal of an application to the HDSRF Program. Applications must also include the following to be eligible for funding through the HDSRF program:

- A comprehensive redevelopment plan for the subject property; or
- Demonstrate that a realistic opportunity exists that the subject property will be developed or redeveloped within a three-year period from the completion of the remediation.

Grants for Brownfields Investigations. Grants are available to conduct PA, SI, and RI activities for real property on which the public entity holds the tax sale certificate, has acquired the property through foreclosure or other similar means, or has acquired or passed a resolution, ordinance or other appropriate document to acquire the property by voluntary conveyance for the purposes of redevelopment. These grants provide for 100% of the eligible costs and are capped at $3 million per municipality per calendar year.

Grants for Brownfield Development Area (BDA). Woodbridge already has a designated BDA which does not include the GTP@W site. However, in the 2011 application year, it may be possible to demonstrate to the NJDEP that expanding the existing BDA to include the GTP@W site is critical to establishing the Woodbridge Innovation Zone. If successful, cleanup studies and actions at the GTP@W could access some of the additional $2 million per year in grants available to contaminated properties within the BDA. An ownership interest in the property is not required. The grant provides 100% of eligible costs for a PA, SI, and RI and 75% of eligible costs for an RA, if there is no responsible party identified. However, if the public entity does not have an ownership interest, a lien in the amount of the grant awarded for an RA will be attached to the property. *Matching Grants for Remedial Action*. Matching grants are available to conduct an RA under the following circumstances:

- A matching grant for up to 75% of the costs of an RA is available if the property will be redeveloped for recreation and conservation purposes. Ownership of the property by the public entity is not required; however, it must be demonstrated that the property is to be preserved for recreation/conservation by conveyance of a development easement, conservation easement, or other restriction/easement permanently restricting development.
- If a public entity owns the property and proposes to perform an RA that uses an innovative technology, a matching grant is available for up to 25% of the costs of the remediation. These grants are typically approved following completion of the RI and are capped at $250,000 per project. NJDEP approval of the proposed innovative technology as a remedial

alternative is a prerequisite to the matching grant approval. Grant monies are disbursed during the course of the RA work.

- If a public entity owns the property and proposes to perform an RA that implements a limited restricted use or unrestricted use, a matching grant for up to 25% of the costs specifically for implementation of the approved remedy is available. These grants are typically approved following completion of the RI and are capped at $250,000 per project. NJDEP approval of the proposed RA to obtain a limited restricted/unrestricted use designation is a prerequisite to the matching grant award. Grant monies are disbursed following NJDEP issuance of a limited restricted use/unrestricted use No Further Action letter.

Loans. Loans are available to public entities for up to 100% of the funding needed to remediate a contaminated site if there is an imminent and significant threat to public health and environment. The loan is capped at $3 million per year per site. The interest rate is 2 points below the Federal Discount Rate with a minimum of 3%, and is determined by the NJEDA. The maximum term for any loan is 10 years.

Loans are available for an RA if a public entity owns the property and has completed the PA, SI, and RI phases of the project.

PRIVATE ENTITIES

Matching Grants for Remedial Action

- Grants are available to qualifying private parties (any person who has a net worth of not more than $2 million) that receive the approval of the NJDEP for an innovative technology as part of an RA. A qualifying private entity meeting these criteria may be eligible for up to 25% of the costs of an RA that is specifically for the implementation of an innovative technology. The matching grant is capped at $250,000 per site. NJDEP approval of the proposed innovative technology as a remedial alternative is a prerequisite to the matching grant award. Grant monies are disbursed during the course of the RA work.
- Grants are available to qualifying private entities (any person who has a net worth of not more than $2 million) for the implementation of a limited restricted use or unrestricted use RA. A qualifying private entity may be eligible for up to 25% of the costs specifically for the implementation of a limited restricted use or unrestricted use RA. These grants are typically approved following completion of the RI. The matching grant is capped at $250,000 per site. NJDEP approval of the implementation of a limited restricted use or unrestricted use RA is a prerequisite to the matching grant award. Grant monies are disbursed following issuance of a limited restricted use or unrestricted use No Further Action letter.

Loans. Loans are available to private entities for up to 100% of the funding needed to remediate a discharge of hazardous substances up to $1 million per year. The interest rate is the Federal Discount Rate with a minimum of 5% and is determined by the NJEDA. The maximum term for any loan is 10 years.

NON-PROFIT ORGANIZATIONS

A pilot program has been developed to provide assistance to non-profit organizations. Grants are available to conduct a PA, SI, and RI for non-profit organizations described in section 501(c)(3) of the federal internal revenue code that are exempt from taxation pursuant to section 501(a) of the federal internal revenue code, 26 U.S.C. s. 501 (a). All requirements for municipalities apply to non-profit organizations. Total funding available for this pilot program is $5 million.

HDSRF PROGRAM FEES

The NJDEP charges fees for a case manager's oversight of a remediation project. Applicants are billed on a semi-annual basis for NJDEP oversight costs. Estimated NJDEP oversight costs are eligible under the terms of each grant or loan as part of the approved HDSRF loan or grant funding. NJDEP is in the process of developing a formula for calculating oversight fees and has suggested to the Township that the fees would be based on the number of areas of concern (AOCs), with a maximum tentatively set at $18,000 per site. The NJEDA also charges a processing fee for each grant application and supplemental application, and an application, commitment and closing fee for each loan application. These NJEDA fees are not eligible costs under the HDSRF program.

HDSRF FUNDING PROCESS

NJDEP. Upon receipt of the application, the Memorandum of Agreement (MOA) is executed, an NJDEP case manager is assigned, and the proposed Scope of Work and Cost Estimate will be reviewed by the appropriate NJDEP personnel. Following NJDEP review and approval, the application will be forwarded to the NJEDA.

NJEDA. Upon receipt of the application from the NJDEP, the NJEDA will review the financial information provided by the applicant requesting financial assistance to determine their financial status and ability to repay a loan. For grant applications from private entities, the NJEDA will review financial eligibility and/or ownership documents for final approval of grant awards. For public entities, the NJEDA will verify the necessary municipal resolutions and redevelopment plans. Following the NJEDA review, eligible applications will be presented to the NJEDA Board of Directors (Board) for funding consideration above a cost threshold of $100,000. Projects that require an initial funding amount that is less than $100,000 do not have to undergo NJEDA Board approval. Supplemental funding, if required to complete the investigation and/or remediation, does not require NJEDA Board approval for up to $100,000. If approved by the Board, closing documents will be forwarded to the applicant for processing. After the properly executed closing documents have been returned, the NJEDA grant or loan will be formally awarded.

FINANCIAL ASSISTANCE DISBURSEMENT

Public Entities. Upon grant approval, funds may be disbursed at the beginning of each phase of the remediation (PA/SI/RI). The municipality will be responsible for compensating its consultant as each required task is completed, and upon NJDEP or NJEDA request, be required to

substantiate project expenditures with actual invoices and/or other documents. Following project completion, the municipality must formally close out the financial assistance agreement with the NJEDA through submission of Schedule B forms and the return of any unused portion of the approved grant.

Private Entities. Upon approval, funds are generally disbursed by phase (PA/SI/RI/RA) following submission of the required remediation reports and NJDEP approval. Detailed invoices, receipts, reports and other documentation supporting project expenditures are required prior to fund disbursements. Invoices must be reviewed and approved by the NJDEP. Funding disbursements will be issued as two-party checks in the name of the applicant and their consultant. If copies of cancelled checks are included with the project invoices, a single-party check may be issued to the applicant.

ELIGIBLE APPLICANTS AND REMEDIATION PROCESS

Grants and loans are available to public entities, private entities, and non-profit organizations described in section 501(c)(3) of the federal internal revenue code that perform a remediation under NJDEP oversight. The remediation process in New Jersey, as prescribed by the Technical Requirements for Site Remediation, N.J.A.C. 7:26E, consists of four primary phases: Preliminary Assessment (PA), Site Investigation (SI), Remedial Investigation (RI), and Remedial Action (RA). The purpose of the PA is to identify the presence of any potentially contaminated areas of concern and is the first step in the process to determine whether or not the site is contaminated. The SI is performed to determine if any contaminants are present at the site above the applicable remediation standards. For contaminants that are identified above the applicable standards, the RI is required to further characterize the area of concern, delineate the contamination and provide the necessary information to evaluate remedial alternatives. The RA requires the selection, development, and implementation of the most appropriate action to remediate the site.

3.6.3 Development Phase Financing Programs

NJEDA Funding Opportunities: Woodbridge Innovation Zone Enhanced Financial Benefits

Edison Innovation Zones are a collaborative state effort involving the NJEDA and other state agencies in partnership with state universities, research institutions and related businesses. These "technology neighborhoods" provide enhanced financial incentives, spur collaborative efforts and encourage the rapid transfer of discoveries from the laboratory to the marketplace. Technology and life sciences companies relocating within the Edison Innovation Zones are eligible for enhanced financial incentives through the EDA, including:

- Additional funds through the Technology Tax Certificate Transfer Program, which allows eligible technology companies to sell net operating losses to profitable companies (Of the $60 million allocated to the program annually, $10 million will be set aside for additional funding under the program to approved projects in the Edison Innovation Zones.)

- A boost to the scoring formula under the Business Employment Incentive Program (BEIP), resulting in a higher grant amount. Under BEIP, qualified companies relocating or expanding in New Jersey are provided a cash grant based on the tax withholdings of new jobs created, as well as additional scoring criteria.
- Companies have access to all of NJEDA initiatives, including low-cost financing and technical assistance.

3.6.4 Operations and Tenant Support Phase Financing Programs

The following funding and financing programs apply to New Jersey-based companies "going green", manufacturers of clean energy systems or products, or innovative companies developing new green technologies. NOTE: As of this writing on April 22, 2010, the NJ Commission on Science and Technology (NJCST) is not in the proposed State budget and is not accepting applications for the funding and financing opportunities they normally offer. The new Governor's administration is still finalizing its business incentives program; once the Governor announces the program, this section will be updated. The Governor has already begun to take an active role in the economic development of New Jersey, reaching out to prospective businesses on a daily basis. In the meantime, though, the NJCST opportunities have not been formally withdrawn, so they are still included among the funding and financing opportunities described below and interested parties should investigate the status of these opportunities directly with NJCST when appropriate.

Technology Incubator Network

The NJCST supports 12 Technology Business Incubators throughout the state. Incubators provide a professional business environment, administrative support and significant networking opportunities within the entrepreneurial community. According to the National Business Incubation Association, start-up companies in incubators have a higher success rate than those developing without the critical business assistance provided by incubators.

Edison Innovation R&D Fund

The NJCST provides funding to New Jersey technology companies, in partnership with a New Jersey research university, company or institution for proof-of-concept research and development activities necessary for commercialization of an identified technology. The Edison Innovation R&D Fund, formerly the Entrepreneurial Partnering Fund, promotes collaboration between universities and companies, increases the amount and value of intellectual property, provides early-stage financing and commercialization support and grows technology businesses in New Jersey. Award Amount: $100,000-$500,000

Edison Innovation Clean Energy Fund

The NJCST's Edison Innovation Clean Energy Fund will provide grants on a competitive basis to New Jersey companies in the amounts of $100,000 to $500,000 for a specific project to develop a renewable energy technologies that can demonstrate their integral nature to the development of Class 1 renewable energy technologies that produce or support the production of renewable or clean electricity generation.

Edison Innovation Centers of Excellence Federal Matching Program

The Edison Innovation Centers of Excellence Federal Matching Program seeks to bring more federal research dollars to New Jersey by leveraging federal investments in New Jersey's research universities and institutions. The NJCST will provide matching funds up to $500,000 to increase the success of receiving federal grants for research centers of excellence in the state's priority technology areas. This program will strengthen the federal proposal of successful applicants by committing to make a significant investment in the center of excellence once awarded by the federal agency.

University Intellectual Property Program

The NJCST provides funding to universities to make services available to companies through the University Intellectual Property Program. For companies interested in licensing intellectual property developed at universities, funds are available for proof-of concept work. The New Jersey Commissions on Science and Technology provides funding for universities to help companies with grant writing, such as ProposaLab@NJIT. Universities throughout the state have offices dedicated to assisting companies with transferring technology developed at the university into the marketplace. The Commission provides funds to NJIT, Princeton University, Rutgers University and UMDNJ. In FY 06 the Commission awarded $2 million toward university technology transfer programs.

Small Business Innovation Research Bridge Grant Program

The NJCST provides grants to companies which have completed a SBIR Phase I award and are awaiting a SBIR Phase II from a federal agency to help bridge the funding gap that occurs. This SBIR Bridge Grant Program increases the success and maximizes the growth of small New Jersey companies in moving from Phase I to Phase II. Award Amount: $50,000

Incubator Seed Fund Grant Program

Companies located in one of the 12 NJCST technology incubators in New Jersey can receive grants to assist emerging technology businesses achieve a critical milestone in their commercialization path. The Incubator Seed Fund Grant support compliments the mentoring and business support provided by the incubators. Award Amount: $20,000-$50,000

SBIR/STTR Training and Assistance

The NJCST offers a series of training sessions throughout the year to help entrepreneurs gain the necessary tools to successfully submit SBIR/STTR Phase I and Phase II proposals to one of the 11 federal agencies. SBIR/STTR training sessions focus on different agency solicitations and topics, and cost a nominal fee to attend. All New Jersey companies, entrepreneurs and students interested in the SBIR/STTR process are eligible and encouraged to attend.

New Jersey Manufacturing Extension Program

NJMEP assists small and medium sized companies to become more productive, profitable and globally competitive. NJMEP offers seminar/training sessions and development of a preliminary assessment of the needs of start-up high-tech businesses.

Clean Energy Fund

A New Jersey-based commercial, institutional or industrial entity, "going green" with an end-use energy efficiency project, combined heat and power (CHP or cogeneration) production facility, or state-of-the-art efficient electric generation facility can use the Clean Energy Fund to purchase fixed assets, including real estate and equipment.

Clean Energy Solutions Capital Investment (CESCI) Loan/Grant

A manufacturer of Class I renewable energy or energy efficiency systems, products or technologies can use the CESCI to identify a manufacturing site, support site improvements, construct a facility, and/or purchase equipment.

Combined Heat and Power Program

To operate a qualified combined heat and power (CHP) project with an electric generated capacity of more than one megawatt. A commercial, institutional or industrial electricity customer in New Jersey with electric demand of at least 750 kilowatts or such level of demand as subjects the customer to payment of the Retail Margin.

New Jersey Technology and Entrepreneur Fellowship Program

The NJCST pays the salary of recent graduates to work in small New Jersey technology companies, providing companies with new talent and expertise. The Technology Fellowship Program provides doctoral graduates with valuable entrepreneur experience and helps create more high-quality high-tech jobs in New Jersey. The Entrepreneur Fellowship Program allows MBA graduates to continue their career development in New Jersey technology companies. The Fellowship provides $65,000 salary for the first year, $75,000 salary for the second year.

Table 6: Funding Opportunity Summary Table

Funding Opportunity	Administering Organization/Agency	Description	Development Phase	Accepting Applications
HDSRF-Prelim	NJDEP	Pays for site investigation	Pre-development	Yes
HDSRF-Remediate	NJDEP	Pays for cleanup if responsible party will not	Remediation	Yes
HDSRF-Matching Grant	NJDEP	Restricted grants (up to 25%, max $250,000) for remediation	Remediation	Yes
HDSRF Loan	NJDEP	Up to 100% of cleanup cost for public entities	Remediation	Yes
Edison Innovation Zone	NJEDA	Tax incentives for technology development	Development / Occupancy	
Operations & Tenant Support			Development / Occupancy	
Technology Incubator Network			Development / Occupancy	

Edison Innovation R&D Fund		Fosters collaboration with research institutes	Occupancy	
Edison Innovation Clean Energy Fund		Grants for development of class I renewable energy technology	Development / Occupancy	
Edison Innovation Centers Federal Matching Grant		Leverage federal research money	Occupancy	
University Intellectual Property Program		Technology transfer grants through NJ universities	Occupancy	
SBIR (Small Business Innovation Research) Bridge Grant Program		Fund for companies that have received SBIR Phase I monies.		
Incubator Seed Fund Grant Program		Funds for commercialization of products/services developed in incubators	Occupancy	
SBIR/STTR (Small Business Technology Transfer) Training and Assistance		Proposal writing assistance to small businesses submitting applications to SBIR/STTR	Occupancy	
NJ Manufacturing Extension Program	NJMEP	Seminars, training, and needs assessment for small businesses	Occupancy	
Clean Energy Fund	NJEDA	Capital funds for clean energy manufacturing		
CESCI (Clean Energy Solutions Capital Investment)	NJEDA	Loan or grant for planning and capital expenses related to new Class I renewable manufacturing	Development	
Combined Heat and Power Program	NJOCE/NJBPU	Incentives for CHP facilities that produce more than 1 MW and demand at least 750kw	Development / Occupancy	No
NJ Technology and Entrepreneur Fellows		Pays salary for new graduates to work at small tech companies		

4.0 ENVIRONMENTAL ASSESSMENT

This section identifies and evaluates elements of environmental sustainability to substantiate GTPW's "green" claim, including:

- Alternative solutions to potential site environmental constraints, including natural resources such as quality of soils, floodplains, and wetlands, and historic resources, via small building footprints, roof solar arrays, roof gardens, and restoring soils and wetlands, resource management plans, etc.
- Capitalizing on or enhancing environmental opportunities at the site, including restoring or preserving floodplains and wetlands, providing opportunities for passive recreation and environmental education
- Preliminary environmental and historic resource management plan/system, including organization, policies, standards and procedures, staff, equipment and facilities
- Concept plan for centralized/shared on-site storm water, domestic wastewater, industrial wastewater, and domestic solid and industrial hazardous waste management
- Phased approach to achieving industrial symbiosis among park tenants as a long-term goal of the park as it evolves over time

4.1 Environmental Constraints

The Green Technology Park @ Woodbridge is situated on a 107-acre site adjacent to Woodbridge Creek, near its outfall into Arthur Kill. The site is bounded by the New Jersey Turnpike to the northwest, the NJ Transit North Jersey Coast Line to the west, Woodbridge Creek to the east, and the City of Perth Amboy to the south. Much of the area lies within the flood plain of Woodbridge Creek, with wetlands scattered across the site. Industrial uses have been prevalent on the site since the middle of the past century, with some uses dating back to the middle of the 19th century. Filling may have occurred over time, but the nature and extent of fill is not yet known. The primary access to the site is from Woodbridge proper via Woodbridge Avenue and Cutters Dock Road.

4.1.1 Floodplains Constraints

The majority of the site lies within the 100-year floodplain of Woodbridge Creek. However, the presence of tidal wetlands on the site indicates that this area would likely be exempt from the floodplain "no-net fill" requirements enforced on most freshwater streams by the New Jersey Department of Environmental Protection (DEP). If the redevelopment were to voluntarily choose to comply with this regulation anyway, the Flood Hazard Area Control Act (NJAC 7:13) stipulates that the 10-year flood, not 100-year flood is used for calculation of floodway and flood fringe volume. Initial contact with the Woodbridge Township Redevelopment Authority (RA) engineering consultant indicates that the most likely mandatory action regarding floodplains will be the necessity to elevate the footprint of all structures such that the finished floor is one foot above the elevation plane of the 100-year flood. Furthermore, initial communications between the RA and NJDEP indicate that NJDEP recognizes that restoring the

entire site to historical conditions may not be feasible and are willing to partner with Woodbridge to create an amenable solution for protecting environmental and economic assets.

Permitting according to the DEP Coastal Zone Management regulations will be necessary. However, in the opinion of the RA engineering consultant, the disturbed state of the flood hazard area means that improvements in the Redevelopment Area which lead to increased environmental value of natural areas should be received favorably as long as the Coastal Zone Management Rules (NJAC 7:7) are satisfied. The Coastal Zone Management Rules serve as an umbrella regulation for waterfront development, and include direct constraints on development as well as references to other relevant regulations that must be satisfied.

The Coastal Zone Management Rules include reference to wetlands, endangered species, flood hazard, and historical resources legislations/regulations. In addition, changes in waterfront access, dune preservation, shellfish bed disturbance, construction of borrow pits, adjacent agricultural uses, utility and transportation infrastructure construction and maintenance, and creation of man-made navigational structures—among other activities—are directly regulated by the Coastal Zone Management Rules.

In order to show that all relevant rules have been met, a Statement of Compliance must be submitted showing that analysis of all pertinent environmental impacts has occurred. The level of effort for completing the Statement of Compliance will depend on the level of disturbance and/or encroachment that will result. It is still likely that plans which minimize disturbance and utilize only the existing building footprints will require a statement of compliance, though the level of effort required for documentation should be substantially lower than projects with broad coastal management implications. In some instances, it may be beneficial to alter the current proposed redevelopment plan to reduce the level of effort for completing the Statement of Compliance and/or increase the likelihood of reaching compliance.

4.1.2 Tidal Marshlands Constraints

The tidal marshlands on the site are likely influenced by previous filling patterns, and delineated wetland borders will likely be along the existing borders of land that has been filled for industrial use or access roads. Significant portions of some lots are currently covered by tidal wetlands according to the statewide GIS maps; whether this has been confirmed by a field investigation is not clear. Furthermore, the quality of the wetlands needs further investigation to determine which areas are would be most important for conservation.

These tidal wetlands are included in the flood hazard area and, as such, any development that may occur in an area designated as tidal wetlands (pending other wetlands permitting), would require consideration of the flood plain constraints discussed above. If the current Phase II investigation shows that contaminants are present, an ecological resource inventory would be completed; this inventory will enhance the understanding of existing wetlands conditions and help prioritize conservation efforts.

4.1.3 Freshwater Wetlands Constraints

Statewide GIS mapping indicates two upland wetland areas, one 2.3 acres between the New Jersey Turnpike and Pennval Road, and the other 3.25 acres in the peninsula occupied by lots 541.8 and 541.10A. The first site, between the NJ Turnpike and Pennval Road is not currently included in the Redevelopment Area. Another disturbed wetland is adjacent to the northwest corner of the site, completely surrounded by a Turnpike turn-around ramp.

The quality of these wetlands will determine the level of remediation necessary if any wetlands are permanently disturbed. Wetlands that are of greater ecological value (according to an assessment by an environmental science professional) may only be disturbed if it is shown that no practicable alternative to permanent disruption exists. Furthermore, greater ecological value typically indicates that higher on-site mitigation will be necessary, or a larger number of wetland bank credits must be purchased. Conversely, lower quality wetlands typically require a less rigorous process to be disturbed, though the proposed Green Technology Park @ Woodbridge may also utilize these wetlands to create a local wetlands credit bank and add an amenity to the redevelopment area. Opportunities to use some of these wetlands for creation of a wetlands bank will be discussed in the next section. Disturbance of any wetlands by the proposed redevelopment will require NJ DEP wetlands permitting. Given the prevalence of wetlands on this site, this will likely be a critical consideration for the development process on portions of this site. Consultation with an environmental professional early in the process of each redevelopment phase is recommended in order to determine how disturbance of wetlands may impact the project timeline.

4.1.4 Contaminated Lands Constraints

The Township has engaged Excel Environmental Resources, Inc. of North Brunswick, New Jersey, to conduct Preliminary Assessments (Phase 1), Site Investigations (Phase 2) and Remedial Investigations of potential contamination of soil, surface water and ground water for 8 of the 11 parcels comprising the Pennval Road Redevelopment Area. Table 7 below lists the 8 site parcels being evaluated by Excel and provides ownership, location and acreage information for each.

Table 7: Properties Included in Preliminary Investigation

Tax Block/Lot	Address	Owner
531.B, Lots 1-B1 and 1-B2	222 Pennval Rd	Pennval Associates LP
531B; Lot 1C		Perth Amboy and Woodbridge Railroad Company
54; Lots 9A, 10A, and 12; 540.G; Lot 10		Briscoe Co.
531; Lot 2	Cutters Dock Rd.	Seaside Properties, LLC
531; Lot 1	2 Cutters Dock Rd.	Fibrenetics, Inc.
531.B; Lot 100		Spector-Woodbridge Co. LLC.
541, Lot 11		Illman Jones, Inc.
531.A; Lot 1		Pennval Associates LP

The three remaining parcels are being, or have been, evaluated separately by their respective current owners, as follows:

- Block 523 Lot 1 – owned by Rick Matera/company, who is conducting their own site investigations and cleanup program
- Block 730 Lot 1 – owned by Woodbridge Township, currently being offered for development separately from the remainder of the Pennval Road Redevelopment Area.
- Block 523 Lot 3 – owned by Chevron USA, who have already completed remediation of their site and have a letter of No Further Action from the New Jersey Department of Environmental Protection

Excel has completed the Phase 1 Preliminary Assessments (PAs). "Areas of Concern", indicating evidence of potential contamination, have been identified on several of the parcels. Phase 2 Site Investigations (SIs) involving actual sampling and analysis are currently being conducted on those parcels to confirm the presence or absence of contamination and to estimate the nature and extent of such contamination. It is anticipated that the Phase 2 SIs will be completed in the next several months. If the Phase 2 Site Investigations detect contamination in a given parcel, NJDEP requires that a Baseline Ecological Evaluation (BEE) also be conducted for that parcel. Excel will also recommend a full Wetlands Delineation Study be carried out after Phase 2. Further information on the status and results of the Phase 1 PAs and Phase 2 SIs can be requested from Woodbridge Township.

4.1.5 Developable Footprint Taking into Consideration Environmental Constraints

In order to estimate the total area that could be developed, two preliminary conservation buffer scenarios have been analyzed. In addition to the Woodbridge River, one other waterway, in the southern portion of the site, was identified on the New Jersey Department of Environmental Protection (DEP) GeoWeb[6].

Utilizing a satellite image from Google Earth, the approximate borders of the waterways, adjacent road and railroad rights-of-way, and existing drainage swales were drawn. Additional features such as buffer zones along the railroad were added based on the Pennval Road Redevelopment Plan completed in 2008. In addition, the buffer zone along the NJ Transit rail right-of-way would be extended past Cutters Dock Road.

According to DEP regulation, the minimum buffer area for streams that have not been classified as highly sensitive to disturbance or of exception quality is 50 feet (50'). New Jersey surface water quality standards (NJAC 7:9b) were consulted, and it was confirmed that the Woodbridge River did not receive any special classifications that would require a buffer greater than 50'. Thus, the first scenario of developable area utilizes a 50' simple offset of all waterways and swales. The second scenario expands the buffer to 100 feet (100') in order to create a system of green areas that showcase the natural potential of the tidal estuary environment in the Woodbridge River. However, the minimum buffer of 50' was still used in three places where

[6] NJ DEP GeoWeb: http://www.state.nj.us/dep/gis/geowebsplash.htm

the 100' buffer could create a lot too small for development or disrupt access to a lot or a large portion of a lot.

The resulting borders of the potential lots attempt to conform to the bulk standards of 2-acre minimum lots, and are not based on current lot lines. These lines should not be determined as final, and may be altered by results of ongoing environmental studies. See Figure 2 for the 50' scenario and Figure 3 for the 100' case.

The potential developable acreage in the 50' buffer scenario is 72.6 acres, while the 100' buffer case could reduce the potential developable area to 63.3 acres. See Table 8 for areas. Buffer zones are not included in the table.

Table 8: Potential Developable Areas

50' Buffer	100' Buffer
9.3	8.3
2.0	2.0
11.4	9.7
2.0	1.9
9.0	7.6
1.6	2.1
12.8	10.7
1.1	1.1
1.0	1.0
3.1	2.4
12.0	9.8
7.3	6.7

Figure 2: Potential Development Areas with 50' Buffer

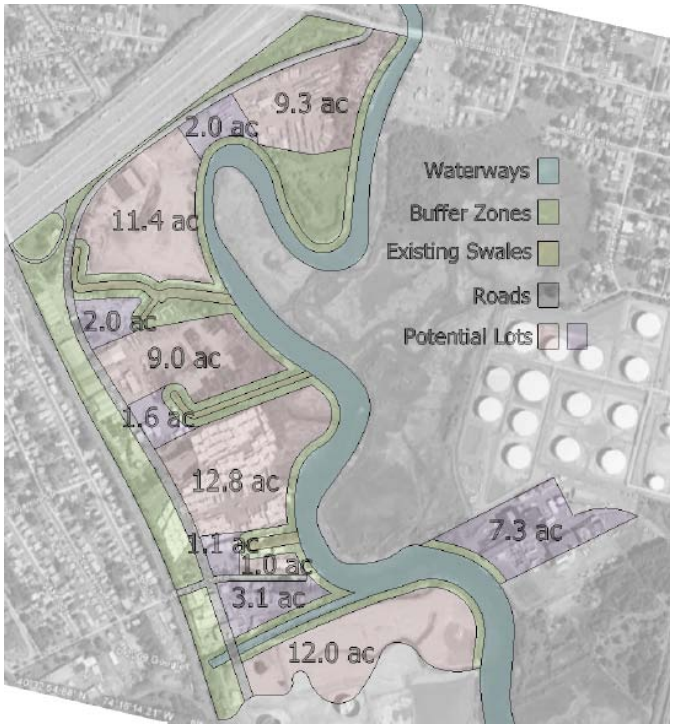
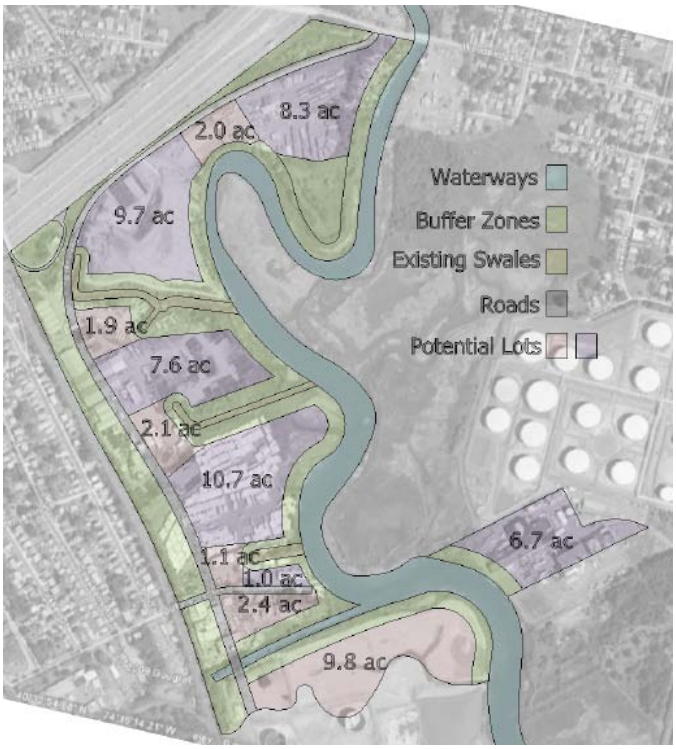


Figure 3: Potential Development Areas with 100' Buffer



4.2 Environmental Opportunities

4.2.1 New Jersey Wetlands Banks Opportunities

Creation of a wetlands mitigation bank will result in additional ecological assets to the community and improved waterway access and recreation space, as well as the potential for economic benefit. This offers the Green Technology Park @ Woodbridge the opportunity to become a model for redevelopment that results in a true increase in sustainability—economically, environmentally, and socially.

Specifically, Woodbridge Township lies in a watershed that is covered by three existing wetland mitigation banks. The Wetlands Mitigation Council, which is charged with managing wetlands mitigation credits in the State of New Jersey, indicates that one bank sold out credits, while another is ambiguously listed as having "no credits available for sale." If in fact there is only one active wetland bank eligible to award credits exists in the vicinity, an opportunity for capitalizing on wetlands restoration measures may be present.

It is important to note that the NJ DEP will require that any wetlands disturbed by construction on the site must be mitigated first before credits will be granted; on-site wetlands mitigation credits are required at minimum mitigation ratios between 2:1 and 3:1, depending on the quality of wetlands destroyed, whether wetlands are being newly constructed or enhanced, and other considerations for local and regional conditions. This means that the redevelopment activities will need to create a minimum of 2 or 3 acres of wetlands for every acre that is permanently disturbed. Once this has been satisfied, the DEP may allow further mitigation measures to be banked for sale to other project owners/operators within a limited geographical region—usually the same watershed.

As discussed in Section 4.1.3, *Freshwater Wetlands Constraints* above, there is one upland wetland on-site and two more adjacent to the Redevelopment Area. Inclusion of one wetland, between the NJ Turnpike and Pennval Road, may be advantageous if feasible, as the plot may be a wetlands remediation or wetlands banking opportunity. Since the property was not included in the original Pennval Road Study, the Township should consider completing an initial investigation of the land located between Pennval Rd. and the Turnpike before pursuing the site as part of the Redevelopment Plan.

4.2.2 Woodbridge River Greenway Opportunity

State law requires that development in a 100-year floodplain and/or adjacent to tidal wetlands and/or along a river in New Jersey requires that a 50-foot setback from the river's edge be provided in order to protect the stability of the river bank and preserve the ecological functions and values of the natural systems along the river's edge. For this reason, and to facilitate environmental education and outdoor exercise opportunities consistent with the concept of a green technology park, the Pennval Road Redevelopment Plan proposed that a greenway trail system be created along the south edge of the Woodbridge River through the GTP@W.

The full value and intent of a greenway system, however, is not only to protect the functioning of important natural systems such as the river itself, but also to establish continuity of ecosystems and protect areas of high ecological importance by connecting those areas with greenways that allow free movement of wildlife among them. For example, wildlife in small areas of critical habitat or high species diversity may be isolated and cutoff by the surrounding human development. In such cases, the impacts of the human development on the wildlife include not only the usual habitat loss, water and air pollution, and light and noise disturbance, etc., but also spatially related impacts such as the natural areas being too small to support the typical home range of some species or too small to support a healthy population gene pool. By providing a natural corridor for movement or flow between such natural areas in a given river basin, natural ranges and healthy gene pools can be accommodated.

Existing Greenway Plans.

Strong precedents for planning such greenways – and blueways in the cases of rivers and streams – can be found for the Arthur Kill, Raritan River and Rahway River in New Jersey, as follows:

- *Arthur Kill***.** Greenways to the Arthur Kill: A Greenway Plan for the Arthur Kill Tributaries, by Durrie A. Greiling, published by the New Jersey Conservation Foundation, Morristown, NJ, 1993. The Arthur Kill tributaries include the Rahway River and Elizabeth River as well as the Woodbridge River and several creeks.
- *Rahway River.* Rahway River Greenway Plan, prepared by Rutgers University, Edward J. Bloustein School of Planning and Public Policy, Fall 2008 Comprehensive Planning Studio.
- *Raritan River.* Raritan River: Blueway for Revitalization, a project in progress being conducted by Rutgers University, Edward J. Bloustein School of Planning and Public Policy.

While the Arthur Kill report is nearly 17 years old, it does address the Woodbridge River and thus serves as an excellent starting point for planning a greenway for the GTP@W that would link with other areas of high natural and cultural importance on the Woodbridge River. One noteworthy element of that plan is the connection of the Woodbridge High School property to the Woodbridge River Greenway via a side trail. The Woodbridge River Greenway proposed in "Greenways to the Arthur Kill" is described in Box 2 below.

The New Jersey Conservation Foundation, the organization sponsoring the Arthur Kill Greenways Project, was contacted to get an update on the project in terms of additional acquisitions, restorations and implementation of the trails system. They stated that NJCF has not funded any additional projects in the Woodbridge River Basin.

Box 2: Description of Proposed Woodbridge River Greenway

(Source: "Greenways to the Arthur Kill", by New Jersey Conservation Foundation, 1993)

South of the Woodbridge River mouth, salt marsh, tidal flats and an adjacent woods (AK7, values 3,5,10) lie in Perth Amboy along the Arthur Kill shore. Because so little salt marsh remains along the Arthur Kill shoreline, each remnant patch is important and deserves protection.

The natural lands lining the Woodbridge River as it flows through Woodbridge Township and Perth Amboy offer a remarkable opportunity for an almost unbroken five-mile-long natural greenway. The Woodbridge River's mainstem is almost completely lined with habitat sites, including broad sections of wetlands and forests. Nearly all are unprotected, and all should be preserved to complete a natural Woodbridge River Greenway. The municipally owned Woodbridge River Watch Wildlife Sanctuary could be the keystone of a greenway extending from its headwaters to its mouth.

Habitat along the Woodbridge is narrowest at its mouth (W1, values 3,5,6,7,10). Even here, hemmed in by oil storage tanks, salt marsh and mud flats used by feeding birds line the creek, extending from the Arthur Kill to State Street. The banks of the river have some bulkheading and riprap which limit the amount of wildlife habitat. Upstream of W1, Spa Spring Creek the border between Perth Amboy and Woodbridge Township, feeds in to the Woodbridge River. Middlesex County's Warren Park (W9, values 5,7,8,9,10,11,13), 126 acres of ball fields, picnic areas, and woodlands at Grove Road at Convery Boulevard, is on Spa Spring Creek. A connection should be made between the park and the mainstem greenway. A tributary of Spa Spring Creek leads south, passing through a municipal park in Perth Amboy. This park and one further south should be incorporated into the greenway.

A large area of tidal marsh and shrub wetlands (W2, values 1,5,6,7,10) surrounds the river below Cutter Dock Road and Woodbridge Avenue, above the confluence of Spring Creek with the Woodbridge mainstem. A small part of this area is Woodbridge conservation land. East of W2, a grove of trees between the storage tanks near the river (W4, value 5) off West Avenue contains red maple and white pine. Between Woodbridge Avenue and the New Jersey Turnpike, a small salt marsh fringes the banks and mudflats along the Woodbridge River (W3, values 1,2,5,10).

Between the Conrail line and Turnpike, the Woodbridge River is bordered by a total of 92 acres of salt marsh, 28.6 acres of mixed deciduous/coniferous shrub or brush, 8.5 acres of shrub wetlands and 5 acres of deciduous forest.

Heard's Brook feeds into the mainstem of the river just upstream of the Turnpike. Woodbridge Township municipal land surrounds Heard's Brook for about a mile, forming a greenway from Fulton Street to the habitat site (W10, value 5) on the west near the intersection of Route 9 and Woodbridge Avenue. A link should be completed to connect the parkland with the river's mainstem. As noted earlier, a connection with the South Branch Greenway may be possible through Heard's Brook to Beth Israel Memorial Park.

Box 2 Continued:

Two feeder creeks enter the Woodbridge River inside the sanctuary. Although neither retains much habitat along its banks, sensitive redevelopment and care could extend a natural greenway up these creeks, enhancing the neighborhood and providing more wildlife habitat. A trail or easement along the western feeder could possibly link Woodbridge High School with the Woodbridge River Watch Wildlife Sanctuary. The eastern feeder passes by a municipal park in Port Reading, which should be connected to the greenway. A good portion of site W6 has been protected inside the sanctuary, but more remains vulnerable.

Upstream of Heard's Brook begins the exceptional part of the potential Woodbridge River Greenway. Site W5 (35 acres, values 1,3,4,5,7,10,11), on the Woodbridge River mainstem north from the New Jersey Turnpike to Carteret Road, contains mixed deciduous/coniferous brush scrubland and tidal salt marsh where egrets feed, and marsh wrens, song sparrows and barn swallows breed among many other species that frequent the marsh. The 42-acre Woodbridge River Watch Wildlife Sanctuary (W6, values 1,2,5,6,7,10,11) between Carteret Road and the Conrail line, owned by Woodbridge Township, contains salt marsh and mudflats where shorebirds feed. Oak forest islands here provide critical habitat for migrant birds.

Above the sanctuary, the river turns to freshwater and supports a different community of plants and animals. Site W7 (values 1,2,3,4,5,6,5,7,8,9,10,11) contains about 1 acres of natural area and extends north of the Conrail line to Morrisey Avenue. It includes 26 acres of salt marsh, 13 acres of deciduous forest and 51 acres of mixed deciduous/coniferous shrub.

Priority Habitat Site – Woodbridge River Headwaters Pin Oak Forest (W8): Priority habitat site W8, 153 acres in size, includes a mix of open freshwater marsh (12 acres), mixed shrubs 57 acres) and forest composed mainly of mature pin oaks interspersed with other floodplain and wetlands species 84 acres). Pin oaks, a tree species that tolerates wet swampy areas, used to blanket most of the Rahway-Linden area. Site W8 reaches from Morrisey Avenue north to a Conrail line southeast of Rahway State Prison. Although the site was once a farm for the prison, when it was left fallow pin oaks came to dominate the canopy, because they existed nearby to colonize it. Sadly, if all the oaks were removed, a forest would return consisting of non-native species, with little habitat value, such as the tree-of-heaven. W8 is a priority habitat site. This forest especially deserves protection, to retain an example of the area's natural history.

4.3 Wetlands/Ecological Restoration Studies and Projects

4.3.1 Previous Wetlands/Ecological Restoration Studies and Projects

Two earlier projects involving wetlands preservation and restoration on the Woodbridge River upstream of the Pennval Road Redevelopment Area provide information and insights regarding the ecological restoration potential and feasibility of the GTP@W site. These are:

Woodbridge River Watch Wildlife Sanctuary

Federal and state government agencies have collaborated to restore 40 acres of wetlands at one location on the Woodbridge River in 2006. The entire 10 square mile drainage area of the Woodbridge River Basin and 5 mile length of the Woodbridge River were studied to select and design the wetlands restoration site. The study found that intense urbanization and development in the study area have directly impacted ecological resources through increased stream bank erosion, loss of wetland acreage, and increased sedimentation, nutrient and pollutant loading, and channel siltation. Indirect impacts have included increased rates and volumes of storm water runoff, reduced groundwater recharge, increased stream temperatures, and increased acreage of invasive species. As a result of these direct and indirect impacts, opportunities for ecosystem restoration exist within the Woodbridge River Basin.

To capitalize on these opportunities, the U.S. Army Corps of Engineers (Corps), Port Authority of New York and New Jersey (Port Authority), National Oceanic and Atmospheric Administration (NOAA) and the New Jersey Department of Environmental Protection (NJ DEP) collaborated to design and implement the Woodbridge River Ecosystem Restoration Project. The project's goals were to:

- Create and restore habitat for native nesting birds and nursing areas for juvenile fishes
- Remove fill within the wetlands and re-grade to allow for daily tidal flushing
- Restore hydrology of the site without adversely affecting flood levels
- Re-grade the site and create an elevation range that is self-sustaining for native salt marsh

The wetland area selected for restoration, located on the Woodbridge River just north and south of Port Reading Avenue, historically functioned as a salt marsh with freshwater influences and a diversity of characteristic vegetation. However, in recent years the site has been overrun by the invasive form of *Phragmites australis*, or common reed, and reduced tidal influences due to filling and diking have led to lower plant and animal diversity. To offset unavoidable wetland impacts related to deepening of navigation channels in the Port of New York and New Jersey, the Corps and Port in 2006 restored about 23 acres of tidal wetland and upland area. To compensate for the 1991 Exxon Bayway Oil Spill, NOAA and the NJ DEP in 2006 restored an additional 17 acres of tidal wetlands at the same site on the Woodbridge River.

Completion of the federal wetlands restoration project leaves about 27 acres of wetlands that were set aside for State preservation. Further complimentary restoration activities would include removal of fill material and restoration of more acres of tidal marsh, as well as removing a partially exposed dam still located near the Port Reading Avenue bridge to improve tidal exchange and flushing between the upstream and downstream reaches.

Utilizing New Jersey Green Acres funding, Woodbridge Township purchased the restored 40-acre wetland site and has designated it as the Woodbridge River Watch Wildlife Sanctuary in honor of the non-governmental organization that has been instrumental in cleaning up and preserving natural areas along the river. The group plans to create a nature trail, bird watching facilities, bird nesting homes, etc.

Woodbridge River Headwaters Pin Oak Forest

Wetlands restoration and preservation efforts have also occurred at the headwaters of the Woodbridge River where Middlesex County in 2003 purchased for $3.1 million nearly 97 acres in the Avenel section of Woodbridge Township, known as the Pin Oak Forest Project. The site, which is located along Omar Avenue and Rahway Avenue, includes a 40-acre unnamed pond in the center surrounded by 57 acres of wetlands and uplands. This project was one of the original 16 projects approved by the Middlesex County Open Space Committee and the Freeholders and represents the County's first open space purchase in Woodbridge Township. This site was heavily impacted by industry for many decades, including construction of a railway embankment in the early 1900s; acid dumping in the 1970s; and filling in the mid-1980s.

Now that the site is protected and being restored, the water quantity and quality are much improved. A variety of wildlife inhabits the area, including deer, fox, and muskrat, as well as numerous species of water fowl and wading birds such as great blue herons; in addition, the park has been stocked with 300 quail and 30 pheasants. In addition to the continuing site cleanup and restoration, Woodbridge Township obtained a $5,000 grant from Conservation Resources Inc. to plant 2,400 pin oak seedlings on 2-3 acres of the park. Other projects to plant a grove dedicated to veterans and a butterfly garden are in progress. Woodbridge Township has also donated a gazebo; is sponsoring engineers delineating the wetlands; and is providing road and trail improvement. Local citizens are providing their relevant expertise to create or restore wildlife habitat.

4.3.2 Proposed Wetlands/Ecological Restoration Studies and Projects

Wetlands Delineation Study and Baseline Ecological Evaluation

There is little site-specific ecological data available on the Pennval Road Redevelopment Area, aside from the Redevelopment Study and Redevelopment Plan, and neither those studies nor the present GTP@W Implementation Plan have the scope or budget to conduct the necessary field data studies. Therefore, a fresh study of the ecology and wetlands of the river near the GTP@W is needed to establish precisely how to locate and design the GTP@W greenway and how it can best be linked physically and programmatically with the overall planned Woodbridge River Greenway, as well as how to catalyze its implementation

If the Phase 2 Site Investigations confirm that land contamination has occurred in the Areas of Concern identified in the Phase 1 Preliminary Assessments being conducted by Excel under the HDSRF grant, then an in-depth Wetlands Delineation Study (WDS) will be needed and a Baseline Ecological Evaluation (BEE) will be required (by NJ DEP), both of which may be funded by the HDSRF grant as well. Since Areas of Concern are so far being identified for nearly all of the Pennval Road Redevelopment Area parcels being examined under the HDSRF grant, it advisable that the developer seek grant funding for a WDS and a BEE covering the entire GTP@W site. Financial and technical assistance may also be obtained from the US Fish and Wildlife Service and state and local conservation organizations, e.g. New Jersey Conservation Foundation, Edison Wetlands Association, NY-NJ Baykeeper and Woodbridge River Watch.

Such studies could facilitate several elements of the greenway planning, including determining the location, setback and width of bicycle and pedestrian trails to minimize impacts on the river and wetlands while maximizing viewing and environmental and historical education opportunities, e.g. by providing public access to the historic brick kiln. (In this regards, it is noteworthy that "Greenways to the Arthur Kill" also contains a set of 22 design and management guidelines for greenways that should serve as an excellent starting point for a land restoration and bicycle/pedestrian trail system along the Woodbridge River in the GTP@W. These guidelines should be updated, however, by using the experience of the more recent Rahway and Raritan River greenway plans, as well as by seeking input from the various organizations that do such work routinely.)

New York-New Jersey Harbor Estuary Program

Goal 2 of the Action Plan of the New York-New Jersey Harbor Estuary Program calls for preserving, managing and enhancing the Estuary's vital habitat, ecological function and biodiversity so that the Harbor is a system of diverse natural communities. To achieve this goal, the Action Plan calls for habitat preservation and land acquisition, specifically for the acquisition of an additional 500 acres by 2012 in waterways associated with the Estuary, including the Arthur Kill, using funding from New Jersey Green Acres program and other sources. The Estuary Program's website lists acquisition priorities and restoration priorities; both lists include "multiple sites" on the Arthur Kill. The previously mentioned publication, "Greenways to the Arthur Kill", is cited as a source, and the associated maps show the Woodbridge River as one of the sites.

Preservation of Additional Parcels at the Pennval Road Redevelopment Area

A strategy for natural resource preservation, based on the Natural Resource Inventory that was completed as part of the Sustainable Jersey Program, should be developed. This will identify important environmental protection steps that municipal leaders should take as part of the redevelopment project. Converting the development from the underutilized state that damages the environment to industries that enhance and showcase the Woodbridge Creek waterfront and wetlands will confirm Woodbridge's continuing commitment to improving the quality of life and the environment.

A map of the proposed Arthur Kills Greenway Project shows the GTP@W site as containing an extensive area of "unprotected habitat" not only running along both sides of the river but also the "landlocked" and undeveloped Block 541, Lot 8 which belongs to Woodbridge Township. However, this parcel is currently designated by the Pennval Redevelopment Plan as suitable for a ground-based solar installation. Not only does this parcel appear to support wetlands and the 100-year floodplain, it provides a critical continuity of natural habitat between the meanders of the river that is used by wildlife as well as by floodwaters and wetlands plants. This particular parcel could be seen as the core of the GTP@W natural area which in turn could be seen as the third such natural area in the system of restored wetlands linked by the Woodbridge River Greenway that also includes the two restored natural areas upstream (described above).

In addition, ideally, the creation of a greenway along the Woodbridge River through the GTP@W site would include restoration and cleanup of riverside property on both sides of the river as well as any other property that supports wetlands or floodplains and provides critical continuity among riverside areas. In this regard, the industrial/commercial parcels on the east side of the river just south (downstream) of Woodbridge Avenue and the two similar parcels just north (upstream) of Woodbridge Avenue along the river are similar in use and condition to the other properties in the Pennval Road Redevelopment Area and should be considered for inclusion in the GTP@W site. Such inclusion would facilitate any cleanup needed and restore and protect their heavily impacted riverside components while positioning these parcels for redevelopment more beneficial to the Township.

4.3.3 Historical Resources Opportunities

In addition, according to the Pennval Road Redevelopment Plan, "The area was historically used for the production of clay bricks as far back as the mid 1800s." The remnants of the M. D. Valentine Brick Company established in the 1860s are a brick kiln and associated structures (located at the center of the far western boundary of Block 531-A, Lot 1 of the Pennval Road Redevelopment Area, which runs along the NJ Transit North Jersey Coast Line). These structures are of a unique historical resource but are not maintained. There is an opportunity to restore these structures and provide public access and education opportunities, including interpretive descriptions of the brick industry that were once prevalent in the area. It is critical that the historic kiln and other structures associated with the historic industrial use of the property be preserved and public access be provided; therefore, any future redevelopment of the area should include such restoration of, and access to, these relics of Woodbridge.

The cultural investigations carried out as part of the multi-agency Woodbridge River wetlands restoration project described above identified an additional significant historic resource upstream of the GTP@W site: Dunham's Mill, a 1670 grist mill, that stood in the project area until about 1804 when a survey of the river described the mill as "pulled down." No excavations have taken place, but timber remains of what might have been the mill dam were observed in the river bed. A Woodbridge River Greenway could link the Dunham Mill site with the Valentine Brick Kiln site, and provide interpretive information about the various historic uses of the river and adjacent land along the way.

4.4 Concept Plan for Centralized/Shared On-Site Environmental Infrastructure

The proposed GTP@W will build and operate shared environmental infrastructure systems to facilitate the GTP@W and its tenants meeting or exceeding relevant environmental protection standards at reasonable costs. These systems will address management of:

- Storm water
- Domestic wastewater
- Industrial wastewater

- Domestic solid waste
- Industrial hazardous waste

The precise types, capabilities, capacities, locations and layouts of these facilities will be determined in later detailed site planning phases, but emphasis will be placed on flexibility to adapt to different directions the GTP@W may evolve in over time in terms of types of industries and facilities that may be located there.

4.5 Preliminary GTP@W Environmental Management System

A detailed Energy and Environment Management System should be developed and implemented as part of the design and operation of GTP@W. Such a system should incorporate the elements below. The degree to which these functions can or should be provided in-house or onsite – as opposed to being outsourced and/or provided offsite by other private or public entities – will of course depend on the nature and scale of GTP@W evolution and the cost-benefit tradeoffs for alternative future scenarios.

- ISO14000 Environmental Management System (EMS) – Including environmental policies, standards, procedures, organization and resources (staff, equipment and facilities); including social and economic "pillars" as well would create a "Sustainable Development Management System" which would facilitate achieving desired "triple bottom line" results.
- Environmental Infrastructure Systems Management – Including operation and maintenance of onsite domestic and industrial water, wastewater, solid waste and hazardous waste management systems.
- Emergency Response
- Industrial Symbiosis Advisory Service – A person to track and facilitate industrial symbiosis opportunities among GTP@W and WBEIZ tenants.
- Energy and Environment Monitoring Center – Including field and laboratory sampling and analysis equipment and technicians monitoring against relevant federal, state, local and GTP@W voluntary standards; for energy management, such standards could include LEED, Energy Star and ULI's Climate, Land Use and Energy (CLUE) Guiding Principles.

4.6 Regional Evolutionary Approach to Achieving Industrial Symbiosis

4.6.1 Concept

Industrial symbiosis is the expansion of corporate awareness of externality beyond that of the individual corporation to the network responsible for the production of goods and services. Industrial symbiosis broadens the scope of economic thinking beyond that of each individual association to an association of associations. Specifically, the model calls for conceptualizing individual corporations as cells within a community of cooperating industries. This biological

model emphasizes the efficiencies found in living organisms that are present out of competitive necessity.

Since industrial symbiosis is primarily about maximizing efficiency between units by gathering information about the way an organization is functioning, it follows that the kernel it uses to manage the process will be both a comprehensive measurement infrastructure used to get information about the processes within and between groups as well as a comprehensive communication tool designed to communicate this information among all members of the industrial symbiosis group. Once this framework is in place, the individual units are better able to make decisions and others within the group are alerted of the consequences of those individual decisions in near real-time. While the model's benefits are immediate, they will only grow as increased globalization promotes increased cooperation among local entities.

4.6.2 Tools

Collection, analysis and distribution of industrial symbiosis information are accomplished via several tools, that when employed create better resolution in understanding a network's functioning; these tools include:

- Embedded Energy and Materials involves using the byproduct of one industrial process as the raw material for another. Small departments are designed to create another product based on the waste generated by the creation of the primary product. Cogeneration is a perfect example of embedded energy/ materials.
- Life Cycle Perspective adopts a more comprehensive view of the history and future of materials used in industrial production allowing plans to be based on what will happen after a material leaves an individual corporation. Closely related to embedded energy and materials practices, a life cycle perspective is well exemplified as the construction of roads and concrete from fly ash.
- Cascading uses a resource more than once for different processes within or between corporations comprising the industrial symbiosis park. As resources cascade from one process to another, they become lower in quality and must be used for new or other purposes than those for why they were imported into the system. Good examples include utilizing grey water and cogeneration.
- Tracking Material Flows
- Encompassing all of the above analytical tools – embedded energy and materials, life cycle perspective, and cascading – tracking material flows allows for the planning of new symbioses and the augmentation of existing ones. Meta-analytical tools for tracking material flows include:
- Industrial Inventory. An inventory of all businesses and resources potentially useful to the corporate network in question. Generic collection of data is important due to confidentiality concerns.
- Input/ Output Matching. Making links of the inputs and outputs of and across various industries. Examples include EPA software "FaST", "DIET", and "REaLiTy". Although I/O matching can overemphasize idealized exchanges, this is addressed by taking this model into account during industrial planning and development.

- Stakeholder Processes. Seeking input from stakeholders within the community not only provides public support for projects, but allows industrial symbiosis businesses increased resolution when predicting the behaviors of individual actors within the community.
- Materials Budgeting. Generating a comprehensive understanding of resource use within an industrial community including where resources are stored, the rate at which these stores are accessed and added to, and the rate at which these resources enter the system as a whole.
- Spatial Application
- Industrial symbiosis is accomplished across a variety of spatial realities. One such spatial structure is that of the non co-located business community. Partners are not located adjacent to each other, but rather are connected by infrastructure that allows for the network to function. This is accomplished through local and regional councils that serve as the informational processing and distribution networks mentioned earlier.
- Temporal Application

In one example of industrial symbiosis, Kalundborg, Denmark, is a small municipality in Denmark that has created an industrial park based on industrial symbiosis. Several things are important to note here. Although interdependence of individual industries comprising the park is a central theme, their interdependence is not centrally planned nor their cooperation centrally controlled. Rather, the park's organic development was guided by creating a kernel process that is able to interchange individual industrial units as the market influences their success, failure or adaptive change. In other words, industrial symbiosis is not so much about telling other entities what to do, as much as it is about collecting good information to inform to adaptation to change.

5.0 ORGANIZATIONAL DEVELOPMENT

Outline a draft park organizational development plan, including a clearly defined process and criteria for attracting and selecting financiers, redeveloper(s), incubator operator(s), training center manager(s), and anchor tenants. An advisory Board has been formed to help guide the development of the GTP@W organization structure, and may continue to be involved in carrying out the GTP@W mission once the Park is established.

Stakeholders will include:

- Financiers
- Redevelopers
- Property/asset manager
- Business incubator
- Woodbridge innovation zone
- Training center
- Energy institute (university research consortium)
- Industrial tenants
- Nonprofits
- Government agencies

5.1 Financiers

- Retail Banks
- Investment Funds, e.g., Global Green, which finances sustainable development projects.
- US Government is providing seed money for planning GTP@W, including funds from the US Department of Energy's Energy Efficiency and Conservation Block Grant and from a US Government earmark
- US Economic Development Agency, e.g., Community Trade Adjustment Assistance Opportunity, and other EDA programs[7]
- NJ EDA

5.2 Master Developers

The Terms of Reference for recruiting master developers for the Woodbridge Green Technology Incubator and GTP@W, respectively, are provided below:

[7] http://www.eda.gov/PDF/CommunityTAAFFOFINAL2.pdf

1) ***Woodbridge Green Technology Incubator.*** Develop and plan the green business incubator and green jobs training building using a public-private partnership (PPP) approach to organization and financing; use this initiative as a platform to look concurrently for an overall GTP@W redeveloper. This initial development group would be representative of the stakeholders for the initial incubator building and overall GTP@W, as described in the Organizational Development section above.

The Woodbridge Redevelopment Agency (RDA) has been proposed to serve as the initial incubator operator (or possibly owner/operator). The RDA can receive federal earmark grant monies and enter into contracts with private sector master developers to accomplish the goals of the GTP@W. It is recommended that the scope of work for the Incubator master developer (to be prepared by the Township) include the following elements:

- Plan the "Green Technology Incubator" (incubator means incubator and associated organizations and facilities) as a key element of the GTP@W, as envisioned in its redevelopment plan, by completing at least the following tasks, in collaboration with Woodbridge Township through the Woodbridge Redevelopment Authority:
    - Define the role, operations and programming of the Incubator
    - Prepare concept for green design of the Incubator
    - Identify issues and develop plan for resolution related to site control to enable the Incubator
    - Create preliminary ownership and financial models for the Incubator
    - Aggressively seek funding and financing for the Incubator, including but not limited to site control, environmental management and project development
    - Develop a university consortium to locate an energy R&D center at the Incubator
    - Develop a green jobs training center at the Incubator
    - Develop a green technology commercialization program at the Incubator
    - Assist in public outreach and stakeholder engagement relating to the Incubator
    - Manage the Incubator promotional storefront at Woodbridge Center mall
    - Create a marketing website for the Incubator
    - Develop a physical model of the Incubator
- Prepare a general development plan with strategies for phased and flexible preparation and development of the Incubator site – consistent with the green business/industry theme and green development specifications of the Incubator site (buildings, grounds and infrastructure).
- Take control of the Incubator site; recruit tenants for individual buildings; develop the site; and manage the Incubator asset.

2) ***Green Technology Park @ Woodbridge.*** Find an overall GTP@W redeveloper first who could also take responsibility for developing the Phase 1 green business incubator and

green jobs training building. Their scope of work for the overall GTP@W development/planning would be as follows:

- Complete a general plan for phased development of the overall GTP@W site consistent with the green business/industry theme and green development specifications of the overall GTP@W site (buildings, site and infrastructure).
- Prepare a pro forma Total Capital Stack - Cost Budget, including: (1) land-related soft costs (i.e., environmental, engineering, approvals, capital carrying cost, etc., and (2) land-related hard costs (i.e., environmental approvals and clean-up, site work, relocation costs, etc.). Discuss various capital sources including municipal bonds.
- Prepare a pro forma Budget for Operating Revenue, including: (1) as detailed as practical identification of revenues and expenses, cap rate, etc.; and (2) discussion of some form of incremental financing. Regarding any revenue gap, provide an assessment of available sources of grants, loans and other sources of revenue that could positively affect the capital cost budget and/or the operating budget.
- Collaborate with Woodbridge RDA in planning the preparation of the overall GTP@W site for development by finding the most expedient and inexpensive strategies, and assisting in finding financing for those site preparation strategies.
- Collaborate with the organization selected to plan, develop and operate the Woodbridge Green Technology Incubator (and associated organizations and facilities) in planning and phasing the integration of the development of the Incubator with the development of the overall GTP@W site, and assist in finding financing for those integration strategies.
- Devise a strategy for accommodating initial anchor tenants consistent with the green businesses/industries theme and green development specifications of the overall GTP@W site, and for accommodating development of the Green Technology Incubator on the overall GTP@W site (if proven to be feasible and is able to find financing).
- Take control of the overall GTP@W site; recruit tenants for individual sites per the general development plan; develop the site; and manage the GTP@W asset.

5.3 Property Manager

The property, facilities or asset manager selected to operate the GTP@W must have unique capabilities and experience in the fields of energy and environmental facilities management, including:

- Environmental Management Office, EMS implementation, environmental monitoring, inspection and enforcement, laboratory management, field sampling, industrial symbiosis manager, and emergency response
- Environmental Infrastructure Facilities – domestic and industrial water wastewater, storm water, solid waste and hazardous waste management
- Energy Management Office, energy efficiency monitoring, renewable energy generation facilities management

- Grounds management, including greenway maintenance; wetlands restoration, protection, enhancement; environmental education, etc.
- Transport management, including shuttle buses, bikeways and walkways, parking, etc.
- Incubator and park tenant development, sales/leases office management, etc.

5.4 Business Incubator

According to the NJ Commission on Science and Technology (NJCST), business incubators play a pivotal role in New Jersey's economic growth by nurturing the state's next generation of manufacturing and technology-based business. The concept of business incubation has been successfully applied throughout the nation and around the world and offers excellent return on investment for successful business creation, job and revenue growth with measurable direct and indirect economic impact. Today, there are 14 technology incubators operating in New Jersey supported, in part, by the Commission on Science and Technology.

According to the National Business Incubation Association, start-up companies in incubators have a higher success rate than those developing without the critical business assistance provided by incubators:

- More than 65 percent of incubator-based early-stage companies are likely to receive third party financing, compared to less than 10 percent of early-stage companies not based in an incubator
- 87 percent of incubator graduate companies remain in business after three years, compared to just half of non-incubator start-ups
- And 84 percent of those incubator graduates remain local to their incubator

Today, New Jersey has twelve technology business incubators. They are innovative, entrepreneurial enclaves which currently support over 350 businesses.

- New Jersey incubators graduated 24 firms since 2004
- New Jersey companies currently in incubators raised ~ $40 million in 3 rd party funding
- New Jersey incubator companies have revenues of $154 million
- New Jersey incubator companies provide more than 1200 jobs

Each New Jersey incubator offers professional office space, some feature "wet" labs with sinks and fume hoods, light manufacturing equipment or warehouse space. Some of the incubators are tailored to meet the needs of specific business sectors like Life Science, Homeland Security, Energy and the Environment while others house a wide range of diverse technology start-ups. In addition to a professional business environment, administrative support and significant networking opportunities within the entrepreneurial community, some of the technology Incubator services provided can include:

- Pre-Admission Consulting
- Access to university/college resources including research collaboration opportunities, student interns, MBA student support teams, etc.
- Business planning & milestone tracking
- Product, marketing & manufacturing strategy support
- Prototyping, software, web development
- Finance and accounting support
- Government agency navigation & grant support
- Seed Funds for milestone specific projects
- Entrepreneurs in Residence
- Virtual membership for non residential clients
- Networking opportunities with Angel venture capitalists and other emerging businesses

While a university or university consortium could serve as the incubator owner/operator, and universities have that experience in New Jersey, it is believed that such a consortium would be better positioned as the owner/operators of a Woodbridge Energy Institute. The NJ Energy Master Plan (NJ EMP) proposed the New Jersey Energy Institute as a university consortium established to coordinate, manage and carry out sustainable energy research relevant to New Jersey. This concept has not been further elaborated or implemented, and near-term funding from the State may not be forthcoming. However, the US DOE has recently announced an initiative to create five regional centers for energy efficiency R&D to be led by university consortia, so the Woodbridge Energy Institute could apply to this program for funding.

While the consortium could still play a valuable role in developing or programming the incubator, the incubator role is more of an entrepreneurial or economic development role that could benefit more from private sector sponsorship with assistance from NJ EDA and related agencies. Nevertheless, during initial development, it is currently envisioned that WEDCO will be the initial owner/operator of the incubator until either a master redeveloper willing to own/operate the incubator is recruited or a private sector operator for the incubator can be identified. It is still foreseen, though, that the NJEI university consortium and incubator would interact extensively, provide services to each other and generally create synergies benefitting the development of the GTP@W.

5.5 Woodbridge Innovation Zone

As mentioned earlier, one of the functions of the GTP@W will be its role in anchoring a Woodbridge Innovation Zone under the statewide Edison Innovation Zone program and thus reinforcing the green re-branding of Woodbridge Township as a community dedicated to sustainable development. The Ecopark redevelopment in Keasbey is another current project in Woodbridge that dovetails with the themes emphasized in this proposal for the GTP@W. More

specifically, rather than having the GTP@W viewed as fixed in one location, it is envisioned that the Park and its tenants will form networks and associations, both ad hoc and formal, with like industries and sectors in the greater Woodbridge region, and in either horizontal or vertical relationships. At a minimum, the GTP@W administration and the Township will work to facilitate these relationships and organizations. To provide a formal framework and incentives for such a development, however, it is further proposed that a Woodbridge Innovation Zone be created. Such an arrangement will help to diversify the tenant mix, maximize synergies and symbioses among Park tenants, and between the Park tenants proper and their larger networks in the region, and thus maximize the sustainability of the GTP@W.

The Edison Innovation Zones throughout the state encompass state universities, research institutions and related businesses. The zones include areas within the cities of Camden and Newark and the Greater New Brunswick Area. The Edison Innovation Zones are a collaborative state effort involving the EDA and other state agencies.

These "technology neighborhoods" are designed to spur collaborative efforts and encourage the rapid transfer of discoveries from the laboratory to the marketplace. Enhanced financial incentives are available to eligible technology and life sciences businesses locating in these zones. Each zone also features a commercialization facility to provide specifically designed office and lab space for these early-stage growth companies.

Companies located within Edison Innovation Zones, described in Section 2.4, will have access to enhanced partnership opportunities coordinated by the state. For example:

- The New Jersey Commission on Science and Technology funded incubators provide small firms with a variety of services in a business- and technology-friendly environment.
- The commission will help strengthen relationships between university researchers and area high-tech business.
- Funding will be available for early "proof-of-concept" commercialization research at universities.
- Technical assistance will be provided to early-stage companies applying for SBIR grants.
- Access to research talent through Technology Fellowship Program
- Partnerships between industry and universities will provide industry researchers access to university labs and will place students in industrial labs.
- Collaborative research facilities, such as the new Stem Cell Institute will provide strategic cooperation.

5.6 Green Jobs Training Center

According to the 2008 New Jersey Energy Master Plan (EMP) “Green Jobs Fact Sheet”, green jobs involve environmentally friendly products and services or businesses and organizations that concern themselves with improving the environment. Meeting the EMP’s aggressive

targets for energy efficiency, renewable energy, demand response, and new generation will require green jobs in sectors such as solar manufacturing, energy auditing, HVAC installation, and smart grid technology installations as well as design, manufacture, installation, operation, and/or maintenance of new renewable energy and energy efficiency technologies.

The $33 billion of investment into the NJ energy infrastructure stemming from the 2008 EMP is estimated to result in the creation of over 20,000 jobs between now and 2020, including:

- Approximately 8,300 jobs involving one-time installation and construction
- Another 7,400 involving annual (permanent) operation and maintenance, including plant maintenance, energy efficiency audits, and energy efficiency installations
- Over 4,000 ancillary jobs

The kinds of businesses that will benefit include solar manufacturing, energy audit contractors, HVAC installers, smart grid technology installations, and many more.

In addition to actions aimed at increasing the number of green jobs available in the State, the EMP includes an action to develop a timely and industry recognized 'green collar' jobs training program to ensure that sufficient numbers of New Jersey workers have the skills demanded by industry to fill the jobs that are created by the EMP. To this end, the Department of Labor has also formed an Industry Workforce Advisory Council (IWAC) to convene senior human resources representatives from the energy sector with the State's agencies working on workforce development, higher education, and training programs.

Over the past three years, 1,953 New Jersey workers have been trained in the emerging green energy sector through more than $1 million in Customized Training Grants provided by the Department of Labor and Workforce Development (LWD) and matched by funds from their employers. In addition, training and apprenticeship programs supported by LWD and local One-Stop Career Centers are currently training more than 200 workers for Trenton and Newark in green construction and energy-efficiency occupations. This opportunity will depend on state government decisions regarding continuing funding.

The proposed concept for a Woodbridge Green Jobs Training Center (GJTC@WB) would have the following elements:

- Recruit, preferably, a national chain type of practical, adult education entity, e.g. University of Phoenix, DeVry, et al., either to own and operate or just to operate under contract, the GJTC@WB. The selected entity would serve as a private sector lead willing to develop or lease a classroom building onsite, provide all of the training administration.
- Utilize resources at local education institutions such as Berkeley College, Middlesex County College, and Thomas Edison College.
- Ask the GJTC owner/operator to develop a special green jobs department and curriculum and call that the GJTC, but allow them to offer their usual full range of courses, or a

curriculum specialized in retraining industrial and other blue collar workers, and offer that curricula through their usual name (University of Phoenix, et al.).

- Assist the GTP@W in applying directly to the NJ DOL for training funds.
- Assist the GJTC owner/operator to establish training partnerships inside the GTP@W wherein they can source trainers, practicums, field trips and on-the-job training internships from the Woodbridge Energy Institute (University Consortium), Green Business Incubator and green industrial cluster tenants at GTP@W.
- Assist the GJTC owner/operator to establish training partnerships outside the GTP@W. There are many other capable in-state training partners, e.g.: (1) Heldrich and the Rutgers Extension Service which just won the ULI educator of the year award for its sustainable development training program; (2) the New Jersey chapter of the US Green Building Council offers a full slate of green building training courses subsidized to members by a grant from the NJ DOL; and (3) labor unions, such as the IBEW (electrical engineers) who provide solar energy training among other offerings.
- Locate the GJTC (and these other organizations) in an existing building elsewhere in what will be the Woodbridge Innovation Zone so they can get started as soon as possible and thus be an incentive for others to come to GTP@W.

5.7 Woodbridge Energy Institute (University Research Consortium)

One of the ways in which the 2008 New Jersey Energy Master Plan (EMP) would prepare the state for "green collar" job growth is to establish a New Jersey Energy Institute (NJEI) to support and coordinate relevant basic and applied energy research efforts at state colleges and universities toward effective and efficient achievement of EMP goals. To date, the concept has not been further elaborated or implemented.

It is proposed that the GTP@W university consortium, that is already in the process of being formed to operate the incubator, apply to the State to serve as the NJEI (if funding is provided for that) or to US DOE to serve as one of their five regional energy efficiency centers. While the university consortium could still play a valuable role in developing or programming the incubator, it is currently envisioned that RDA be the initial owner/operator of the incubator until either a master redeveloper willing to own/operate the incubator is recruited or a private sector operator for the incubator can be identified.

5.8 GTP@W Tenants

Section 2.2 provides a detailed description of alternative scenarios of established firms that could be tenants of GTP@W; these include R&D, industrial, and warehouse/distribution firms, among others.

5.9 Local Organizations

5.9.1 Woodbridge Township Energy Coordinator

The position of Woodbridge Township Coordinator was established in 2009 to manage the Township's various sustainable energy initiatives, including those carried out pursuant to certification under the Sustainable Jersey program and Woodbridge Energy Consortium, as well as work funded under the Township's USDOE Energy Efficiency and Conservation Block Grant, i.e. community and municipal carbon footprint analysis, climate action plan, municipal building energy retrofits and this GTP@W plan. This position reports to the Chief of Staff of the Mayor's Office.

5.9.2 Woodbridge Energy Consortium

The Woodbridge Energy Consortium is an *ad hoc* group of energy-related organizations formed in 2009 under the leadership of Woodbridge Township to achieve synergies and economies of scale in implementing and operating energy efficiency and renewable energy systems. Their interests range from collective development of a local PSEG substation through which their collective renewable energy generation could be transmitted to the regional grid to obtaining volume discounts on energy efficiency and renewable energy equipment.

5.9.3 Local River Basin and Greenway Organizations

The Woodbridge River Watch, Edison Wetlands Association and NY/NJ Baykeeper are examples of local non-governmental institutions with environmental protection interests and capabilities relevant to the GTP@W and its environs. For example, the Woodbridge River Watch was organized in August 1988 as a group of 6 concerned citizens but which now numbers over 100 volunteers. Their purpose is the cleanup and restoration of all the waterways of Woodbridge, including the Woodbridge River. Activities have included creation of wetlands preserves, waterway trash cleanups, trail building and environmental education, among others.

New Jersey Conservation Foundation prepared the report, "Greenways to the Arthur Kill", which includes a detailed plan for a Woodbridge River Greenway (see Section 4._? above). Other organizations that have supported greenway and blueway projects in New Jersey include the Garden State Greenways, Land Conservancy of New Jersey, Trust for Public Land, Regional Plan Association, and East Coast Greenways.

5.9.4 Woodbridge Green Team

The Woodbridge Green Team plays an integral role in establishing and executing sustainability policies and practices in Woodbridge. The Green Team is comprised of political, business, and community leaders representing every corner of Woodbridge. The team consists of several subcommittees, including ones dedicated to the Local Economy, and to Outreach and Planning, as well as one called "ABC" (Anything But Cars).

5.9.5 Youth Leadership Council

This newly formed group leverages the enthusiasm of local students, demonstrating ways that young people can be more involved in their community. Typical YLC projects include: conducting surveys and providing outreach to businesses and residents in the community relating to the Township's sustainable development initiatives.

5.9.6 GTP@W Advisory Board

The Township has recently formed an Advisory Board of key experts in development to advise it on matters relating to successful creation of the Woodbridge Green Technology Business Incubator and Green Technology Park at Woodbridge.

5.10 Government Agencies

5.10.1 New Jersey Economic Development Authority (NJEDA)

In order to promote a green economy in New Jersey, the EDA has created Clean Energy Solutions (CES). This suite of financing programs includes interest-free loans and grants to ensure that commercial, industrial and institutional entities have the resources they need to grow and prosper while simultaneously reducing New Jersey's carbon footprint. Ultimately, CES supports the goals of Governor Corzine's State Energy Master Plan: to reduce New Jersey's energy consumption by 20 percent and increase the state's percentage of energy supply from renewable sources to 30 percent by 2020. NJEDA's relevant funding and financing opportunities are described in Section 3, Economic and Financial Assessment. The US Economic Development Agency also offers relevant assistance including, e.g. the Community Trade Adjustment Assistance Opportunity.

5.10.2 New Jersey Corporation for Advanced Technology (NJCAT)

NJCAT was created to promote in New Jersey the retention and growth of technology-based businesses in emerging fields such as environmental and energy. NJCAT provides innovators with the regulatory, commercial, and technological assistance required to bring their ideas to market successfully. Specifically, NJCAT functions to:

- Advance policy strategies and regulatory mechanisms to promote technology commercialization
- Identify, evaluate, and recommend specific technologies for which the regulatory and commercialization process should be facilitated
- Establish relationships/alliances to bring new technologies to market and new business to the state
- Assist in the identification of markets and applications for commercialized technologies

Operating as a public private partnership is the cornerstone of the NJCAT programs; in this manner, the commercial marketplace has direct input to the technology development and commercialization process and the public sector gains confidence in technology solutions through reliance on an independent honest broker examination of technology.

Of particular relevance to the GTP@W, NJCAT sponsors the Energy and Environmental Technology Verification Program (EETVP). The New Jersey Legislature enacted the Energy and Environmental Technology Verification (EETV) Act, which provides the guidelines to verify and certify for use innovative energy and environmental technologies that benefit the environment and economy of New Jersey. The New Jersey Legislature found that, in establishing the technology verification and certification program, it is in the public's interest to encourage the commercial development and use of new technology-based environmental and energy related products, services and systems that abate and prevent environmental pollution and promote energy conservation in the most cost-effective and environmentally efficient manner in the State.

The EETV Program specifically encourages collaboration between vendors and users of technology. Through this program, teams of academic and business professionals form to implement a comprehensive evaluation of vendor specific performance claims. The result of successfully completing this program is documentation of independent third party confirmation of claims that provides valuable information to business and governmental decision-makers. The EETVP utilizes a sliding scale of fees depending on the annual revenues of the firm.

It is therefore proposed that NJCAT establish a branch office in the GTP@W and that the Park's organizations and facilities be managed to serve as the technical resources for the EETV Program. In particular, some combination of the business incubator, energy institute and university consortium could provide technical resources to the EETV Program.

6.0 ORGANIZATIONAL DEVELOPMENT AND STAKEHOLDER OUTREACH ACTION PLAN

This plan aims to better define, illustrate and communicate the many advantages, especially green jobs, overall sustainability and financial benefits, of the GTP@W to potential stakeholders. This section presents a plan for preparing communication tools, as well as a plan for public outreach, visioning, and stakeholder engagement to facilitate development of GTP@W.

6.1 Communications Tools

Develop communication tools to market and publicize the GTP@W, including:

- Concept Plan
- Marketing Brochure

6.1.1 Concept Plan

Further elaborate the GTP@W concept in a brief document that can be used as a basis for both internal and external discussions and communications, e.g. brochures and prospectuses, and for work on the subsequent tasks described below. This concept document will describe how sustainability and green design will influence all levels of the park development structure, as follows:

- Park supports green business development, green jobs promotion and green jobs training through the green business incubator, green industry cluster and green jobs training center
- Tenants occupy buildings and sites designed, operated and managed to green standards, such as LEED or Energy Star
- Park supports green tenants through low-cost, centralized/shared green energy and environmental infrastructure, including renewable energy generation and use, park-wide energy efficiency measures, and centralized environmental facilities, staff and management system
- Park land development and management addresses site environmental opportunities and constraints through restoration, enhancement and preservation of natural soils, floodplains, and wetlands and ecosystems, as well as historical features present

The brochure could start with the executive summary length concept document that has been prepared as a companion to this Implementation Plan and be guided in format and style by brochures for similar projects that can be found on the Internet, e.g. the one prepared for the Docklands eco-industrial park in London, UK.

6.1.2 Marketing Brochure

Develop a marketing brochure covering the topics addressed by the Concept Plan above, but in a more concise and graphically appealing way.

6.2 Stakeholder Outreach Plan

1) To "get the word out" and attract private developers to the GTP@W, give PowerPoint presentations of the GTP@W development concept at conferences and to organizations likely to include sustainable development planners, developers and financiers, and then follow-up by distributing brochures, prospectuses and RFQs to interested parties. An initial list of such organizations is provided below; the most appropriate divisions and events should be determined for each.
    - Particular banks who finance such projects, esp. CitiBank who have strong policy of sustainable development (Equator Bank, J Cloud's grant, success fees for bringing sustainable development projects)
    - Developers known to focus on sustainable development, e.g. Jonathan Rose Companies, even if their focus is not on industrial / office parks, since they can help point the Township to more appropriate developers
    - Particular potential large, anchor tenants, e.g. major battery manufacturer serving the battery-powered automobile market, green building materials manufacturer, building energy efficiency controls makers, solar panels or wind turbine manufacturers, et al.
    - National Association of Industrial and Office Parks
    - National Association of Manufacturers
    - Urban Land Institute
    - USGBC, et al.
    - Planning and design professions – AIA, ASLA, APA, et al.
2) To further develop possible State of New Jersey roles in GTP@W, continue working with a group of relevant State agencies and corporations to vet proposed concepts involving them in the planning and operation of the GTP@W; proposed concepts involving the State and potentially relevant organizations include:
    - Woodbridge Innovation Zone (EDA)
    - Sustainable Business Incubator (EDA)
    - Energy and Environmental Technology Verification Program (CAT)
    - Energy Institute (Governor's Energy Czar, USDOE)
    - Green Jobs Training Center (EDA, Labor)
3) To ensure and expand possible federal funding for planning and developing the GTP@W, call a meeting with the Township's Congressional delegation, possibly to include regional office representatives of relevant federal agencies, to identify and elaborate proposals for substantive involvement of one or more federal agencies in long-term operation of the GTP@W, e.g. in an R&D/testing role, or in a green jobs training role, including:
    - US DOE
    - US EPA

- EDA
- Labor

4) To further develop the concept of establishing a university research consortium at GTP@W, use FDU's interest in developing the sustainable business incubator to organize a work group of relevant universities to discuss whether and how such a consortium would be organized, including especially how it would relate to the various other concepts listed in no. 2 above; interested universities include:
    - FDU
    - NJIT
    - Princeton
    - Rutgers
    - Stevens Institute of Technology
5) Establish a working group to set up the Woodbridge Innovation Zone, explore synergies among relevant sectors and industries linking the GTP@W with the larger Woodbridge business and manufacturing community, and introduce the concept of a regional industrial symbiosis that develops and evolves over time, with possible sub-groups along sector or industry lines, as follows:
    - Sustainable energy – Woodbridge Sustainable Energy Consortium, Woodbridge Sustainable Energy Clusters (Township, Board of Education, Libraries), PSE&G, et al.
    - Green construction materials – key national manufacturer (e.g., BASF), Bayshore Recycling, et al.
    - Sustainable transport – existing owners and tenants at GTP@W site, battery manufacturer serving battery-powered automobile market, et al.
6) To provide public information, get additional ideas on how to develop the GTP@W, and elaborate concepts generated by the above outreach tasks, build a webpage on the Township's Greenable Woodbridge website dedicated to the GTP@W planning process. Regularly update the GTP@W webpage with outputs from the above outreach tasks and solicit on-line inputs by the general public.

7.0 IMPLEMENTATION ACTION PLAN

7.1 Technical Development

- Using the refined developable area footprint (see Section 7.3 *Environmental Opportunities and Constraints* below), recalculate setbacks, building sizes and shapes, and building energy usage patterns.
- Using the site development parameters recalculated above, reevaluate the alternative development themes and development concepts.
- Refine and elaborate the concept for park-wide and individual building renewable energy generation and distribution systems, including type, capacity and location.
- Prepare the general development plan.
- Engage a master developer to prepare a detailed plan.

7.2 Economic and Financial Development

- Obtain comparable sales figures and conduct a market analysis of the alternative development themes, development concepts, developable footprints, and build-out scenarios outlined in Section 7.1 above.
- Prepare a general pro forma, including: (1) identification of where the revenues will be coming from; (2) if revenues are tax-based, whether Woodbridge would issue debt to back the project or collect PILOTs or some other form of increment financing; (3) whether the County would offer a guarantee if Woodbridge is unable to; and (4) provide an assessment of all the available sources of money, what the project can realistically obtain and what size of gap remains.
- Implement the pre-development phase financing plan to fund site cleanup and site preparation.
- Implement the development phase financing plan providing development incentives, such as tax breaks and grants.
- Implement the financing plan for operations and tenants support.

7.3 Environmental Opportunities and Constraints

- Complete the Phase 2 Site Investigations of the "Areas of Concern" identified in the Phase 1 Preliminary Assessments, and prepare a plan for remediation which includes a cleanup schedule and budget and identifies what constraints the remediation and result of remediation put on the type and extent of development of the affected areas.
- Conduct floodplains and wetlands delineation studies and confirm with regulatory authorities what setbacks are mandatory for buildings, site infrastructure and trails.

- Based on the contaminated areas remediation plans and floodplains and wetlands delineations outlined above, refine the developable footprint calculations and feed these back into the technical, economic and financial assessments.
- Conduct a study of the terrestrial, wetlands and aquatic ecologies of the river near the GTP@W site.
- Use the floodplains and wetlands delineations and ecological studies to establish precisely how to locate and design the GTP@W Greenway and how it can best be linked physically and programmatically with the overall planned Woodbridge River Greenway, as well as how to catalyze its implementation.
- Use the floodplains and wetlands delineations and ecological studies to decide whether to: (1) preserve the undeveloped Township-owned wetlands area in the center of the site; (2) add the parcels along the river above the north end of the site to extend the riverside buffer zone north and thus also link the GTP@W Greenway to the overall Woodbridge River Greenway; and (3) acquire the freshwater wetlands outside of the northwest and northeast corners of the site and include them in the RDA and Township Wetlands Mitigation Bank.
- Prepare a historic resource preservation and education program and integrate it into the GTP@W Greenway and overall Woodbridge River Greenway.
- Prepare a concept plan for centralized/shared on-site storm water, domestic wastewater, industrial wastewater, and domestic solid and industrial hazardous waste management.
- Develop an ISO14000 Environmental Management System (EMS), including organization, policies, standards and procedures, staff, equipment and facilities, to facilitate operation and maintenance of the GTP@W in an environmentally sustainable way; incorporate Industrial Symbiosis and Environmental Asset Management concepts and tools in the EMS.

7.4 Organizational Development and Stakeholder Outreach

- To "get the word out" and attract private developers to the GTP@W, give PowerPoint presentations of the GTP@W development concept at conferences and to organizations likely to include sustainable development planners, developers and financiers, and then follow-up by distributing brochures, prospectuses and RFQs to interested parties. An initial list of such organizations is provided below; the most appropriate divisions and events should be determined for each.
- To further develop possible State of New Jersey roles in GTP@W, use the Township's current involvement in Governor Christie's energy transition team to establish a working group of relevant State agencies and corporations to vet proposed concepts involving them in the planning and operation of the GTP@W.
- To ensure and expand possible federal funding for planning and developing the GTP@W, call a meeting with the Township's Congressional delegation, possibly to include regional office representatives of relevant federal agencies, to identify and elaborate proposals for

substantive involvement of one or more federal agencies in long-term operation of the GTP@W, e.g. in an R&D/testing role, or in a green jobs training role.

- To further develop the concept of establishing a university research consortium at GTP@W, use FDU's interest in developing the sustainable business incubator to organize a work group of relevant universities to discuss whether and how such a consortium would be organized, including especially how it would relate to the various other concepts listed in no. 2 above.
- Establish a working group to set up the Woodbridge Innovation Zone, explore synergies among relevant sectors and industries linking the GTP@W with the larger Woodbridge business and manufacturing community, and introduce the concept of a regional industrial symbiosis that develops and evolves over time, with possible sub-groups along sector or industry lines.
- After (or concurrent with) stakeholders having had their awareness raised and their interest piqued in potential involvement in the GTP@W through the above outreach tasks, invite them to join a formal local visioning process, driven by the Township and Woodbridge stakeholders.
- To provide public information, get additional ideas on how to develop the GTP@W, and elaborate concepts generated by the above outreach tasks, build a webpage on the Township's Greenable Woodbridge website dedicated to the GTP@W planning process. Regularly update the GTP@W webpage with outputs from the above outreach tasks and solicit on-line inputs by the general public.