Pathway to Revitalization

Economic Impacts of Phased Completion of the Naugatuck River Greenway

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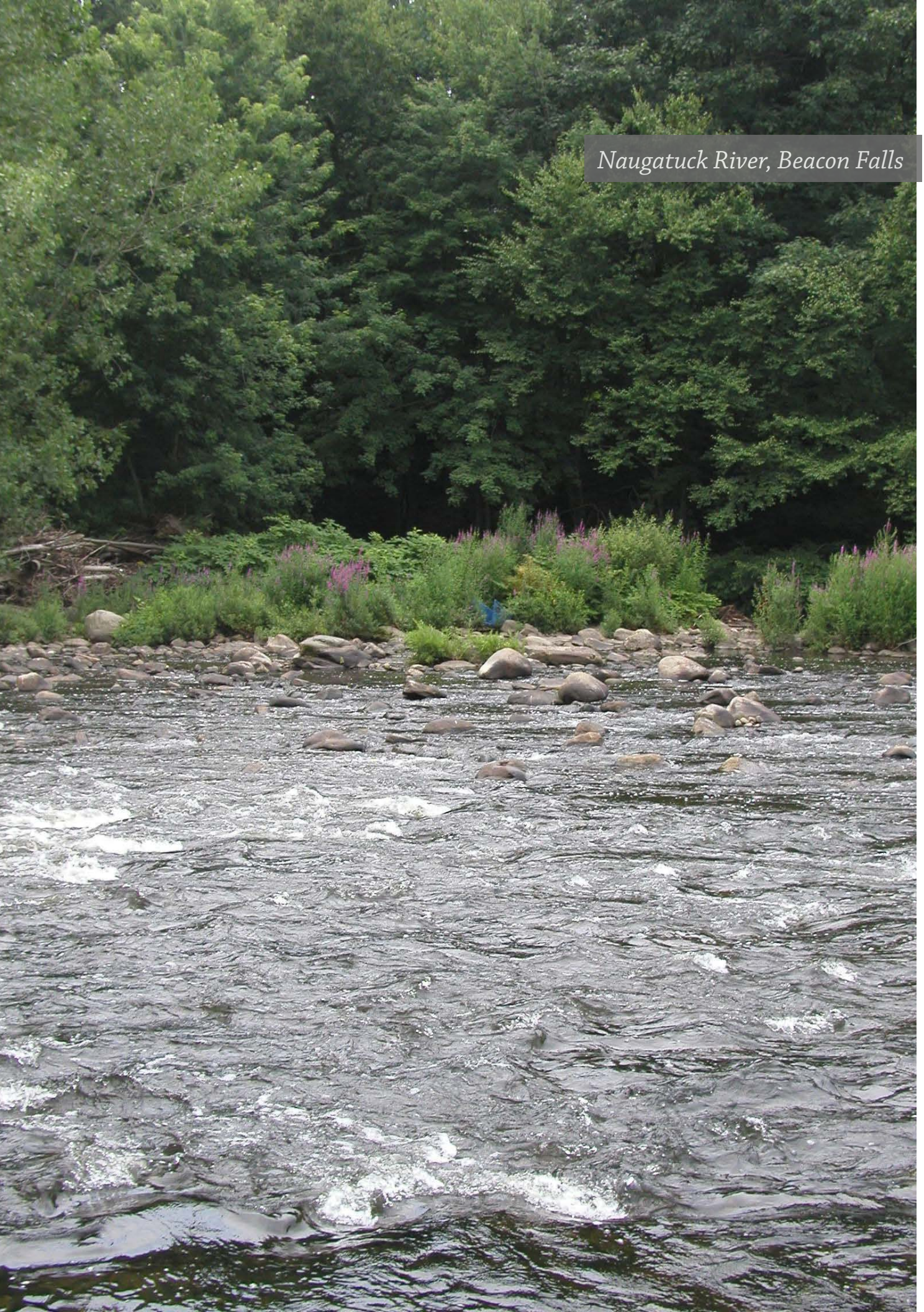


Naugatuck River, Beacon Falls

Executive Summary

This study assesses the potential economic impacts of the development of the Naugatuck River Greenway (**NRG**) Trail, a proposed 44-mile multi-use trail that will run through 11 Connecticut communities historically linked by the Naugatuck River from Torrington in the north down river to Harwinton, Litchfield, Thomaston, Watertown, Waterbury, Naugatuck, Beacon Falls, Seymour, Ansonia, and Derby. As of this writing, five unconnected sections of the Greenway have been completed: the Derby Greenway (about 2.2 miles), the Ansonia Riverwalk (about a half mile), Beacon Falls, (half mile), and Naugatuck (1.1 miles). The study addresses the primary question: *"How will communities and residents along the Naugatuck River benefit from their investment in building the proposed trail?"* The study involved a literature review, collection of new quantitative and qualitative primary data through trail counts, a trail user intercept survey, three focus groups, and deployment of the Regional Economic Impact Model (**REMI**) to estimate total economic impacts of the proposed trail. Considerations included in the impact analysis are construction costs, operating expenditures, user amenity benefits, user expenditures, as well as potential impacts on population, employment, income, and fiscal impacts.

Key recommendations/findings from impact study

Currently, unconnected trail segments of the NRG are already yielding benefits to citizens within the Naugatuck River valley region. Residents within closest proximity to trailheads and those nearby realize a combined annual consumer surplus *(the value they derive from being near the trail but for which they may not be paying)* of about $13.8 million. It is important to note that, based on the findings presented here, residents of the region derive significant consumer surplus from the NRG, even if they do not reside in an area that has a nearby trail head or easy trail access point. In addition, many trail users visit the trails often enough to realize health benefits and to reduce risks of obesity, diabetes, cardiovascular diseases and many types of cancer, specifically breast cancer. Such benefits will grow with expansion and completion of the NRG. Recent studies underline the significance and array of health benefits that flow from green spaces and trails; for example, just walking in a pocket park measurably reduces blood pressure. Such studies reinforce the analysis offered here of the health benefits the NRG will deliver.[1]

Expeditiously completing the NRG will yield additional and growing benefits to the residents of the Naugatuck Valley region. This document reports three potential growth scenarios. The first, a "slow growth" scenario, is based on the current usage of the open sections of the NRG, that is, the sections in Derby, Beacon Falls and Naugatuck and their current average expenditure levels. These rates are applied to new sections of the trail as the mileage is completed. This forms the *Baseline* scenario. Under the second "moderate growth" or *Current Trend* scenario, usage and spending rates are based on all completed sections in the region and includes trail counts from the Middlebury Greenway and the Sue Grossman Trail in Torrington. Both sections are not a component of the

1 Ellard, C. *Places of the Heart: the pscyhogeography of everyday life*. Bellevue Liberty Press, New York, 2015. Ellard summarizes a broad array of sophisticated studies that analyzed how the environment within which we move impacts our basic physiology and psychology, from levels of stress and anxiety to blood pleasure. The beneficial impact of green space is striking.

NRG, but were included in the current trend scenario to assess the economic impacts from a more complete trail network. This second case was augmented by the potential impacts of bicyclists by including bicyclists' utilizing trails at national ratios of walkers to bicyclists. These first two scenarios are somewhat conservative as they do not take into account the potential increase in trail usage that may occur from creating linkages among trail segments. The final completion of the trail will increase its appeal to both walkers and bicyclists and accelerate the growth rates. For that reason the "high growth" case includes constant growth rates that will double trail use per mile by 2031. This is identified as the *Accelerated Growth* scenario.

The normal direct impacts of constructing and operating the trail, annual expenditures to expand and maintain it, as well as increased consumer spending by users were the primary drivers of economic impacts of the NRG.

- The cumulative direct construction spending to complete the NRG is expected to reach $77.2 million by the year 2030.
- By 2031, annual direct consumer spending will rise to about $42.6 million under the *Baseline* scenario, up from the approximate $5.6 million spent today by trail users.

These amenities are extremely beneficial to inhabitants and strong attractors to the Naugatuck Valley region. However, as the Surgeon General argues[2], improving consumer surpluses and health amenities also drives economic benefits. To some extent, the consumer surplus and health benefits may eventually be absorbed into property values and therefore distributed between landlords, tenants and recipients of property taxes.

- Using federally-determined values, the net present monetized value of health-related benefits will increase from about $5.2 million currently to $37.9 million in 2031 after the completion of the entire trail *(baseline scenario)*.
- For residents living close to the trail, the derived amenities benefits rise from a current value of $5.1 million to about $34.6 million *(baseline scenario)*.

By 2031, as a result of increased attractiveness, accessibility, and health benefits, the completion of NRG will generate significant economic benefits. The CCEA's impact analysis used the REMI to estimate anticipated changes in population, employment, real gross domestic product (**RGDP**), personal income, disposable income and other generated public revenues, as measured by income taxes. These impacts were calculated for New Haven and Litchfield counties *(the county is the smallest geography that REMI can analyze)*. The results indicate that, on completion of the NRG in 2031, and based on the *Baseline* scenario, the two counties, as an aggregate, will experience:

- Population growth reaching over 9,000;
- Employment expanding by 1,400 jobs;
- RGDP would expand by $128 million (in 2009 dollars); and,
- Personal Income would grow by $206 million with disposable income increasing by $166 million in current dollars.

In short, the construction of the NRG–despite its $77 million price tag–has the capacity and potential to improve the quality of life and economic well-being of the residents of the Naugatuck Valley region by increasing property values, reducing risks to various diseases, and stimulating economic growth. The investment in the trail will result in a substantial return on that investment

2 U.S. Department of Health and Human Services *Set It Up! The Surgeon General's Call to Action To Promote Walking and Walkable Communities*, Washington, DC: U.S. Dept. of Health and Human Services, Office of the Surgeon General; 2015.

and more than pay for itself over the time frame assumed for completing the NRG. Between now and 2031 when the trail is assumed to be fully operational, total cumulative economic benefits, in terms of user spending, consumer surplus, and monetized health benefits, are estimated at over $7.3 billion *(mostly due to health benefits)*, *amounting to over 95 times the cost to construct the trail.*

As was emphasized through the focus group discussions, however, these impacts are not inevitable even if sections of trail are built. The assumptions made throughout this document emphasize the importance of trail use to realize its full economic potential. The effective implementation of a fully functional multi-use trail will involve significant investments in capacity building and community organization. In addition to the recommendations cited in this report in the areas of trail promotion, safety, amenities, demonstrating value, trail maintenance, community and business engagement, and trail planning and routing, data collection and documentation will be essential in promoting use of the trail. This study revealed that the current state of data collection regarding trail use in Connecticut is limited. The data collected for this study may serve as a baseline for which communities along the NRG can continue to gauge progress, involvement and impact.

Derby-Shelton Bridge, Derby

Introduction

Project Overview

In 2014 the Naugatuck River Greenway Steering Committee realized the need for a comprehensive economic analysis that would estimate the potential impact of completion of the Naugatuck River Greenway (**NRG**) Trail, a proposed 44-mile multi-use trail, motorized vehicles aside, that will link eleven Connecticut communities from Torrington in the north to Harwinton, Litchfield, Thomaston, Watertown, Waterbury, Naugatuck, Beacon Falls, Seymour, Ansonia, and Derby, the southern extreme. Representatives of these communities comprise the Naugatuck River Greenway Steering Committee, and the Naugatuck Valley Council of Governments (**NVCOG**) provides the staff support and administers the on-going efforts of the NRG Steering Committee.

NRG Steering Committee members expressed interest in better understanding how the Greenway would change trail usage and visitor spending, impact property value, create development and redevelopment possibilities, deliver health and quality of life enhancements, and generate possible connections to brownfield remediation projects. The NVCOG approached the University of Connecticut-Extension and University of Connecticut Center for Economic Analysis (**CCEA**) regarding the collaborating on the economic analysis. An agreement was executed between the NVCOG and CCEA for the CCEA to produce this analysis and determine the potential economic benefits that would accrue to region and municipalities from the construction of the entire planned NRG. This report covers the topics above, with the exception of brownfield remediation potential, which was outside the scope of work.

In June 2015 UConn-Extension began this project by undertaking a literature review to better understand existing studies that estimated economic impacts of similar (and potential) greenways, the types of impacts captured through these studies, and the methods and data used. The literature review revealed that no existing studies of this kind had been performed on multi-use trails in Connecticut (though CCEA had performed a similar analysis of state parks). Further, there was little primary data from trails in the state of Connecticut that could be used to inform an appropriate economic model. While the literature uncovered a wide range of existing trail studies from across the country, comparisons between trails are difficult due to variations in methodologies used and nature of trail studied. The **Literature Review** section of this report[3] provides additional results.

Given the relative absence of primary trail user data in Connecticut on which to base the economic impact analysis, the research team designed several methods for collecting this information from built sections of the NRG. This process presented an important challenge: only a few sections of the NRG have been built (at this time sections are open in Derby, Ansonia, Beacon Falls, and Naugatuck), and those that are built are relatively short in length, Derby Greenway is the longest at about two miles in length. Because it will not be constructed along an existing road or a former rail corridor and the proposed route includes property in federal, state, municipal, and private ownership, the process of constructing the 44-mile NRG is likely to occur over a period of many years. The status of the trail, as well as likely changes in users as the trail segments become

3 Full report may be accessed online at http://communities.extension.uconn.edu/trails.

more integrated and longer, were weighed carefully in the economic analysis. After discussion of these limitations and conducting pilots using infrared counters to determine highest use points, the research team selected primary points of study on three sections of built trail in the communities of Beacon Falls, Derby, and Naugatuck, as well as two additional sections of similar, nearby trails, in Torrington (the Sue Grossman Still River Greenway) and Middlebury (the Middlebury Greenway).

Data collection methods included trail counts (through the use of infrared counters calibrated through manual counts) and a trail user intercept survey. This study includes a short summary of results of these analyses which provided a basis for the economic impact model.[4]

To best capture appropriate recommendations for communities to capitalize on the construction of the NRG, the research team turned to other similar existing trails in Connecticut. The Farmington Canal Heritage Greenway is a multi-use trail that runs along the route of a former canal for approximately 84 miles, from New Haven, Connecticut to Northampton, Massachusetts. About half of this trail has been developed as a paved trail for non-motorized transportation and recreation. The research team convened three focus groups of stakeholders along the Farmington Canal Heritage Greenway: business owners, public health professionals, and trail administrators. Again, this report summarizes the comments and opinions provided by focus group participants. A complete report of survey findings is attached as an **Appendix** of this document.

Research Team and Study Approach

The NVCOG, on behalf of the NRG Steering Committee, partnered with the CCEA at the University of Connecticut to develop a dynamic economic impact analysis of the benefits that would flow from the construction of the NRG. In addition, the research team would develop data from an intercept survey, convene focus groups to ascertain best practices, and conduct a nationwide literature review of similar studies of other greenways.

The economic analysis investigated direct impacts from trail construction, maintenance and consumer spending by those using the trail, amenity benefits in terms of consumer surplus and accrued health savings, and indirect and induce economic benefits. For the indirect and induced impacts to the region's economy, the team deployed a general dynamic, equilibrium model (**REMI**). Since its founding in 1988, the CCEA has participated in the development of the REMI model and utilized it to complete over 150 impact studies. The approach for this analysis involved the unique approach of using the derived amenity benefits as inputs to the model.

At the October, 2016 REMI meetings on the advanced use of the model, CCEA researchers presented this study's methodologies for estimating amenity values to advanced REMI users. The response to the approach was very favorable, with 10-to-15 percent of attendees mentioning that they had been contemplating making similar estimates, but were unaware of many of the inputs used *(specifically the data and methodologies presented in the US Surgeon General's report to monetize improved health outcomes)*. Many indicated that they would follow the same approach in similar studies.

The products delivered by the research team during the course of this study include:

- *Literature Review:* The review involved a thorough search for relevant literature through standard academic search engines. It resulted in a summary report: *The Economic Impact*

4 Full report may be accessed in the **Appendix**.

of Greenways and Multi-Use Trails: A review of literature prepared as part of the Naugatuck River Greenway Economic Impact Study, August, 2015. The report was prepared by the University of Connecticut-Extension.

- *Multiuse Trail Counts:* During the summer and fall of 2015, the NVCOG conducted trail use counts on five sections of multiuse trail assess the popularity and use patterns of trail facilities in and near the region. The trail counts were conducted using passive infrared counters. The report was prepared by the NVCOG.
- *Intercept Survey:* To obtain insights into trail users' characteristics, including spending habits, a survey tool was developed and administered along open sections of the multiuse trail system in the region. The results and analysis of the intercept surveys were collated into a technical report: *Analysis of User Survey Data on Extant Sections of the Naugatuck River Greenway Trail*, February 2016. The report was prepared by the University of Connecticut-Extension.
- *Focus Groups:* The University of Connecticut-Extension convened three focus groups involving health professionals, trail administrators and business owners. The intent was to obtain statements from persons with experience and knowledge of the potential impacts of a mature trail, in this case the Farmington Canal Heritage Trail. A report, *Naugatuck River Greenway Economic Impact Study Focus Group Report*, May 2016, was prepared by the University of Connecicut-Extension.
- *Economic Impact Analysis:* A full narrative report was prepared by the research team that describes the methodology on which the analysis is based, the data on which the analysis is developed, and the range of potential economic benefits that will the proposed greenway will generate *(this document)*.

The primary research was conducted by the CCEA. The CCEA is a semi-independent center located within the School of Business at the University of Connecticut. It specializes in economic impact and policy analysis studies, as well as advising clients regarding business strategy, market analysis, and related topics. CCEA focuses particular attention on the economic and business dynamics of Connecticut. CCEA's studies of state issues are founded on data sets maintained by Amherst, Massachusetts-based REMI, which licenses dynamic models of the state's economy.

The CCEA was created at the request of Governor Weicker in 1992 to serve the state's citizens by providing timely and reliable information regarding Connecticut's economy and to evaluate the potential impacts of proposed policies and strategic investments. By mobilizing and directing the expertise available at the University of Connecticut, state agencies, and the private sector, CCEA aims to equip the public, decision makers, and stakeholders with transparent analyses to facilitate systematic, thoughtful debate of public policy issues.

Additional information regarding CCEA, as well as copies of its studies and reports available to the general public, can be found at http://ccea.uconn.edu.

Key personnel who worked on this study are:

- *Peter Gunther:* As Senior Fellow at CCEA, Peter Gunther has successfully applied normal economic criteria for development–Real Gross Domestic Product, increased employment–as well as amenity concepts in support of strategic economic development of the State. He has a long history of conducting studies, dynamic analyses, and evaluations of investment projects and other similar economic development initiatives. As a former Director of Economic Research for Canada's Department of Regional Economic

Expansion, Mr. Gunther is fully aware of importance of economic development to regions and municipalities as well as successful approaches to achieve development without destroying attractive features and assets. Mr. Gunther is an expert in using REMI to model different scenarios involving infrastructure development investments and capital project expenditures at the state and local government levels.

- *Fred Carstensen:* Dr. Carstensen is currently Professor of Finance and Economics at the University of Connecticut and is Executive Director of the CCEA, a post he has held since 1998. Professor Carstensen has directed more than 100 studies at CCEA, frequently testified in legislative hearings, handled media relations relating to CCEA studies, and made numerous presentations to stakeholders and interested organizations.
- *Danielle Jensen:* Ms. Jensen was a Research Assistant at CCEA during the conduct of the study and has recently graduated.
- *Laura Brown:* Laura Brown is an Associate Professor, Community & Economic Development Specialist at the University of Connecticut, Department of Extension and a Certified Economic Developer (**CEcD**). Ms. Brown conducts applied research and educational programs that address asset based community and economic development, regionalism, place-making and economic development readiness. Over the past fifteen years she has coordinated economic development, food systems and community development education programs throughout New England and the Mid-West.

The Naugatuck River Greenway

The NRG is a planned 44-mile multipurpose trail following the Naugatuck River from Torrington to Derby. When complete, the Greenway will link 11 municipalities, help reclaim the Naugatuck River for recreation, provide an alternate mode of transportation, support tourism and economic development in the region, and improve residents' quality of life.

In 2010 the then Council of Governments of the Central Naugatuck Valley (**COGCNV**, now NVCOG) commissioned a routing study to explore the potential and routing possibilities for a multi-use trail that would run adjacent to the Naugatuck River in Western Connecticut. The stated goals of the proposed NRG at that time were to: 1) develop a non-motorized transportation facility for walkers and cyclists and 2) provide public access to the Naugatuck River[5]. This effort resulted in five studies for five municipalities along the proposed trail and included recommendations for the trail and related improvements such as trailheads, parking areas, canoe/kayak landings, river access for fishing, bike improvements, spur connections, cost estimates and phasing recommendations. The effort included significant community participation through workshops, site walks, and stakeholder meetings. The Regional Naugatuck River Greenway Committee (**RNRGC**) oversaw this initiative, which included municipal officials, representatives from state and federal agencies, and COGCNV staff to keep the public informed about the study and to solicit public comment. This study committee created the foundation for the current Naugatuck River Greenway Steering Committee (**NRGSC**), which continues to oversee trail development.

5 *Naugatuck River Regional Routing Study Overview*. (2010) Accessed at http://www.nvcogct.org/sites/default/files/COGCNV-Naugatuck-River-Greenway-Routing-Study-Overview.pdf

Other Trails Referenced in this Study

The Middlebury Greenway

The Middlebury Greenway follows the historic route of a Connecticut Company trolley line that once connected the residential towns of Woodbury and Middlebury and the Lake Quassapaug Amusement Park to the City of Waterbury.

The Sue Grossman Still River Greenway

The Sue Grossman Still River Greenway runs for nearly three miles through a wooded corridor between Lanson Drive in Winchester and Harris Drive in Torrington. The paved multi-use trail occupies the old right-of-way for the New York, New Haven, and Hartford Railroad's Naugatuck division and parallels Winsted Road. There are plans to extend the trail south into downtown Torrington to connect to the NRG, and north to the Winsted section of Winchester.

Farmington Canal Heritage Trail

The Farmington Canal Heritage Trail runs approximately 84 miles, extending from New Haven into the neighboring state of Massachusetts to Northampton. In Connecticut, the trail is about 56 miles in length. The Farmington Canal was constructed in the 1820s and 30s as a means of bypassing Hartford, where the navigable portion of the Connecticut River ends, to transport goods from the harbor at New Haven into central Massachusetts. The canal ceased operations 12 years after its completion in 1835, but a railway was built within its right-of-way, portions of which remained active until the late 1990s (Central Connecticut Regional Planning Agency, *Farmington Valley Greenway*, 2009). In the 1990s, work began on the Farmington Canal Linear Trail in Cheshire and Hamden and on the Farmington River Trail in Burlington. The idea of creating the Farmington Canal Heritage Trail from New Haven to Massachusetts was borne of the nationwide greenway movement of the 2000s. The Connecticut portion of the East Coast Greenway will follow much of the Farmington Canal trail.[6]

A 2013 Farmington River Trail user study extrapolated data gathered in Farmington, Canton, and Suffield from May to October of 2013 and arrived at an estimate of roughly 250,000 trail uses per year. This data was collected using infrared motion sensors.[7] In 2013, the Burlington portion of the trail was studied; that study predicted nearly 100,000 annual users.[8] Both studies used National Bicycle and Pedestrian Documentation Center methodology to arrive at these figures. The Farmington Canal Trail sees even heavier usage, with over 400,000 annual users estimated for its Southington section. The Burlington study determined that most trail users were locals, although some came from Massachusetts, and that the majority of people used the trail for walking.[9] These utilization and demographic characteristics are likely to be common for most Connecticut greenways; the study anticipates that this is the pattern along existing sections of the Naugatuck River Greenway.

6 East Coast Greenway. (2015). *Farmington Canal Heritage Trail*. Retrieved from http://www.greenway.org/ http://www.greenway.org/

7 Farmington Valley Trails Council. (2013). *Farmington Valley Trail usage study*. Retrieved from http://fvgreenway.org/pdfs/FVTC%20Trail%20Usage%20Study%20Complete.pdfhttp://fvgreenway.org/pdfs/FVTC%20Trail%20Usage%20Study%20Complete.pdfhttp://fvgreenway.org/pdfs/FVTC Trail Usage Study Complete.pdf

8 Central Connecticut Regional Planning Agency. (2013). *User survey of the Farmington River Trail*. Retrieved from http://www.ccrpa.org/projects/trails/Burlington%20Trail%20User%20Survey%202013%20Report.pdf

9 Central Connecticut Regional Planning Agency. (2009). *Southington-Plainville Farmington Canal Greenway Study*. Retrieved from http://www.fvgreenway.org/pdfs/Southington-Plainville-Farm-Canal-Greenway-Study.pdf

Union City Gateway, Naugatuck

Literature Review

A literature review of existing trail studies that estimate economic impacts of similar (and potential) greenways was conducted to better understand and appreciate the types of impacts captured through these studies including the methods and data used. The literature review involved a thorough search for relevant literature through standard academic search engines including SCOPUS and Google Scholar. Additional documents reviewed included meeting minutes from the Naugatuck Greenway Steering Committee, reports, and studies related to the completion of the existing sections of the NRG.

The trails literature pointed to the following types of impacts: impacts related to trail user spending, tourism impacts, amenity benefits *(which include consumer surplus and increases in property values, tax revenue, public cost reductions, and quality of life and health impacts)*, expenditures by agencies, and expenditures due to construction and development. Some trails or greenways also included impacts related to commercial uses such as rentals for events, impacts related to agency oversight, or fees charged for trail use, most of which are not anticipated for the NRG.

Trail User Spending

One of the most basic ways of considering economic impact is in the value of dollars spent by trail users. Spending by local residents typically refers to residents who reside within a given radius of a trail or greenway. While this spending generally doesn't include spending by tourists who live out of the area and tend to stay overnight, some studies do not explicitly differentiate between local and non-local visitors. Local resident spending may include clothing or footwear, equipment, gear or related outdoor recreational services, travel to and from the trail, food or concessions, as well as fees paid to use the trail. Data collected directly from users or from local businesses in communities along a trail provides a basis for projecting these impacts.

The actual amount of local spending on a trail or greenway may vary significantly by state or region, demographic of trail users, proximity to a major metro area, or proximity to or availability of amenities. There is also significant variation in how "local visitors" or spending categories are defined when, and if, primary data is collected from a trail. These factors complicate the task of determining average or generalized spending figures from trail to trail. Collecting primary data on a trail over a period of time is probably the most effective way to estimate spending.

- A 2013 study of 3,133 national participants (distributed across regions) in non-motorized recreational activities found that participants spent an average of $60.26 per trip on trail-based recreational day trips and $43.81 on bicycle related recreational day trips. Overnight trips resulted in more than double the daily expenditures: $148.89 for trail based trips and $150.93 for bicycle related trips. *(This study used "in state" or "out of state" to define local travelers.)*[10]

Table 1: Average Expenditures per Trip for Non-Motorized Recreation

Day Trips	*Trail Based*	*Bicycle Based*
Food and Drink	$18.73	$14.91
Transportation	$20.97	$15.05
Recreation & Miscellaneous	$12.93	$8.61
Souvenirs	$7.62	$5.24
Total	**$60.26**	**$43.81**
Overnight Trips	*Trail Based*	*Bicycle Based*
Food and Drink	$32.66	$33.54
Transportation	$37.17	$31.65
Recreation & Miscellaneous	$20.47	$20.85
Souvenirs	$5.40	$17.04
Lodging	$43.91	$47.86
Total	**$148.89**	**$150.93**

Source: Outdoor Industry Association, 2013

- Participants in trail based recreation spent an average of $119.30 annually on equipment and accessories including, but excluding transportation costs.

Table 2: Annual Average Expenditures for Equipment and Accessories

Item	*Trail Based*	*Bicycle Based*
Apparel	$33.21	$31.25
Equipment	$26.12	$55.78
Accessories	$20.54	$19.98
Services	$16.25	$11.27
For Children	$23.18	$13.10
Total	**$119.30**	**$131.38**

Source: Outdoor Industry Association, 2013

- The same report estimates that Connecticut residents spend a total of $353,489 annually on trail-based recreation and $704,067 on bicycle based recreation.

10 Outdoor Industry Association. (2013). *The Economic Contributions of Outdoor Recreation: Technical Report on Methods and Findings by Southwick Associates*. Retrieved from https://outdoorindustry.org/images/ore_reports/oia-state-recreation-economy-technical-report-2013.pdf

- Many impact studies have been conducted on greenways and trails around the United States using methods similar to those used for this study. The following selected studies were reviewed as comparable recent examples of east coast trails.
- A 2010 study of the 12.5-mile Burlington Waterfront Path in Vermont estimated that in-state day users spent an average of $60.20 per trip and out-of-state domestic day users spent $67.16. In-state overnight users spent $124.78 while overnight out of state domestic users spent $156.84. Out-of-state users had the highest expenditures per trip at $80.63 for day users and $193.31 for overnight users.[11]
- A 2004 survey of the 20-mile Northern Central Railroad Trail in Maryland found that users spent an average of $333.12 on "Hard goods" such as bikes, gear, shoes and supplies, $9.14 on "Soft goods" such as snacks, food, and rentals, and $61.09 on Accommodations.[12]
- The Georgia Silver Comet Trail Economic Impact Analysis conducted in 2013 found that most trail users spend about $50 on trail use (additional spending data was not collected and all other figures are extrapolated).[13]

Tourism Impacts

While tourism and travel represent an economic engine for many areas of the United States, tourism does not encompass one particular industry sector, product, or service making its impact difficult to quantify.[14,9] Industrial sector areas from the Census Bureau's SIC or the NAICS often include hotel and other forms of lodging, restaurant or other eating establishments, travel, retail, and some services. In addition, "local" visitor spending is sometimes difficult to separate from "tourist" spending, unless there are overnight stays or the origin of the visitor or the purpose and intention of the visit is known.

Natural amenities, trails, parks, greenways, open space and wildlife habitat play an important role in tourism, particularly for leisure travelers. Amenities with significant tourist drawing power might include national parks or established bike trails or walks. Not all of these amenities have significant tourist drawing power and the extent of the draw may help to determine what proportion of travel expenditures can be attributed to the amenity itself.[15]

The Connecticut Department of Community & Economic Development (**DECD**) has contracted with Witan Intelligence to conduct *Vision Intercept* tourism intercept surveys throughout the state, including at casinos, beaches, parks, shopping destinations, arts venues, farms and markets, vineyards, and other tourist venues every year since 2001. These surveys include questions about spending, demographics, and satisfaction.

- According to the *2014 Vision Intercept Survey* report, 35% of all parties included someone from out of state; visitors from New York and New Jersey accounted for 46% of all out of state visitors.[16]

11 University of Vermont Transportation Research Center. (2010). *Estimating Tourism Expenditures for the Burlington Waterfront Path and the Island Line Trail*. Retrieved from http://www.uvm.edu/tourismresearch/

12 Trail Facts. (2005). *NCR Trail 2004 User Study and Economic Impact Analysis*. Retrieved from http://www.railstotrails.org/resource-library/resources/ncr-trail-2004-user-survey-and-economic-impact-analysis/?state=Maryland

13 Alta Econsult Solutions. (2013). http://nvcogct.org/sites/default/files/COGCNV-Naugatuck-River-Greenway-Routing-Study-Watertown.pdf *Silver Comet Trail Economic Impact Analysis and Planning Study*. Retrieved from http://www.bwnwga.org/wpcontent/uploads/Silver_Comet_Combined.pdf

14 Smith, V. K. (1997). *Pricing What is Priceless: A Status Report on Non-Market Valuation of Environmental Resources*. Retrieved from http://doi.org/10.2139/ssrn.31974

15 Nadel, R. (2005). *Economic impacts of parks, rivers, trails and greenways*. University of Michigan. Retrieved from http://erb.umich.edu/Research/Student-Research/Nadel.pdf

16 Witan Intelligence. (2015). *2014 Year Connecticut Visitor Intercept Study*. Documents provided by Witan Intelligence.

- Connecticut residents represent two-thirds of the state's overall tourism market. Over the past four years the number of tourism trips by Connecticut residents has grown from 6.7 to 10 trips annually.[10]
- Visitor parties spent an average of $623 during each trip, a total of $4,859 each year. Local residents spent $369 per trip (mainly on shopping, meals and recreation), while out of state visitors spent $1,114 per trip (mainly on lodging, wagers and shopping). Two out of three parties stayed overnight.[10]
- The median household income of visitors was $76,300; 16% earned more than $150,000. Thirty-eight percent (38%) of parties included children and 33% included someone 55 or older.[10]
- While the percentage of parties with out of state residents declined slowly from 2002 (48%) to 2014 (37%), the average percent of all trips which were made to Connecticut increased from 47% in 2002 to 61% in 2014.10 The peak of 82% in 2006 (prior to the recession) followed by a significant drop to 42% in 2007 suggests that the recession had a significant impact on Connecticut tourism.

The *2013 Traveler Research Profile* compared Connecticut travelers to a set of travelers in other New England states. This study suggests that at the time of this study travelers to Connecticut (including business and leisure travelers) were not typically participating in activities related to trails and greenways compared to travelers to eight other New England area states. These were largely out of state travelers (81.5%) from the New York metro area with overnight stays (73.9%).

- Fewer travelers to Connecticut participate in hiking or other adventure sports (1.1%) than travelers to other New England States (3.0%). Fewer travelers to Connecticut participate in fishing (1.3%) compared to other states (2.0%), biking (0.8%) compared to other states (1.9%), or bird-watching (2.0%) compared to other states (2.5%). Primary activities included visiting relatives and friends, dining, gambling, and going to the beach.[17]

Studies have shown that trails and greenways support local business development as a result of increased visitation to the area or to "gateway communities." Following trail openings, communities have documented increases in businesses such as lodging and restaurant facilities, bike rental establishments, and bed and breakfasts.[18] Business output, or sales volume, includes the gross level of business revenue and net business income and is probably the most common measure of business activity. It is important to note, that the presence of a trail itself does not imply that business will naturally increase. Communities might facilitate business development efforts by providing adequate signage and access to the trail, supporting local businesses by helping them understand trail user demographics and spending preferences, and coordinating efforts for local businesses to reach trail users.

Trail Construction and Maintenance

For the purposes of this analysis, the study estimated annual construction and maintenance costs for each section of trail for timely integration into the dynamic REMI model. The task of estimating annual construction costs for sections of the NRG is complicated by the piecemeal

17 H2R Market Research. (2013). *Connecticut 2013 Traveler Profile & Benchmark Comparison Study*. Retrieved from http://www.cultureandtourism.org/cct/lib/cct/tourism/outreach2015/connecticut_-_tns_traveler_profile_2013-final_022615.pdf

18 Nadel, R. (2005). *Economic impacts of parks, rivers, trails and greenways*. University of Michigan. Retrieved from http://erb.umich.edu/Research/Student-Research/Nadel.pdf

approach to construction, as each community undertakes development of its own section of trail separately and independently, and by fiscal constraints that limits how many sections can be funded in any given year. Despite federal transportation appropriations that set aside funds for transportation alternative projects, such as multi-use trails, only about $3.8 million in federal funds are likely to be available for trail construction in the Naugatuck Valley region over the next five years, an amount that is substantially less than the funds needed to construct priority sections of the NRG. Trail construction is further complicated by the unique conditions faced by each community in creating the trail around existing transportation, rail, and industrial infrastructure. For each trail segment, annual maintenance costs are incurred only upon completion of construction.

Health- and Fitness-Related User Amenity Benefits

Amenity benefits are non-pecuniary benefits arising from positive assets of the NGR, including health benefits derived from its use. This section generates a base for understanding and assessing future amenity benefits by estimating those derived from the present very limited number of trail segments. This knowledge enlightens researchers and readers on approaches to establishing amenity benefits and their current magnitudes. Clearly, extending and integrating disparate trail segments until the trail's eventual completion has potential to expand benefits. As in the *Field of Dreams*, proponents argue, *"Build it and they will come."* Why they may come requires not only an understanding of trail users' amenity benefits but also empirical documentation.

Because many trail and greenway walkers primarily use these facilities for exercise,[19] it is logical to consider how these amenities may improve physical and mental health and reduce the costs of healthcare. In the face of prevalent obesity and other chronic illnesses, planners, public health and medical professionals have begun to consider how changes in the built environment, such as parks and trails, might contribute to a solution.

The literature search conducted for this study links walking, and walking communities, to health. The Surgeon General minces no words in describing the health of Americans. The following is a summary of his findings at the end of 2015 *(original sources provided in the footnotes)*:

- In 2012, almost 50% of U.S. adults (117 million people) were living with a chronic disease.[20]
- More than 15 million U.S. adults aged 20 years or older (6.4% of the population) had coronary heart disease in 2007–2010.[21]
- In 2010, more than 6 million adults aged 18 years or older (2.6% of the population) reported having had a stroke.[22]
- In 2012, more than 29 million people (9.3% of the population) had diabetes, a disease that can lead to other serious health complications, including heart disease, blindness, kidney failure, and lower extremity amputations.[23,24]
- More than 1.5 million people were diagnosed with cancer in 2011, and more than 13 million

19 U.S. Department of Health and Human Services *Set It Up! The Surgeon General's Call to Action To Promote Walking and Walkable Communities*, Washington, DC: U.S. Dept. of Health and Human Services, Office of the Surgeon General; 2015. p 1. Further supported by UConn's and NVCOG's Trail Intercept Survey.

20 Ibid.

21 Go AS, Mozaffarian D, Roger VL, et al. *Heart disease and stroke statistics—2014 update: a report from the American Heart Association*. Circulation. 2014;129(3):e28-e292.

22 Centers for Disease Control and Prevention. *Prevalence of stroke — United States, 2006-2010*. MMWR Morbid Mortal Wkly. Rep. 2012;61(20):379-382.

23 Centers for Disease Control and Prevention. *National Diabetes Statistics Report: Estimates of Diabetes and its Burden in the United States, 2014*. Atlanta, GA: Centers for Disease Control and Prevention, U.S. Dept. of Health and Human Services; 2014.

24 CDC WONDER Database. *United States Cancer Statistics: 1999-2011 Incidence Request*. Atlanta, GA: Centers for Disease Control and Prevention, U.S. Dept. of Health and Human Services; 2014. http://wonder.cdc.gov/cancer-v2011.html. Accessed April 7, 2015.

are living with the disease.[25]

- During 2011–2012, more than one-third of adults aged 20 years or older and one out of every six children and adolescents aged 2–19 years were obese.[26]
- Children with obesity have an increased risk of Type 2 diabetes,[27,28] high blood pressure,[29] and being obese as an adult.[30,31,32]
- Adults with obesity have an increased risk of: coronary heart disease, Type 2 diabetes, cancers - postmenopausal, breast, and colorectal - osteoarthritis, and stroke.[33]
- About 16 million adults aged 18 years or older and more than two million adolescents aged 12–17 years had a major depressive episode in 2012[34] that negatively affected their ability to work, sleep, study, eat, and enjoy life.[35]

The Surgeon General views walking and having appealing places to walk, not as a panacea to all the above, but as a step to curbing such afflictions. In his words, walking will:

> *"…significantly reduce their risk of chronic diseases and premature death and support positive mental health and healthy aging."*[36]

Still cited in the Surgeon General's Report, physically active people

> *"…have about a 30% lower risk of early death than people who are inactive."*[37]

> *"Conversely, physical inactivity accounts for about 11% of premature deaths in the United States"*[38,39]

25 *Surveillance, Epidemiology, and End Results (SEER) Cancer Statistics Review 1975-2011*. Bethesda, MD: SEER Program, National Cancer Institute; 2014. http://seer.cancer.gov/csr/1975_2011. Based on November 2013 SEER data submission. Accessed May 1, 2015.
26 Ogden CL, Carroll MD, Kit BK, Flegal KM. *Prevalence of childhood and adult obesity in the United States, 2011-2012*. JAMA. 2014;311 (8):806-814.
27 Franks PW, Hanson RL, Knowler WC, et al. *Childhood predictors of young-onset type 2 diabetes*. Diabetes. 2007;56 (12):2964-2972.
28 May AL, Kuklina EV, Yoon PW. *Prevalence of cardiovascular disease risk factors among US adolescents, 1999–2008*. Pediatrics. 2012;129(6):1035-1041.
29 Freedman DS, Dietz WH, Srinivasan SR, Berenson GS. *The relation of overweight to cardiovascular risk factors among children and adolescents: The Bogalusa Heart Study*. Pediatrics. 1999;103(6):1175-1182.
30 Serdula MK, Ivery D, Coates RJ, Freedman DS, Williamson DF, Byers T. *Do obese children become obese adults? A review of the literature*. Prev. Med. 1993;22(2):167-177.
31 Biro FM, Wien M. *Childhood obesity and adult morbidities*. American Journal of Clinical Nutrition. 2010;91(5):1499S-1505S.
32 Whitaker RC, Wright JA, Pepe MS, Seidel KD, Dietz WH. *Predicting obesity in young adulthood from childhood and parental obesity*. N Engl J Med. 1997;337(13):869-873.
33 National Heart, Lung, and Blood Institute. *Managing Overweight and Obesity in Adults: Systematic Evidence Review from the Obesity Expert Panel, 2013*. Bethesda, MD: National Institutes of Health, U.S. Dept. of Health and Human Services; 2013.
34 Substance Abuse and Mental Health Services Administration. *Results from the 2012 National Survey on Drug Use and Health: Mental Health Findings*. Rockville, MD: Substance Abuse and Mental Health Services Administration; 2013.
35 National Institute of Mental Health. Depression website. http://www.nimh.nih.gov/health/topics/depression/index.shtml. Accessed October 29, 2014.
36 U.S. Department of Health and Human Services *Set It Up! The Surgeon General's Call to Action To Promote Walking and Walkable Communities*, Washington, DC: U.S. Dept. of Health and Human Services, Office of the Surgeon General; 2015. p 1.
37 Physical Activity Guidelines Advisory Committee. *Physical Activity Guidelines Advisory Committee Report, 2008*. Washington, DC: U.S. Dept of Health and Human Services; 2008.
38 Lee IM, Shiroma EJ, Lobelo F, et al. *Effect of physical inactivity on major non-communicable diseases worldwide: an analysis of burden of disease and life expectancy*. Lancet. 2012;380(9838):219-229
39 Yang Q, Cogswell ME, Flanders WD, et al. *Trends in cardiovascular health metrics and associations with all-cause and CVD mortality among US adults*. JAMA. 2012;307(12):1273-1283.

> *"Regular physical activity helps prevent risk factors for disease (such as high blood pressure) and protects against multiple chronic diseases (such as heart disease, stroke, some cancers, Type 2 diabetes, and depression)."*[40,41]

For additional data, see the section on **Amenity Benefits**.

Other Amenity Benefits and Property Valuation

Resources such as trails and greenways may have value even to those who do not use them. These may be considered passive-use values. One form of passive-use value is preservation.[42] Preservation values include option value, the knowledge of guaranteed future access to the greenway; existence value, the knowledge that the greenway will be preserved in perpetuity; and bequest value, the knowledge that future generations will have access to the greenway.

Another form of passive-use value is property valuation. This process describes changes in property values as a result of proximity to trails or green spaces. Property values may increase due to proximity to open space; this seems to be most pronounced when the greenways highlight open space, prohibit vehicular access, and have regular maintenance and security.[43] It is important to note that while the effect of greenways on property values remains unclear, no negative effects have yet been determined.[44]

- A 2011 study by the Connecticut Center for Economic Analysis analyzed the value of properties overlooking state parks and/or forests and state trails. While the results varied by region, this study identified a *green space bonus* of $41,961 to $50,124 for properties overlooking Connecticut Department of Energy and Environmental Protection (**CTDEEP**) managed green spaces compared to those that did not.[45]

40 U.S. Department of Health and Human Services. *2008 Physical Activity Guidelines for Americans*. Washington, DC; 2008.

41 Physical Activity Guidelines Advisory Committee. *Physical Activity Guidelines Advisory Committee Report, 2008*. Washington, DC: U.S. Dept of Health and Human Services; 2008.

42 Walsh, R., Sanders L., & Loomis, J. (1984). *Measuring the economic benefits of proposed wild and scenic rivers*. [as cited in Nadel, R. (2005). Economic impacts of parks, rivers, trails and greenways.]

43 United States Department of Interior, National Park Service (1995). *Economic impacts of protecting rivers, trails, and greenway corridors*. Rails, Trails, and Conservation = Assistance Program. Retrieved from https://www.nps.gov/pwro/rtca/econ_all.pdf

44 Nicholls, S., Crompton, J. L., & others. (2005). *The impact of greenways on property values: Evidence from Austin, Texas*. Journal of Leisure Research, 37(3), 321.

45 Gunther, P., Parr, K. E., Graziano, M., & Carstensen, F. V. (2011). *The Economic Impact of State Parks, Forests and Natural Resources under the Management of (Connecticut) Department of Environmental Protection*. Connecticut Center for Economic Analysis (CCEA) University of Connecticut. Retrieved from http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2195058.

Alternative Trail Studies with REMI

There are two other studies of the impacts of trails using REMI modeling:

- East Central Florida Regional Planning Council's *Economic Impact Analysis of Orange Lake County Trails*;[46] and
- *Vermont Agency of Transport, Economic Impact of Bicycling and Walking in Vermont*, 07/12/2012.47 *(Prepared by Resource Systems Group, Inc., Economic and Policy Resources, Inc., and Local Motion.)*

Orange County Florida

Economic Impact Analysis of Orange Lake County Trails mentions health benefits and amenities in passing but takes no account of them. It is a 2010–2011 study based strictly on expenditures by trail users on three relatively short multi-use trails–Cady Way (6.5 mi.), Little Econ (7.4 mi.) and West Orange (22 mi.). They are all heavily utilized by local residents with 57% of users being within a mile, 84% within five miles and 89% within 10 miles.[48]

Noteworthy has been Orange Lake County's role in upgrading Winter Garden's downtown. The report claims:

> *"By embracing the Trail as the spark to ignite redevelopment, the City has redefined their Downtown by investing in the area and downtown businesses. Five million dollars was spent by the City to extend the Trail through their Downtown and enhance infrastructure and streetscape to create a one of a kind destination. Improvements included brick streets, the clock tower and other enhancements. The dedication of the City to the quality of the Downtown is evident through the high standards of maintenance throughout, including City facilities. With 90%+ downtown occupancy rate, the City's strategy to attract business development within its downtown area has succeeded."*[49]

This claim may slightly exaggerate the current attribution following the complementary massive expansion of the Morse Museum, which should share credit for upgrading the Downtown core, but that has occurred subsequent to the evaluation based on 2010-2011 data.

Community Redevelopment Area (**CRA**) was established, to 2010. The total 2010 CRA value was estimated at $69.39 million versus $22 million in 1993, a cumulative increase of 215% from base year, with an average annual increase of 11.32% for 19 years. While the Trail improvements were completed in 2002/2003, 2001 to 2008 marked the highest and fastest growth of the assessed value in the downtown area. Even with the CRA value reduced by 12.6%, due to the overall economic conditions of 2009 and 2010, the CRA area lost less value than the overall city reduction of 15%.[50]

This report has the advantage of being retrospective and being based on extensive expenditure surveys sufficient to justify the expenditures on the trail and its association with rising downtown property values. The report falls short of the mark for not taking more account of the health amenity benefits it has generates among its frequent users.

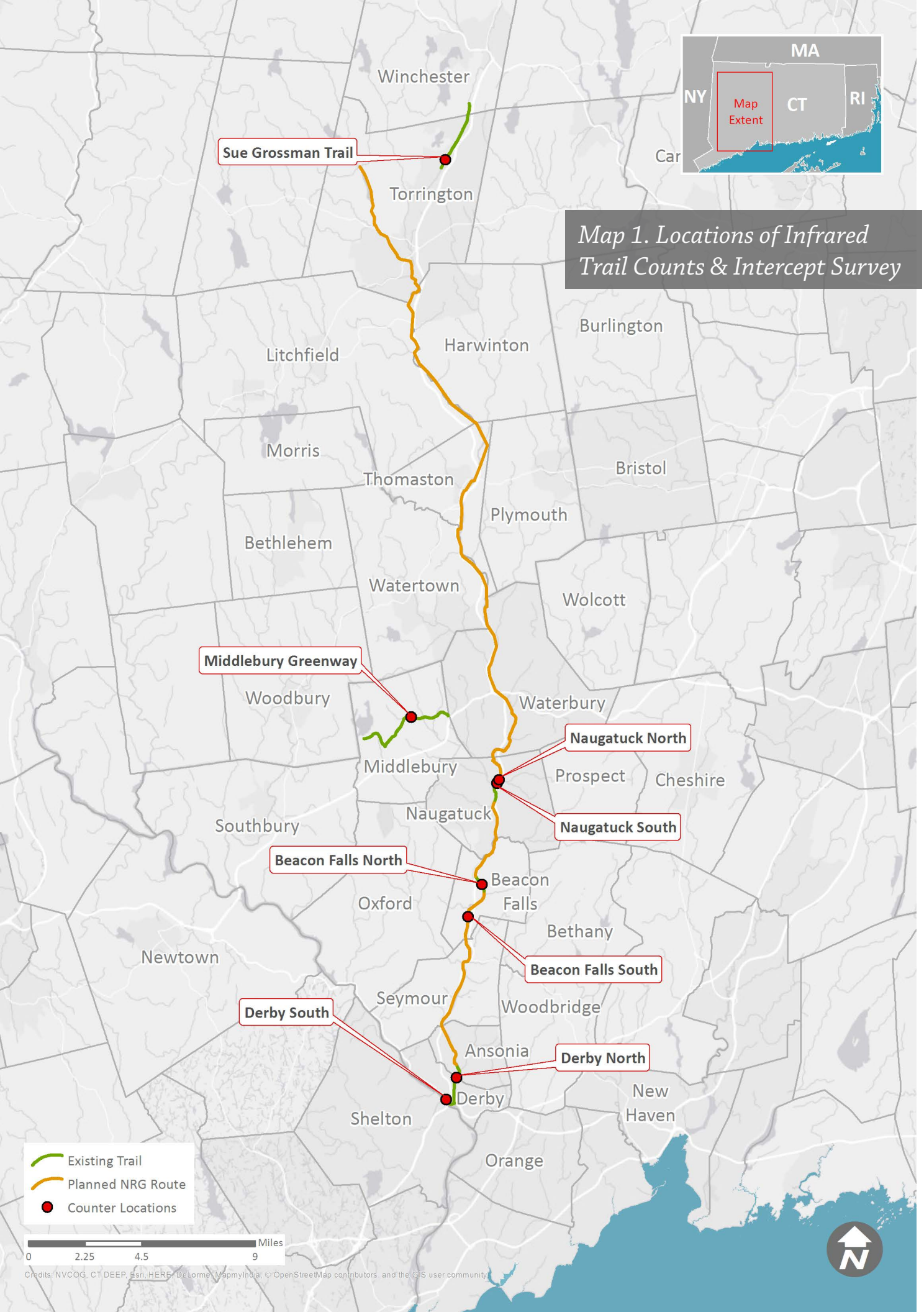
46 https://www.dep.state.fl.us/gwt/economic/PDF/Orange_County_Trail_Report_final_May2011.pdf (April 28, 2016)
47 http://vtransengineering.vermont.gov/sites/aot_program_development/files/documents/ltf/BikePedFinal%20Report%20Econ%20Impact%20Walking%20and%20Biking2012.pdf (April 28, 2016)
48 Op. cit. East Central Regional Planning Council, p. 20.
49 Ibid. p. 7.
50 Ibid. p. 11.

Vermont

This study also focused on 2009 expenditures directly on Vermont trails and by bicyclists and hikers. Direct expenditures on construction and repair amounted to $9.6 million. Sixteen thousand (16,000) people attending 40 major bicycling or hiking events spent another $6 million and bicyclist-pedestrian-oriented businesses in Vermont sold another $30.7 million during the year of which 40% was marketed outside the state for a total direct expenditure of $37.8 million. The resulting total economic impacts were $82.7 million in output, and over 1,400 jobs with $40.9 million in labor earnings (wages, salaries plus proprietors' income).[51]

Again the shortfall in this study is that it contains none of the amenity health values albeit it found transportation costs amounted to $42-$43 million for each of the public and private sectors.[52] Further, being located within walking distance of a trail adds $6,500 to the value of a home relative to a car-dependent home. This approach was based on relative values of home sales, not as in the CCEA's study, justified by health amenities and consumer surplus estimates.

51 Op. Cit. Vermont Agency of Transport, p. 4.
52 Ibid. p. 5.



Map 1. Locations of Infrared Trail Counts & Intercept Survey

Research Methods & Preliminary Findings

In addition to the data noted above from previous studies, data regarding trail usage is germane to the assessment of both health and economic impacts. Data collection for this study began with a survey of the literature but those results were found to lack specificity regarding likely use of the currently fragmented sections of the NRG. To address this point, the research team undertook trail counts on five trail segments three along the NRG and two on nearby or feeder sections of the NRG. A total of eight separate locations were counted. Counts involved manual calibration and installation of two TRAFx passive infrared *(pyroelectric)* trail counters. UConn and NVCOG also conducted intercept surveys of trail users on the same five trail segments at five separate locations. Additional data collection included three stakeholder focus groups involving stakeholders along the Farmington Canal Trail. These instruments yielded expenditure data including travel costs of residences of origin, estimates of *consumer surplus* (value consumers attach to trail activities over and above the costs they actually pay). CCEA has added health amenities accruing to trail users, based on national and local health indicators and estimated a dynamic economic model to the year 2031. Methods and preliminary findings are discussed below.

Trail Count Data

During the summer and fall of 2015, staff from the NVCOG conducted trail use counts on five sections of multi-use trail to assess the popularity and use patterns of trail facilities in and near the region. Two passive infrared counters were temporarily installed with the intent of collecting four weeks of un-interrupted counts at predetermined locations along open sections of NRG in Derby, Beacon Falls, and Naugatuck, as well as on the Middlebury Greenway in Middlebury and on the Sue Grossman Still River Trail in Torrington. Locations were chosen based on pretests to determine which would be most suitable for the infrared counters *(to avoid circular paths, for instance)* as well as areas that would be appropriate for the intercept survey as well. **Map 1** shows survey locations.

Count Data Collection Methods

Equipment

Two TRAFx passive infrared (pyroelectric) trail counters were used to conduct the trail user counts. The counters work by detecting the heat difference between passing trail users and the ambient air or background temperature. The counters were affixed to signs or fence posts on one side of the trail facing trail traffic. The counters record warm objects passing by the count site 24 hours per day, compiling data into one-hour time blocks. Text files were downloaded from the counters and imported into Microsoft Excel where the hourly count information was converted into more illustrative tables and graphs.

Limitations

There are some limitations to passive infrared counter technology. For instance, the counters are not capable of determining the type of use: pedestrians, bicyclists, and any other user are indistinguishable in the count data. From limited in person manual counts, mode share was

observed to be mainly pedestrian (84%), with approximately 11% bicyclists and 5% other (stroller, wheelchair, roller-blade, etc.). Further study would be necessary to compare mode share between trail sections, but given the relatively short lengths of the open trails, it is reasonable to expect that currently the majority of users are walkers.

Undercounts

The TRAFx trail counters used are considered "screenline" counters: they detect trail users passing the line of "sight" of the sensor. Two individuals walking or riding side by side would be counted only once because the counter would only "see" one heat signature. This type of undercount is typical and is referred to as occlusion. The same problem occurs when users pass the counter at the same time in opposite directions, and the undercount can be even greater for larger groups.

High ambient air or background temperatures can also cause undercounts. As the temperature approaches human body temperature, the differences between the two may become difficult for the counter to distinguish and may result in undercounting. In a similar fashion, during very cold weather, highly insulated clothing may prevent counters from registering the difference between the background and clothing surface temperature resulting in undercounts. Whenever possible, counters were placed in shaded areas as per the manufacturer's recommendation to reduce the likelihood of overheating.

Over counts

There are also conditions that may cause passive infrared (**IR**) counters to over-count users. For instance, if trail users stop or congregate in front of a counter they may be counted several times. Pets or wildlife may be inadvertently counted. Heated background vegetation moving in the wind may cause false counts. Understanding these possibilities, the counters were placed in a manner to minimize the risk of over counts. The counters were placed away from areas where trail users typically congregate, at a height so that most pets or wildlife would not be counted, and to avoid background vegetation in the counter's field of vision.

The counter records trail users every time they pass, meaning that a trail user who takes an "out and back" route will be counted twice. Because the NRG is not yet a through trail, all of the trail sections counted likely have a high percentage of these types of users, but it is difficult to calculate the percentage to be used in corrections. Therefore, the figures presented in this report do not correct for out and back users. The number of trail *trips* or *uses* are presented in this report, not trail users.

Tampering and Malfunction

Because trail counters are often in remote areas, and thus cannot be constantly monitored, there is risk of tampering or the possibility that a counter malfunction might not be caught for an extended period of time. Both scenarios played out during this study. A regular check of counters in Naugatuck determined that a sunflower seed had been placed in a manner to block the sensor, resulting in just under a week of no data collected for that counter. Because the goal was to obtain four weeks of uninterrupted data, counts were extended to remedy the situation. A counter malfunction occurred in Torrington, when, upon downloading the data at the end of the four weeks, it was found that a battery had come loose and the counter had stopped working after nine days. A check of the counter in the first week found it to be working, and limited staff availability prevented additional checks. Because Torrington was the last site to be counted, and winter conditions were starting, it was not feasible to extend the count survey and data in this report reflects only nine days.

Adjustments

To account for potential differences between the actual number of trail uses and what the IR counters registered, an adjustment factor was used to extrapolate the raw counts to better reflect total number of uses. The adjustment factor was determined by conducting manual counts several times at each location. At each count location, NVCOG staff manually counted the number of people walking or riding a bicycle past the counter while it was recording. In all, manual counts from 28 one-hour time periods were compared with the IR counts from the same time period to determine that there was an overall 24% undercount. This factor falls within the typical range of IR counter error. *A correction factor of 1.24 was applied to account for these inherent discrepancies.*

Extrapolation

Staff used the National Bicycle Pedestrian Documentation (**NBPD**) Project extrapolation methods to estimate annual uses based on limited duration collection periods. The NBPD Project is a joint effort of Alta Planning & Design and the Institute of Transportation Engineers (**ITE**) Pedestrian and Bicycle Council. Using previous counts from across the country, the NBPD provides extrapolation factors to estimate daily, monthly, and annual figures based on counts done during any period of a day, month or year. The NBPD provides different monthly-to-annual extrapolation factors based on regional variation due to climate. This report uses the factors for "Long Winter Short Summer". This assumes that more trail users will be using multiuse trails in the warm months (April through September) than in colder winter months. In Middlebury, for instance, for purposes of estimating annual uses, the analysis assumes that 6% of total annual uses would occur in October, the month that users were counted. In Naugatuck, the count was completed in July; therefore, it is assumed that the recorded data represent 13% of the total annual uses.

Count Data Findings

The Derby North count location was by far the most popular trail section analyzed in this study with over 30,000 adjusted uses recorded over the four-week count period, and an annual extrapolated total of over 300,000 uses. Beacon Falls South was the least used trail studied, likely due to the fact that it is minimally developed as a trail. A summary of findings follow for each trail count location; the full report for each location can be found in the Appendix of this document. The table below shows the adjusted average uses and total extrapolated uses per year. As discussed above, the count data from the IR counters were extrapolated to provide an estimate of annual uses. These results need to be used with caution as a certain amount of double or multiple counting is likely. This is possible because one person may be recorded at multiple points along the trail or multiple times by the same counter, that is, someone who started walking along the Derby Greenway from Bridge Street and ended at Division Street would have been recorded by each IR counter installed at both locations and by the same counter multiple times if the same person reverse their trip. Since it is not practical to determine the extent of overlapping counts, it is important to reiterate that these counts estimate *uses*, and not users.

Based on the infrared trail counts and the NBPD methods, the current total number of uses on the surveyed trails is estimated at 747,886. The number is reduced to 385,791 uses when the second count point in Derby, Beacon Falls and Naugatuck is subtracted and the counts attributable to the Middlebury Greenway and Sue Grossman Trail are not included. This is the baseline total for just the sections of the Naugatuck River Greenway.

Table 3: Multi-use Trail Counts

Count Location	4–Week Adjusted Total	1–Week Adjusted Average	1–Month Adjusted Extrapolated	Month Collected	Annual Extrapolation Factor	Annual Trips* Adjusted Extrapolated
Beacon Falls North	2,572	643	2,784	September	0.11	25,311
Beacon Falls South	702	176	762	September	0.11	6,928
Derby North	30,730	7,682	33,263	May	0.11	302,391
Derby South	15,281	3,820	16,541	May	0.11	150,369
Middlebury [1]	5,276	1,319	5,711	October	0.06	95,188
Naugatuck North	6,977	1,744	7,552	July	0.13	58,089
Naugatuck South	5,477	1,369	5,928	July	0.13	45,598
Torrington [2]	NA	887	3,841	October	0.06	64,012

Source: Naugatuck Valley Council of Governments, Multiuse Trail Counts, Summer/Fall 2015
[1] Middlebury Greenway; [2] Sue Grossman Trail

Trail User Intercept Survey

An Intercept Survey was completed in October 2015. The data offer insights into trail use on the short, completed sections of the NRG. Intercept data was collected at trailheads in the communities of Naugatuck, Middlebury, Derby, Beacon Falls and Torrington, at five of the eight locations as shown in **Map 1**. It was decided not to conduct intercept surveys at all locations due to the likelihood for repeat users at the beginning and end of these trail sections. While the trail sections in Middlebury and Torrington are currently not proposed sections of the Naugatuck Greenway, they represent nearby trails with similar characteristics and there are proposals to make these sections contiguous with the NRG.

Intercept Survey Methods

UConn and NVCOG staff developed the survey protocols. The survey tool is attached in the **Appendix** and included questions completed by the interceptor, including time of day, apparent gender, group size, and activity, and questions completed by trail users. These questions included trail use times and seasons, trail related expenditures, transportation methods, age, income, and suggested trail improvements. Users were intercepted in 2-hour windows on 12 separate days throughout the month of October. These times included both weekday and weekend dates in the morning and afternoon to best represent accurate trail usage. Days and times for data collected were selected based on best practices developed by the National Bicycle and Pedestrian Documentation Project as well as preliminary infrared counts at points on the trail conducted in August 2015. The surveys were conducted by NVCOG staff and by active volunteers recruited from local trail organizations. To ensure consistency in survey protocols, training occurred when NVCOG staff and volunteers were on the trail. One question regarding group gender was not included in this analysis due to unexpected inconsistencies in data collection. A total of 383 intercept surveys were completed. Response rates varied by question and complete reports of the data can be found in the survey report in the **Appendix**.

Intercept Survey Findings

Below is a summary of highlights from the Trail User Intercept Survey. Full results can be found in the **Appendix**.

- Trails are used on a very regular basis. Across all communities, 74% of all users stated they used the trail at least one or more times per week.
- Trail users reflect the general age and income demographics of the region. Of the 374 individuals who responded to the survey question regarding age, the majority were over the age of 45 years old and 66% indicated their household income was $50,000 or more. Over half of the users were female.
- The majority of trail users (53%) traveled by car or motorcycle alone to access the trail followed by walking to the trail (21%). Naugatuck and Beacon Falls were the only two survey sites where the majority of users walked to the trail, while only of 4% of the users walked to access the trail in Torrington.
- Overall respondents made use of these trail sections fairly consistently through the spring, fall, and summer. Fifty-three percent of users indicated they used the trail in the fall, 44% in the spring, and 48% in summer. Only 1.3 % of users indicated use in winter.
- Exercise was by far the primary activity for the majority of trail users (88%), followed by recreational uses (25%). The Naugatuck and Derby sections were the only areas where any users indicated use for travel to school or work.
- The average amount spent by users annually on trail-related items is $155, with the lowest amount reported in Derby with expenses of $124, the highest from Torrington reporting $268.
- Thirty-eight percent of users reported spending any money during their visit. The average spending per visit was $14.03, adjusted to account for travel-related expenses. This expenditure is consistent with other trails in the region with a high number of local users. About 56% of users who reported spending money spent it on beverages.
- Ninety-seven percent (97%) of respondents considered the trail an asset to their community. Seventy four percent (74%) felt the trail had increased property values, 5% said it had not, and 21% were not sure.
- Suggested improvements to the trail included lengthening, reviewing dog use policies on the trail, lighting, and restroom facilities improvements.
- The manual count of users conducted at the same times as the intercept surveys resulted in a higher annual estimate than determined based on the IR counters. This is likely because the surveys were conducted during peak times and when the weather was pleasant. The higher usage rate resulted in an annual total of about 968,647 uses.

Estimate of Annual Users based on Intercept Survey Findings

In an attempt to estimate the number of individual persons that use the trail each year and differentiate "uses" from "users," the extrapolated number of Annual Uses was discounted based on the responses from the intercept survey. The intercept survey asked respondents how often they used the trail. The results indicate the following breakdowns:

- 18.1% use the trail every day;
- 35.3% use the trail 3-to-5 times per week;

- 20.7% use the trail 1-to-2 times per week;
- 16.0% use the trail 2-to-4 times per month; and
- 9.9% use the trail 1-to-2 times per year.

The percentage breakdowns were then multiplied by total uses and then divided by the frequency of use over the course of a year, that is, by 365 for those who use the trail every day, 208 for those who use it 3-to-5 times a week, 52 for those using it once or twice a week, 24 for those using it 2-to-4 times per month, and two for those who use it once or twice per year.

This method results in baseline number of users of about 24,375 and about 47,261 users based on all IR counts. If the higher count from the intercept survey is applied, *about 60,386 persons use the trail each year.*

Stakeholder Focus Groups

Focus Group Methods

In addition to the count and intercept survey data collection, UConn-Extension convened three focus groups as part of the Study. The primary purpose of the focus groups was to learn best practices for trail development and maintenance from stakeholders' experience along a similar existing trail. The trail chosen for this purpose was The Farmington Canal Heritage Greenway. As described above, it is a multi-use trail that runs along the historic canal route for approximately 84 miles between New Haven, Connecticut and Northampton, Massachusetts. Similar to the planned NRG, about half of this trail has been developed as a paved trail for non-motorized recreation.

The three focus groups represented: business owners, public health professionals, and trail administrators. Participants were asked about their opinions regarding the use and the impacts of this trail. The focus groups were conducted on:

- March 30, 2016 for public health professionals;
- March 31, 2016 for trail administrators; and
- April 5, 2016 for nearby business owners.

In total, fifteen stakeholders participated in the focus groups. They were recruited through local trail organization networks, chambers of commerce, and a "snowball" type referral process. Participants received information about the purpose of the study, the agenda for the focus group, and consent forms *(permitting UConn's use of the information)* in advance of the meetings. Questions for each stakeholder group were developed in advance with feedback from the research team and NVCOG staff, and based on best practices developed by Richard A. Krueger.[53] The focus groups were conducted in adherence to UConn protocols and procedures, and were recorded and transcribed to ensure the discussions were accurately and properly coded.

All focus group statements were coded into four main areas:

- Statements about uses and users of the trails;
- Statements about the impacts of trails;
- Statements about challenges; and

53 Krueger, Richard A. (1994). *Focus Groups: A Practical Guide for Applied Research*. SAGE Publications, Inc. 2nd edition

- Statements about recommendations.

Coding was reviewed and verified by two coders. Where statements may have reflected multiple meanings they are duplicated in the data reported below. Two additional sections were created, one to specifically address comments related to data collection and impact assessment on the trails, and the other on successes and case studies that were mentioned throughout the discussions.

Focus Group Findings

A summary of key findings from the focus groups after coding is provided below; the complete report is attached in the **Appendix** of this report and is also available online at www.nvcogct.org. A limited number of quotes are provided here as examples.

Trail Uses and Users

Statements about trail use during the focus groups reflected the wide range of uses, and potential uses, for multi-use trails as well as a diverse range of existing users. Discussions emphasized the potential for increasing use by overcoming winter maintenance challenges and promoting and supporting trail use among millennials, young families, and those who use it for shopping, transit, to access local amenities, and for commuting.

Summary of perceptions of current trail uses:

- Organizations use trails as a venue for providing public health education

  "Chamber of Commerce Health and Wellness committee had been working on and partnering with relevant local agencies to take a part of the trail and doing different things along the trail. My nurse will be sitting doing blood pressures, we're having a staff member set up public information sessions on Lyme disease. All of the issues that we see creeping up in the health department. But also the Y will be doing exercising along the trail. It's a day dedicated to educating, using the trail as an educational tool. Maybe people using the trails are great at rollerblading, but not informed about Lyme disease, an easily avoided risk."

- Schools use trails as part of curricular activities and for fundraisers
- Communities use trails for family events and fundraisers
- Trails are used in winter, whether they are maintained or not

  "People are riding their bikes to work in snowstorms and in the pouring rain. You can't believe how people are out riding bikes. Conditions in which the hardest core of my friends would not ride bikes. It's just the reality of the situation. "

  "We have a lot of lower income people using it as a commuting resource, not just a recreational resource. And that's why I'm always arguing with the parks and rec department about whether we should plow or not, the snow in the winter. People use this resource to go to work and to go shopping, and when it doesn't get plowed until April that's a transportation, justice, social justice issue."

- Women and young people use trails when they are perceived as safe
- While there is a vocal contingent of bicyclists, pedestrian users likely comprise a significant percentage of total users

- Due to present remote access points and difficult terrain, some extant trails may not be easily accessed by or promoted to people with disabilities
- Perception that users are primarily suburbanites and out of residential towns
- Perception that most users are families and light recreational users who value safety
- Employers use trails to promote employee wellness
- Trails serve an important role as transportation routes, connecting communities, and connecting local residents to amenities

  "... these trails are transportation...for a segment of the population that is easily overlooked. And those are people who can't afford cars. And they can only get to work by bike. They need a way to get down ...to the food service establishments. So they close at 9 (pm), maybe they get done at 11 and they're on their way back home. There is a whole class of people will use these and its against all of the rules of the trail... because the trail says were open from dawn to dusk. We close at dusk. You can't use it after that. People will use it. It's a fact of life. And I'm glad it's going to be there for them because otherwise they're getting further underprivileged than they already are."

Impacts of Trail Use

Statements about the impacts of trail use included the trails function as an educational tool *(for health and environmental education)*, community development and planning purposes *(to increase community ownership, as an amenity to promote for economic development, and to slow traffic)* as well as fiscal impacts such as spending at local businesses and potential for increasing property values. The statements here are perceived benefits and should be viewed in light of the discussions regarding challenges associated with collecting trail impact data reported above.

Summary of statements about the impacts of trail use

- Trails promote general health, well-being, and public health education

  "I think the major impact is to get the people out and walking...." "I don't think the parks and recs people understand. They know exercise, but they might not understand that the trails are important public health assets. It was a teachable moment."

- Trails create community ownership and spark other community development initiatives

  "Once you have a trail, there's more opportunities for other parts of town to become walk-able and also for developing youth programs to get kids on bikes. We have two such programs now. We have children in fourth grade that now have bicycling as part of their PE. So once you become more of a bicycle friendly community."

- Trails may serve as tools to educate and promote coordination among trail stakeholders
- Trails help to increase environmental awareness
- Trails add value to and encourage maintenance of nearby properties

  "There was a big concern that my property values were going to go down or crime would increase, and I'm sure we have stats that show that that isn't the case. And property values have increased as a result. As it turns around, the trail has added value to your property as opposed to be a derelict rail. But after seeing the value of the trail, a new neighborhood nearby is clamoring for the trail to come to provide that vital link.

- Direct impacts of trails on businesses can be both positive and negative
- By facilitating bicycle commuting, trails may reduce congestion and greenhouse gases (GHGs) and speed traffic but slow it at trail crossings.
- Trails generate amenities that can be marketed to attract young families and millennials both for fitness and commuting

"But there's a growing number of young people who want to get their fitness in in the morning and at night, they want to be able to commute to work, they want to be able to commute without having to go over the mountain and to compete with cars. So that link to … again, it's a huge draw for business for recruiting young talent."

Challenges

Statements about challenges focused primarily on development issues, routing and construction, maintenance, and safety issues. Specific challenges are listed below.

- Actual or perceived safety and security issues
- ADA Compliance/ access for people who are differently abled

"A couple of weeks ago we had a mom and a son in a wheelchair who couldn't use our...trail because it's a soft trail and not paved...this poor kid in a wheelchair didn't have a place to go outside and enjoy the river, since it was not paved. You know it has to be considered that it's for them too. These trails are for people of all ability levels."

- Lack of public awareness
- Routing issues

"There is a long term goal of connecting the NRG to the FCT [Farmington Canal Trail] through Cheshire and Waterbury but we're not finding a real good path for it but that's why it's a long term."

- Liability concerns

"Liability is really a touchy issue with a lot of communities. But the real key to reducing liability is maintenance and good planning prevents liability issues best. Fencing design, proper standards followed then that reduces liability. It's a big budget issue."

- Lack of organizational capacity

"Some trails have very active community groups that will be willing to take this up, but when community groups are not strong they aren't able to maintain very well. Then it's up to city and towns and that becomes problematic."

- Competition or lack of cooperation with neighboring towns
- Poor planning or lack of budget for maintenance
- Lack of support from community leaders/businesses

"We tell our town leaders we need to keep pushing the envelope because we want to make [the community] a destination for cyclists...some businesses will say I'm in the jewelry business I don't get anything out of this. Well you do. All boats rise when money comes into town, and that's part of the story we've been trying to communicate to people."

- Unsafe connections from neighborhoods to the trail

  "The problem is getting there safely if you are a family with kids. And I think if we were to have done something differently we would've done a lot more forward thinking on good safe arterial connections down from neighborhoods down to the trail to get people to those businesses safely. I hear students... when they are coming down- the first thing parents want to know is there a safe route? Do I have to worry about my kids on bikes really congested road?"

- Lack of consistency/state policy or standardization of regulations

  "Our state has not created any policies to dictate what municipalities have to do. So you'll see differences as you go from one town to another. So it's important that you get started with some sort of standardization."

- Difficulty working with state agencies

  "It was an immense hassle to get, for instance pedestrian activated flashers up. It would take years. Literally years of studies and people saying oh I lost the study. No really!"

- Too much signage
- Costs of aging trail infrastructure and funding issues in general
- Trees, foliage maintenance issues- poor site planning

  "We cannot maintain all of the plantings we put in, and we put in fences that the mower wouldn't fit under so they have to use a weed whacker...which takes more time and costs."

- Too much fencing
- Water safety in areas near a river
- Poor mile marking
- Graffiti
- Few existing businesses along the trail
- Conflicting uses

  "We learned of new uses, like fishing...something that we didn't think about or plan for. And the fishing people for example used the trail in different directions to cross into the river to fish."

  "...we also had a problem with snowmobiles and motorcycles which really tear the stone dust trails up. And bollards are useless against them because they're coming in from the farms."

Recommendations

The focus groups provided suggestions, based on their experiences, that they felt would be of most interest to other trail developers to effectuate greater public use and awareness of multiuse trails. The recommendations were organized into the following general categories: *promotion*, *safety*, *amenities*, *demonstrating value*, *trail maintenance*, *community and business engagement*, and *trail planning and routing*. Detailed recommendations are on **page 25**.

Promotion

- Use environmental education to increase appreciation for the outdoors
- Develop events to promote trail use
- Consider using social media
- Create a consistent brand

Safety

- Get more people using the trail to increase safety
- Develop citizen/volunteer patrol programs
- Engage public safety officials in using trails
- Be attentive to traffic safety issues
- Provide a way for users to locate themselves in case of emergency
- Consider emergency access points

Amenities

- The three B's: bike racks, benches and bathrooms
- Develop good traffic signage and cross walks
- Maps and consistent way finding signage are essential

Demonstrating Value

- Collect data about trail use
- Educate leaders, planners, economic developers and citizens about how the trail impacts your community
- Look for low-cost, high visibility projects

Trail Maintenance

- Use technology like SeeClickFix to get the right information to the right people
- Create a plan and budget for maintenance from the start
- Know who your users are and plan for winter maintenance
- Engage volunteers in maintaining the trail
- Choose materials that are graffiti resistant

Community and Business Engagement

- Find champions, involve community groups and get them to take ownership
- Engage a diverse range of businesses and create ways to connect them to the trail
- Involve schools and young people
- Integrate the trail into other community planning efforts from the beginning
- Collaborate with neighbor communities on cost sharing and to create consistency in signage
- Build a culture of support for the trail in your community
- Be patient and go slow
- Look to other communities and trails as examples
- Build a culture of support for the trail in your community
- Use the trail to stimulate innovative ideas

Trail Planning and Routing

- Create a destination and an enjoyable experience for users
- Create safe routes for local users from the trail to neighborhoods, transit points and community amenities
- Make accommodations for trees
- Mitigate user conflicts
- Consider costs and benefits of paved or stone dust trails and consistency of surface

Fish Bypass & Park, Seymour

Economic Impacts

Direct Economic Impacts

Introduction

The direct dynamic economic impacts of completing the NRG flow from the timing of completion of construction of its major elements and future uses. Direct inputs include remaining trail construction costs net of any land acquisitions, expenditures by current and future users of the greenway and its component parts, health or amenity benefits enjoyed by users, inclusive of any consumer surplus that users and onlookers enjoy. By definition, these direct elements are dynamic because they increase as portions of the trail are completed. Because trails take time to plan, design and secure funding, construction of the entire trail is not expected to be completed until 2030, at the earliest. Given a year's lag in expected usage, the number of people utilizing the greenway related to completion of trail segments can be expected to continue to grow through 2031. Combined, these direct expenditures generate direct impacts that form the basis for estimating additional indirect[54] and induced[55] economic impacts. Collectively, these expenditures constitute economic impacts measured by population augmentation, employment, personal income, personal disposable income, and various fiscal impacts.

This report first estimates direct economic impacts by utilizing currently available data. The Connecticut Center for Economic Analysis (**CCEA**) then deployed the Regional Economic Model Inc.'s (**REMI**) model to estimate annual impacts to 2050. The particular model on which the CCEA relied in this analysis is REMI IP+ v1.7 at the Connecticut county level for impacts on New Haven County and Litchfield County. In doing so it identifies opportunities for expansion by industry for the Naugatuck River Valley.

This section concentrates on establishing all direct impacts. Included are likely annual construction costs and associated timing, amenity benefits including consumer surplus, and operating costs borne by users and governments.

Construction Costs

The NVCOG, based on its earlier engineering studies, provided estimates of the cost to construct the remaining sections of the NRG and the anticipated timing for that construction. The construction estimates are in 2016 dollars and represent annual capital costs between 2016 and 2020, and in five-year increments from 2021 to 2025 and 2026 to 2030. The trail is expected to be completed in 2030, again in annual average expenditures.

Table 4 illustrates annual construction costs based on NVCOG data. Cost estimates were extracted from a previous route alignment study and are illustrative and considered preliminary.

54 *Indirect impacts* include those in the counties back up the supply chain for each direct purchase. For example, if a locally produced Power Bar is purchased for sustenance while walking, the direct employment would cover its selling and production costs whereas the indirect employment would capture all local employment in inputs into the Power Bar, such as honey and grains plus the production of all the parts going into those raw materials.

55 *Induced impacts* are above and beyond the direct and indirect impacts because they take account of consumption arising from the wages and salaries generated in both the assembly and throughout all the rest of the supply lines as well as expenditures from wages and salaries earned in the production of induced impacts themselves.

The timeframe reflects current status of the trail projects and whether or not advanced planning has been completed. These data exclude coincident downtown improvements in Derby, a major road widening project that includes the installation of a bi-directional cycle-track with direct connections to the Derby Greenway. For trail sections to be built after 2020, the average construction cost was assumed to be $1.5 million per mile, as an order of magnitude cost estimate. The table contains the resulting annual construction expenditures completed in 2030 and fully operational in 2031. *(Note: the costs listed in the 2021-to-2025 and 2026-to-2030 columns represent annual average costs for the five-year time frame.)*

In total, the NRG is estimated to require an additional investment of about $77.2 million to fully implement. Over half of this total, about $53.2 million, would be allocated to sections to be constructed in New Haven County. Trail construction in Litchfield County communities would need about $24.0 million to complete.

Table 4: Annual Estimated Construction Cost by Community and Trail Section (in $1,000s Constant 2016)

Community	*2016*	*2017*	*2018*	*2019*	*2020*	*Annually (2021–2025)*	*Annually (2026–2030)*	*Total*
Litchfield County Total	**$0**	**$0**	**$2,347**	**$0**	**$6,029**	**$900**	**$2,190**	**$24,021**
Torrington	$0	$0	$500	$0	$0	$900	$0	$5,000
Litchfield/ Harwinton	$0	$0	$0	$0	$0	$0	$2,190	$10,950
Thomaston	$195	$0	$0	$0	$5,529	$0	$0	$5,724
Watertown	$0	$0	$1,847	$0	$500	$0	$0	$2,347
New Haven County Total	**$2,220**	**$7,457**	**$6,210**	**$3,200**	**$14,580**	**$420**	**$3,490**	**$53,197**
Waterbury	$0	$5,500	$0	$0	$8,600	$0	$2,380	$26,000
Naugatuck	$0	$0	$3,000	$0	$3,236	$420	$0	$8,336
Beacon Falls Trail	$0	$1,357	$0	$3,200	$2,744	$0	$0	$7,301
Seymour	$700	$0	$0	$0	$0	$0	$750	$4,450
Ansonia	$1,500	$0	$0	$0	$0	$0	$360	$3,300
Derby [1]	$0	$600	$3,210	$0	$0	$0	$0	$3,810
Total Construction Costs	**$2,395**	**$7,457**	**$8,557**	**$3,200**	**$20,609**	**$1,320**	**$5,680**	**$77,218**

[1] Construction costs include a bi-directional cycle-track to be built as part of the reconstruction and major widening of Route 34/Main Street (2017), but exclude the cost to construct the major road widening. It should be noted that Winter Garden, Florida has found it very useful to remake its downtown core as an integral part of the Orange Lake County Trails system yielding appreciating land values in the downtown core of 11.3% over 19 years. (See **Appendix 1**)

Operating Expenditures

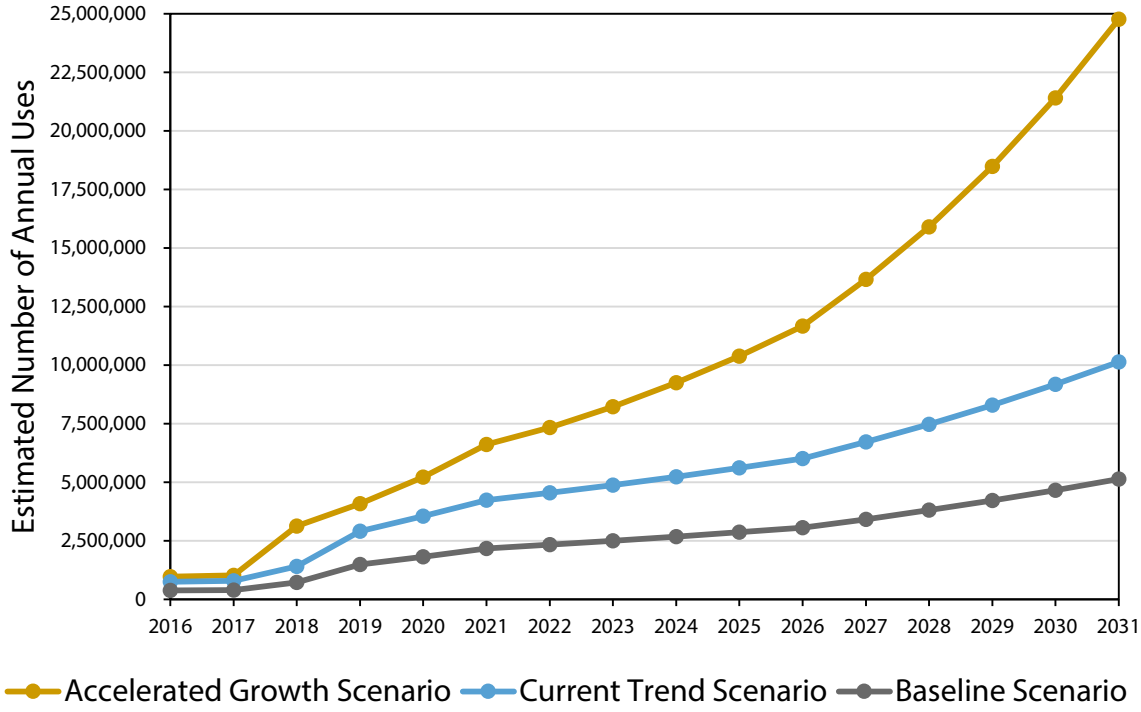
Based on data from Derby, maintenance and repair costs by town are set at $4,000 annually per mile, with annual publicity and promotion costs assumed to match this level from 2018 onward. Both of these outlays are financed by local governments and modeled as reductions in other expenditures so that budgets balance at each level of government. In addition, amenity benefits are expected to increase with use of completed trail segments, contributing particularly to improved health of users.

Projected Annual Trail Uses

As sections of the NRG are built and it is actively promoted by the host communities, the amount of usage is expected to increase beyond current trends. The CCEA developed three growth scenarios: (1) a *baseline* case that uses the annual number of uses from just the open sections of the NRG *(390,996 uses)* as the basis; (2) a *current trend* case based on the total extrapolated number of uses from the IR counters; and (3) an *accelerated growth* scenario that assumes use will increase exponentially with trail development and at a rate that will double usage by full completion of the NRG.

For the baseline and current cases, the assumed growth rate is related to current trail usage per mile and construction of trail sections. The growth in the number of annual uses shows variability because trail construction occurs at different rates over time, with completion expected in 2030. The accelerated growth scenario includes expansion factors that take into account the enhanced attractiveness of longer, more completed trails and assumes that, as the trail becomes more complete, usage will occur at a higher pace than the current rate calculated for the existing short, fragmented trail.

Chart 1: Estimated Total Annual Trail Uses



Under these scenarios, the amount of usage on a fully completed NRG has the potential to be substantial. Under the baseline case, annual uses would increase to over 5 million in 2031, while the growth based on current per mile miles usage rates would result in annual uses to exceed 10 million. The trend lines are depicted in **Chart 1** *(previous page)*. As discussed above, these projections represent uses and are a summation of the use on trail sections in each community; these number do not indicate the number of users.

The use of these numbers to calculate economic benefits, however, has the potential of overstating the effects because they represent the number of times the trail counter is actuated, as opposed to an estimate of individual visits. Because of where the counters were installed and the nature of a typical visit, it is very likely that each person on the trail was counted twice: once entering the trail and a second leaving. For this reason, subsequent analyses presented in this report were based on the annual number of uses divided by two, reflecting a ratio of two uses equal to one visit.

User Amenity Benefits Associated with Current Trails

Consumer Surplus Methodology and Benefits

This report documents two types of amenity benefits: *consumer surpluses* and *health benefits*. Both of these types of benefits over time will increase property values and to that extent be transferred from participants to landowners and property taxing authorities, albeit the timing and share of those adjustments are far from certain. This section outlines and measures benefits initially accruing to residents through consumer surplus.

Consumer surplus is the value that consumers are willing to pay over and above what they actually pay for consumption of a good or to participate in an activity. It is the monetary measure of net consumer benefit and is calculated by subtracting the amount spent on a good or service from the amount a person is willing to pay for that good or service. Because greenways usually do not have explicit fees for their use, it is often necessary to use surrogate measures to estimate. Two possibilities are the comparison of property values near and away from the greenway and estimating travel costs to the greenway. For the former method, after accounting for all pricing variables, the estimated willingness-to-pay more for properties located next to the greenway is determined.[56] The travel cost method works by estimating greenway users' willingness-to-pay based on amount they spend traveling to and using the greenway.[57]

The assessment of property values near and away from the greenway was beyond the scope of this study. As an alternative, the study team estimated net consumer surplus by using the travel cost method.[58] For example, under the currently segmented trails a resident of Waterbury might drive to Naugatuck to utilize that trail. In doing so that Waterbury user incurs return driving costs, recognized by the IRS at $0.55 per mile for roughly 11.6 miles[59] per round trip or $6.38. However, in the future that Waterbury resident could effectively save $6.38 by living close to a new section of the NRG that runs through the City and being able to access the trail directly by walking or riding a bicycle. In addition, the $6.38 savings would accrue each time the resident uses the trail. In essence, the Waterbury resident's price for using the trail falls, and as is typically the case whenever prices decrease on any other good or service, consumption will increase. In this case, it is likely that the

56 Bunting & Briand, 2003
57 ibid.
58 Refer to the companion report: *The Economic Impact of Greenways and Multi-Use Trails: A review of literature prepared as part of the Naugatuck River Greenway Economic Impact Study*, August, 2015
59 https://www.google.ca/?gws_rd=ssl#q=Waterbury%2Cct+to+Naugatuck%2C+ct

frequency of using the new trail will increase; and as the frequency increases the odds of getting sufficient exercise to be beneficial to his or her health will improve.

While $6.38 in this example does not sound like a large amount, the savings would accumulate every time the trail is used. Over the course of a year total savings could reach nearly $1,000 based on using the trail three times a week, walking sufficiently often to gain health benefits. In economic terms, this is referred to as consumer surpluses: that is, the Waterbury resident would no longer be incurring costs to use the trail, but instead would be realizing savings.

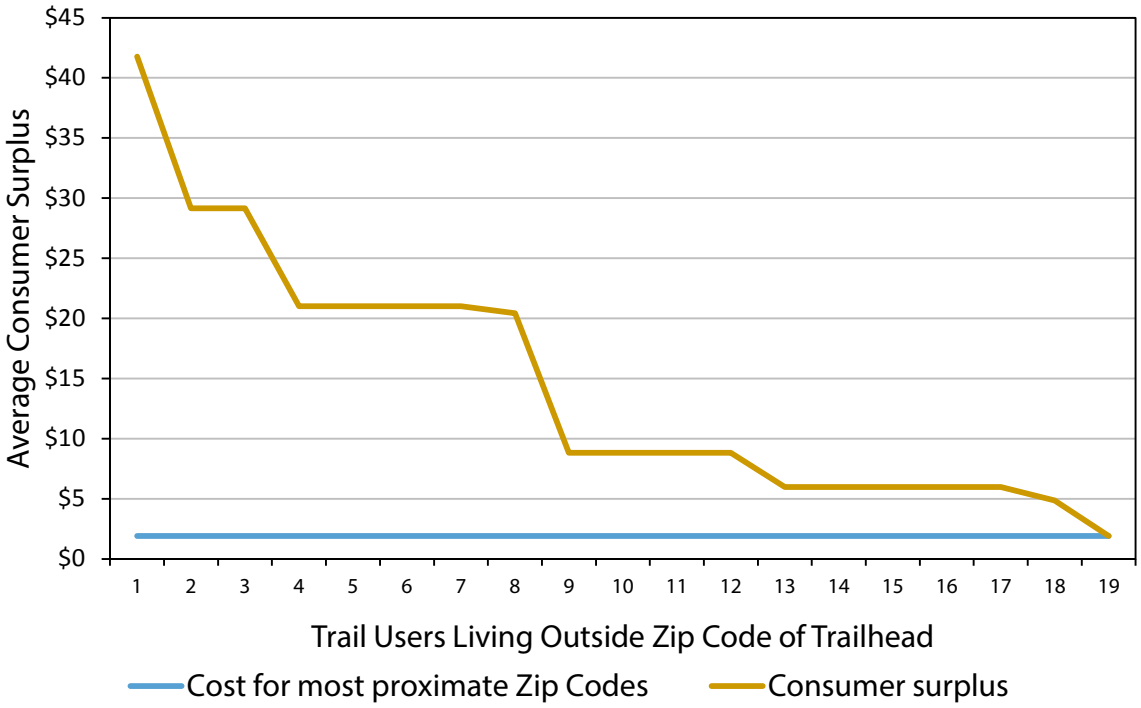
Economists estimate such avoided transportation costs for all users of the expanded trail as the measure of consumer surplus. Consumer benefits can then be estimated as the costs which some people are willing to incur but no longer have to because of free or lower access cost access brought about from extensions to the NRG. The value of consumer surpluses can rise substantially as more residents are afforded direct access to the NRG. For every 1,000 residents that realize savings as in the above example, the expanded trail system would generate a million dollars in consumer surplus. Of course, not all current trail users will live in walking distance to the extended trail, but most will reside closer to the trail thereby attaining benefits of lower costs and the corresponding likelihood of increasing both consumer and consequential health impacts. Further, due to lower costs and closer proximity, other current non-walkers will increase their participation.

The intercept survey asked respondents to provide their home ZIP Code. Travel distances and costs were then estimated between respondents' home ZIP Codes and the trailhead ZIP Codes. This calculation is based on the responses of those who were captured by the intercept survey. Consumer surpluses rise as the spreads between distances of driving to trailhead under the current disparate trail system and the expanded one shrink. In practice, the data required to make the above estimates are not readily available. Nevertheless, the CCEA approximated distances travelled to each current trailhead for users that responded to the survey based on individual ZIP Code information provided by respondents. Because most trailheads are very specific points and ZIP Codes cover larger areas, trail users who live in the same ZIP Code as the trailhead or live in an adjacent ZIP Code area will still incur a small transportation cost.

For example, the trailhead for the Naugatuck NRG section is in ZIP Code 06770. Based on an assumed average travel distance from the centroid of the ZIP Code area to the trailhead, an average transportation cost for residents to and from the trail is estimated at $1.89.[60] Persons who live outside of the area but still use the Naugatuck trail section demonstrate a willingness to pay a higher cost because of the longer travel distance to the trail. This willingness is indicative that parties with sufficiently similar choices will pay the higher cost. The value they pay over and above the $1.89 paid by those who live closest to the trail generates an estimate of consumer surplus. The intercept survey results indicated that 86 users of the Naugatuck trail section lived in ZIP Code 06770 and 18 users were from more distant ZIP Code. These latter trail users were willing to incur higher transportation costs. The difference between the transportation cost incurred by these users and the users who live in ZIP Code 06770 is the measure of consumer surplus accrued to the

60 An approximation for the distances travelled within these home ZIP Codes was made by assuming that each of the home ZIP Code land masses were approximately square and the population evenly distributed within the square, travelling to a central point (trailhead) within the square, that is half the distance inside each. From known areas within each home ZIP Code several points exist within the square in which a circle containing half the area would capture half the residences. So as the crow flies the perimeter of the circle having half the area of the square is as far as the average resident needs to travel. In addition, as long as roads are designed in rectangular blocks, the shortest travel distance within any of these circles will approximate the radius of the circle and the longest the two sides of an equilateral triangle whose hypotenuse is at 45% to the foregoing radius. The average distances travelled within each home ZIP Code is taken as the average of those two extreme measures. Where trailheads are located within any circle described as above, these are reasonable measures to capture average users because participants from most approximate origins are apt to be higher than those more distant and outside the circle.

Chart 2: Consumer Surplus for Residents of Zip Code 06770 (Naugatuck)



residents of ZIP Code 06770.

Chart 2 illustrates how consumer surplus was calculated based on users who were interviewed on at the Naugatuck trailhead. While most of the respondents live in Naugatuck (ZIP Code 06770), there were 18 persons who were from outside of the immediate area of the trailhead. These users are shown in **Chart 2** by those with the highest transportation costs *(that is, farthest from the Naugatuck trailhead)* to those with lowest cost. The chart depicts what participants from other ZIP Codes are willing to pay over and above the lower costs incurred by residents of ZIP Code 06770. The blue line depicts the assumed transportation costs for those living the closest to the trailhead, estimated at $1.89. The resulting consumer surplus estimates are illustrated by the solid orange line as the difference between travel costs from out-of-the-area ZIP Codes and the average transportation cost paid by residents of ZIP Code 06770.

The consumer surplus derived by each trail user living close to the trailhead from those outside the trailhead ZIP Code was summed and an average value was calculated. This method results in an average per person consumer surplus per visit of about $12.66. Based on the number of respondents to the intercept survey, the consumer surplus for an average day amounts to $1,089 and over the course of the year it would total $65,304. The same method was used to calculate the consumer surplus realized by trail users from any ZIP Code.[61] For this example, trail users living within fifteen miles of the Naugatuck trail section trailhead accrue an annualized consumer surplus amounting to $184,272. Trail users from farther ZIP Codes realize an additional $21,243, increasing the total consumer surplus to $205,516. The estimates of consumer surplus by ZIP Code are listed in **Table 5**.

61 For example, to establish consumer surplus for the 19th individual, rather than subtracting $1.89 subtract his or her costs of $4.45 from each of the remaining total travel costs and repeat the process.

Table 5: Estimated Annual Consumer Surplus Accruing from Extant Naugatuck Trail, by ZIP Code

Trail-ZIP Codes	06770	06403	06708	06779	Within 15 Miles	Total All ZIP Codes
Naugatuck	$65,304	$50,051	$40,074	$28,843	$184,272	$205,516

Based on respondents to the intercept survey and estimated travel costs from home ZIP Code to ZIP Code 06770.

Table 6: Estimated Annual Consumer Surplus Accruing from Extant NRG Trails By ZIP Code

ZIP Codes/ Trailhead	Naugatuck	Middlebury	Derby	Torrington	Total
06770 Naugatuck	$65,304	$52,804	$1,796,620		$1,914,728
06403	$50,051				$50,051
06708	$40,074	$64,024			$104,098
06779	$28,843	$30,826			$59,669
06762 Middlebury		$2,468,749			$2,468,749
06706		$56,879			$56,879
06488		$42,938			$42,938
06478		$41,322			$41,322
06798		$42,704			$42,704
06795		$35,170			$35,170
06705		$31,022			$31,022
06704		$34,962			$34,962
06712		$6,529			$6,529
06418 Derby			$2,466,232		$2,466,232
06401			$2,043,273		$2,043,273
06525			$2,002,117		$2,002,117
06484			$1,993,069		$1,993,069
06481			$1,973,225		$1,973,225
06463			$1,894,745		$1,894,745
06460			$1,863,875		$1,863,875
06614			$1,857,815		$1,857,815
06478			$1,844,532		$1,844,532
06611			$1,837,049		$1,837,049
06513			$1,825,446		$1,825,446
06606			$1,813,408		$1,813,408
06790 Torrington				$61,687	$61,687
06791				$41,485	$41,485
06057				$13,961	$13,961
06778				$10,272	$10,272
06098				$13,554	$13,554
Total	$184,272	$2,907,929	$25,211,406	$140,959	$28,444,566
Trailhead ZIP Codes	**$65,304**	**$2,468,749**	**$2,466,232**	**$61,687**	**$5,061,972**

This process was repeated for the other four trailheads at which intercept surveys were conducted and for which there were sufficient data. The results of the consumer benefits by ZIP Code within 15 miles driving one-way from residences to the trailheads are listed in **Table 5**. Estimates of consumer surplus in Middlebury and Derby are influenced by the higher number of respondents that traveled farther to access the trails than occurred in Naugatuck or Torrington. *Note: Consumer Surplus attributable to several respondents who indicated an out-of-state ZIP Code were excluded from the calculations.*

Data in **Table 6** are unadjusted for non-responses and for trails not covered by the four towns. Summing the estimated consumer surpluses for the ZIP Codes containing trailheads yields a modest $5.1 million for the year. Extrapolating to cover both non-responses and other ZIP Codes containing trailheads, yields annual consumer surplus of $6.5 million for residents in ZIP Codes containing trailheads alone. When all ZIP Codes of visitors to the open sections of the NRG are summed, the consumer surplus totals about $28.5 million.

The CCEA has taken this very conservative approach to utilizing benefit accruing only in the trailhead ZIP Codes as the starting point for consumer surpluses generated by the trail system. CCEA's lower case assumes that trail usage will increase proportionately with the miles of trail completed, calculated using the number of annual uses exrapolated from one count location per open section and only for those sections on the NRG.

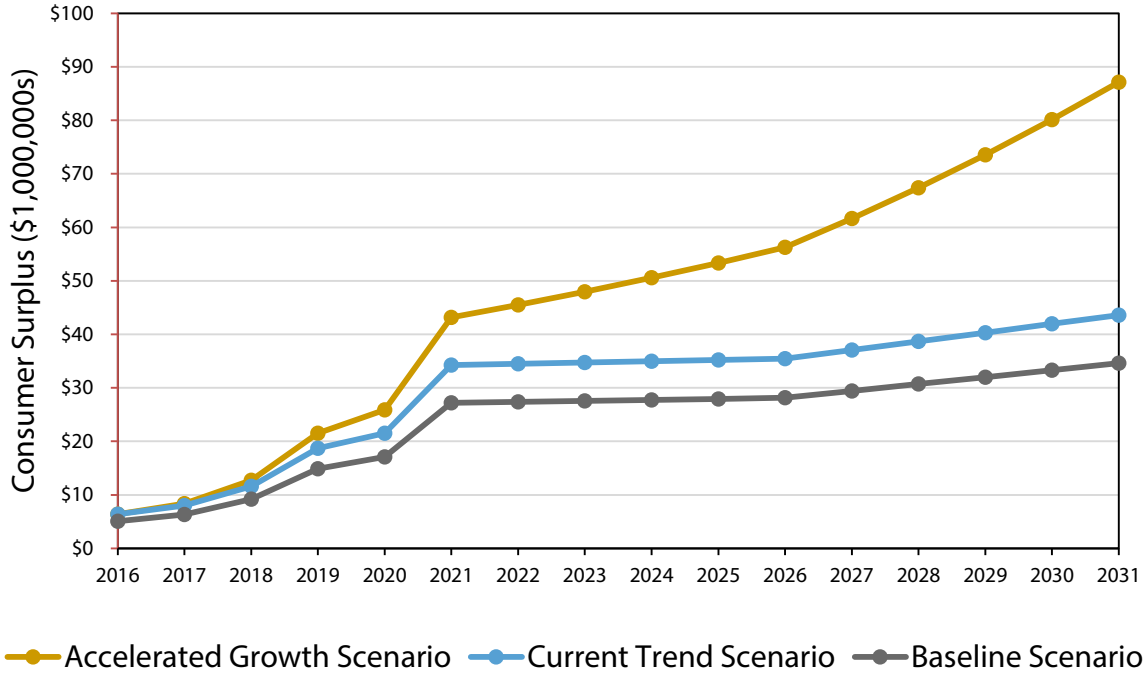
As noted earlier, trail expansions and construction of additional trail sections will make the trail more accessible at lower costs to both current and new users. For that reason, trail usage is expected to increase and average usage rates per mile are expected to grow as the NRG becomes more accessible and attractive to use. For its upper case, the CCEA assumed that trail use will double at completion of the full trail. A constant growth rate rather than a linear extrapolation was also used in the calculation of future consumer surplus. This results in a more conservative process to avoid front loading impacts.

Trail construction is likely to fluctuate annually with some years experiencing the opening of several miles of trail while other years may not see any new trail construction. Because of this, annual consumer surplus values also fluctuate year-to-year. **Chart 3** illustrates the growth in consumer surplus as the entire NRG is constructed and opened. It is assumed that the consumer surplus associated with a new section of trail will accrue in the year following its construction. This dynamic explains why the contour of the lines in **Chart 3** show substantial jumps in consumer surplus in some years and periods of slow growth in other years.

Chart 3 represents the amount of consumer surplus accruing in each year. Because the portions of the trail driving consumer surplus from each previous year remain in place the following year, the points along the consumer surplus curves are cumulative. The annual increments along the curves represent the annual gains in consumer surplus derived from completion of trail segments in the previous year only.

With consumer surplus expanding from NRG expansion at current usage rates only and under the baseline scenario, the estimated economic values would grow from $5.1 million in 2016 to $34.6 million by 2031. Based on the higher use counts for the current trend scenario, consumer surplus totals $6.4 million today and would increase to $43.6 million in 2031. With trail usage rates doubling, the rise would be to $87.1 million. The CCEA analysis calculated consumer surplus at the county level with the results showing that roughly 78% of the consumer surplus would accrue to New Haven County residents. **Chart 3** also establishes that different assumptions about use clearly matter. The estimated consumer surplus is enhanced with increased access to the trail as well as higher usage rates.

Chart 3: Annual Cumulative Consumer Surplus



Assessed Land Values

The change in assessed property values as a result of proximity to a trail or greenway is difficult to quantify because of the number of factors that influence land values, such as age and condition of the home. Previous studies that have attempted to monetize increases in property values have found that proximity to trails and greenways either increase property values or have no negative impact. These studies have also concluded that increases are most pronounced near greenways that highlight open space, limit vehicular traffic and effectively maintain and provide security on the trails. Another key factor is minimizing trail-home owner conflicts.[62] Past studies have concluded that proximity to a trail increases the selling price of a home and typically reduces the time in which a house sells. A 2011 study by the CCEA analyzed the value of properties overlooking state parks and or forests and state trails. While the results varied by region, this study identified a *green space bonus* of $41,961 to $50,124 for properties overlooking managed green spaces compared that those that did not.[63]

Relative to the latest assessed land values within walking distance of current and future trails, consumer benefits as a percent of the assessed values accruing within walking distance of currently available trails range from 0.14% in Derby to 0.08% in Naugatuck.[64] Both these results could be elevated by increased use of trails by more people for three days or more. Both estimates are conservative because they do not account for persons exercise on several trails contributing to frequency of use. For example, a person walking three different trails each of three days a week would slip through the cracks in the data. Nor do the numbers account for the increased access of the completed trail increasing frequency of use with which the NRG would be utilized. The

62 *Economic Impacts of Protecting Rivers, Trails and Greenway Corridor*, US Department of the Interior, National Park Service, 1995
63 Gunther, Parr, Graziano, Carstensen, 2011
64 The impacts on land values were assessed over 10 years discounted at 15% indicative of high risks associated with expected completions of the trail segments. Data were insufficient to make similar estimates for the other communities.

estimates are also constrained by the databases to only benefits derived from walking and exclude those accruing to bicyclists.

When amenity values are considered as part of the economic model, they generate incentives to live and reside in an area proximate to a trail section. The National Association of Home Builders and the National Association of Realtors conducted a survey on the importance of community amenities to homebuyers. Walking and biking trails came in second only to highway access.[65] Furthermore, trails are some of the cheapest amenities to build with the highest value.[66] These factors clearly demonstrate that proximity to trails as a positive impact on and increases property values.

Health Benefits Methodology and Benefits

Health benefits are expressed in terms of lives saved, that is, extended life years, and improvements in the quality of patients' and caregivers' health, and, in this instance, trail users' quality of life improvements and consequentially lives saved. The CCEA explores these concepts based on surveys of current trail users and on counts obtained along extant sections of the NRG, as well as, documents on various health concerns that are partially redressed by increased participation. Trails in Naugatuck, Middlebury, Derby, Beacon Falls and Torrington are all envisioned as becoming part of the NRG, integrating those and adjacent communities with multiple entry points, including trailheads and other less structured points of access and egress, to encourage local participation.

While persons can exercise in a wide variety of places, trails provide excellent venues for people to exercise in a comfortable and non-threatening environment and achieve sufficient health benefits from frequent physical activity. By frequently using trails and greenways, users can curb and reduce obesity, diabetes, cardiovascular diseases (**CVD**) and various cancers, particularly breast cancer.[67] Trails have also been shown to provide excellent places for people to walk in groups and socialize, and thereby, reap psychological benefits derived from group activities.

Based on a report from the Surgeon General:

- Physically-active people have about 30% lower risk of early death than the inactive.
- Physically-inactive people account for about 11% of premature deaths in the United States.
- Physical activity helps prevent risk factors and protects against multiple chronic diseases.

While the CCEA does not have medical information for trail users,[68] it does have incidences for these afflictions by type of Connecticut community[69]. Based largely on relative incomes and their impacts on incidence rates, **Table 7** shows likely incidences of the three major diseases within each type of community.

The CCEA used these incidences to estimate how many people could potentially benefit from health improvements related to trail use. The trail user intercept survey identified how frequently users utilized these trails more than three times per week. Inclusive of walking to and from trailheads for those residing within a half a mile, the CCEA assumed that these uses extended for 30 minutes or more, which is enough effort and duration to improve health and extend longevity

65 Trails Are Important to Homebuyers, Survey Shows http://www.americantrails.org/resources/benefits/homebuyers02.html
66 Trails Add Values to New Homes http://www.americantrails.org/resources/devel/Trail-system-community-developer-investment-return-Martin.html
67 Harvard Health Publications Harvard Medical School, *Walking your way to Health*, http://www.health.harvard.edu/newsletter_article/Walking-Your-steps-to-health.
68 Doing so would clearly be invasive and is beyond CCEA's expertise.
69 *2015 DataHaven Community Wellbeing Survey*, DataHaven and Siena College Research, February 2, 2016.

(based on a recent Surgeon General's report and other general health recommendation). The expected incidences of different diseases (**Table 7**) were applied to the current trail usage along open sections. This calculation results in the number of people who could potentially realize health improvements from using the trail (**Table 8**). Because the health literature pertains to walking, this assessment relates only to walkers. Bicyclists were treated separately.

Table 7: Expected Adult Incidences of Disease by Community

Disease	Naugatuck	Middlebury	Derby	Beacon Falls	Torrington
Obesity	25%	12%	25%	21%	25%
Diabetes	9%	4%	9%	7%	9%
CVD	6%	5%	6%	7%	6%

Source: CCEA application of the 2015 DataHaven Wellbeing Survey

Table 8: Potential Number of People Avoiding Health Issues by Using Existing Trail Sections

Disease	Naugatuck	Middlebury	Derby	Beacon Falls	Torrington	Total
Obesity	100	21	426	26	27	600
Diabetes	36	7	153	9	10	215
CVD	24	9	102	9	7	150

*Calculated by multiplying percentages in **Table 7** by the number of trail users.*

Obesity is a precursor to other inflictions, though not all obese persons become diabetic or experience CVDs. In redressing diabetes alone, the current trail system is expected to facilitate the saving of 2.5 lives per year, based on the information in the Surgeon General's Report. Throughout their lifetime this value is modestly set at $7.3 million for each life[70] saved or $18.2 million.[71]

Had these patients been walking all their lives, 27 would have avoided having the first incident with diabetes.[72] Walking regularly reduces the risk of Type 2 diabetes by 60% and even reduces the risks of other types of diseases, such as colon cancer.[73] A case study involving male graduates at Harvard University walking at least nine miles a week showed a 22% lower death rate. Not only does walking have many of the same benefits as more vigorous exercise, like running, but it also has fewer negative impacts on a body; running is a high impact activity and therefore has more risk of injury–20% to 70%–while the risk of injury to walkers is only 1% to 5%.[74]

Two major studies provide indications of the extent that walking reduces CVD:

- Among 44,452 male health professionals, walking at least 30 minutes a day led to an 18% lower risk of coronary artery disease;
- Among 72,488 female nurses, walking at least three hours a week led to a 35% lower risk of heart attack and cardiac death and 34% lower risk of stroke;

70 Lisa A. Robinson, *How US Agencies Value Mortality Risk Reductions*, Policy Monitor 2009 p. 283. http://opim.wharton.upenn.edu/risk/downloads/RiskSeminar_2008-09-23_Robinson.pdf (June28, 2916) Review of agency practices suggests … the central tendency of the range of twenty-six estimates used in many EPA analyses is $7.2 million (2005 dollars), while the mean EPA estimate based on recent meta-analyses is $5.5 million (1999 dollars)

71 These calculations are based on the values of Statistical life (VOSL) for each life saved.

72 An alternative approach, based on the American Heart Association, *Walking can lower risks of heart related conditions as much as running*. http://newsroom.heart.org/news/walking-can-lower-risk-of-heart-related-conditions-as-much-as-running.

73 *8 Reasons why walking is great for your health.* https://www.tescoliving.com/articles/8-reasons-why-walking-is-great-for-your-health.

74 Harvard Health Publications Harvard Medical School, *Walking your Way to Health*, http://www.health.harvard.edu/newsletter_article/Walking-Your-steps-to-health.

- A 10-year study of 229 post-menopausal women randomly assigned the volunteers to walk at least one mile a day or to continue normal activities. At the end of the trial, the walkers enjoyed an 82% lower risk of heart disease.[75]

In contrast with Harvard's meta-data article, the National Heart Foundation relies on a major study by Paul T. Williams at Lawrence Berkeley National Laboratory, Life Science Division. It concluded that walking reduced heart disease by 9.2%.[76] These data suggest that had the people with cardiovascular disease been walking prior to their problems, 14%-to-50% would have avoided the disease, resulting in considerable savings in medical costs and lost employment for both patients and their professional and home caregivers.

In its 38-year longitudinal study starting with 18,863 male British civil servants, Whitehall found that those with cardiovascular disease at age 50 died 10 years earlier than those with no baseline risk factors at age 50.[77] In short, every group of eight was expected to avoid an entire life of 80 years of premature death.

Walking has also been connected to a decreased risk of cancer. More specifically, exercise has been linked to decreasing the risk of breast cancer. Physical activity decreases the level of estrogen in women's bodies, which in turn reduces the risk of contracting breast cancer, as well as boosting the body's immune system.[78] Walking as little as 75 minutes-to-2 hours per week reduces a woman's risk of breast cancer by 18%.[79] Breast Cancer Risk in American Women estimate that 12.4% of women will develop breast cancer at some point during their lives; therefore 2.2 of every 100 women could avoid breast cancer by increasing exercise.[80]

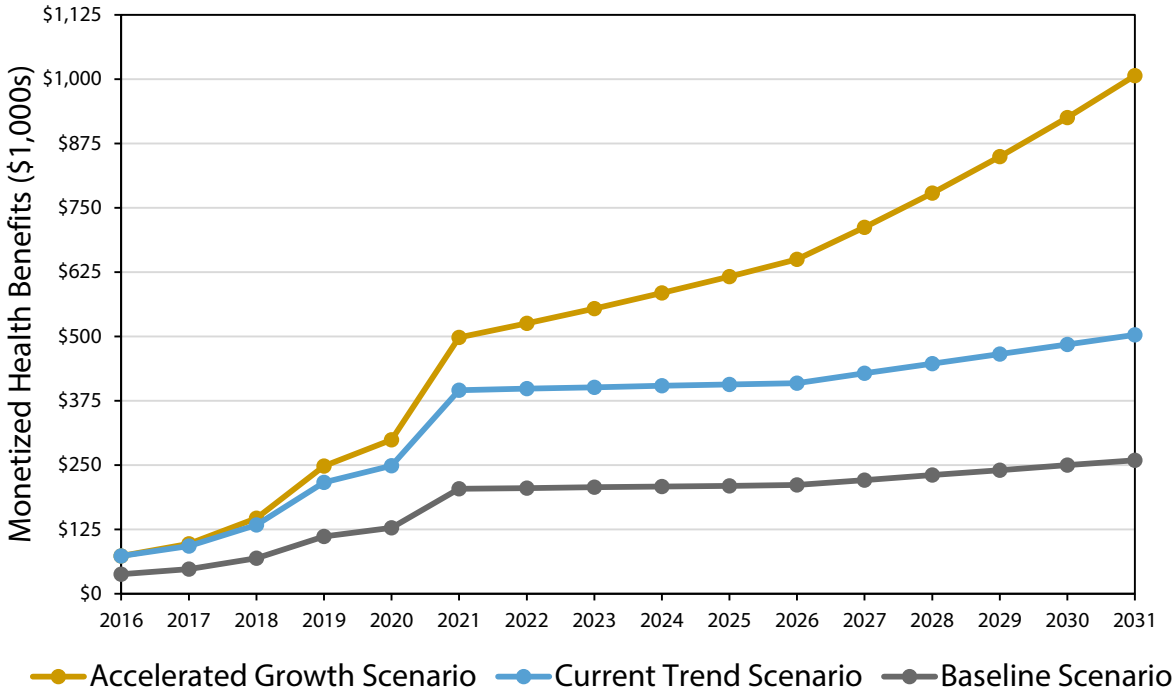
During the intercept survey conducted as a part of this study, 185 women were interviewed. This level of participation rate combined with the avoidance rate for breast cancer infers that 4.2 women among those surveyed are expected to avoid breast cancer as a result of trail related exercise (assuming this was their only form of exercise). The incidence of breast cancer currently in Connecticut is relatively high at 137/100,000. In the short-term expansion of the trail by 2020, there are expected to be 427,000 trail uses. To gain sufficient exercise by using the trail without any other exercise, an individual would need to exercise about 160 times a year, meaning that a maximum of 2,500 people and 1,250 females could be getting enough exercise to reduce their risk of breast cancer. With 12.4% of the female population likely to contract breast cancer at some juncture over their lifetime that would reduce breast cancer incidence by 155 cases over 80 years or about two per year. By age 68, half the women who have or will get breast cancer have died.[81] That is at least 10 years prematurely relative to U.S. female life expectancy. Avoiding those premature deaths amounts to at least another half a life a year saved carrying with it an amenity value of at least another $3.6 million annually at a VOSL of $7.3 million.

Based on the limited sample from the four trails included in the intercept survey and the health benefit factors described above, about 7.25 premature deaths could be avoided: 1.25 deaths from obesity, 3 deaths from diabetes, 2.5 deaths from CVD, and 0.5 deaths from breast cancer. These

75 Ibid.
76 American Heart Association, *Walking can lower risks of heart related conditions as much as running*. http://newsroom.heart.org/news/walking-can-lower-risk-of-heart-related-conditions-as-much-as-running.
77 http://www.bmj.com/content/339/bmj.b3513.
78 How Can Physical Activity Affect Breast Cancer Risk http://ww5.komen.org/Breastcancer/Lackofexercise.html.
79 Get Moving to Help Reduce Your Risk of Breast Cancer http://www.cancer.org/cancer/news/features/get-moving-to-help-reduce-your-risk-of-breast-cancer.
80 Breast Cancer Risk In American Women http://www.cancer.gov/types/breast/risk-fact-sheet.
81 SEER, *Cancer Statistics Review 1975-2912* Table 1.13. Without further medical progress in avoidance and treatments, only 31% of women who have or will contract breast cancer live beyond the normal life expectancy of American females.

numbers do not include possible avoidance of premature deaths from other cancers. Monetizing the lives saved at federal guidelines of $7.3 million yields a total annual value of $52.9 million in health benefits. Extrapolating that value to cover all of the currently open trails increases the monetized health benefit to an estimated $73.5 million. These values are based on the results from the intercept survey and include sections not on the NRG. An adjustment for the baseline scenario reduces current health benefits to about $37.9 million, lower value but still substantial.

Chart 4: Cumulative Monetized Health Benefits Accruing from Expanded Trail



As sections of the trail are built and opened, the health benefits from active and frequent use will increase proportionally under the baseline and current trend scenarios and exponentially for the accelerated growth scenario. The relationship between moderate exercise and reduced incidence of various diseases is well established. The expansion of the NRG will greatly increase access to an attractive and convenient venue for exercise, resulting in health benefits accruing to frequent users.

The estimated monetized value of health benefits over time is staggering. By the project completion year of the trail of 2031, the accumulated value of deaths avoided amounts to $259.6 million under the baseline scenario and just over a half-billion dollars under the current trends case, with about 138 people enjoying healthier lives because they lived close enough to the trail to reduce their risk of experiencing diabetes, cardiovascular disease and various forms of cancer. Based on current use and length of open trail, 14 people will avoid a premature death. With the completion of the trail, an additional 70 lives may be saved. These results are based on the current trend scenario and a constant increase in trail usage. If usage increases at a higher rate, the expected health benefits will also increase. Under the accelerated growth scenario, the cumulated monetized health benefits would reach just over $1 billion with a total of 138 premature deaths avoided.

Other medical research has noted that physical activity can reduce the risk of colon,

endometrial and advanced prostate cancer.82 Women who are active have a 20% to 40% decreased risk of endometrial cancer, with risk decreasing as physical activity increases. Studies have also been done to examine the effect an increase of physical activity has on lung cancer; however, these studies found it difficult to control for the effects of smoking and other respiratory diseases.

The CCEA's health benefit estimates described above are conservative in that the use of future trail section is based on the users of currently open and relatively short trail segments. Where individuals get additional exercise by using a variety of trails the extent of the workouts are being underestimated. This approach underestimates health benefits. The NRG will also assist in avoidance of many cancers in addition to breast cancer and the economic values from reducing other forms of cancer have not been estimated. Further, no account has been taken of the social costs of actually being ill. In addition, the analysis of health benefits did not estimate the effects trail usage by walkers and bicyclists may have on reducing greenhouse gas (**GHG**) emissions. These reductions could further enhance the health benefits over and above those included in the study.

It is useful to note the impact that advertising could have on the use of trails. A telephone survey conducted in a southeastern county of the United States found that awareness of trails was low, and advertising should be directed at older and irregularly active adults for best results.83 A number of campaigns have been undertaken across the United States to increase physical activity among inactive adults. In Wheeling, West Virginia, a program was developed which encouraged insufficiently active adults to walk for 30 minutes a day. The Wheeling Walks program resulted in a 14% net increase in self-reported walking among the target group, showing that encouragement through print, media, and television advertisement can lead to increased physical activity.84 Advertising dollars were not considered in the REMI analysis of potential impacts.

User Spending

Spending by users on the day they visit the trail is a form of direct economic impact. Direct effects are impacts as a result of direct spending by consumers on goods and services related to activities utilizing the trails or amenities accruing from the trails, e.g. consumer surplus and health benefits identified above. In the case of the NRG or any other multi-use trail, direct effects can be defined as purchases made by users including spending on food, beverages, gasoline, gear, clothing and equipment (such as bicycles), or services. This also includes tourism expenditures such as lodging for trail-based recreational activities, although at its current composition, it is not likely that the NRG generates any overnight stays. The construction of the trail also has a direct economic effect, in labor hired and material used by construction firms to build the trail.

The CCEA estimated direct user spending based on the answers to the intercept surveys conducted along open sections of the trail. Transportation expenses to and from the trail access points, however, were calculated based on approximate travel distances from the center of the home ZIP Code to the trailhead and federal mileage rates. Survey data collected user spending for snacks, food, beverages and meals on the day walkers and bicyclists were interviewed, as well as, the amounts spent over the past year on specific items, such as equipment, gear, active wear, and any other retail expenditures in general that the user made specifically because of the trail. It is difficult to attribute all of these latter expenditures to the trail, as consumers can use these items anywhere. For example, the person who purchases a new bicycle can ride it on the trail or may use it mostly on a road. Despite this, the survey attempted to gauge whether or not users were making

82 Physical Activity and Cancer. http://www.cancer.gov/about-cancer/causes-prevention/risk/obesity/physical-activity-fact-sheet#q7.
83 Awareness and Use of Community Walking Trails http://www.sciencedirect.com/science/article/pii/S0091743504001707
84 The CDC Guide to Strategies to Increase Physical Activity in the Community http://www.cdc.gov/obesity/downloads/PA_2011_WEB.pdf

new purchases because they frequently visited an open section of the trail.

Average single visit spending patterns among respondents to the survey are listed in **Table 9**. It also contains CCEA's extrapolations from spending on gasoline to mileage charges on vehicles. Respondents were asked about their spending on gasoline because they are not apt to think in terms of total costs of driving.

Table 9: Single Visit Spending per Intercept Survey Responses by User Category – Walker or Bicyclist

Single Visit Spending | Average Costs	*Walkers*	*Bicyclists*
Beverages	$2.07	$0.31
Snacks	$0.58	$0.23
Meals	$2.37	$0.77
Gas	$1.54	$4.23
Retail	$2.81	$17.69
Equipment	$0.05	$30.77
Lodging	$0.03	$0.00
Activities	$0.05	$7.69
Other	$0.58	$0.00
Total *(Unadjusted)*	$10.08	$61.69
Total Vehicle Costs [1]	$5.49	$15.07
Total Adjusted Costs	**$14.03**	**$72.53**

[1] Total vehicle costs are based on vehicle mileage rate allowed by the IRS (at the time of the survey, it was 57.5¢ per mile and an approximate average travel distance. Gasoline expenditures indicated by respondents were subtracted from the vehicle costs to avoid double counting.

To establish what impact consumer spending would have in 2016, the above average single visit spending was multiplied by the annual number of trail uses based on data collected from the infrared trail counters. The estimated total annual uses is 747,886. *(As discussed above, the trail count data were extrapolated based on factors from the National Bicycle and Pedestrian Documentation Project and reflect counts collected at all points, including two not on the NRG.)* This results in a total direct spending of about $5.6 million over the course of an entire year. If the second NRG data points and the counts along the trails in Middlebury and Torrington are subtracted from the total, the annual uses drop to 385,791, reducing direct user spending to about $2.9 million.

These costs cover those going to and returning from the trail, food consumed on and off the trail, incidental other retail and activities associated with trail usage.

During the intercept survey, only 13 respondents were bicyclists with 8 respondents fully completing the survey. This represents only 3.4% of the total number of people that stopped and were willing to complete the survey. The low percentage of bicyclists is likely due in part by the short lengths of the open sections and a preference of bicyclists to remain on a parallel road. The currently open trails are more conducive to walking than riding a bicycle. Because of the small sample size, it is difficult to extrapolate bicyclist expenditure data with any confidence to represent

the entire trail. However, the data suggest that the spending pattern of bicyclists is somewhat different than walkers. Based on the survey data, bicyclists spend more annually than other users of the trail. The average annual spending by bicyclists is about $351, compared to the average annual expenditure of about $114 made by walkers. The difference is likely attributable to the more specialized equipment and gear used by bicyclists, and may include big ticket items, such as new bike purchases. In addition, these estimates are likely high because they assume that all the bicycle equipment expenditures were made for use of the NRG.

The average amount spent by bicyclists on the day using the trail was also substantially higher, amounting to $61.69 as compared to $10.08 for all users. The difference is primarily attributable to the amount spent on meals. Bicyclists spent, on average, $22.73 on meals while the average for all other users was only $1.60. Transportation costs were also higher. Bicyclists travel costs averaged $15.07 based on distance times the standard mileage rate, suggesting bicyclists were willing to drive longer distances to use the trail. This cost increases the daily average direct expenditure by bicyclists to about $72.53, about five times as much as spent by walkers and other users. It is also interesting to note that more than half of the bicyclist-respondents indicated that they rode their bike to access the trail and therefore spent no money on gas.

Table 10: Bicycling Spending Shares

Type of Spending	*Shares*
Ground transportation	14.1%
Full service restaurants	2.6%
Limited service restaurants	2.6%
Accommodations	0.1%
New bicycles	48.4%
Bicycle Accessories	22.2%
Repair & Maintenance	10.1%

Source: The Economic Impact of Bicycling in Colorado and CCEA

The total number of bicyclists that use the open trail sections each was estimated using the same aggregation methods described above for all other users. This method indicates that total annual bicycle use is in the range of 2,600–6,500 uses. *Based on this, direct expenditures of bicyclists amounted to between $191,000 and $473,000 in 2016.* While this comes from a smaller sample than those on walkers, the results are illustrative of the potential spending of bicyclists that use the trail and can be used to inform future expenditures.

To estimate future direct spending, current total uses of the open trail sections was converted to a per mile rate. This rate was then held constant over time with new trails considered to only come into use the year after their construction, no matter the month when construction is actually completed. Per walker expenditures per mile was also assumed to remain constant in real terms, rising only by inflation.

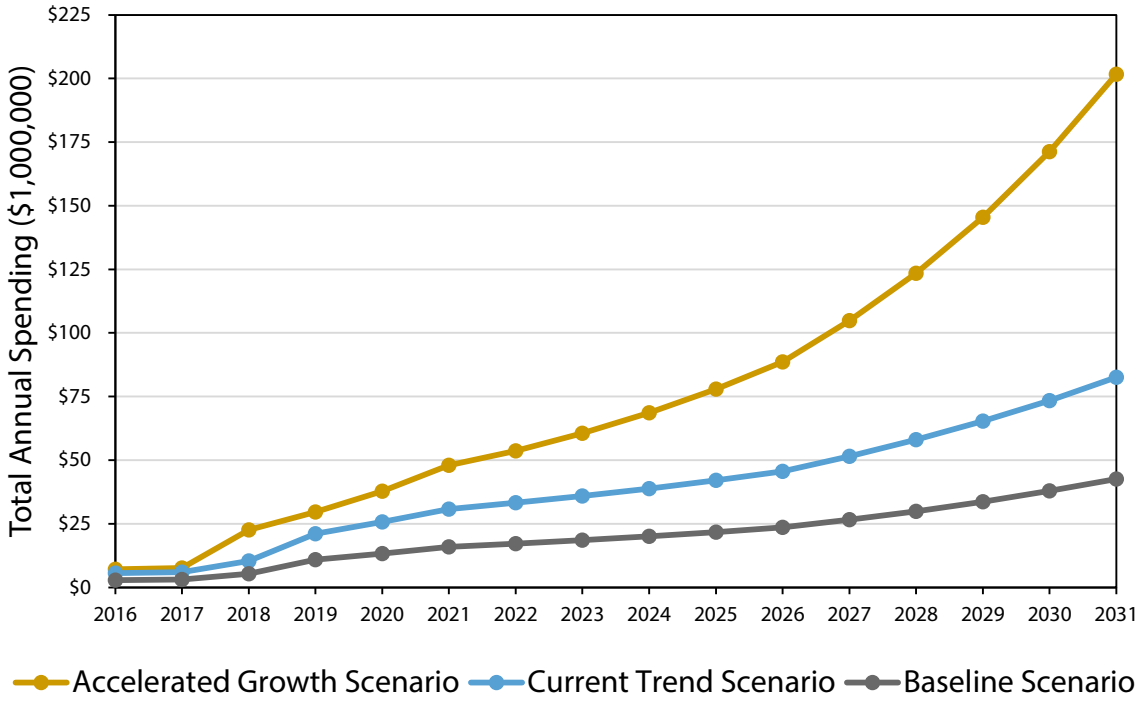
The counts of trail users conducted on the days of the intercept surveys suggest a higher annual number of uses than calculated based on the infrared counts. Direct expenditures were determined based on this higher count as a way of representing a high use scenario. This scenario also includes an accelerated capture growth rate that expects trail use per mile to double by 2031 relative to the result without the accelerator. The doubling is reflective of both expectations that the trail usage will increase in-line with activities on longer trail segments and success from

augmented publicity for the NRG.

As evidenced by the survey, the present short segments do not attract many bicyclists relative to walkers. Those relatives will change, particularly as the NGR nears completion. For that reason and in-line with national averages for longer trails, CCEA expects the number usages by bicyclists to rise to 18.2% of the number of walker usages by 2031. These increases start from the current low bicyclist user rate and rise at a constant rate through time. This methodology delays the major impacts of bicyclists to the late 2020s and early 2030s. See **Chart 5**.

The points of inflection, where the slope of the spending curves change, are caused by differing rates of trail completion out to and including 2030. By 2031, total estimated direct spending by walkers, bicyclists and all other trail users are expected to reach about $42.6 million under the baseline scenario to about $201.7 million based on an accelerated growth rate. The actual spending that occur will depend on the quality and safety of the trail and the capacity of NRG merchants to service an increasing community of users. **Chart 5** shows the projected trends in direct spending over time.

Chart 5: Total Annual Direct Spending by Trail Users



The data suggests that the Naugatuck River Greenway has the potential to generate substantial direct user spending each year. However, because of the very limited number of bicyclists included in the survey, the actual economic impact of bicycling is likely understated. Therefore, the CCEA also looked at other sources to determine contributions to the region's economy by bicyclists. A 2006 study by the Outdoor Industry Foundation found that bicycling accounted for $133 billion of outdoors' $730 billion total contribution to the U.S. economy.[85] This yields a ratio of about 18.2%. It should be noted that not all bicyclists will use or want to use multiuse trails, as many experienced ridings prefer riding on road. Included in this estimate are

85 Outdoor Industry Foundation, *The Active Outdoor Recreation Economy: A $730 Billion Annual Contribution to the U.S. Economy*, 2006

the direct spending by bicyclists during a ride, ground transportations costs to travel to and from the starting and ending points of the trip, and purchases of new equipment and maintenance of existing equipment. Due to the paucity of responses by bicyclists to the intercept survey, bicyclists' aggregate spending is broken out according to consumption shares noted in *The Economic Impact of Bicycling in Colorado*[86] with general spending being further disaggregated by shares within the survey of NRG users. CCEA broke out bicyclists' spending shares as noted in **Table 10**.

Due to the fragmented nature of the trail development, the CCEA assumed constant growth rates for bicycling of 36.0% and 45.2%, rather than a simple linear extrapolation. That methodology takes until 2029 to reach half the impacts with the completed trail finally being fully operational in 2031.

The NRG, when completed, will have several advantages that will likely increase the attractiveness to bicyclists and generate use:

- The NRG will be short enough for bicyclists to undertake round trips in a single day, but long enough to offer a challenging experience;
- The NRG will provide access to the small, compact downtowns along the Naugatuck River and generate inter-city travel to and from work;
- The NRG will provide a very diverse and interesting riding experience with multiple urban, suburban and rural sections;
- The NRG will provide access to the Naugatuck River that is not currently available.

While local resident bicyclists are likely to access the trail at the closest entrance to their home, riders from outside the region are more likely to start at an end point to take full advantage of a longer trip. This would encourage the establishment of bicycle shops and convenience stores, as well as significant parking in Torrington and Derby. It would also encourage other intermediate services at which bicyclists could take a break. Those staying overnight before and/or after riding will also bolster demand for accommodations and food services.

Based on this alternate method for estimating future direct spending, total direct spending by 2031 amount to $51.3 million in the current rate case and $102.6 million for the high rate scenario. The year in which this spending commences will be determined by the actual completion of trail segments. If segments linking towns which encourage commuting by bicycle rather than car are completed earlier, bicycling impacts could be brought forward. Alternatively if those commuter-segments are delayed the reverse would be true.

Key Direct Expenditures and Influences

Based on the foregoing discussions, the completion of the entire length of the NRG has the potential to generate substantial direct economic benefits, from the investments in construction, the value accrued by those living close to the trail (consumer surplus), health benefits derived by those who take advantage of the trail for exercise, and expenditures made by users for goods and services. **Chart 6** summarizes the results from the previous discussions and compares the monetized direct effects of building the NRG by growths scenario and county. Under the three trail use scenarios, the increased growth scenario that assumes an accelerated growth in users as the trail is built, the chart itemizes the key direct effects from spending by bicyclists and all other users, the amenities of consumer surpluses and health benefits for Litchfield and New Haven counties under each scenario. The total costs to construct and maintain the NRG are depicted as a trend line

86 http://atfiles.org/files/pdf/CObikeEcon.pdf. Accessed June 09, 2016.

Chart 6: Estimated Cumulative Economic Benefits in 2031 by Growth Scenario and County

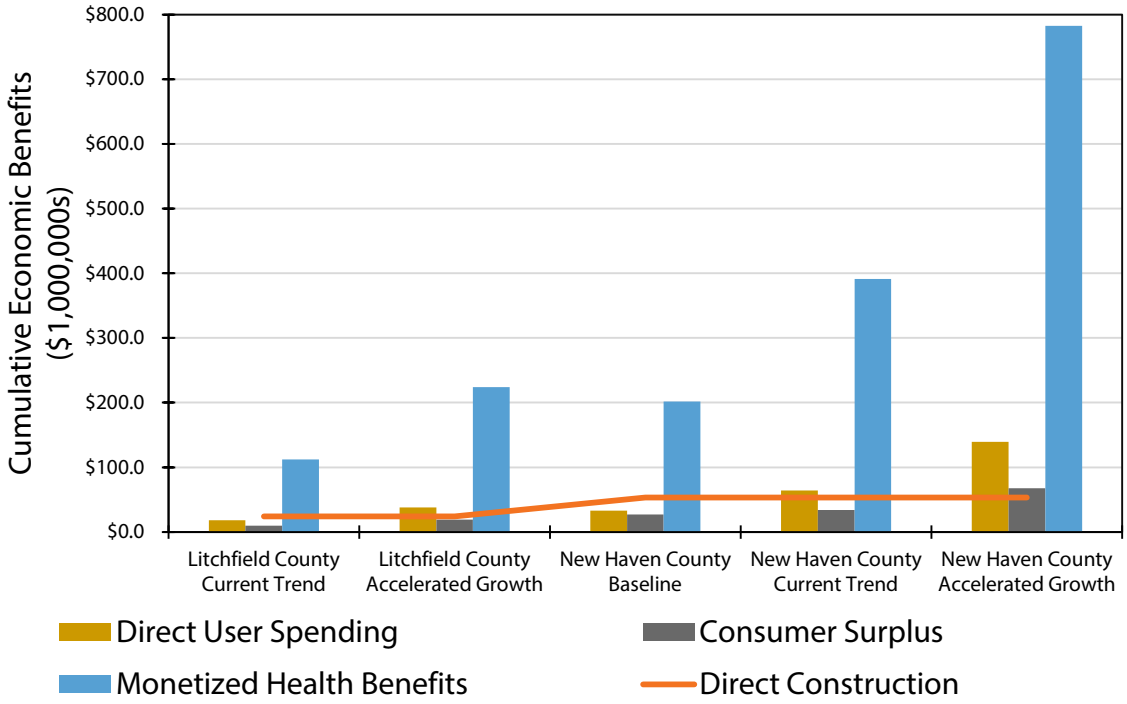
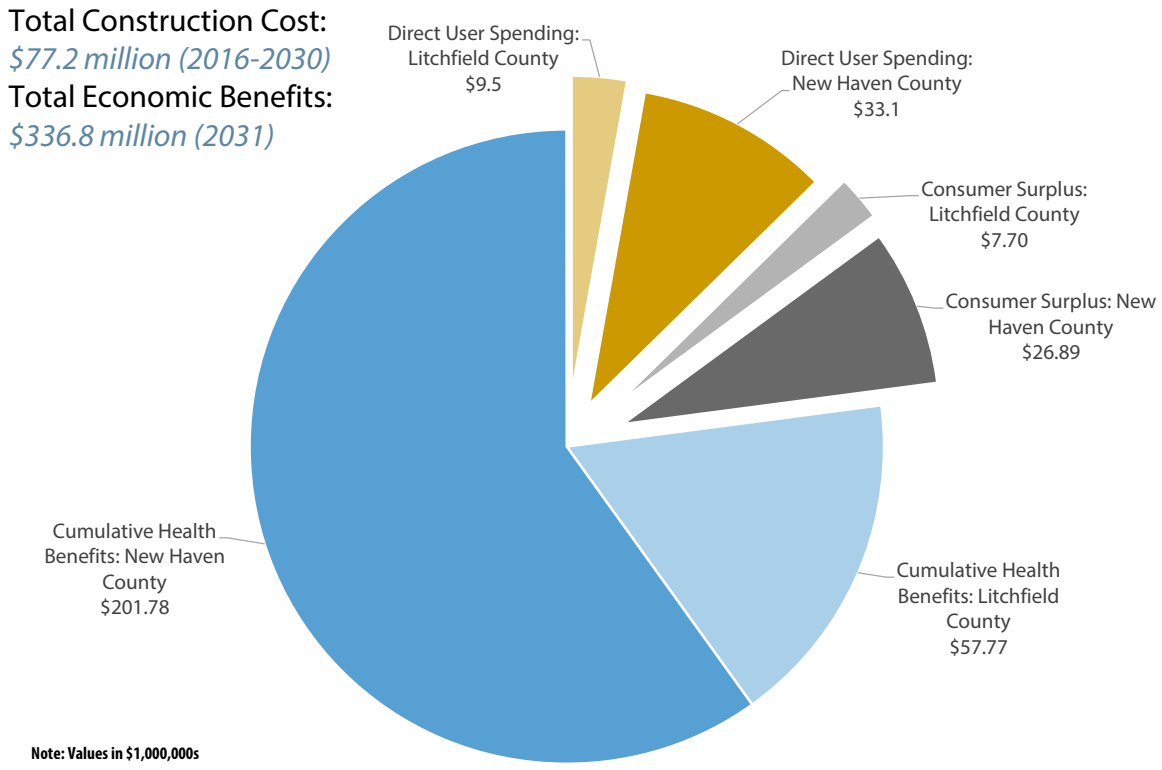


Chart 7: Breakdown of Cumulative Economic Benefits in 2031 by County under the Baseline Scenario



and shows that the investment to construct the trail is significantly returned and exceeded by the monetized benefits. These are the drivers of the subsequent impact analysis.

Direct spending is the combined amount for all users, but as noted above the spending by bicyclists is expected to be particularly strong in later years. However, because no account is taken of the health benefits and consumer surpluses attributable to bicyclists, their economic contributions augment direct spending only.

In 2031, the total economic benefits are estimated at between $336.8 million under the *Baseline* scenario and about $629 million under the current trend scenario. The majority of the benefits would be attributable to monetized improvements to health. The value of improved health for those who frequently use the trail is estimated at $259.6 million, with residents of New Haven County realizing about $201.8 million in health benefits and about $57.8 million attained by Litchfield County residents. These values would be attained under the more conservative *Baseline* scenario. For the *Current Trend* scenario, monetized health benefits are expected to reach $503.3 million in 2031. However, direct spending by trail users on consumables on the day of their visit also yields substantial economic benefits. In 2031 alone direct spending by users is estimated at $42.6 million in the *Baseline* scenario and $82.6 million under the *Current Trend* case. Over the time frame *(2016–2031)* used in the study, trail users will spend a total of about $626.1 million. The total cost to construct the entirety of the NRG as plannd is estimated at just $77.2 million. Comparing this investment to just direct spending yields a benefit-cost (**B:C**) ratio of 4.18 for the very conservative *Baseline* scenario. If trail usage approaches the numbers estimated under the *Current Trend* scenario, direct spending would rise to $1.2 billion over the 2016–2031 time period, resulting in a B:C ratio of 8.11. These B:C ratios suggest a highly cost effective project and an extremely valuable investment. And these ratios do not account for the cumulative health benefits that would accrue to trail users nor the economic benefits *(consumer surplus)* realized by those living in proximity to the trails. When these monetized benefits are considered, the economic returns on that investment far exceed the cost to build and maintain the NRG.

Under the *Accelerated Growth* scenario, usage of the NRG is expected rise exponentially based on the assumption that a longer and more connected trail will attract higher usage and generate significantly high economic benefits. In 2031, based on the projection that trail usage will double over current trends, the total economic benefits are estimated to exceed $1.2 billion, again the primary contributor to this amount is monetized health benefits *(estimated at slightly more than $1 billion in 2031)*.

Clearly, from these data the key contributors to the economic value of the NRG are health benefits, consumer surplus, and direct expenditures by users for goods and services. Health benefits and consumer surplus are amenity values augmenting life and its quality. Even though the health benefits are monetized, the full value of avoiding death also encompasses avoided costs from becoming prematurely ill and hospitalization. Lost time at work and burdens borne by family and other caregivers are also health benefits not directly included in the calculations.

Attaining and maximizing the economic benefits described above will depend greatly on fully investing in trail construction. Increasing the population's awareness of access points to the NRG is also critical to encouraging participation in its safe use and upkeep. The actual distribution of the direct effects among the host communities will differ with the extent to which people utilize the trail with sufficient frequency to avoid health issues and in generating new business to serve those utilizing the NRG. Once it is built citizens will have those opportunities, and as part of this assessment, the CCEA added 10% of the value of annual construction costs for publicity and

promotion of the NRG to facilitate and encourage use of the trail.

Benefits & Strategies for Businesses along Trails

The construction of multiuse trails can provide economic benefits to local businesses through an increased customer base resulting from improving pedestrian and bicycle access, and by drawing customers from outside the immediate area. Trails can also offer new business opportunities by catering to the needs and desires of trail users, for example, the sale of bicycles and accessories, repair services, and refreshments. These benefits have been reported along trails across the country. A 2015 study by the Indiana University Public Policy Institute stated that more than half of businesses near the Indianapolis Cultural Trail saw an increase in customers and 48% reported increased revenues since the trail was built.[87] The report also reported numerous new businesses locating near the trail and increased hiring due to increased business attributed to the trail. In Greenville, South Carolina, most businesses along the Swamp Rabbit Trail reported a 30-to-50 percent increase in sales after the trail opened in 2011, and five businesses that relocated to be closer to the trail reported 30-to-90 percent increases in sales.[88] Similar benefits were noted in a 2015 report about the Great Allegheny Passage Trail, where businesses saw a 41% increase in trail user traffic, and attributed 67% of business expansion to positive impacts from the trail.[89]

These benefits, while conceivable, are not guaranteed. It will not always be the case that "if you build it, they will come". Current and potential business owners along trails need to think strategically about how they can best benefit from trail traffic. The Rails to Trails Conservancy (**RTC**)[90] offers tips taken from discussions with business owners regarding trail user impacts on business. Most recommendations are related to business visibility and accessibility, as well as catering to trail users' needs. Proper signage is crucial to notify those on the trail that businesses are nearby, requiring coordination with trail managers to provide proper wayfinding signage and maps along the trail. RTC also suggests that businesses cater to trail users by offering refreshments, healthy food, bike racks and relevant information available for visitors. They also recommended coordinating with trails groups on special events and advertising, and generally being involved with the trail user community.[91]

Communities that embrace trails and provide amenities and safe connections for trail users can maximize the benefit that local businesses can realize. In order to accentuate business benefits along the Great Allegheny Passage (**GAP**) Trail in Pennsylvania, the Allegheny Trail Alliance authored *Trail Towns: Capturing Trail-Based Tourism, a Guide for Communities in Pennsylvania* in 2005. The guide provides a roadmap for trail communities and businesses to benefit from trail traffic by organizing efforts, developing partnerships, identifying deficiencies and provides tools to help towns evaluate and improve existing amenities and facilities. To date, 13 communities along the

87 Indiana University Public Policy Institute. (2015). *Assessment of the Impact of the Indianapolis Cultural Trail: A Legacy of Gene and Marilyn Glick*. Indianapolis: Indiana University. Retrieved from http://policyinstitute.iu.edu/Uploads/PublicationFiles/15-C02%20CulturalTrail%20Assessment.pdf

88 Reed, J. (2014). *Greenville Health System Swamp Rabbit Trail Year 3 Findings*. Greenville, NC: Furman University. Retrieved from http://greenvillerec.com/wp-content/uploads/2014/12/SRT-Impact-Study-Year-3-Final.pdf

89 Trail Town Program. (2015). *Trail User Survey and Business Survey Report: Great Allegheny Passage March 2015*. Greensburg, PA: Trail Town Program. Retrieved from https://gaptrail.org/system/resources/.../2015-GAP-Report.pdf

90 www.railstotrails.org

91 Lynch, J. (2012, September 27). *How To: Attract Trail Traffic to Your Business. Building Trails*. Retrieved January 25, 2017, from http://www.railstotrails.org/trailblog/2012/september/27/how-to-attract-trail-traffic-to-your-business/

GAP trail have been identified as *Trail Towns*.[92]

Focus groups conducted with stakeholders along the Farmington Canal Heritage Trail as part of this study supported the idea that the trail has had economic benefit, but also reported that there could be drawbacks as well. A focus group that centered on business owners near the FCHT was held on April 5, 2016 in Simsbury, CT. The benefits reported include increased business for bike shops and some businesses that cater to trail users. Participants also reported that realtors were using the trail as a selling point and some businesses might be using the trail to help recruit talent from outside the area. Some drawbacks include drawing business away from other parts of town, especially when there are special events, and the potential for increased taxes to build and maintain the trail. Overall, the focus groups recommended similar approaches to draw trail users that have been suggested for other trails. Several main themes included proper signage, promotion, and connectivity. Participants also recommended improving downtown streetscapes to accommodate trail users, providing public restrooms and other trail user amenities, and engaging with a diverse range of businesses near the trail. More details can be found in the **Appendix**.

Indirect and Induced Economic Impacts

Direct economic impacts require inputs to identify the supply chain in the production of any good or service being consumed or used as an input. As an example, money spent by walkers and bicyclists on meals form part of the direct economic impact. The restaurant preparing those meals must purchase food, consume energy, hire and pay personnel, and expend time, etc. to prepare and serve it, and pay for the facility in which it is served. Additionally, the food may require processing or preservation before it gets to the restaurant. Production of all those goods and services forms the indirect economic impacts. In addition, those producing goods and services for trail use, such as restaurant owners and servers, spend their own incomes. All that additional spending represents the induced impacts.[93] Sequential iterations of those impacts also capture consumption from earnings from previous iterations of induced incomes. Each direct impact has its own supply chain within the economy. The total economic impact is the sum of the direct, indirect, and induced impact.[94]

The CCEA utilizes the REMI model to aggregate the direct, indirect, and induced impacts in order to estimate total economic impacts of the NRG. The analysis determines total impacts for Litchfield and New Haven Counties and for the entire state. *(Note: The smallest geographical unit that REMI can model is the county; therefore, town-level impacts cannot be calculated by REMI.)* State impact estimates generally exceed those for the counties because some economic activity will occur in other parts of the state. Alternatively, locating the NRG with all is amenity values in New Haven and Litchfield Counties may retain some population there that otherwise might have left as well attracted others from elsewhere in the state. These changes to migratory patterns can erode population impacts elsewhere in the state thereby reducing total state impacts relative to the sum of those in New Haven and Litchfield.

92 Allegheny Trail Alliance. (2005). *Trail Towns: Capturing Trail-Based Tourism - A guide for communities in Pennsylvania*. Pittsburgh, PA: Schiff Printing. Retrieved 2 1, 2017, from https://gaptrail.org/assets/TrailTownManual-c7ef7d3de9ff523f6118e3f0868cf946.pdf

93 To avoid double counting, only the value added by each stage of production is additive in the sense of generating economic activity at that point in the production process of inputs into any final good or service.

94 On a technical note, because amenity values are accumulated within the REMI model through lagged variables only the annual increments to amenities enter the model.

The REMI model measures economic activity via the following economic indicators:

- Population;
- Employment;
- Personal income;
- Disposable Personal income;
- Personal income taxes; and,
- Fiscal impacts.

Over the years, annual direct impacts rise in both counties to meet these heights as noted for the low case by way of example. The values are shown in 2015 dollars after converting expenditures to REMI categories. For all but amenities in the last line for each county, **Table 11** describes the amounts by which various direct impacts are incremental to the base case annually, albeit each of the last two five-year periods are stated as annual averages for each quinquennial. The amenities are increment to the year in which they begin to avoid double counting because they are accumulated within the model. These amenities are used as inputs to REMI.

REMI

REMI is a general dynamic equilibrium economic model developed by Regional Economic Models Inc. in Amherst, Massachusetts. It estimates and calculates economic activity at the county level; it is not designed to model economic activity at the local level. Working in tandem with the national economic model from the Regional Seminar of Quantitative Economics and the University of Michigan[95], REMI simulates the county and state economies out to 2050. In doing so it establishes differential rates of growth in income and employment among counties and utilizes them to establish population shifts in response to economic opportunities. Capturing the migratory impacts allows the model to take further account of the changing demands that migrants generate over time for housing and private and public goods and services as part of establishing total economic impacts. *(A more detail description of the REMI model is included in the* **Appendix***.)* Outputs generated by REMI are all incremental to a base case of what would happen without the additional stimulus. Only in flat base cases are incremental impacts additional to the previous year. Thus, if an economy is shrinking or growing, annual incremental impacts are only incremental to the base in the given year. They may exceed or wholly or partially offset year-over-year declines in the base case. *In this sense readers need to be clear on the meaning and context of incremental as not being from the previous year but from the base case of what would have been the state of the economy without the construction and use of the NRG.* Therefore, the economic impacts described and depicted in the following sections and accompanying charts do not represent additive or cumulative effects, but rather the incremental changes in the state and county economies due to the construction of the NRG. To simplify the assessment, the report focuses on the impacts predicted for 2031–the year after the target year for the complete construction of the NRG–and when the corridor would be fully operational and open to the public. Again, the results denote the incremental change over the base case without any investments in and use of the NRG.

95 CCEA remains an active participant in RSQE's annual deliberations. See RSQE, *The Economic Outlook for 2015*, University of Michigan at Ann Arbor, 2016.

Table 11: Annual and Five-Year Average Direct Impacts by County, 2016 through 2031 ($1,000s)

Litchfield County	*2016*	*2017*	*2018*	*2019*	*2020*	*2021*	*Average 2022-26*	*Average 2027-31*
Snack food manufacturing	256	292	292	955	955	2,163	2,163	2,163
Food manufacturing	4,358	4,976	4,976	16,263	16,263	36,839	36,839	36,839
Beverage and tobacco product manufacturing	4,358	4,976	4,976	16,263	16,263	36,839	36,839	36,839
Retail trade	813	928	928	3,034	3,034	6,874	6,874	6,874
Transit and ground passenger transportation	2,905	3,322	3,335	10,809	10,832	24,458	24,670	24,953
Full-service restaurants	527	602	605	1,960	1,964	4,435	4,473	4,525
Limited-service restaurants	527	602	605	1,960	1,964	4,435	4,473	4,525
Motorcycle, bicycle, and parts manufacturing	119	155	199	337	418	672	1,398	2,367
Sporting and athletic goods manufacturing	915	1,053	1,073	3,365	3,401	7,580	7,913	8,357
Civic, social, professional, and similar organizations	18	20	20	67	67	152	152	152
Recreational items	15	17	17	55	55	124	124	124
Highways and streets	195	-	2,347	-	6,029	900	1,158	1,674
Accommodation	15	18	18	57	57	129	130	131
Advertising, public relations, and related services	20	-	235	-	603	90	116	167
Nonresidential maintenance and repair	23	30	39	62	79	121	272	474
Amenities*	31,313	4,440	-	81,103	-	147,854	-	-

New Haven County	*2016*	*2017*	*2018*	*2019*	*2020*	*2021*	*Average 2022-26*	*Average 2027-31*
Snack food manufacturing	1,164	1,495	2,293	3,218	3,848	5,473	5,634	5,926
Food manufacturing	19,826	25,460	39,052	54,821	65,544	93,223	95,964	100,948
Beverage and tobacco product manufacturing	19,826	25,460	39,052	54,821	65,544	93,223	95,964	100,948
Retail trade	3,699	4,750	7,287	10,229	12,230	17,394	17,906	18,835
Transit and ground passenger transportation	13,216	16,980	26,017	36,513	43,704	62,134	64,912	69,494
Full-service restaurants	2,396	3,079	4,718	6,621	7,925	11,267	11,770	12,601
Limited-service restaurants	2,396	3,079	4,718	6,621	7,925	11,267	11,770	12,601
Motorcycle, bicycle, and parts manufacturing	542	727	1,020	1,400	1,840	2,532	5,858	10,302
Sporting and athletic goods manufacturing	3,978	5,122	7,813	10,952	13,171	18,694	20,734	23,708
Civic, social, professional, and similar organizations	82	105	161	226	270	384	395	415
Recreational items	67	86	131	185	221	314	323	340
Highways and streets	2,200	7,457	6,210	3,200	14,580	420	1,034	2,262
Accommodation	70	89	137	192	230	327	342	366
Advertising, public relations, and related services	220	746	621	320	1,458	42	103	226
Nonresidential maintenance and repair	103	138	192	263	349	479	1,171	2,094
Amenities*	142,464	40,482	97,666	113,306	77,055	198,886	6,567	21,685

** All variables but amenities are incremental to the base year. Amenities are for the year in which they initially occur because they are additive within the model. The closest industry to paved trail construction was highway construction so it is used in the simulation. Similarly for "Motorcycle, bicycle and parts manufacturers," albeit the NRG is for strictly non-motorized traffic.*

The following sections are based on three scenarios:

1. *Baseline Scenario:* Current use of the trail is based on trail counts collected by the IR counters installed at the north end of the Derby Greenway at Division Street, the north end of the Beacon Falls trail at South Main Street, and the north end of the Naugatuck trail at Bridge Street; future use of the NRG is assumed to be proportional to miles of trail completed at the outset of each year. Trail use count data was adjusted to better represent the number of individual trips. Because trail counters likely record one person twice: once entering the trail and a second time leaving; the annual use estimates were discounted by 0.5, resulting in two uses equaling one trip. To reach national shares of activities on trails, bicyclists' participation grows exponentially to 2031, at which time both groups usage flattens out. This scenario is conservative because rates of use are expected to expand as sections of the trail are linked. Further, the health and environmental benefits from walking those derived from bicycling are excluded because of lack of sufficient data.
2. *Current Trend Scenario:* This scenario projects future use based on the proportional use per miles of trail completed at the outset of each year, as described for the Baseline Scenario. The difference is the number of trail uses for 2016. In this scenario, annual trail uses are derived by summing the counts from all IR counter installations, including the counts collected by the counters in Torrington and Middlebury. This is considered a moderate approach because use rates are expected to increase as the NRG becomes more complete and interconnected but the use of the trail is based on a less constrained starting point.
3. *Accelerated Growth Scenario:* Building on economic theory, this scenario is more in keeping with experience with other trails. Per mile use rates for walking and jogging activities are expanded exponentially and double by completion of the NRG in 2031. Bicycling would rise even higher as the NRG nears completion in 2031 because the interconnected trail would be more attractive to bicyclists and provide better connections to downtown areas along the trail. This scenario is considered a much more hypothetical and uncertain approach, but it is informative in providing an understanding of what is possible if the entire NRG were built.

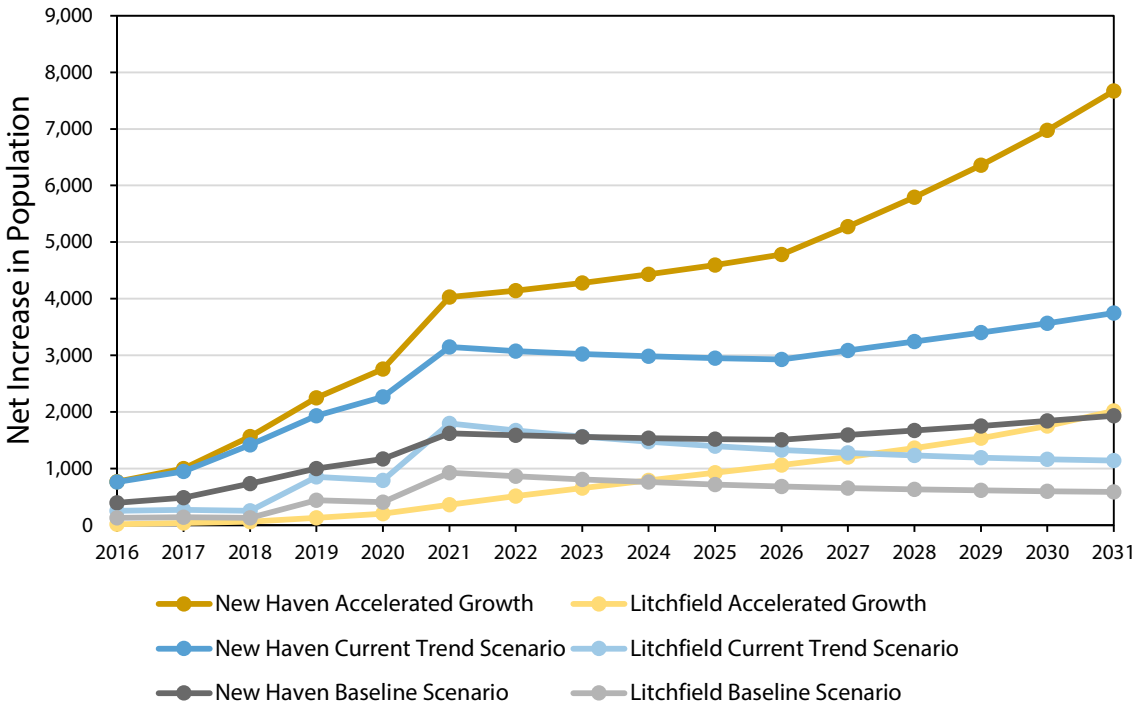
Population

The construction of the NRG is expected to retain and attract new residents to Litchfield and New Haven counties and to Connecticut as a whole because of the extent of the amenities accruing to users and increased incomes from usage of the Greenway. **Chart 8** illustrates the net migration attracted by the construction of the NRG out to 2031.

The model relies on the rate of trail construction as the determinant of net population changes. Under the *Baseline* and *Current Trend* scenarios, the construction of trail segments and the subsequent use of those segments reflects the anticipated construction schedule and current usage rates. This results in lines depicting net population increases being more variable. The *Accelerated Growth* scenario assumes increasing usage rates in response to a more connect and longer trail and explains the peaks in the shape of those trend lines.

Based on current use of the NRG and constant rates of use, Connecticut population impacts peak twice at about 4,800 people in 2021 and a second time in 2031. The first reflects the earlier construction and completion of segments of the NRG in Litchfield County, while the second occurs because of trail construction in New Haven County. At these peaks, the Connecticut impacts are less than the sum of the two counties because of migration within Connecticut. Under the *Accelerated Growth* scenario that assumes usage rates double by 2031, 9,500 people would be retained or attracted to Connecticut. New Haven County population impacts peak at 7,700 people in 2031, while in Litchfield County the peak impact is 2,000 people. Without any further trail construction but with increasing productivity, the initiative's impacts drop off to about two-thirds of their peak population impacts by 2050.

Chart 8: Net Population Impacts in New Haven and Litchfield Counties from NRG Completion by Scenario



Employment

The expected employment impacts follow the same basic patterns as the population trends shown above. Employment growth peaks in 2031 for the *Baseline* scenario with the creation of 1,157 jobs in New Haven County and 258 jobs in Litchfield County. Under the *Accelerated Growth* assumptions, job growth due to the construction of the NRG is projected at 4,586 jobs and 972 jobs in New Haven and Litchfield counties, respectively.

The vast majority of the employment impacts are in the private sector. Job growth in the private sector accounts for about 92.5% of the total estimate of new employment. Minor public sector employment increases occur to maintain the trail and deliver public services to the increased population. The REMI model ensures that public sector revenues rise sufficiently to meet these expenditures with balanced budgets.

Real Gross Domestic Product

Additional employment generates increased incomes in both real and current dollars. Real Gross Domestic Product (**RGDP**) is measured in real or constant 2009 dollars net of any impacts from price changes, in order to eliminate any inflationary influences. Its pattern is similar to that of the previous two charts; however, the trend becomes less regressive after 2031 due to rising productivity through time. The impacts under the *Baseline* and *Current Trend* cases peak in 2031 at $106.2 million and $206 million in New Haven County and $21.7 million and $42 million in Litchfield County. The *Accelerated Growth* scenario increases the RGDP to $421.1 million in New Haven County and $85.8 million in Litchfield County. These results are illustrated in **Chart 10**. To put these high growth rate scenario figures in perspective, at their peak in 2031, increases in RGDP amount to 0.7% of base levels for New Haven County, 0.9% for Litchfield County, and 0.17% for the state.

Chart 9: Net Employment Impacts in New Haven and Litchfield Counties from NRG Completion by Scenario

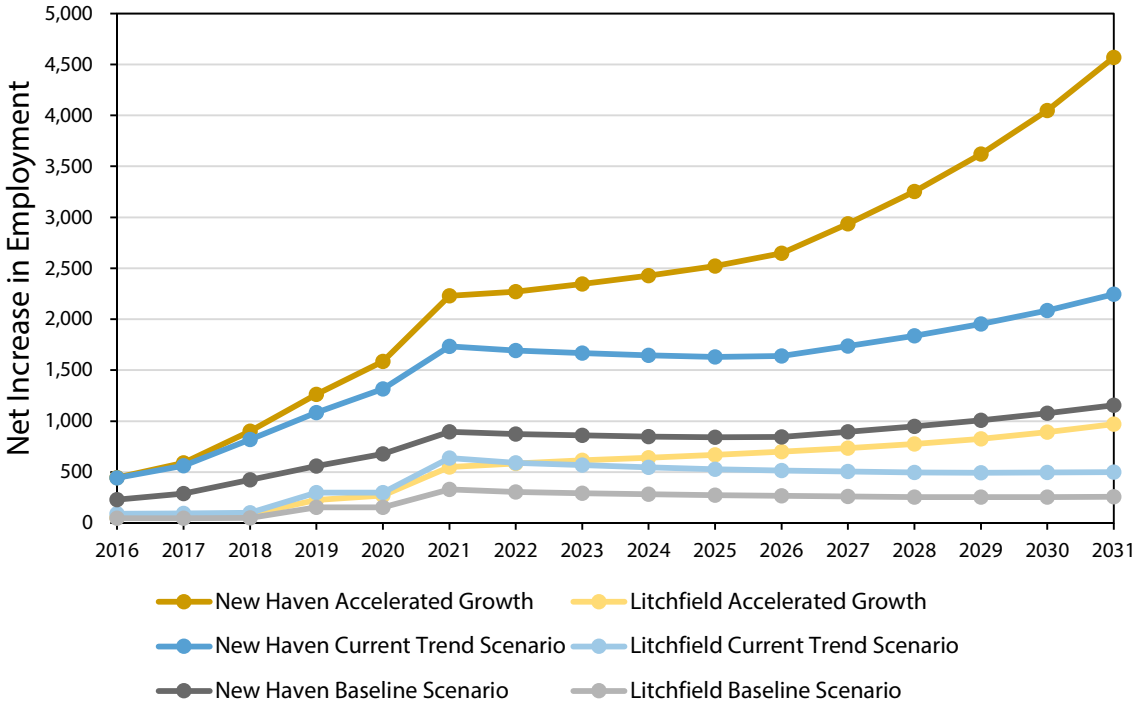
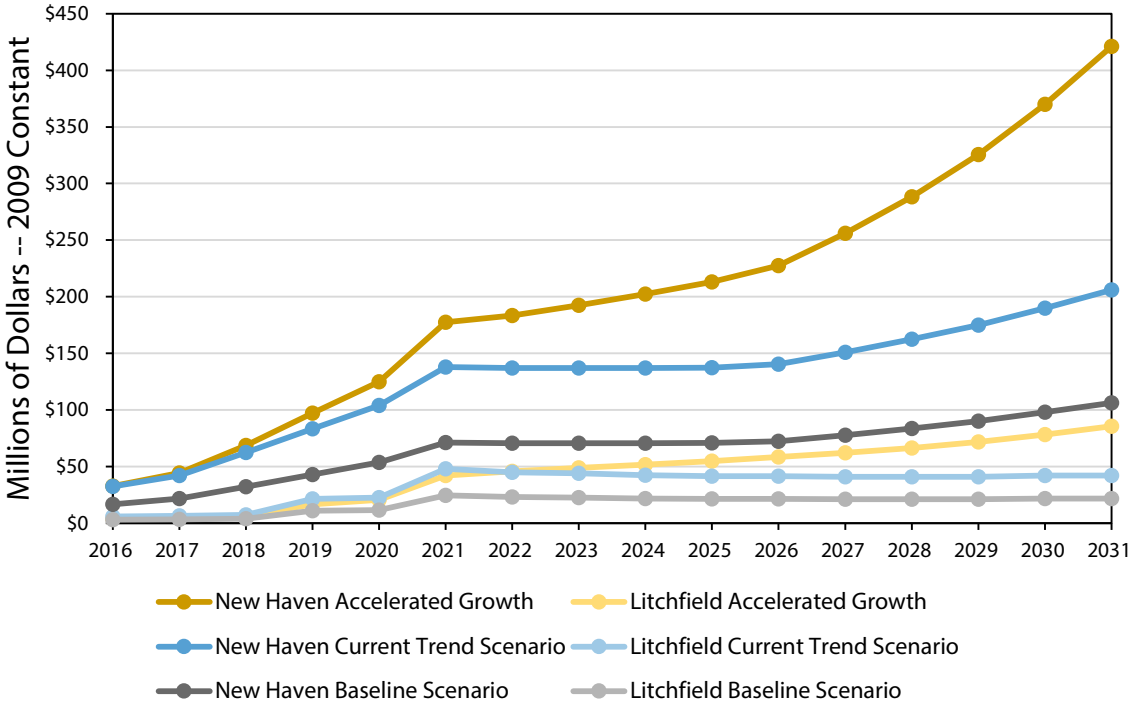


Chart 10: Net Real Gross Domestic Product Impacts in New Haven and Litchfield Counties from Construction of the NRG by Scenario



Personal Income

Personal income is measured in current dollars inclusive of inflation. For that reason, personal income impacts continue to increase after 2031. In 2031, personal income impacts hit $160.4 million in New Haven County and $45.4 million in Litchfield County under the *Baseline* scenario. Under the *Accelerated Growth* scenario, the impacts on personal income for the individual counties reach almost $633.9 million for New Haven County and $168.2 million for Litchfield County. For the *Current Trend* scenario, the county results are more modest at $311 million and $88 million, respectively.

In percentage terms, these gains are small. Even under the *Accelerated Growth* rate scenario, personal income impacts in 2031 add only 0.6% to total New Haven County personal income and 0.7% million for Litchfield County. For the *Baseline* and *Current Trend* scenarios, the county results are more modest at between 0.15% and 0.3% of personal income in New Haven County and between 0.2% and 0.35% for Litchfield County.

Disposable Personal Income

Disposable personal income is calculated by deducting personal income taxes and other minor adjustments from personal income. It is an important performance measure because it captures the additional freedom of choice that consumers gain and the essence of economic growth accruing to citizens. Other than the personal tax rate, which is assumed not to change, growth in disposable personal income is driven by the same forces underpinning personal income covered above.

By 2031, annual personal disposable income impacts, depending on growth scenario, range between $128.9 million and $509.4 million in New Haven County. For Litchfield County, the incremental increases in disposable personal income would amount to $36.9 million in the *Baseline* case, $71.5 million under the *Current Trend* scenario and $134.8 for the *Accelerated Growth* scenario. For Connecticut, the incremental increase climbs to $570.2 million in the *Accelerated Growth* scenario suggesting that the NRG will draw some population from other Connecticut counties into New Haven and Litchfield. These results also demonstrate that the construction and operation of the NRG will substantially increase and empower consumers' choice.

Chart 11: Personal Income Impacts in New Haven and Litchfield Counties from Construction of the NRG by Scenario

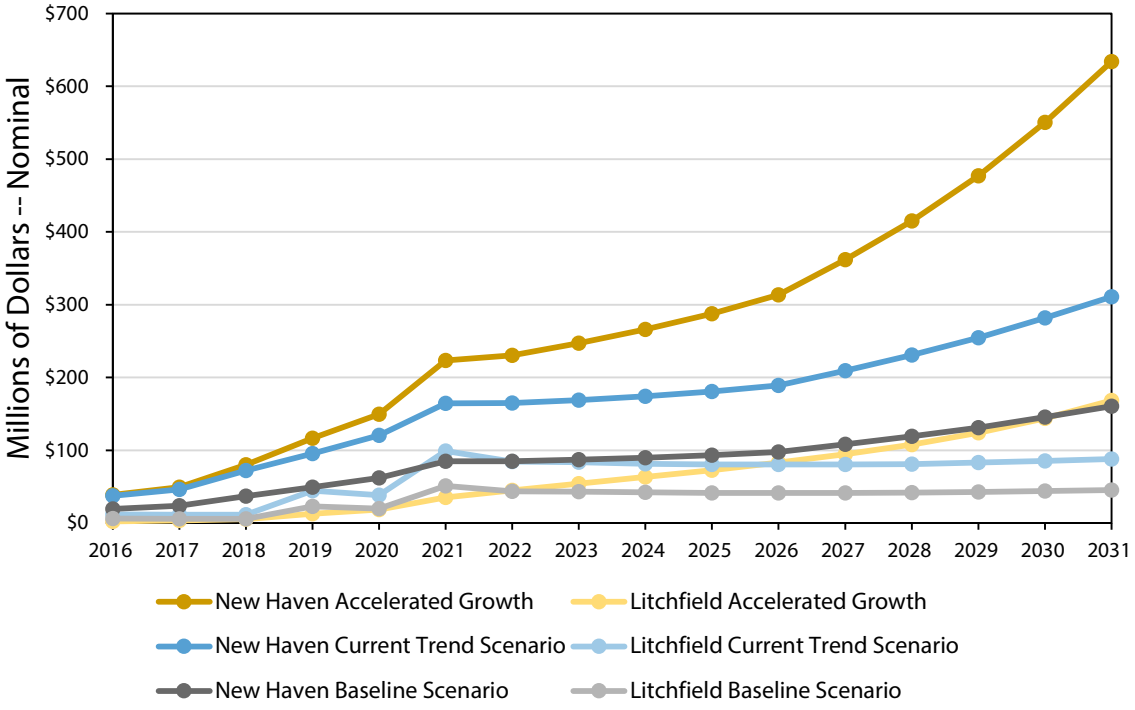
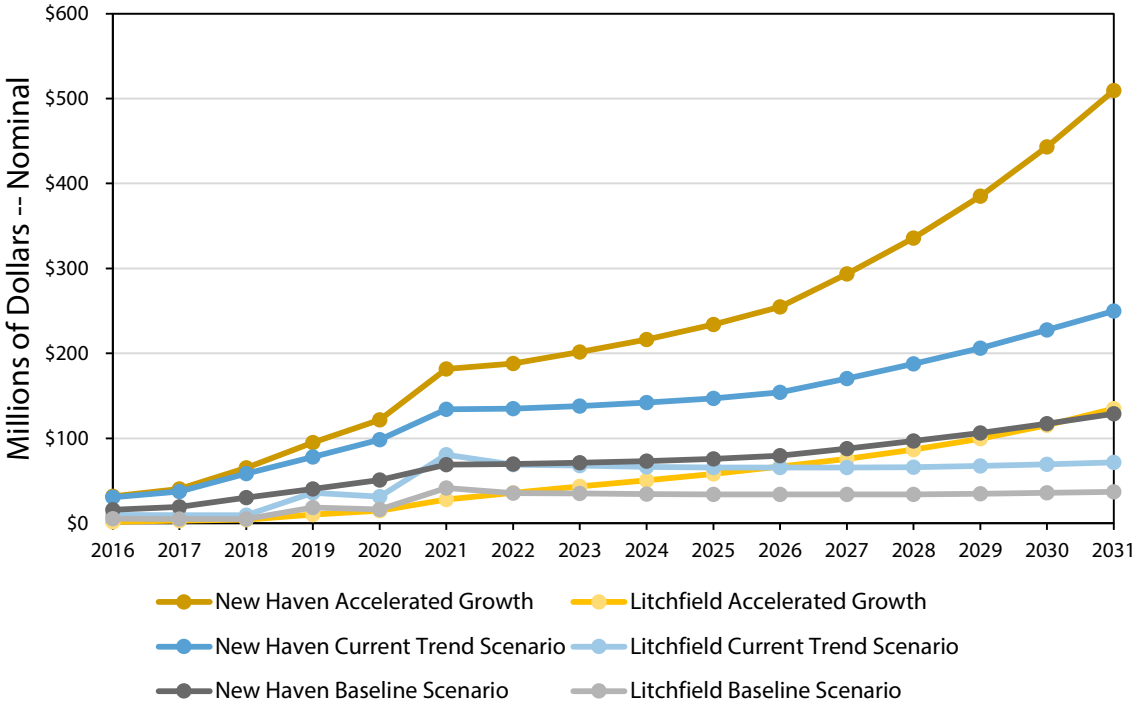


Chart 12: Disposable Personal Income Impacts in New Haven and Litchfield Counties from Construction of the NRG by Scenario



Fiscal Impacts

The REMI model measures aspects of fiscal impacts on all three government levels: local, state, and federal. The projected increases in population, employment and income from constructing the NRG will generate additional personal income tax revenues, as depicted in **Chart 13**. These taxes are shared between the federal and state governments, with the latter receiving about 23% of the total.

The REMI model calculates the personal taxes paid by residents from their home jurisdiction: New Haven County, Litchfield County and Connecticut. The tax data are for the jurisdiction for which they were paid, and do not reflect additional public revenues accrued by the counties. Instead, New Haven and Litchfield counties receive additional revenues from personal income taxes only via transfer payments from the state or the federal governments, not directly.

For New Haven County, the incremental personal taxes that flow out of the county in 2031 would be worth about $31.5 million under the *Baseline* scenario and increase to a value of $61 million in the *Current Trend* case. Based on the *Accelerated Growth* rate scenario, the additional tax generation would amount to $124.5 million. The tax values from Litchfield County would total about $8.5 million, $16.5 million and $33.4 million under the three scenarios. Due to migration within the state, personal income taxes paid throughout the state rise less.

The bottom line is that the federal government, without even accounting for its avoided health care costs of Medicare and Medicaid, is sufficiently remunerated through increases in personal income taxes to cover its contribution to construction of the NRG.

Chart 13: Fiscal Impacts in New Haven and Litchfield Counties from Construction of the NRG by Scenario

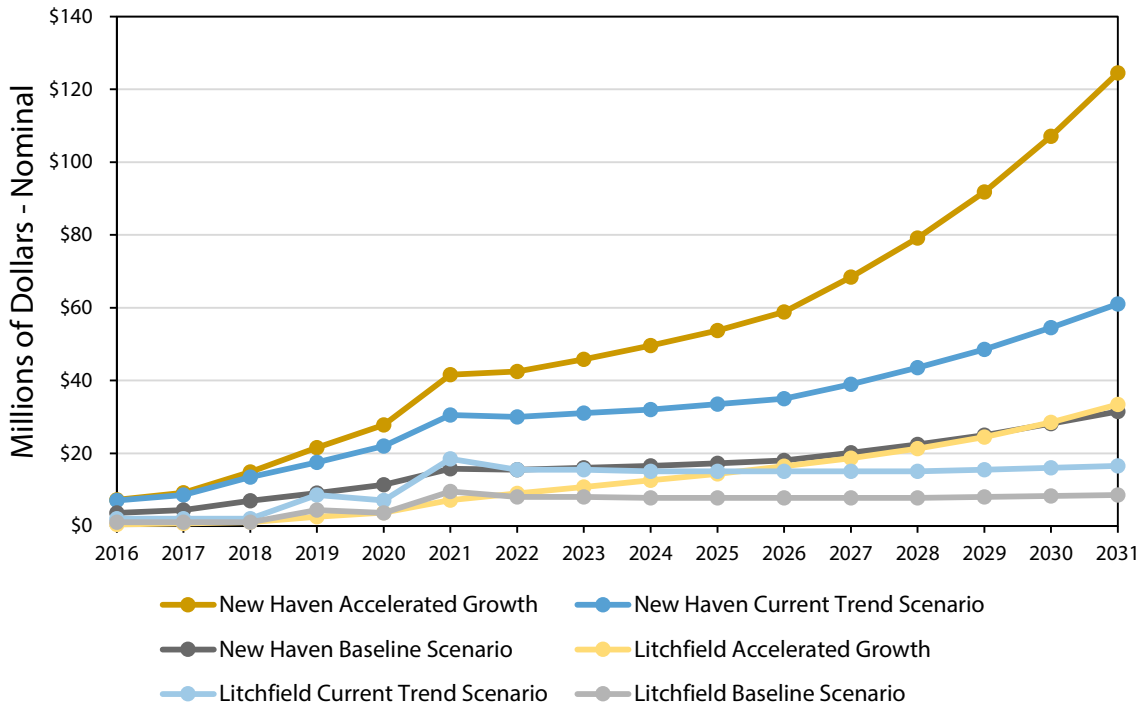
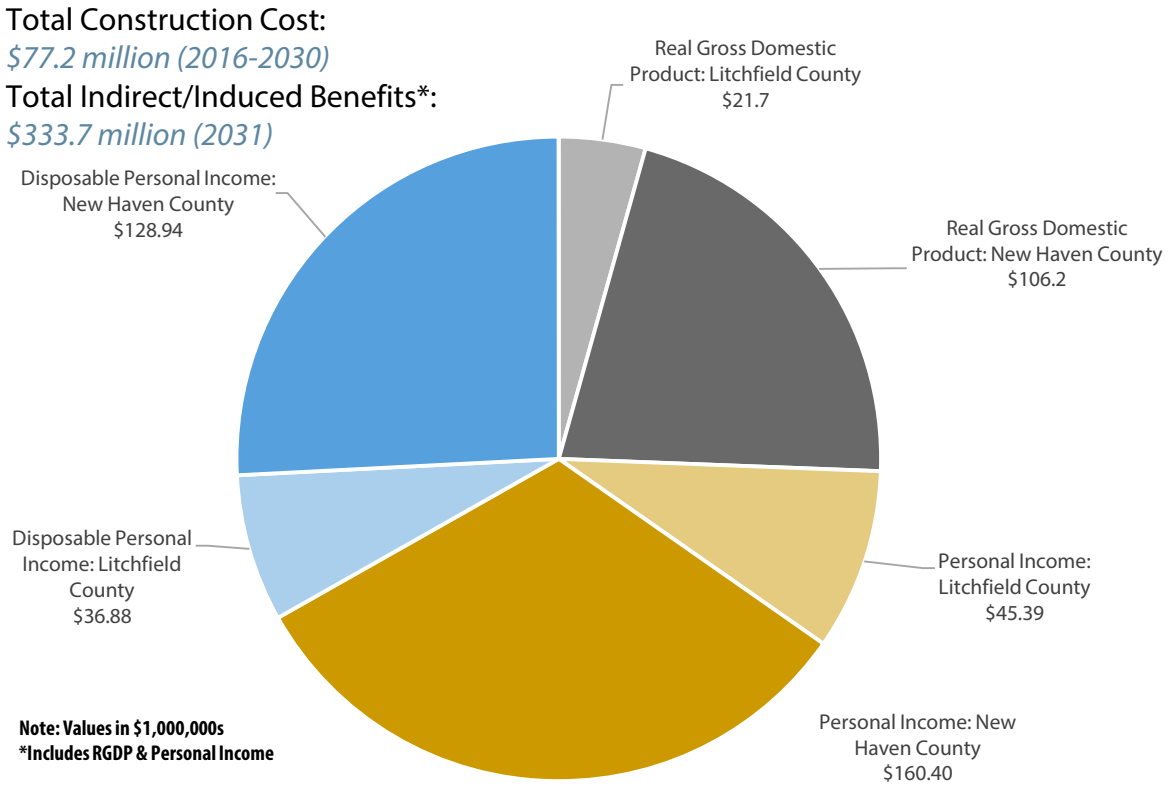


Chart 14: Breakdown of Total Indirect or Induced Benefits in 2031 by County under the Baseline Scenario



Community Impacts

A limitation of the REMI model is that it simulates the economy only at the county level. The communities along the NRG are located in either New Haven County or Litchfield County, with the southern portion of the trail south of Watertown in New Haven County and those north of Waterbury located in Litchfield County. The REMI model was run simultaneously for both counties with each of the counties containing the NRG being impacted. While the model estimates fiscal expenditure it also balances budgets of both local and state governments so that local governments have sufficient funds to meet any incremental expenditures arising from the larger population base attracted by construction and completion of the NRG. The actual local impacts realized in each community will depend critically on the extent to which residents and outsiders use the host community's trail and whether local businesses cater to the needs of trail users. Approaching and after NRG completion, the share of trail users, particularly bicyclists, many of whom will be tourists,[96] is likely to rise so that accommodations will expand in importance.

The extent to which communities will support their sections of the NRG is unknown. However, it is likely the largest local impacts will accrue to the population residing within a half a mile of the trail Currently, about 40,950 people reside within a half mile of the open and planned route of the NRG. This is a distance that is easily accessible to both walkers and bicyclists. The farther residents

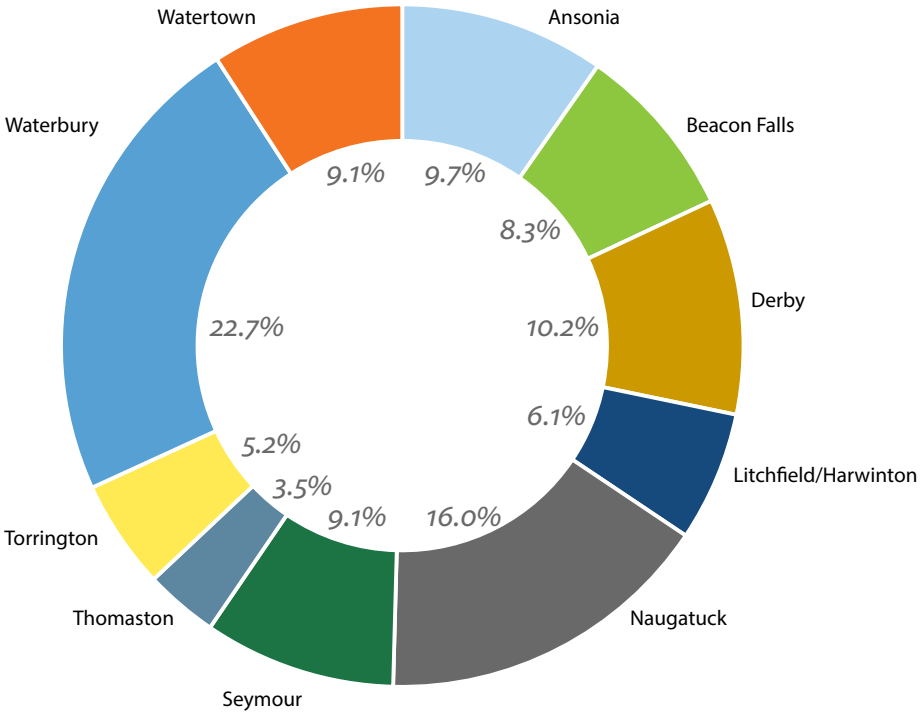
96 The UNWTO deploys three criteria simultaneously in order to characterize a trip as belonging to tourism: "The displacement must be such that it involves a displacement outside the usual environment; Type of purpose: the travel must occur for any purpose different from being remunerated from within the place visited: the previous limits, where tourism was restricted to recreation and visiting family and friends are now expanded to include a vast array of purposes; Duration: only a maximal duration is mentioned, not a minimal. Tourism displacement can be with or without an overnight stay." http://www.tugberkugurlu.com/archive/definintion-of-tourism-unwto-definition-of-tourism-what-is-tourism

live from the trail, the less likely they would be to use the trail as frequently as those who live closer to the trail. And, usage rates would further decline if users need to drive to access the trail. As the trail is completed, settlement patterns may adjust and the number of people in close proximity of the trail can be expected to rise. Therefore, the beneficial impacts are likely to be broadly and increasingly distributed.

Beneficiaries will include those who frequently use the trail, and, therefore, derive direct health benefits, and residents with easy access to the trail, who are more likely to realize consumer surpluses. The value of consumer surplus will be reflected in rising land and home values. Increases in residential land values may be fairly broadly spread among those owning land within about a half a mile of the NRG. Beyond the impacts modelled by REMI, the increase land values will add to the local property tax base and generate incremental increases in municipal revenues. Commercial land values will also be positively impacted due to the increased appeal of locales in the immediate vicinity of the NRG for health clubs, restaurants and accommodations with active scenic vistas. Due to the omission of these improved tax bases from REMI, the results will be more favorable to community financing than covered by REMI.

Currently, the population of the eleven communities through which the NRG passes is about 278,102 people *(2010 Census)*. However, the number of people living within 10 miles of the planned route of the trail increases to about 831,149 people, nearly a quarter of the state's population. About 57% of participants live within one mile of the trail, 27% from between one and five miles, and 5% from between five and ten miles. Since it is reasonable to assume that the closer someone lives to the trail, the more likely they would be to use it and the more often they will use it. The percentage breakdown of persons living within five miles of an open and planned trailhead by municipality is shown in **Chart 15**. Waterbury has the highest proportion of people living within five miles of a trailhead at 22.7%. This is reasonable because it is the largest community along the NRG and, once completed, will be the home to 8.2 miles of the entire trail or roughly 18.6%.

Chart 15: Percent of Population Living within 5 Miles of Open and Future Trailheads

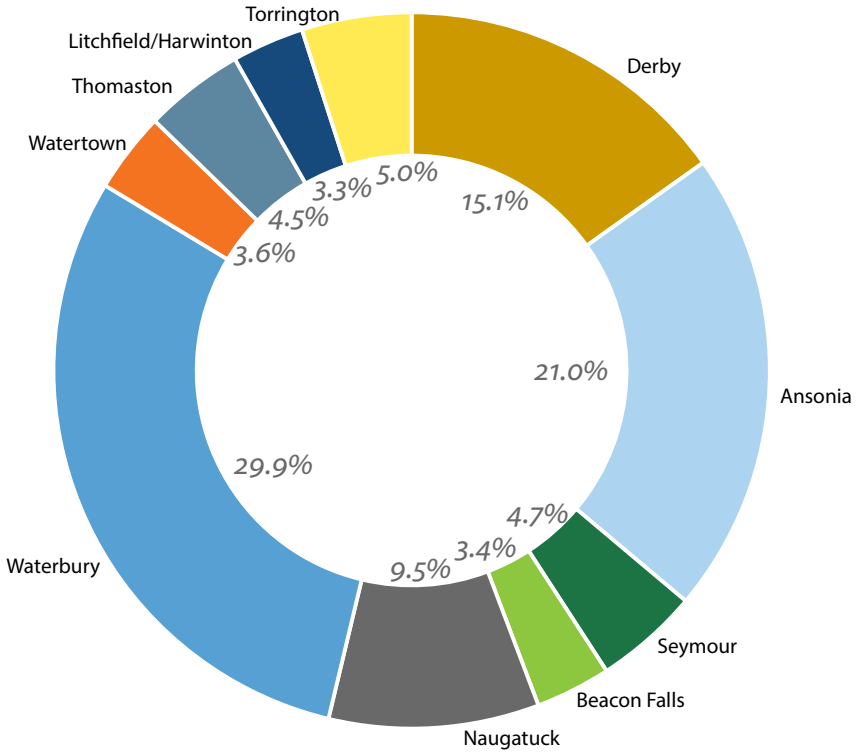


While using the population percentages shown above would provide a rough approximation of the benefits accruing to host communities, the study team assessed which factors were the better predictors of trail use. The method applied multiple regression techniques to develop a trend line to predict trail uses. Interestingly, trail length within a municipality was determined not to be a good predictor of trail use. Instead, the best fit line was based on the population density of the host community and the number of people living within five miles of current trailheads. Because this method used a non-liner approach, population density was raised to a power of two *(that is, squared)*. Although this approach is based on participation by the present residents it does not take into account different mixes of industries among the towns. It does, however, rest on the very important amenity benefits identified earlier in this report. As noted throughout, the distribution of the magnitude of the benefits will depend critically on each town's ability to serve participants–initially primarily walkers–but with growing numbers of bicyclists as the NRG nears completion.

The disaggregation of the county-level data into town-based estimates involved a two-step approach. First the trail use by town was estimated using the regression equation; then a proportional distribution was calculated. These percentages were applied the county-level results to estimate town-by-town estimates. A second step was added to adjust the disaggregated estimates to the county total. That is, the county totals were assumed to be the control value. The percentage breakdowns are shown in **Chart 16**.

The disaggregated economic benefits by town are included in the **Appendix**.

Chart 16: Percentage Breakdowns of Trail Use Based on Regression Analysis



Conclusions

The economic impacts from the completion of the Naugatuck River Greenway, as derived from REMI, surveys, personal accounts and health documents are substantial and far exceed the investment in constructing and maintaining the NRG. The results illustrate how the economies of both Litchfield County and New Haven County would be affected between now *(2016)* when only a few sections are open, and in 2031, when the trail is projected to be completed. Through the use of REMI, the CCEA derived annual economic impacts the completion of the NRG will have on local, state, and federal economies. These are listed and summarized in **Table 12**. The CCEA found that the initial construction costs and annual operating costs would be offset by the positive economic impacts the completed NRG will deliver. The NRG will offer numerous amenities and health benefits, including an increase of home values, and decrease the risk of obesity, diabetes, cardiovascular disease, and some cancers. Furthermore, visiting users will support local businesses and increase revenues for goods and services including: food, snacks, meals, equipment, gear, and possibly in the future accommodations.

These direct expenditures will lead to a number of indirect economic impacts. The construction of the NRG will retain and attract people to the area and create new jobs. This dynamic will in turn positively affect numerous economic factors, such as real GDP. With an increase in employment and personal income, there will be a corresponding increase in personal income taxes paid to the state and federal governments. The federal government will realize a substantial return on its contributions to building the trail, even without accounting for avoided Medicare and Medicaid costs from improved health outcomes. In addition, the completion of the NRG will have an overall positive economic impact on the local, state, and federal economies.

Table 12: Summary Total Economic Impacts in 2031 by County and Growth Scenario

	Baseline Scenario		*Current Trend Scenario*		*Accelerated Growth Scenario*	
Economic Indicator	*Litchfield*	*New Haven*	*Litchfield*	*New Haven*	*Litchfield*	*New Haven*
Population	590	1,933	1,143	3,747	2,017	7,668
Percent Increase	0.30%	0.20%	0.60%	0.40%	1.05%	0.85%
Employment	258	1,157	500	2,244	972	4,568
Percent Increase	0.25%	0.20%	0.50%	0.45%	0.95%	0.85%
RGDP ($1,000,000 2009 Constant)	$21.66	$106.24	$42.00	$311.00	$85.77	$633.88
Percent Increase	0.25%	0.20%	0.45%	0.35%	0.90%	0.70%
Personal Income ($1,000,000 Nominal)	$45.39	$160.40	$88.00	$311.00	$168.20	$633.88
Percent Increase	0.20%	0.15%	0.35%	0.30%	0.70%	0.65%
DPI ($1,000,000 Nominal)	$36.88	$128.94	$71.50	$250.00	$134.81	$509.42
Percent Increase	0.20%	0.15%	0.35%	0.30%	0.70%	0.65%

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South End Buildings, Waterbury

Brownfields Opportunities

Background

Brownfields are properties with known or suspected environmental contamination, the presence of which has hindered investment on site. Some brownfield sites require remediation activities that far exceed the value of the property. In accordance with historic development patterns, many brownfields are located in areas with robust existing infrastructure in close proximity to train stations and densely settled residential neighborhoods. Although more difficult to develop than clean sites, brownfields offer abundant opportunities for infill development and neighborhood revitalization.

Throughout the late nineteenth and early twentieth centuries, land adjacent to the Naugatuck River was fertile for industry due to its relatively flat topography, opportunities for hydroelectric power and, later, access to freight train service. These same characteristics have left a legacy of environmental contamination in and around the river. Due to the legal and financial obstacles that brownfields present to any type of development, constructing a greenway from Torrington to Derby will require proactive collaboration between brownfields officials and the Naugatuck River Greenway Steering Committee. Reimagining these sites by integrating the Naugatuck River Greenway into future developments along the river will continue to improve water quality and will encourage economic vibrancy in our communities.

Environmental Regulation Governing Brownfields

Environmental regulation that affects brownfield properties in Connecticut is shaped by legislation at both the state and federal levels. Most federal environmental statutes are monitored by the U.S. Environmental Protection Agency (**EPA**) and its compliance monitoring programs. These programs were enabled by many pieces of legislation, including those listed below:

- Clean Air Act (**CAA**)
- Comprehensive Environmental Response, Compensation, and Liability Act (**CERCLA**).
- Clean Water Act (**CWA**)
- Federal Insecticide, Fungicide, and Rodenticide Act (**FIFRA**)
- Resource Conservation and Recovery Act (**RCRA**)
- Safe Drinking Water Act (**SDWA**)
- Toxic Substances Control Act (**TSCA**)

In brownfields, TSCA and RCRA are familiar acronyms. The 1976 RCRA is the primary law governing the disposal of solid and hazardous wastes in the United States. According to the EPA, RCRA established programs for managing solid waste, hazardous waste, and underground storage tanks. These programs set criteria for waste disposal, prohibited open dumping of solid waste, established a system of controlling hazardous waste through EPA, and regulated underground storage tanks containing hazardous substances and petroleum. The contemporaneous TSCA

provided EPA authority to regulate chemical substances and mixtures from production through use and disposal *(with the exception of pesticides addressed under FIFRA)*. Common contaminants like PCBs, asbestos, and lead based paint are regulated under TSCA and are subject to the act's compliant remediation practices.

These landmark federal acts completely changed the role the federal government plays in the health of the environment. Through decades of iterating, these acts have been shaped into what is known today to be one of the most important bodies of legislation implemented in the twentieth century. While many good outcomes were witnessed at the national level, the processes and procedures that these laws created did not solve all issues at the local level.

Recognizing the financial and legal burden that contaminated sites present to all levels of government and the private sector alike, the EPA began piloting a brownfields funding program in the mid-1990s. The pilot programs were intended to direct funding to high priority sites identified by municipalities. With community support and input, the funding began a now-twenty-year history of federal investment executed by local governments on sites challenged by known or suspected contamination. In contrast to the superfund site programs conducted under CERCLA, largely led by EPA staff on vast sites with extensive contamination, these programs encouraged ground up collaboration to realize good outcomes on more manageable properties. One such pilot was the Naugatuck Valley Pilot program established in 1996.

While the EPA has the primary role of regulating hazardous substances and chemical contaminants in soils, structures, and water resources, states have enacted their own legislation to fulfill requirements of federal environmental laws and to address environmental concerns specific to their respective regions. As in all U.S. states and territories, Connecticut in 1971 established the Connecticut Department of Environmental Protection (**CT DEP**) to oversee and aid in the implementation of environmental law. The CT DEP was consolidated with the Department of Public Utility Control in 2011 to create the current Connecticut Department of Energy and Environmental Protection (**CT DEEP**).

In addition to federal environmental laws, Connecticut has its own set of regulations governing brownfields. The Remediation Standards Regulations (**RSRs**) set guidelines and standards that may be used at any site to determine if remediation is necessary. While the RSRs alone do not trigger any required actions, Connecticut has enacted legislation surrounding the sale and transfer of contaminated sites that does set mandatory assessment and remediation milestones. Connecticut's property transfer law, commonly known as the *Transfer Act*, applies to sites that qualify as an establishment. An establishment is defined as any site meeting the following criteria stipulated by Connecticut General Statute 22a-134 Section 3):

> *"Establishment" means any real property at which or any business operation from which (A) on or after November 19, 1980, there was generated, except as the result of (i) remediation of polluted soil, groundwater or sediment, or (ii) the removal or abatement of building materials, more than one hundred kilograms of hazardous waste in any one month, (B) hazardous waste generated at a different location was recycled, reclaimed, reused, stored, handled, treated, transported or disposed of, (C) the process of dry cleaning was conducted on or after May 1, 1967, (D) furniture stripping was conducted on or after May 1, 1967, or (E) a vehicle body repair facility was located on or after May 1, 1967;*

More than any other state level brownfield regulation, the Transfer Act has had perhaps the most profound effect on brownfield redevelopment in Connecticut. Since it was signed into law in 1985, the Transfer Act has been modified to address the ground level needs of developers

and municipalities to realize successful remediation and redevelopment projects. CT DEEP and the Connecticut Department of Economic and Community Development (**CT DECD**) work collaboratively to oversee and implement brownfields grants and loans, voluntary remediation programs, and liability relief programs enabled by the legislature.

The Abandoned Brownfield Cleanup (**ABC**) program, for example, provides liability relief and allows Transfer Act sites with limited existing environmental conditions to enter into an expedited environmental closure process. This program ensures environmental remedial management and safety while providing banks and developers more certainty and fewer administrative requirements stipulated in the original Transfer Act. In the past, many brownfield sites subject to the Transfer Act required massive investments in time and resources from the public and private sectors. Programs like the ABC make brownfields more feasible sites for all types of redevelopment projects, small and large.

Despite these programs, contaminated properties often remain expensive to remediate. Many sites cost more to remediate than their worth, presenting very real financial obstacles to development. Currently, funding for brownfield sites is limited and highly competitive both at the state and federal level. Additionally, the legal complications related to ownership of these sites and the liability that ownership precipitates has led to continued abandonment and negligence.

Reimagining Brownfields through the RBP

In order to meet the challenges present on brownfield sites, the NVCOG hosts the Regional Brownfields Partnership (**RBP**). The RBP grew out of the Naugatuck Valley Brownfields Pilot program established by the EPA pilot funding round in 1996. Since then, the RBP has expanded to encompass 27 eligible cities and towns in west central Connecticut. The RBP is geographically diverse, representing a collection of historic downtowns, neighborhood centers, and surrounding suburban and rural communities from Torrington to Shelton north to south and Newtown to Southington west to east.

Technical Assistance Available through the RBP

At the request of a dues paying municipal member of the RBP, the NVCOG brownfields team may conduct initial site investigations for any given property address at no additional cost. Such work may include researching past assessments conducted on the site, reviewing any files available through CT DEEP, and meeting with local chief elected officials and staff. The process is guided by a context specific approach to each site. There are a number of physical, legal, and historical characteristics that affect how a brownfield property might move through the assessment, cleanup, and redevelopment process. These include site ownership, location, historical use, current use, past assessment history, history of transfer, water resources on or adjacent to the site, and more. If a site appears to be a good candidate for further assistance, NVCOG staff will discuss a strategy for bringing the site through the brownfields process. Additional assistance may be completed through a negotiated maximum fee to the municipality attached to a scope of services, billed on an as needed basis. Services include but are not limited to preparation of grant applications, preparation of liability relief applications, project management, and strategy development.

Over the last two decades, NVCOG staff have been involved in hundreds of brownfield site inquiries.

Funding Opportunities Available through the RBP

As a service to members of the RBP, NVCOG has secured federal funding to assess and cleanup brownfield sites in our region. Over the past decade, NVCOG has managed more than $2.6 million in federal brownfields funding awarded and administered by EPA. Through redevelopment projects led by chief elected officials and aided by state and federal partners, this funding has leveraged more than $76 million in additional federal, state, municipal, and private investment. There are three federal resources available through NVCOG and directly to municipalities:

- *EPA Revolving Loan Fund*: The EPA's Revolving Loan Fund (**RLF**) program allows NVCOG to issue grants and loans to municipalities, economic development agencies, and developers. These funds may be used for cleanup activities on eligible sites. The NVCOG was awarded $427,000 in supplemental RLF Funding FY 2016. All funding is committed at this time, however, additional funding may be made available as previous private borrowers make loan payments.
- *EPA Assessment Grants*: This funding may be used to develop environmental information for a site in order to better understand existing conditions. Data is leveraged to develop cleanup strategies with the ultimate goal of remediation and reuse. Most recently *(FY 2016)*, NVCOG was awarded a highly competitive $400,000 assessment grant. An RFQ process will be conducted in October 2016 to select a shortlist of firms that will conduct environmental assessment activities. Municipalities will be solicited for additional assessment project proposals in the coming months.
- *EPA Cleanup Grants*: Municipalities may request up to $200,000 in cleanup funding per parcel. Funding rounds are highly competitive and generally released on an annual basis. Cleanup funding must target sites with well-defined and immediately actionable remediation and redevelopment goals. NVCOG may assist a municipal application to EPA cleanup funding.

In addition to grants offered by EPA, Connecticut offers brownfield funding assistance through the DECD's Office of Brownfield Remediation and Development, described below:

- *CT DECD Office of Brownfield Remediation and Redevelopment Municipal Grant Program*: DECD grants provide funding for a range of cleanup activities and associated costs, including but not limited to abatement, assessment, demolition, and remediation. NVCOG may apply to DECD grant funding rounds on behalf of a municipality or assist in the development of a grant.

Data into Action

In July 2015, NVCOG brownfields staff began assembling a comprehensive brownfields inventory. Announced and released as part of the 2016 NVCOG Annual Report, the NVCOG Brownfields Inventory is a collection of data on brownfield properties located within the 27 municipality region of the RBP. Properties included in the inventory are those with existing environmental information in the NVCOG brownfields library in addition to those that have received state and federal brownfields funding through CT DEEP, CT DECD, and EPA.

As of October 2016, there are 157 parcels in the NVCOG Brownfields Inventory. Staff identified brownfield sites that may be considered for future development of the Naugatuck River Greenway. Twenty-two of the 157 total parcels in the inventory have boundaries within 250 feet

of the Naugatuck River. In addition to these parcels, NVCOG may review sites listed within the CT DEEP List of Contaminated or Potentially Contaminated Sites. The criteria for this list is broader. Understanding the potential risks and opportunities for each of these parcels if not already listed within NVCOG's Brownfields Inventory will require more research. The PDF provided by CT DEEP is easily searched for specific property addresses.[97]

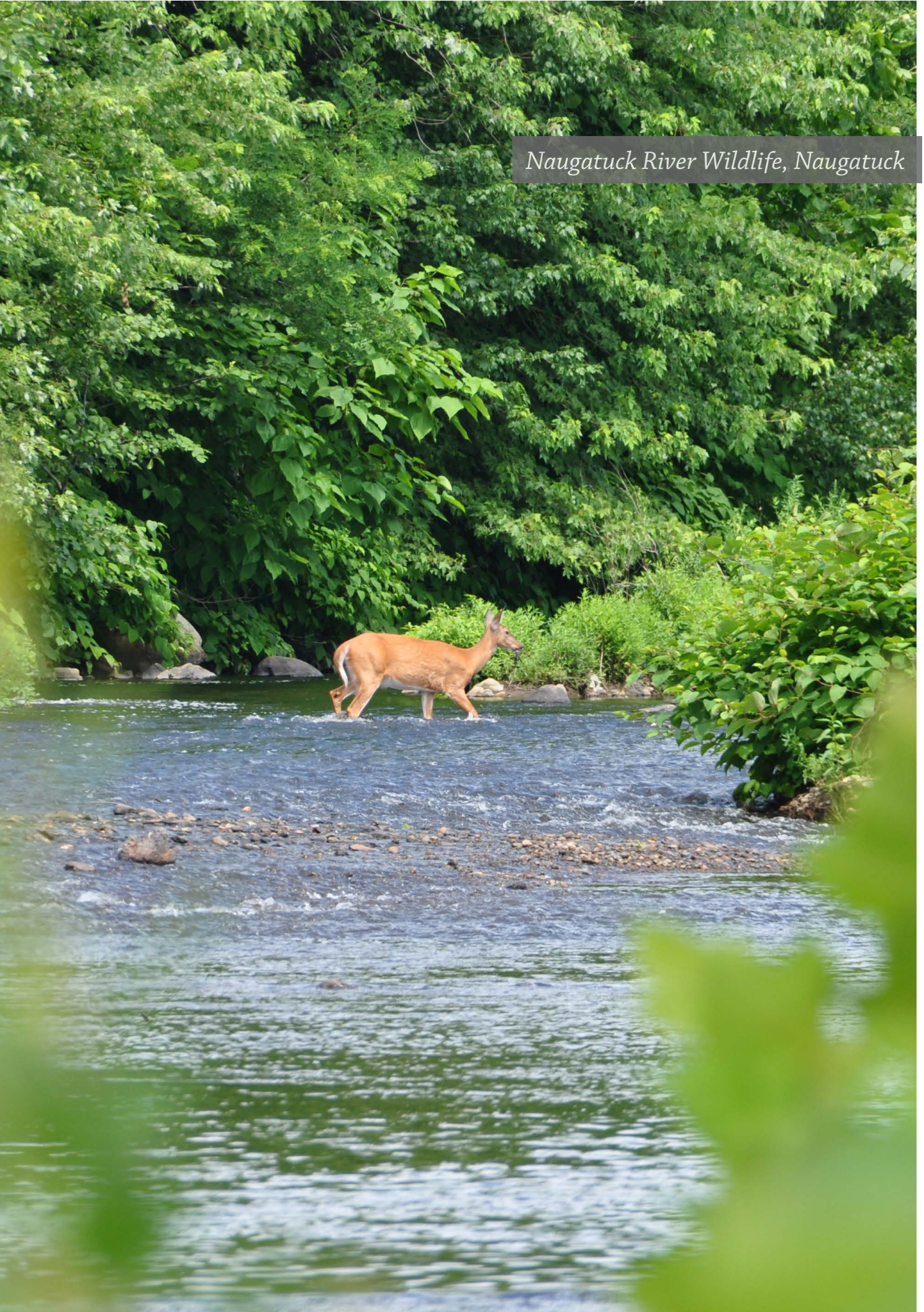
The NVCOG brownfields team may be of assistance to municipalities as Naugatuck River Greenway projects move forward. Routing studies should leverage the information available from the NVCOG to inform feasible routing alternatives. Knowing what it will take to remediate a site is critically important. NVCOG works with environmental professionals to identify appropriate remediation strategies and to estimate these costs. This information is critical to developing working plans for remediation and redevelopment for all projects. The NVCOG brownfields team understands greenway projects improve quality of life and catalyze development. Constructing remaining portions of the Naugatuck River Greenway will add value to current brownfield sites and spur further investment nearby. In the effort to reimagine and revitalize land along the Naugatuck River, redeveloping brownfields and constructing the greenway should be made a symbiotic process with each step reinforcing the other. The NVCOG brownfields team will work with the Naugatuck River Greenway Steering Committee to realize the Naugatuck River Greenway as a network of gathering places throughout the cities and towns of the Naugatuck River Valley.

The economic benefits presented in this report depend critically on the assumed increase in trail uses by walkers and bicyclists, and are based on the trail being completed and well publicized. Under the current rate scenario, use of the NRG will be at a constant level based on the number of uses recorded today. The high growth rate scenario is based on the expectation that, as the trail expands and offers an enhanced experience, use of the trail will not remain at a constant rate, but will increase exponentially and double by the time the NRG is fully constructed. However, critical to capturing the amenity benefits will be enhancing and increasing participation and use on the NRG. Trail counts show that the longer the trail and the better the access, the more people use the trail. Therefore, the most important factor in increasing use is construction of the entire planned trail. While it is being built, increased participation can be achieved through expanded health awareness, signage, and advertising, including public-private hosting of community oriented events on it.

Similar trail expansions nearby would normally reduce the relative attractiveness of the NRG and the Naugatuck Valley as a place reside thereby eroding some of the benefits captured above. That threat could be offset if the combined trails expansions were complementary in the sense being able to jointly attract more tourists than they could separately.

The following recommendations are based on the comments and suggestions received from the focus group portion of this study which involved stakeholders from along a similar nearby trail, the Farmington Canal Heritage Trail. Recommendation statements derived from that study are organized into the following general categories: promotion, safety, amenities, demonstrating value, trail maintenance, community and business engagement, and trail planning and routing. A limited number of quotes are provided here as examples. Full data is available in the full report in the **Appendix**.

97 http://www.ct.gov/deep/cwp/view.asp?a=2715&q=325018&depNav_GID=1626



Naugatuck River Wildlife, Naugatuck

Recommendations

Promotion

- Use environmental education to increase appreciation for the outdoors
- Develop events to promote trail use

  "It's about promoting [the trail] and doing events that would get people out there using it."

  "I'm sure there are youth groups of some kinds in the neighborhoods, if you build youth events around use of the trail and environmental projects, those people will keep using the trails and make users feel safer. You get the youth involved early on I'm sure there's a way we can make the whole trail feel good for people..."
- Consider using social media
- Create a consistent brand including frequent and standardized signage
- Get more people using the trail to increase safety

  "As you get more and more and more people on the trail it becomes self-policing. So not only do you have much less crime or no crime, in the case of the vast majority of the trail system that I know of, you get less graffiti, you get less kids kicking in fence rails, all of the stuff that traditionally we used to have in abundance 15 years ago is almost all gone because there's so many people using the trail that it is in fact self-policing"

  "Again the best solution is getting more people on the trail and more eyes on the trail."
- Develop citizen/volunteer patrol programs
- Engage public safety officials in using trails
- Be attentive to traffic safety issues
- Provide a way for users to locate themselves in case of emergency

  "We painted mile markers into the trail, so that if you're reporting to the police department or maintenance you can locate it."

  "The medallion either gives you the exact mileage from a specific point, or in some cases it's a color, but whatever it is that's important"
- Consider emergency access points
- Ensure cell phone access

Amenities

- The three B's: bike racks, benches and bathrooms
- Develop good traffic signage and crosswalks
- Maps and consistent way finding signage are essential
  "We have kiosks, information kiosks, along the trail that not only, we contribute particularly to the installation of those but we also keep them up. The advocacy groups keep those the information those up to date- maps notices and so forth. "

  "We started with way finding signage. Eventually we'll get municipal signage, library this way, town hall that way. Eventually we will move into commercial signage. But you have to be really careful doing that. We don't want to make your trail to look like Las Vegas."
- Ensure adequate parking at trail access points
- Adjust downtown streetscapes to accommodate Greenway participants

Demonstrating Value

- Collect data about trail use (all statements related to this topic can be found separately in the section on collecting data and measuring impact).
- Educate leaders, planners, economic developers and citizens about how the trail impacts your community

  "And that's a big part of becoming a bicycle-friendly community ...not only attracting residents to town but attracting businesses. Quality of life is important to the younger generation coming in. They want places where they can walk and bike and maybe commute to work three or four miles. That's an enormous part of that whole initiative- it isn't just about kids in school now, its about the businesses."
- Look for low-cost, high visibility projects

Trail Maintenance

- Use technology like SeeClickFix to get the right information to the right people
- Create a plan and budget for maintenance from the start

  "Definitely have the maintenance people at the table while the design is going through, so you can fix these maintenance issues beforehand." "Have the public safety at the table at the beginning for all of the natural resources or conditions involved, and then they can plan for their budgets." "Involve the police early. They need sightlines so they can see into certain parts of the trail, and they need appropriate access to the trail. Most of that isn't necessary during the day, but at night."
- Know who your users are and plan for winter maintenance
- Engage volunteers in maintaining the trail
- Choose materials that are graffiti resistant

Community & Business Engagement

- Find champions, involve community groups and get them to take ownership

  "One is that you have mavens in the community that will stir the pot a lot and keep everything moving. You have to have those dedicated volunteers to make everything work. If you don't it won't."

  "And if all of the communities that abut that trail start their bicycle-friendly community activity now, set up a committee, start learning what it really takes to become a bike friendly community, and start assembling a collection of people who have very diverse skill sets or instance. For instance, real estate, public works engineer, someone in marketing, someone that's tied into the economic development commission so that you start getting all of these brains working in the same direction. The police, the board of education, businesses..."

- Engage a diverse range of businesses and create ways to connect them to the trail

  "The businesses have to be supportive and be supported. You can't keep coming to the business and asking for donations if you're not getting, like putting up a little sign that says "restaurants this way."

  "But the trail wouldn't be successful if the businesses weren't supporting the people to get repeat customers. So the businesses have to rally around it and so forth. Because the repeat businesses ...and over the past three years over the summer time a lot of it is repeat business."

  "But getting business on board earlier, we didn't do that, because we were just learning ourselves about how to build a bicycle friendly community. We were focusing on the low hanging fruit. And I think that in hindsight if we were to start all over again knowing what we know now, we would. I hate to use the word propaganda, but a lot of times people need to hear things two or three times before they connect the dots."

  Involve schools and young people

  "... we now have bicycles in the PE programs in the school. We've also trained 100 high school kids last year and 85 the year before for programs in the summer. So it takes off ...The growth has been phenomenal."

- Integrate the trail into other community planning efforts from the beginning

  "Finally our public works people are they are so connected to complete streets no they have bought into the concept...every new project they are looking at through complete streets policy eyes. And we should have done that so much longer ago."

- Collaborate with neighboring communities on cost sharing and to create consistency in signage
- Build a culture of support for the trail in your community

  "At the end of the day, it's part of the network in this community that's just critical. It's not just the trail. And that's I think what's coming through here. I'm a big picture guy. It's the river. It's the quality of the community which is critical."

- Be patient and go slow

- Look to other communities and trails as examples
- Use the trail to stimulate innovative ideas

Trail Planning and Routing

- Create a destination and an enjoyable experience for users
- Create safe routes for local users from the trail to neighborhoods, transit points and community amenities

  "Finding safe routes for people to the town center is the key." "The connectivity between bike and transit is becoming more and more important."

  "It isn't just the old school concept of the linear park, but it's an alternative transportation corridor. You can actually get from one place to another, to the store, on your bike or by walking. And that's the other huge issue here is that if you're talking about multimodal connectivity this would be part of it."
- Make accommodations for trees
- Mitigate user conflicts
- Make accommodations for water and drainage issues
- Integrate the trail with parks and playgrounds to increase use

  "The other thing I've seen that helps with young families is the Rotary Park here. So as you think about the greenway ...are there plans for parks and playscapes along the way as another family attraction? "

  "It's the integration of playgrounds, the integration of the town maintenance staff, ... It's the integration of businesses..."
- Consider costs and benefits of paved or stone dust trails and consistency of surface
- Look to other communities and trails as example
- Use the trail to stimulate innovative ideas

Many of the recommendations provided in this section are reinforced by the Surgeon General's Report which establishes five goals promoting health, of which three are related to generating positive publicity:

- Design communities that make it safe and easy to walk for people of all ages and abilities:
- Design and maintain streets and sidewalks so that walking is safe and easy;
- Design communities that support safe and easy places for people to walk;
- Promote programs and policies to support walking where people live, learn, work, and play:
- Promote programs and policies that make it easy for students to walk before, during, and after school;
- Promote worksite programs and policies that support walking and walkability;
- Promote community programs and policies that make it safe and easy for residents to walk;
- Provide information to encourage walking and improve walkability:
- Educate people about the benefits of safe walking and places to walk;
- Develop effective and consistent messages and engage the media to promote walking and walkability; and,
- Educate relevant professionals on how to promote walking and walkability through their profession.[98]

98 Op cit. Surgeon General pp. 33-42.

Naugatuck River Wildlife

Funding Opportunities

To realize the economic benefits presented in this analysis, the host communities will have to make a substantial investment in the construction of planned sections. In total, the NRG is estimated to cost an additional $77.2 million to complete. Funding trails locally can work in some communities and local funding does offer some advantages: less stringent design standards and regulatory requirements of local funds, as compared to state or federal funds. Local control of the design and construction are usually reflected in lower costs and shorter project completion times. However, with high projected construction costs, municipalities may not be able to commit 100% local funds to building NRG sections; often communities are hard pressed to obtain the 20% match of federal funds for these projects. Therefore, funding is likely to come from a variety of sources.

The following summarizes the current funding programs that may be used to implement multi-use trail projects. Funds need to be accumulated for all aspects of trail development, from concept planning, design, property acquisition (if needed) and construction. While the state and federal government have greatly increased the funding levels for non-traditional transportation projects, the amount of funds available to construct multi-use trails remains very limited, highly competitive and insufficient to meet all of the needs of communities wanting to build trail systems. However, as presented throughout this assessment, the investment in trails returns substantial benefits, in terms economic measures, improved health, and better quality of life, that far exceed the direct costs incurred by the communities.

State Programs

The state of Connecticut recognized the funding needs for bicycle and pedestrian programs and included bicycle and pedestrian trails as a priority in the CTDOT's long term goals for transforming the transportation infrastructure in the state, including:

- Completion of gaps in the regional trail system; and
- Establishment of a program to support walkability and pedestrian urban centers.

Specifically, the 25-year vision for transportation improvements calls for:

- A $30.0 million investment to maintain, in a state of good repair, the statewide regional trail network by funding $1.2 million per year for 25 years for trail maintenance. The program will leverage other funding sources for trail construction and help address a longstanding issue of deferred maintenance.
- Implementing a new program to implement pedestrian and bicycle improvements in urban centers. The program would be funded at $10.0 million per year for 25 years to help construct sidewalks and on and off-road bike improvements in the State's urban centers making them more walkable, livable, and safe. The focus will be on creating networks of bicycle and pedestrian mobility and access.

- Completing gaps in the statewide regional trail network, including the spine of the East Coast Greenway and major regional trail systems. Completing gaps in the statewide and regional trail system enhances opportunities for recreation, as well as providing transportation options for non-motorists. The program would be funded at $10.0 million per year for 25 years.
- A $250 million investment to construct a multi-use, recreational trail along the Merritt Parkway (Route 15) from the New York state line to the Housatonic River.

These goals and actions are highlighted in the CTDOT's report: *LET'S GO CT! Connecticut's Bold Vision for a Transportation Future*, February 2015.

To realize this vision, the CTDOT must work with the state legislature and Bond Commission to authorize these programs. As part of the state's 5-year ramp-up of transportation investments, two programs have been initiated and partially funded. The state also funds a recreational trails program that, in 2015, supplanted the National Recreational Trails Program administered by the Federal Highway Administration.

Community Connectivity Program

The program is administered through CTDOT and provides funds to municipalities for various projects and initiatives that enhance safety, mobility and access for bicyclists, pedestrians and persons with disabilities. The intent of the program is to make community centers more bicycle friendly, walkable, safe, livable, and prosperous. The program will help pay for various improvements such as the construction of sidewalks, pedestrian crossings, intersection improvements, ADA accommodations, bike lanes, sharrows, signage, and roadway safety audits, as well as, other measures. As part of the CTDOT's ramp-up, $3.2 million was authorized in 2016. The CTDOT plans to expand the program to an annual program amount of about $10 million per year on average.

Multipurpose Trails Program

The program is administered through CTDOT and focused on closing gaps in the State's major trail corridors, as well as, addressing a longstanding issue of deferred trail maintenance. The program will allow for the strategic infill of the state's prioritized trail network, including the spine of the East Coast Greenway and other major regional trail systems. State funds will be used to leverage other funding sources for trail construction. As part of the CTDOT's ramp-up, $7.7 million was authorized in 2016. The CTDOT plans to expand the program to total $56.0 over the next five years.

Connecticut Recreational Trails Program

The program is administered through the Connecticut Department of Energy and Environmental Protection (**CTDEEP**) and provides funds to private nonprofit organizations, municipalities, state departments and tribal governments. Program funds can be used for the following activities:

- Planning, design and construction of new trails (motorized and non-motorized);
- Maintenance and restoration of existing trails (motorized and non-motorized);
- Access to trails by persons with disabilities;
- Purchase and lease of trail construction and maintenance equipment;

- Acquisition of land or easements for a trail, or for trail corridors; and
- Operation of educational programs to promote safety and environmental protection as related to recreational trails.

Project proposals and applications are solicited on an annual basis, and awards, pending the availability of funds, are made based on a competitive selection process. A 20% local match of the grant amount is required, but it can be in the form of in-kind services.

Other State Funding Opportunities

In addition to the above bicycle and pedestrian focused programs, there are several other state programs that, while not specifically bicycle and pedestrian programs, include transportation alternative projects as eligible for funding:

Local Transportation Capital Improvement Program

The Local Transportation Capital Improvement Program (**LOTCIP**) program was authorized under Section 74 of Public Act 13-239 and allocates State funds for capital improvements to local roads that would be eligible for funding under the federal-aid highway program. The program is administered through the Councils of Governments (**COGs**). The COGs are responsible for soliciting project proposals from their member municipalities, reviewing applications, and ranking and setting regional priorities. The program requires the municipal sponsor to fund the design phase, but the acquisition of any right-of-way and construction of the project are 100% state funded. Because of these funding arrangements, the LOTCIP program is expected to entail fewer constraints and requirements, thereby, streamlining project delivery and limiting costs.

Because the LOTCIP program mirrors the federal aid program in terms of project eligibility, bicycle and pedestrian projects can be implemented under the program. The one caveat is that the total LOTCIP funds allocated to all multi-use trail projects in a region are expected to be limited to a reasonable level. In other words, while there is no explicit cap on the use of LOTCIP funds for transportation alternative projects, the COGs are expected to allocate most of the LOTCIP funds to road projects and restrict the expenditure of LOTCIP funds to a few high priority transportation alternative projects.

Urban Action Bonds

The State Bond Commission has the power, under Section 4-66c of Connecticut General Statutes, to authorize the issuance of bonds for economic development, community conservation and quality-of-life capital projects for localities that are determined to be eligible. For the purposes of this statute, eligible municipality means a municipality which is economically distressed, classified as an urban center, classified as a public investment community or in which the State Bond Commission determines that the project in question will help revitalize the community.

Small Town Economic Assistance Program

The Small Town Economic Assistance Program (**STEAP**) is authorized under Section 4-66g of Connecticut General Statutes and funds economic development, community conservation and quality-of-life capital projects for localities that are ineligible to receive Urban Action *(CGS Section 4-66c)* bonds. This program is managed by the Office of Policy and Management, and the grants are administered by various state agencies.

Federal Programs

The US Department of Transportation (**USDOT**) promotes safe, comfortable and convenient walking and bicycle for people of all ages and abilities. Federal transportation acts provide funding assistance under various program to states to implement a wide range of improvements to the surface transportation network. Bicycle facilities, including bike lanes on roads, paved shoulders on roads for bicycle use, recreational trails, road diets, signed bicycle routes, multi-use trails, and trail bridges, are eligible for funding under all major federal aid programs.

In December, 2015, the Fixing America's Surface Transportation (**FAST**) Act was signed into law and replaced the previous federal transportation act (**MAP-21**). The FAST Act authorizes federal spending for transportation improvements over the next five years through the end of Federal Fiscal Year 2020 (September 30, 2020). The FAST Act replaced the stand-alone Transportation Alternatives Program that was authorized in the MAP-21 Act with a set-aside of funds under the Surface Transportation Block Grant (**STBG**) program. The project eligibility and program requirements were unchanged. The FAST Act maintained bicycle and pedestrian project eligibility in the other federal aid transportation programs.

Surface Transportation Block Grant Program

The Surface Transportation Block Grant (**STBG**) program provides flexible funding that may be used by States and localities for projects to preserve and improve the conditions and performance on any Federal-aid highway, bridge and tunnel, including bridges on any public road, pedestrian and bicycle infrastructure, and transit capital projects, including intercity bus terminals. Program funds are allocated to states as a lump sum but divided by statutory percentages to apportioned programs. About half of STBG funds are sub-allocated to urbanized areas based on their relative population, referred to as the STBG: Urban program, and the other 50% of the STBG funds can be used anywhere in the state, referred to as the STBG: Anywhere program. Before these drawdowns are made, funds are set-aside for Transportation Alternatives (see below). The MAP-21 Act added "recreational trails projects" as eligible activities under the STP and TAP programs. This eligibility was continued in the FAST Act; therefore, it is not required to demonstrate a transportation purpose in order to be eligible for STBG funds.

Transportation Alternatives Set-Aside Program

The FAST Act eliminated the Transportation Alternatives Program (**TAP**), originally authorized in MAP-21, as a stand-alone program and replaced it as a set-aside of STBG program funding. These set-aside funds can be used to implement all projects and activities that were previously eligible under TAP. Eligible activities encompass a variety of smaller-scale transportation projects, such as pedestrian and bicycle facilities, recreational trails, safe routes to school projects, community improvements, such as historic preservation and vegetation management, and environmental mitigation related to stormwater and habitat connectivity. Fifty percent of the TAP set-aside funds are sub-allocated to urbanized areas, with larger UZAs (greater than 200,000 in population) authorized to select projects. For smaller urbanized areas, project selection rests with the state. The remaining set-aside funds can be allocated to anywhere in the state; however, the state has the ability to flex up to 50% of the set-aside funds to the STBG: Anywhere program. In all cases, a competitive selection process is required.

Congestion Mitigation and Air Quality Program

The FAST Act continued the Congestion Mitigation and Air Quality (**CMAQ**) program to provide a flexible funding source to State and local governments for transportation projects and programs to help meet the requirements of the Clean Air Act. Funding is available to reduce congestion and improve air quality for areas that do not meet the National Ambient Air Quality Standards (**NAAQS**) for ozone, carbon monoxide, or particulate matter *(nonattainment areas)* and for former nonattainment areas that are now in compliance *(maintenance areas)*. CMAQ program funds may be used for bicycle and pedestrian activities, including constructing bicycle and pedestrian facilities *(paths, bike racks, support facilities, etc.)* that are not exclusively recreational and reduce vehicle trips. This requirement is different from the STBG program. Multi-use trail projects funded under CMAQ are required to demonstrate that they are primarily intended to provide a transportation function. In addition, these projects must also demonstrate that reductions in air pollutant emissions will result.

National Highway Performance Program

The National Highway Performance Program (**NHHP**) provides funds for improvements to highways included on the National Highway System (**NHS**). Under MAP-21 the NHS was enhanced to include: interstate highways, other expressways and all principal arterials. The NHPP was continued under the FAST Act. Bicycle projects funded under the NHPP must benefit an NHS corridor.

FTA Section 5307 Capital Program

The Federal Transit Administration apportions funds under the Section 5307 Capital Program to designated recipients for public transportation capital and planning projects. Bicycle and pedestrian projects funded under this program must provide access to transit and, for a bicycle project, must be within a three-mile radius of a transit stop or station. If the project is beyond a three-mile radius, it must be within a distance that people could be expected to safely and conveniently bike to use to the particular station. For pedestrian projects, the distance criterion is ½ mile. Examples of eligible bicycle activities, include creating defined or dedicated bicycle routes to transit, installing bike racks and shelters at stations, and providing equipment for public transportation vehicles. Transit-related bicycle projects require only a 10% non-federal share.

Innovative Financing

USDOT permits the use of innovative financing techniques supplement and leverage available federal aid dollars. Section 323 of the National Highway System Designation Act of 1995 included provisions for innovative financing techniques that allow donated funds, material and services, the value of land donated by private individuals and companies for the right-of-way, and the value of the construction of sections of the trail completed without federal participation to be used as the non-federal matching share. Typically, the local sponsor is required to provide a 20% match of federal aid funds. The Innovative Financing techniques can provide a credit for the non-traditional funding sources as the non-federal match to federal funds.

An example of this approach to funding a multi-use trails is the Pequonnock River Trail (**PRT**) through the towns of Monroe and Trumbull and the city of Bridgeport. Implementation and construction of the PRT has been funded mainly by federal aid funds authorized under USDOT programs, supplemented by state grants. Because of the availability of local cash to match the

federal assistance, a variety of non-traditional funding sources were obtained to leverage the federal funds and an *Innovative Financing Plan* (**IFP**) was developed for the trail project.

The IFP was based on establishing a single federal aid project for the entire Pequonnock River Trail. This approach allowed any non-federal expenditures on the various sections to be accounted and credited as part of an overall project instead of separate projects for individual sections. It also stipulated that any credits designated in the IFP can be allocated to match future federal allocations for the design and construction of remaining sections of the trail, as the funds become available, regardless of town-specific locations. The following non-traditional sources were used to leverage federal funds:

- The value of a donated, defined permanent easement through an office park in Monroe was credited to the non-federal match requirement. The private developer of the office park donated a defined, permanent 25-foot easement with the right to build and maintain a multi-use trail through development.
- In addition to the value of the donated easement, the private developer constructed the section through the office. The work was completed without federal participation and the value of the construction was credited to the non-federal match requirement.
- The Town of Trumbull constructed the section of the trail through Twin Brooks Park without federal participation, using primarily town forces. The value of this construction was credited to the non-feral match requirement. Work included excavating and grading, labor, material and equipment. The value of the work was credited at $492,000.

Combined, the value of these non-traditional sources leveraged the federal funds to construct other sections of the trail, including an approximate one-mile section in lower Trumbull and 1.1 mile section in Bridgeport. The IFP authorized the value of the work completed in Monroe to be used as the non-federal match for the new project sections in Trumbull and Bridgeport.

Funding Open Trail Sections

Currently, four sections of the NRG have been constructed and are open to the public: Derby Greenway, Ansonia Riverwalk, Beacon Falls and Naugatuck Greenway. And, one section (the Seymour Linear Park and Greenway) will be constructed during the spring of 2017. All five sections were funded under a federal-aid transportation program, with 80% of the costs reimbursed by the federal program and 20% paid by the municipal sponsor.

Derby Greenway

The Derby Greenway, which was the first completed section of the Naugatuck River Greenway, had its beginnings in a proposed Housatonic Riverbelt Greenway by the Housatonic Valley Association (**HVA**) in 1992. The Olde Birmingham Business Association was a driving force in efforts to create the greenway and began to work with the HVA on the plan to align the Housatonic Riverbelt Greenway through Derby's downtown. At the same time, another major grassroots community planning effort was underway that was looking at all aspects of quality of life in the Valley called *Healthy Valley 2000*. Because of the flood control walls that line the Naugatuck River and the existence of O'Sullivan's Island, the idea of developing a greenway at the juncture of the Housatonic and Naugatuck Rivers was suggested by several members of that group.

The use of the flood control walls presented a unique opportunity to construct a greenway because the right-of-way was already under public ownership and the top of the walls was already

being used by walkers and joggers and was wide enough to accommodate a 10-foot wide trail. To determine the feasibility of constructing a paved trail on the top of the flood walls, a study was commissioned. The findings of the study concluded that a trail could be built as long as the integrity of the walls was maintained.

The City of Derby, under then Mayor Marc Garofalo, applied for funding under the federal Transportation Enhancement Program and initiated the project. A critical complication, however, was the presence the Waterbury branch rail line (**WBL**) and the Maybrook rail freight line and the need to cross the tracks. To cross the WBL, a short tunnel was created under the tracks at a site of an existing bridge. The tunnel was needed to protect trail users from the open rail bridge. The crossing of the Maybrook line required to construction of a large overpass of the tracks, with long approach ramps to maintain a shallow grade. A third constricting point was at the crossing under Route 34. The road is elevated over the WBL tracks, and, to avoid a steep grade to Route 34 and then a crossing of the highway, it was decided to align the trail next to the tracks. To separate the trail and tracks, a wall was built.

In the second phase of its development, Derby also moved to develop the entrances to the Greenway as special landmarks. At the Division Street side, a 100-year-old fountain was restored and it was surrounded with a beautiful plaza that now includes the Derby Hall of Fame. Bricks were sold to the public to raise funds and build a relationship with those who bought the bricks as memorials to family members and special events. Benches were also added and again the public had the opportunity to purchase memorial plaques on the benches.

At the Main Street entrance to the trail, two historic water wheels were salvaged from one of the old factories being demolished along Main Street and placed at the entrance as a reminder of the industrial heyday of the center of town. That area will be developed into a more formal plaza as part of the major widening and reconstruction of Main Street. A new project is being initiated to renovate and rehabilitate the Derby-Shelton Bridge to create a pedestrian plaza and cycle-track. The new facilities will be connected and integrated into the Derby Greenway. The project is being funded in part by a $2 million state bond, with the remainder of the construction costs being financed by federal transportation dollars.

Middlebury Greenway

Completed in 2000, the Middlebury Greenway extends 4.4 miles east to west parallel to Route 64 from near the Woodbury town line to Route 63 near the Waterbury city line. The trail follows the route of a trolley bed that was in use by The Connecticut Company trolley line between 1908 to the 1930s, carrying passengers between Waterbury and Woodbury, and stopping at the popular Lake Quassapaug amusement park and resort area. Planning the development of a recreational trail along the old trolley route first began in 1985 and advocated by First Selectman Edward St. John. A greenway committee was formed, working first on public outreach and education. Early on, there was some public apprehension about the idea, and public outreach was critical to gain support from residents.

Since the trolley right of way had been inactive for over fifty years, ownership of much of the line had reverted back to adjacent property owners. Because of the number of parcels involved, there were some issues gaining permissions and easements to use the trolley bed for the greenway. While most easements were given willingly, eminent domain was used to acquire a few properties and the town purchased two properties to allow the construction of some critical trail features.

Middlebury obtained funding through the federal Intermodal Surface Transportation Efficiency Act (**ISTEA**) under the Transportation Enhancements (**TE**) program. The federal aid funds were

and used to purchase materials for the construction of the trail, with the town's engineering department designing most of the trail and its public works department personnel building it. Some of the more sensitive or difficult sections were designed by a consultant with local funding, including areas where the trail was in close proximity to Route 64 and where a tunnel was used to carry the trail under Route 188. In these sensitive or complex areas, the CTDOT required additional engineering that the town was not able to provide.

The trail was designated an official Connecticut Greenway by the CT Greenways Council in 2002. There has been interest in Woodbury to continue the trail along the trolley bed, through newly acquired open space to US Route 6 in the town's center. Middlebury is currently investigating an extension of the greenway along Route 63, and a redesign of Exit 17 on I-84 by CTDOT will include a greenway extension along a new service road to Chase Parkway in Waterbury. First Selectman St. John maintains that the greenway has been one of the most popular projects he has worked on. Despite early opposition to the project, the heavily used trail has been almost universally embraced by residents since it was completed.

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