



The Pennsylvania Housing Research Center

Project Plan

July 2015 – June 2016

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Preface

Each year, the Pennsylvania Housing Research Center (PHRC) seeks to identify and prioritize a series of projects that collectively satisfy the following criteria. Projects should:

- meet the residential construction industry needs and the needs of the housing consumer in Pennsylvania;
- be consistent with the mission and goals of the PHRC;
- be affordable and feasible, given the resources available and the prevailing constraints on time, expertise, and facilities; and
- be a balanced program of projects that address both the long- and the short-term needs of all sections of the industry.

This PHRC project plan is the result of assistance and input from numerous groups and individuals. The PHRC Industry Advisory Council (IAC), in particular, has responsibility for the final choice of activities. This housing industry-based body consists of builders, developers, manufacturers, suppliers, remodelers, design professionals, industry associations as well as building code organizations and state agencies.

On April 2, 2015 the IAC met to discuss over 30 potential projects for the PHRC to pursue. After a thorough discourse, the members of the IAC voted on projects they felt were the highest priority for the industry. This voting resulted in a prioritization of projects. The high-priority projects are included in this plan. The IAC Land Development Subcommittee met via conference call on April, 23, 2015 to discuss and prioritize land development topics. The land development related projects are included in this project plan.

Unless otherwise noted, the projects contained in this plan are anticipated to start July 1, 2015, and be completed on or before June 30, 2016.

The list of projects that follows identifies only those projects that are to receive funds provided to the PHRC by the Commonwealth of Pennsylvania. The PHRC attempts to use Commonwealth funding to leverage outside support; in other cases the work is considered important enough to warrant full state support. It should also be recognized that the PHRC undertakes additional projects that do not receive any of these funds and are therefore not listed in this plan.

Please note that with the collection of monies under Act 157 of 2006, there is not an accurate estimate of the exact amounts of funding available during this period. Because of this, the current plan only considers funds in-hand, funds collected from July 2014 to June 2015 (and the final quarter from April 2015-June 2015 is estimated from previous quarters within the current fiscal year).

The PHRC plans projects and allocates funds at the start of each year. However, there is a real need for the PHRC to be able to take on special projects during the year. These projects typically fall into two categories: the first includes short term and limited scope projects that are

time sensitive, while the second requires the ability to allocate some funds to leverage additional outside funds in response to requests for proposals.

In June of 2015, at the time of the development of the PHRC Project Plan for the fiscal year of July 2015 to June 2016, there is a piece of legislation in the Pennsylvania General Assembly that would amend Act 157 of 2006 and could potentially change the allocations of funds collected through the permit fees. A reallocation of permit fee monies would reduce the funds available for PHRC projects. The PHRC may need to adjust the proposed projects or the registration fees for programs to accommodate changes in funding.

At the writing of this report in June 2015, the Uniform Construction Code Review and Advisory Council has voted to adopt 16 provisions of the 2015 ICC codes in Pennsylvania. Updates to programs to reflect these new provisions can be made as part of the existing projects to maintain and update programs. If there is a legislative change to the UCC, then the proposed projects in this plan will need to be adjusted to allow for staff time to be refocused on the development of code-based training programs as needed.

PART I - Training, Technical Assistance & Outreach

The PHRC has a mandate to transfer knowledge by providing the necessary training and education to the wide variety of groups that make up the housing industry. The projects that are described below are in response to the recommendations from the PHRC's Industry Advisory Council and reflect the current needs within the housing industry.

A. Program Development

The PHRC will develop or update the following training programs. These programs will address issues challenging the residential construction industry (builders, developers, remodelers, building code officials, design professionals, materials suppliers, etc.). During this period the following programs will be developed.

1. Existing Program Update & Maintenance

Description: Some of the PHRC's existing training programs are starting to show their age and technology, as well as educational pedagogy, have progressed quite a bit since the early programs were first developed. This project will involve an organized effort to give the most-delivered existing programs a face lift. Much of the focus in the update will be to improve the photos in programs, incorporate more photos or videos as appropriate, and expand active learning exercises to increase learner participation and knowledge retention. This project will also include the beginning of a focused effort to provide more training programs online.

Manager/PI: B. Heitzmann

2. HVAC Design and Installation

Description: As new home construction introduces tighter and more efficient wall assemblies, the need for design and installation of efficient HVAC equipment is essential. With this flexible program, we will work with industry HVAC experts in creating a full day HVAC design and installation class which can also be delivered in two, half-day sessions, or one full-day session. This will be a two-year project with the focus of the 2015-2016 being on the design portion. Outside content experts will be consulted for assistance in development and final program review.

Manager/PI: C. Hine

3. Update of Existing Deck Program

Description: Based on a 2012 NAHB statistic, 26% of new single family homes are constructed with decks (roughly 5,000). This does not include decks constructed after the certificate of occupancy has been issued. With that being said, the review of code compliant residential wood deck design and construction is vital to the safety of consumers and builders alike. This project will review and update the existing PHRC Residential Deck Program to include up-to-date requirements along with incorporating critical details.

Manager/PI: C. Hine

4. Moisture Considerations in Residential Building Enclosures Program

Description: The PHRC currently offers a Building Envelope Design and IECC Code Compliance workshop that analyzes some of the fundamental building science concepts and the effect they have on code requirements for residential construction. This full-day workshop will take a deeper look at the design of building assemblies including foundation, wall, floor, and roof assemblies as they relate to moisture. This workshop will focus, in-depth, on concepts such as water resistive barriers, vapor retarders, and rainscreen cladding systems. This workshop will be primarily marketed to design professionals including engineers and architects.

Manager/PI: B. Wolfgang

5. Update to Existing Exterior Rigid Foam Program

Description: The PHRC has previously developed a half-day exterior rigid foam workshop that was piloted but did not gain traction. As the industry and above-code programs continue to focus on the reduction of thermal bridging, it is timely to expand this program to a full day workshop by adding content related to building science, updated code provisions, and new products and technologies. This workshop will also focus on details developed by the PHRC related to penetrations through exterior rigid foam.

Manager/PI: B. Heitzmann

6. Training Needs Assessment for the Modular Industry

Description Modular homes are both an important part of the housing stock in Pennsylvania and a major export commodity out of the state. There is a strong need for training within this sector of the industry in Pennsylvania. The project will include working with stakeholders to determine the keys topics for training and the best methods for delivery.

Manager/PI: K. Blansett

7. Deck Details – Expansion of Mockup-based Training

Description: Over the past year, the Mockup Training series has been delivered to over 250 people across the state of Pennsylvania through speaker engagements, conference invitations, association board meetings and industry leading corporate meetings. These programs have reached everyone in the industry profession from builders, code officials, architects, engineers and sub-contractors from all trades. We will continue the expansion of our mockup training series by developing a one-hour design/construction program, which will include code compliant requirements along with best practice guidelines from the American Wood Council’s document DCA-6 (Design for Code Acceptance, Prescriptive Residential Wood Construction Guide). It will also include development of a mockup for visual aid and generation of critical details to populate the Details that Work detail book.

Manager/PI: C. Hine

8. Stormwater Regulations Training for Municipal Officials

Description: It is very difficult to keep up with the constantly evolving regulations related to stormwater management (SWM), especially when SWM is the not your primary focus, as is the case for many municipal officials. There is a need for a training to local government officials on the overlapping regulations and permits related to land development and SWM such as Subdivision and Land Development Ordinances, Act 167, and Municipal Separate Storm Sewer Systems (MS4s). This program will be a one- to two-hour overview of the different regulations and how they can apply to and executed in different municipalities

Manager/PI: K. Blansett

B. PHRC Training Program Delivery

Description: The PHRC has developed and maintains a wide array of training for all sectors of the construction industry with a focus on residential construction. These programs are intended to address technical issues facing the industry. The intended audience for these programs includes builders, remodelers, trade contractors, design professionals, teachers, and building code officials. Additionally, the PHRC can customize programs to better meet the needs of an industry partner.

The PHRC seeks to partner with relevant outside organizations whenever possible. These industry partners may include trade associations such as the Pennsylvania Builders Association or their 42 local associations, professional associations, building code associations, as well as the Pennsylvania Construction Code Academy (PCCA).

Current PHRC training program offerings are listed below. These are broken into three categories: (1) Residential Building Scholar/ Residential Code Scholar/Code Refresher, (2) Focused Topics, and (3) Academy Programs.

(1) **Residential Building Scholar (RBS)/Residential Code Scholar (RCS)/Code Refresher** programs are intended for those wishing to attain the RBS or RCS designation. These 1-day programs are a shorter alternative to the multi-day academies and are also well-suited for anyone interested in an introduction to building codes, an update from 2006 to 2009 IRC provisions, or information to make inspections go more smoothly. The RBS program was established as part of the 2012-2013 project plan.

- | | |
|-----------------------------|-------|
| a. IRC Building | 1 day |
| b. IRC Plumbing | 1 day |
| c. IRC Mechanical | 1 day |
| d. IRC Electrical | 1 day |
| e. Residential Energy Codes | 1 day |

(2) **Focused Topics** programs are designed to immerse the attendee more deeply into a particular aspect of construction. These programs are ideal for meeting continuing education requirements for RBS designees and certified code officials.

- | | |
|--|----------|
| a. Advanced Framing – Increasing Performance & Reducing Costs | ½ day |
| b. Blueprint Reading | 1 day |
| c. Building with Exterior Rigid Foam | ½ day |
| d. International Residential Code Inspections | 2 day |
| e. Photovoltaic Installation and Inspection | 1 day |
| f. Residential Deck Design and Construction | 1 day |
| g. Residential Fire Sprinklers | 1, 2 day |
| h. Solar Hot Water Installation and Inspection | 1 day |
| i. Special Issues with Two-Family Dwellings and Townhouses | 1 day |
| j. Fundamentals of Exterior Plaster and Thin Stone Veneer Assemblies | 1 day |
| k. Energy Plan Review and Inspection | 1 day |
| l. | online |
| m. Land Development Process | 2 hour |
| n. Stormwater 101 | 2 hour |
| o. Building Envelope Design and IECC Code Compliance | 1 day |
| p. Building Code Plan Review and Inspection | 1 day |

(3) **Academy Programs** are typically offered twice per year through the Pennsylvania Construction Codes Academy (PCCA). These programs are geared toward beginning code officials seeking to pass their certification exams, or anyone interested in a comprehensive overview of residential building codes.

- | | |
|---|-------|
| a. International Residential Code – Building Essentials | 4 day |
|---|-------|

- b. International Residential Code – Plumbing Essentials 4 day
- c. International Residential Code – Mechanical Essentials 4 day
- d. International Residential Code – Electrical Essentials 4 day
- e. Residential Energy Code Essentials 2 day
- f. International Energy Conservation Code Essentials – Commercial 2 day

For program descriptions, visit <http://www.phrc.psu.edu/Outreach/PHRC-Training-Programs/Workshops/Available-Workshops>.

Manager/PI: K. Blansett

C. Web-Based Training

Description: In today’s economic climate, there is a need for educational programs without travel costs. The PHRC will continue its successful monthly webinar series. Webinars are delivered live, and are also archived for on-demand viewing. Proposed topics are listed below. One certification maintenance credit is offered for each webinar for PA code officials. As appropriate, AIA Learning Units (LUs) for architects and professional development hour (PDHs) for engineers and land surveyors will be offered.

2015-2016 Webinar Series

Month	Proposed Title/Topic
Sept	Challenges, Considerations, & Concerns of Indoor Air Quality
Oct	Where to Draw the Line with Thermal Boundaries
Nov	Moisture Considerations for Insulated Building Assemblies
Dec	Technology in the Connected Home
Jan	Defining Failures in Residential Construction
Feb	Affordable Housing Initiatives in Pennsylvania
Mar	No webinar
Apr	Shedding Light on Glazing Safety and Performance
May	Residential Deck Design and Detailing

A special topics webinar on the “Updates to the PA UCC” will be developed and delivered at a time appropriate to the adoption of the 2015 ICC codes in Pennsylvania.

As part of the land development initiatives, a webinar on the topic of “Designing Maintainable and Sustainable BMPs” will also be developed and delivered during the project year.

Programs are subject to change and additional programs may be added to address industry demands and emerging issues.

Manager/PI: B. Heitzmann

Deliverable: The PHRC will develop and deliver at least eight webinars. Additional programs may be added to address emerging issues as they arise.

D. Builder Briefs

Description: The PHRC will continue its series of short technical documents called Builder Briefs that address specific issues that have been identified by builders or remodelers. These documents are intended to be quick to read with a lot of the information presented graphically or pictorially. Potential topics include:

- Frost Protected Shallow Foundations
- Durability of Insulated Rim Joist Assemblies
- Downspouts as a BMP for Builders

Manager/PI: K. Blansett

Deliverable: Builder Briefs will be researched, written, printed and distributed.

E. Technical Assistance, Technology Transfer & Outreach

Description: This initiative is a continuation or expansion of activities to get technical information, resources, and publications to builders, remodelers, design professionals, building code officials and others involved in the residential construction industry.

Manager/PI: K. Blansett

Deliverables: The PHRC will work with the PBA and other industry and trade organizations by means of the following activities:

- 1. Annual Pennsylvania Housing and Land Development Conference:** For 23 years this conference has been the premier technical conference for housing and land development issues in Pennsylvania. This two-day conference provides the latest information on emerging technologies and how to resolve problems facing the housing industry. The conference is intended for all sections of the housing industry including builders, remodelers, code officials, educators, design professionals and modular and HUD-code builders. The Housing Day of the conference focuses primarily on the house itself, while the Land Development Day serves as an annual forum that addresses emerging planning, design, and regulatory issues affecting the land development industry in Pennsylvania.
- 2. PCCA Symposium:** The PHRC will work with the PCCA to develop and deliver 3 one-day programs (one in the central region of the Commonwealth in conjunction with the PHRC Annual Housing and Land Development Conference, one in the eastern part of the Commonwealth, and one in the western part). This annual event is intended to address technical issues being faced by building code officials.
- 3. Speaker Service:** The PHRC will hold and/or participate in talks, seminars, and conferences directed at the housing and land development industries. This may include trade and professional association functions and regional meetings, local association meetings, or state or national conferences. Speaker service topics include:
 - UCC Overview/update

- Floor Fire Protection
- Exterior Water Management
- PA Alternative Residential Energy Provisions
- Foundation Systems for Relocated Manufactured Housing
- Subdivision and Land Development Guidelines
- Stormwater 101
- Intro to WQ Calculations
- Land Development Process
- Stormwater Management Concerns in Karst Regions
- Insulation: Is this “stuff” right?
- Code Compliant Air Barriers: It’s All About Continuity
- Green Infrastructure as a Tool for Stormwater Management

4. **General Outreach Activities:** This initiative includes activities to keep industry professional up-to-date on technical issues, as well as, informed on the services and publications the PHRC provides. These activities may include the PHRC newsletters, mailings, promotional pamphlets, articles in trade journals, phone calls, and the PHRC’s website.

This also involves attending relevant industry meetings, such as the Pennsylvania Department of Environmental Protection (DEP) meetings (Water Resources Advisory Council, Sewage Advisory Council); participating in technical committees such as the Pennsylvania Stormwater Technical Workgroup; and serving as a technical resource to legislative committees as needed

Pennsylvania Stormwater Technical Workgroup. As part of outreach activities, Dr. Blansett will continue to serve on the Executive Board of the Pennsylvania Stormwater Technical Workgroup (PaSTW). PaSTW is working to revise the DEP PA Stormwater BMP Manual. She serves as the chair of the Low Impact Development Committee (Chapter 5) and as a member of the Land Development Process Committee (Chapter 4).

5. **Annual Newsletter** – The PHRC Annual Newsletter will be sent to PHRC members to keep them up-to-date on recent PHRC activities and promote upcoming events. In the past, the newsletter has been sent in January. For the 2015-2016 project year, the PHRC intends to change the newsletter schedule to be delivered in the late summer or early fall to provide more timely updating of the audience with the outcome of the previous year’s projects and what to expect in the coming year.
6. **Educating the Next Generation of Tradespeople** - Educating the “next generation” of residential trade contractors is essential for the future of residential construction. With the support of the IAC, the PHRC will consider the education of the next generation of tradespeople as an ongoing project. The ultimate goal is to increase the detailed knowledge of future industry tradespeople through this general outreach and provide students with professional development opportunities within the residential construction industry. This project includes relationship building, sharing of resources, speaker services at schools, leveraging resources and contacts to bring opportunities to students, and getting feedback from instructors and administrators to better address

their needs. Other outreach activities includes trying to increase participation of vocational students and instructors in the PHRC conference, PCCA Symposia, and PHRC webinars. For the 2015 Annual PHRC Housing and Land Development Conference a scholarship program was established. An ice storm hindered attendance, but the scholarship program will be continued for the 2016 Conference.

7. **Support of the UCC RAC** - At the end of May 2015, the Pennsylvania's Uniform Construction Code (UCC) Review and Advisory Council (RAC) voted on the provisions of the 2015 International Code Council's (ICC) to recommend for adoption in Pennsylvania. According to the UCC, these provisions will become part of the PA UCC as of January 2016. The PHRC will to support the RAC and the public by serving as a general technical resource upon request and will develop trainings, such as a special webinar, to educate the public on coming code changes.
8. **Support of Standards** - The PHRC has developed three standards to respond to industry demand. Each of these standards requires training and timely technical assistance for local governments, builders/developers, design professionals, and contractors. All of these standards are available electronically for free. Education on this standards will continue to be provided through various training programs as requested and technical assistance will be provided through telephone and email support by the PHRC. The PHRC standards include
 - Pennsylvania's Alternative Residential Energy Provisions - 2009
 - Guidelines for Subdivision and Land Development in Pennsylvania (formerly the Pennsylvania Standards for Residential Site Development Standards
 - Foundation Systems for Relocated Manufactured Housing

PART 2 - Applied Research

A very important function of the PHRC is to undertake or stimulate research and development on materials, products, procedures, and processes. These efforts may have a longer-term or a more fundamental focus than other projects. Projects in this category foster partnerships and draw on the expertise and strengths of the people and facilities available at the Pennsylvania State University.

1. Performance Evaluation of Wall Panels Incorporating New and Innovative Materials Developed with High Insulation Properties

The objective of this project is to evaluate the energy efficiency and cost competitiveness of residential wall panels incorporating insulation materials or technologies that enhance thermal resistance or energy performance of enclosure components using them. The study will first perform a comprehensive literature review on traditional and evolving insulation technologies for enclosure systems. Examples of such traditional and advanced technologies are: mineral wool, various types of rigid boards (e.g., EPS, XPS, polyurethane, polyisocyanurate), cellulose, vacuum insulation panels, gas-filled insulation

panels, aerogel, and phase change materials. Once the properties of the materials/systems are determined, then thermal performance, energy performance, and condensation potential of walls incorporating such materials/systems will be evaluated for a typical home through simulation tools. By varying the climate data and wall configuration data including the materials and systems identified, it would be possible to predict the performance of different systems in various regions. The end result is a better understanding of the appropriateness and suitability of evolving technologies for residential application.

Manager/PI: Dr. Ali Memari

Deliverables: The project will deliver a final report, a paper for the Residential Building Design and Construction Conference, and likely a journal paper.

PART 3 - Applied Projects

The Applied Project category refers to projects that are application-oriented and have a direct need by the residential construction industry. This may also include longer term initiatives.

1. Details that Work: Deck Details

Description: New construction practices create a need for new and innovative details for contractors and sub-contractors to ensure proper installation. These necessary details encompass a wide range of scenarios starting from the footing level through shingles. Details that Work has become an ongoing project to develop details for programs such as speaker services and other training programs. The Details are also compiled and available for free from the PHRC website. The topic for the 2015-2016 project year will be decks.

Manager/PI: C. Hine

Deliverables: This project will include the development of construction details on the topic of decks that will be added to the Details the Work resource on the PHRC website and used in other PHRC training programs.

2. Frost Protected Shallow Foundations

Description: Frost protected shallow foundations are an economically feasible alternative to traditional foundation construction in Pennsylvania, yet they require special attention to structural and insulation detailing. This project will look at the feasibility of different FPSF systems as well as the coordination of FPSF systems with current energy codes.

Manager/PI: B. Heitzmann, B. Wolfgang

Deliverables: This project will result in a Builder Brief and likely both a speaking engagement topic and a webinar.

3. Exterior Plaster Assemblies in Pennsylvania

Description: Exterior plaster continues to be a hot topic in Pennsylvania as efforts to improve best practice are ongoing. The Pennsylvania Builders Association is leading an initiative to address exterior plaster assemblies (including hardcoat stucco and thin stone veneer). This project would allow for support of PBA's efforts and would include activities such as providing technical support, construction detail development, and assistance in the development of general outreach. This project will also include an evaluation of existing research and literature review related to moisture accumulation at exterior wall penetrations, building on the previous report that focused on overall code requirements.

Manager/PI: B. Wolfgang

Deliverables: This project will result in continued technical support of trade groups in Pennsylvania who are addressing the ongoing needs of exterior plaster wall assemblies. This includes speaking engagements, participation in committees and focus groups, and the development and publication of technical papers, including Builder Briefs, when appropriate.

4. Durability Evaluation of Insulated Rim Joist

Description: Insulated rim joists have traditionally been a weak point in the building envelope. This area not only needs thermal insulation, but also requires air sealing to perform adequately. Insulated rim joists are subjected to moisture damage if not designed properly and often this damage can go undetected for significant periods of time. This project will analyze code provisions related to insulated rim joists, will evaluate insulation options for this assembly, and will investigate the impact of moisture on the durability of insulated rim joists.

This project is in support of a NAHB Construction Technology Research Sub-Committee (CTRSC) Research Priority and will be the background work needed to submit a proposal to address the NAHB level question.

Manager/PI: C. Hine, B. Wolfgang

Deliverables: This project will result in a Builder Brief.

5. Guidance of the Downspouts as a BMP for Builders

Description: Sumping of gutter downspouts is a common stormwater management technique to allow the rainwater that falls on a roof to infiltrate and one of the most frequently used BMPs by builders of single homes that aren't part of a larger subdivision plan. The DEP has provided design guidance in the BMP manual on the sizing of these sumps, but the material can be difficult to find and is targeted to an engineering audience. This project will collect and summarize the details on the sizing of downspout sumps for into an easy-to-use reference for homebuilders.

Manager/PI: K. Blansett

Deliverables: This project will result in a Builder Brief.

PART 4 - Contingency Projects

Some issues and project ideas arise after the spring Industry Advisory Council (IAC) planning meeting, yet are important topics to address. The PHRC may take on high priority, short-term projects mid-cycle as opportunities arise. Other project ideas were brought to the IAC, but lacked sufficient outside financial support or staffing at the time this plan was issued.

This section of the plan describes a project that was noted as a priority by the IAC that may be undertaken contingent upon the availability of required data.

1. Determination of Unspecified Snow Loads

Description: The ASCE-7 ground snow load table shows a significant portion of Pennsylvania shown as “CS”, indicating that a case study is required to determine the snow loads in that area. Over 60% of all PA municipalities have at least some of their land area in a CS zone. In such areas the selection of an appropriate snow load is left to the authority having jurisdiction. In most cases such authorities know little about snow loads.

This project will consist of two phases. Phase 1 - Obtain the US Army Cold Regions lab snow database and calculation spreadsheet, and beta test it with AE faculty and/or AE 537 students using PA sites. Phase 2 - Perform a comprehensive analysis of PA snow loads using an MS student to determine the procedure and coordinate with PA structural engineers and builders. This project was planned for the 2012-2013 project year but data was not available from the Army Cold Regions lab. If the data becomes available the project will be pursued.

Manager/PI: K. Blansett, B. Wolfgang

Deliverable: This project will result in a research report, and a revised snow loads map with more comprehensive coverage of Pennsylvania municipalities (contingent on receiving the necessary data from the US Army Cold Regions lab).

This project is contingent on the availability of funding to the US Army Cold Regions Lab for the processing and release of snow loads data. Cuts in Federal funding are preventing the Lab from processing and releasing the necessary data.

Projected Budget by Project Categories

The following table provides a breakdown of the distribution of funds between the categories of Training, Technical Assistance, and Outreach; Applied Research; and Applied Projects. The

funding for each project year is based on the funds received over the previous fiscal year, which allows for the PHRC to have an estimate of the monies available. The budget for 2015-2016 project year is based on the Act 157 Funds collected during the 2014-2015 fiscal year. The Act 157 Funds available for the 2015-2016 year are approximately \$531,300¹.

Project	Act 157 Funds¹	Outside²	PSU Support	Total
Training, Technical Assistance and Outreach	\$404,171	\$86,368	\$209,765	\$700,303
Applied Research	\$28,234	\$5,649	\$14,654	\$48,537
Applied Projects	\$97,477	\$33,975	\$50,591	\$182,043
Total	\$529,882	\$125,992	\$275,009	\$930,883

1. The final quarter funds for the 2015-2016 project year are not yet known at the time of publication of this plan. The expected budget is an estimate and, to be conservative, the fourth quarter value used in this calculation is lowest of the previous three quarters.
2. Outside funding is received from a variety of sources including fees for services, in-kind contributions, industry contributions, grants and contracts.