material as well as 180 person-hours of labor. The second item is the miscellaneous items, which varied from the cost of soft drinks for the workers to the value of the blueprinting. These 100 percent donated items totaled approximately $6,590. Adding in the donated amount of $16,221 would bring the respective totals to the following:

Total Project Construction Cost	**=**	**$ 114,610**	
Direct Cash Cost	**=**	**$ 52,969**	**(46%)**
Donation Value	**=**	**$ 61,641**	**(54%)**

The third and fourth items not included in the cost tabulation are the project planning, administration, and engineering design. These processes date back approximately four years. The NY-NJ Trail Conference undertook the project leadership role in 1991, with Ms. Lutkenhouse, a professional staff member, serving as Project Director. A significant amount of time and resources was dedicated to the project. The engineering legwork leading to the final design was a volunteer endeavor by Mr. Latincsics. Among the purposes of this long-winded report is an attempt to compile the lessons learned in the Pochuck Quagmire to benefit future projects. Suspension bridges will continue to be a solution to long-span problem crossings.

Preliminary Project Cost Estimates

It is very helpful in preliminary project planning to be able to identify project cost on a “ballpark” level. The previous accounting should be helpful in this regard. This thought process shall be taken one step further by comparing the material costs of the Pochuck Quagmire Bridge to three other trail suspension bridge projects of the 1990s. Each project was unique in the problems it had to overcome, the standards to which it was built, and the resources available to the project owner. The variety in the projects allows one to establish a range in material costs for general planning purposes.

The first comparison project is the Smokey Angel Snowmobile Bridge (SAB) over the West Branch of the Sebasticook River in Hartland, Maine. The SAB is a 190-foot span by 5.4-foot wide bridge constructed in 1992 as a link in a snowmobile corridor. A photograph is provided in Appendix H. Similar to the Pochuck Quagmire Bridge, the SAB was constructed as a volunteer community project by the Smokey Angel Snowmobile Club. It also made adaptive use of readily available material. It was the recipient of a USDA Forest Service, Wood In Transportation grant. The SAB project engineer, Mr. Robert Doane, provided good practical advice and inspiration to the Pochuck Quagmire Bridge.

The second and third comparison projects are the Tye River and Hastings Trail Bridge projects. Both involve the reconstruction of the cable suspension system and the walkway of damaged bridges. In each case, the existing foundations are reutilized. The project expenses deal specifically with just the superstructure. The Tye River Bridge (also known as Cripple Creek) is one of the Appalachian Trail Suspension Bridges. It is located a short distance off the Blue Ridge Parkway south of Rockfish Gap. The bridge has a 148-foot span and a 26-inch wide walkway. It was originally constructed in 1972. The bridge appears to be the model for the later bridges in George Washington and Jefferson National Forests. Due to deterioration, the suspenders, walkway, and rail system were replaced in 1992 in a joint project between the Virginia Tidewater Trail Conference and the ATC Konorock Professional Trail Crew with the benefit of Forest Service supervision. This was another volunteer driven project.

The Hastings Trail Bridge in White Mountain National Forest, Maine, was reconstructed in the late summer of 1997. Because the existing foundation was reused, and there is a paved road to the site, the work was limited

to the reconstruction of the towers, cables, and timber walkway. Since the river crossing is a critical link in a New Hampshire to Maine snowmobile corridor, the bridge width was expanded to 5.5 feet. The span is 179 feet, 7 inches. The bridge has been constructed to USDA Forest Service specifications and is a "showpiece" facility similar to the Lincoln Woods Trail Bridge. The project was put out to public bid by professional construction companies. The construction bids varied from $150,000 to $315,000, with the majority clustered around $185,000. The low bid of $142,675 was awarded the project. The superstructure material has a market value of approximately $66,500.

	Pochuck Quagmire Bridge	**Smokey Angel**	**Tye River**	**Hastings Trail**
Dimension	146 feet by 44 in.	190 feet by 65 in. plus ramps	148 feet by 27 in.	179.6 feet by 66 in.
Material Costs	$35,836 or $245/ft	$32,474 or $171/ft		$66,500
Heavy Equipment Costs	$7,657	$4,056 plus donations		
People-Hours	5,239	2,800	2,400	
Walkway Material Costs	$17,313 or $118/ft	$14,000 or $96/ft	$60,000 or $334/ft	
Project Cost	$98,400*	$59,4000*	$28,000	$142,675
*includes value of volunteer labor				

Because the Pochuck Quagmire Bridge and SAB share many similarities, and both bridges were "from scratch," comparison of the material costs is helpful.

Material costs for the Pochuck Quagmire Bridge and SAB projects are in the same general range, but the Pochuck Quagmire Bridge did require higher material costs for the following reasons:

- Most items tend to cost more in the New York Metropolitan area.
- The resourcefulness and community spirit of the Downeast Yankees behind the Smokey Angel Bridge put even the Pochuck Gang to shame. For example,
  - The SAB primary cables were donated by a ski lift company in Vermont. Pochuck Quagmire Bridge paid $1,394 for 400 linear feet of proof tested 6 x 25 wire rope with spelter sockets.
  - The material for the 28-foot SAB pylons were donated by a paper company. A local machine shop donated the use of their facility, allowing skilled volunteers to fabricate the towers and cable saddles. Pochuck Quagmire Bridge paid $3,200 for the fabrication of the cable saddles.
  - The Pochuck Quagmire Bridge primary catenary cables terminated in spelter sockets, chain shackle, and turnbuckles at all four ends. The turnbuckles alone cost $1,000. The SAB had the benefit of a skilled volunteer welder who substituted lower cost alternatives and wire rope clips.

- The Pochuck Quagmire Bridge engineer specified CCA.40 #1 KDAT 19% SYP for the dimensional lumber. This specialty item cost the Pochuck Quagmire Bridge $10,479. The SAB used CCA.40 #2 SYP from five different lumber companies donating 50 percent of the lumber.
- Both projects had significant foundation expenses. Interestingly, concrete costs the same in Maine as in New Jersey. This may be explained by the fact that the higher density of concrete plants in New Jersey results in more competitive pricing and lower transportation costs. The extremely poor subsurface Pochuck Quagmire Bridge soil conditions led to an innovative but extensive foundation system made up of the reinforced concrete snowshoe, geogrid, helical piers, and helical anchors. As previously explained, these innovations saved the project at least $14,000 in concrete costs. But the Pochuck Quagmire Bridge foundation system still cost $8,000. The SAB appears to have had more suitable subsurface conditions and, therefore, utilized a more conventional system with approximately 200 tons (100 CY) of concrete. This had a market value of $7,500, but 50 percent was donated. Both sides of the SAB river were accessible by vehicles, so the SAB project did not have to rent a concrete pumper as did the Pochuck Quagmire Bridge.
- Due to the construction codes in New Jersey, the Pochuck Quagmire Bridge is built to a more restrictive standard. The Pochuck Quagmire Bridge was designed for a live load of 78 PSF, while the SAB utilized a live load of 22.6 PSF. The higher standard led to higher material costs. For example, the SAB utilized 4-inch by 4-inch cross stringers, while the Pochuck Quagmire Bridge used 6-inch by 6-inch. The cost difference is significant.

To wrap up this line of thought and to provide some practical meaning to the array of figures provided, based on the Pochuck Quagmire Bridge, a concept "ballpark" project market cost can be estimated as follows:

- Identify the superstructure material costs based on the span, the bridge width, cablework, and towers. Double this figure for the completed value. Call this (A).
- Sitework, foundation cost, erosion control, and cleanup will equal (A) above. Call this (B).
- Engineering, survey work, soil borings, environmental studies, and project administration may equal at least 20 to 40 percent of A + B.

Planning purposes cost estimate = 1.2 to 1.4 x (A + B).

This is a simplistic estimate. It is up to the project planner to add in the additional costs for the normal and expected challenges.

Project Volunteers

Following is a full listing of the project volunteers. Photo 87 on page 92 is a partial group picture.

NY-NJ Trail Conference

Barry Beaver, Allen Bell, Paul Bell, Peter Bidoglio, Gene Bove, Allan Breach, Bob Busha, Bob Boyle, Paul Campbell, Doug Castellana, Jonathan DeCoste, Paul DeCoste, Dave Dougert, Joe Dowling, Rob Eldridge, Ann Fitzgerald, Terry Gallagher, Ron Geredien, Dave Giordano, Rudy Haas, Tom Hass, Hank Hagedorn, Doug Henckl, Rob Hill, Bob Jonas, Robert Kirchmer, Steve Klein, Andrew Latincsics, Bernadette Latincsics, Shauna Latincsics, Tibor Latincsics, George Lightcap, Harold Lott, Gregory Ludwig, Kevin Maher, Tom Majenski, Chris Mazza, Jason Meissner, Bob Messerschmidt, Martha Olsen, Jim Palmer, Walt Palmer, Sandy Parr, Steve Petshaft, Charles Rosien, Glenn Scherer, Helmut Schneider, Bill Shapiro,