

# Using Archival Materials to Study the Influence of Public Policy on a Hydroelectric Project

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**Abstract**—A case history of a hydroelectric power project was studied using archival materials of a former Pennsylvania governor by civil engineering technology students. The case history illustrated the role of public policy and outside influences on a local civil works project. The multi-purpose, federally constructed dam was a controversial project with hydropower development supported by some while opposed by others. In studying the history of the project, students utilized images of archival materials, rather than published materials. This innovative use of unpublished letters, meeting notes, and memos between the Governor and his staff provided students an opportunity to see how political decisions and public policy influence engineering projects. It also provided students an appreciation of the importance of documenting their work, their communications with others and the basis on which decisions are made.

**Keywords**—public policy, archival materials, civil engineering

## I. INTRODUCTION

The civil engineering profession is often directly affected by public policy decisions. The policies of political and administrative authorities influence the extent to which certain highways, bridges, dams and other public works projects receive funding while others do not. For students studying in the undergraduate civil engineering curriculum, the focus is often on the analytical and design methods used in engineering practice, with little regard for the influence public policy has on the engineering profession. In recognizing this, ASCE in developing and refining the Body of Knowledge (BOKII) [1], which influences ABET [2] program criteria for civil engineering bachelor degree programs, has strongly advocated that civil engineering graduates should possess an understanding of the role public policy plays in the civil engineering profession.

Engineering educators are challenged to follow accreditation requirements to best prepare the next generation of engineers. This includes incorporating in the undergraduate civil engineering curriculum the ways public policy influences engineering practice. Review of the literature shows that public policy issues are being addressed in various ways at different institutions [3-9]. Some programs include public policy issues throughout the curriculum, [3][5] while others have created new courses [4][6] with modules on public policy.

## II. CONCEPT DEVELOPMENT

An understanding of public policy and its influence on the practice of engineering is recognized as an important aspect of the engineering profession [1-2]. Because of this, it was desired to somehow incorporate how public policy affects the practice of dam engineering into the curriculum. Research in the University of Pittsburgh's archives resulted in the discovery of a case history of a controversial multi-purpose hydroelectric dam. This case history provided a local project to which students could easily relate.

### A. Using Archives in Engineering Education

Historic articles and archival materials have been used by others [10-13] in teaching science and engineering. Brown and Brown [10] used figures and articles from popular contemporary publications to help physics students critically analyze and consider the historical evolution of scientific developments, including how scientific developments were influenced by societal needs. Anderberg [11] discussed how archival research can be integrated into undergraduate engineering and STEM courses. Benefits of this integration included an increase in student archival knowledge and opportunities to practice critical thinking skills. Proper planning and support of faculty colleagues are necessary for successful integration of archival research into the curriculum [11]. Leslie and Anderberg [12] discussed how archival research can help STEM students better understand innovation and use critical thinking skills to connect scientific developments and societal influences. While there is a growing division between the humanities (intellectuals) and technology (scientists), Leslie and Anderberg [12] sought to provide a bridge for STEM undergraduates to appreciate the history of invention and innovation preserved in archival materials. In their review of the literature [12], they present the gradual development of using archival materials in higher education, with special emphasis on archival use in STEM fields. In their study, archival materials were used in an *Introduction to the History of Western Philosophy* course. A series of activities were used to show the differences between primary and secondary sources, the diversity of materials found in archival collections, and the physical space and concerns associated with archival material usage [12]. Students worked in groups but prepared an individual research paper on a topic

of interest utilizing archival collections of various industrial corporations, or pioneering scientists, engineers, and engineering educators. Leslie and Anderberg [12] concluded that the activities used were valuable in that STEM students learned about the connections between primary source documents and innovation in a given discipline. In a more recent paper, Leslie and Anderberg [13] incorporated archival materials into an *Introduction to Science and Technology* course. Their concept of “archival interventions” involved providing students exposure to archival materials in the classroom and library setting. Their goal was:

“to encourage students to explore archival collections as a way to think critically about engineering within particular contexts, to understand and cope with unstructured problems, to learn how to access and evaluate information, to practice communication within teams, and to feel closer to the work of real engineers.”[13]

Four archival collections were used and students were given a very open-ended assignment: “explore a collection and relate it to course themes through a paper or presentation [13].” The conclusion was that students reacted in different ways to this open-ended project. Some students were challenged by the detective work involved in piecing together the information, while others were frustrated by the lack of clearly defined objectives. The end result was that students were exposed to the unstructured and iterative nature of research [13].

#### *B. Political Archives Provide a Source of Public Policy Materials*

While others have used archival materials from scientists, engineers and corporations [10-13] in engineering and science courses, the use of archival materials of a political figure in engineering education was used in this research [14].

The University of Pittsburgh houses the archives of Dick Thornburgh, former Governor of Pennsylvania (1979-1987), Attorney General of the United States (1988-1991), and Under-Secretary General of the United Nations (1993) [15][16]. His time as Governor coincided with newly enacted dam safety legislation following the devastating 1977 Johnstown flood, in which several dams failed, including Laurel Run Dam, which claimed 40 lives [17]. The efforts of the newly elected Governor to implement and support greater state oversight of dams in the Commonwealth illustrates the importance of public policy on the engineering profession.

To encourage their use, the University offers a grant program to fund faculty scholarship activities that incorporate the utilization of the archival materials into new or existing courses, and to develop student recognition in the value of using primary source materials [16]. In 2014, the author applied for and was awarded a grant, looking at how dam rehabilitation and water resources infrastructure projects were related to the Governor’s economic development program. The archives provided a significant source of information on this topic, as well as a number of other areas that were discovered to be of interest to the author [14].

#### *C. Teaching with Case Histories in Engineering*

The materials were organized in boxes and folders and one of the folders dealt with a specific dam located about an hour away from the University of Pittsburgh at Johnstown. The materials encountered in the file provided adequate information for an interesting case history related to a controversial dam and the public policy surrounding its eventual completion.

To help students connect course concepts to real-world applications, engineering and science educators often use case histories. There are different ways to teach with cases [18]. One of their greatest benefits, in addition to presenting course concepts, is they require the integration of material from multiple fields and require critical thinking skills to understand and assess information [18]. Case histories have been used in studying structural engineering failures [19] as well as in the geosciences [20-23]. Case history based courses have been used in teaching geotechnical engineering [20-21], geology [22], and geoscience [23]. Case histories can present problems that actively engage students in developing their knowledge through inquiry [22] and critical thinking [21]. The case histories must be carefully chosen and presented to match the students’ current level of expertise [21]. Using case histories throughout the courses, the topics typically covered in conventional lecture courses are still covered, but the topics are introduced and discussed as they relate to the case histories [22]. Ideally, the case histories should engage the students’ curiosity and challenge them to develop critical thinking skills leading them into learning the topics covered in the course [21]. Using local case histories provides an added advantage as students often become more engaged in learning concepts that are relevant to things with which they are familiar [23-24].

#### *D. Raystown Lake Dam Hydropower Controversy*

Using the search engine available for the archives [25], the case of an Army Corps of Engineers (ACOE) flood control dam was discovered. Raystown Lake Dam, on the Raystown Branch of the Juniata River outside of Huntingdon, Pennsylvania was first proposed in the 1960s to relieve downstream flooding. The dam was completed in 1973, replacing an older (circa 1905) smaller dam which generated electricity. The new dam was also designed with hydropower generation in mind. The original 1962 ACOE proposal was for a 500 MW pumped storage hydropower facility which would have served the local electric cooperatives in a rural, economically depressed part of the state. Although construction of the dam progressed without the hydropower component included in the initial construction, the design allowed that it could be added at a later date. Fig. 1 shows a photograph of the completed dam.



Fig. 1. Raystown Lake Dam (By Tex Jobe, U.S. Army Corps of Engineers - U.S. Army Corps of Engineers Digital Visual Library Image)

The hydropower project would be similar to the 435 MW pumped storage facility that had been completed in 1970 on the ACOE Allegheny Reservoir in northern Pennsylvania. At the time, even before the oil embargo and energy crisis of the mid 1970s, energy projects that reduced the need for foreign oil were quite popular. Early studies for the Raystown project conducted by the Pennsylvania Department of Environmental Resources, however, identified detrimental effects the pumped storage facility would have on aquatic life and fishing at the lake. In a pumped-storage hydropower facility, water from a lake is pumped up into a constructed reservoir at a higher elevation at night with low-cost power from conventional (fossil fuel or nuclear) power plants. During the day, when electricity usage is higher, the water stored overnight would be released from the higher reservoir back into the lake and in the process, generate electricity for consumption. The daily cycles of raising and lowering the lake level would have had an adverse effect on the aquatic habitat in the lake, harming the local recreational economy that had formed in the area following the lake's creation. The result was the Commonwealth had issued a statement in March 1978 to the ACOE that it did not support a pumped-storage hydropower development at Raystown Lake.

While the pumped-storage hydropower project appeared dead, Governor Milton Shapp, the exiting governor, was heavily influenced by leaders of the rural electric cooperatives who were lobbying in favor of the large pumped-storage hydropower project. On January 10, 1979, one of his final days in office, Shapp sent a letter to the ACOE reversing the Commonwealth's previous stance stating that Pennsylvania had obtained new information and therefore wanted the ACOE to consider the installation of hydropower facilities at Raystown. This apparent change in policy led to one of the first controversies Governor Thornburgh would need to address as he began his first term on January 16, 1979.

The debate continued for several months as the new Governor's staff sifted through the project's details. Local residents and outdoorsmen were against the development, while the electrical cooperatives supported it. It even appeared that the letter Governor Shapp sent reversing the Commonwealth's position, had actually been written by the president of the local electric cooperative. Meetings and briefings were held and two draft letters prepared by the Governor's staff. One letter supported the hydropower project, the other was against it, depending on which side Governor Thornburgh eventually would choose to support. So as not to alienate any particular constituency right at the beginning of his first term in office, notes and correspondence from staff encouraged the Governor to not take either side but to leave it to the Federal government and local congressmen to act on. Fig. 2 shows a typical document found in the archives.

The final letter sent to the ACOE by Governor Thornburgh indicated the Commonwealth did not support a pumped storage facility but that other options for hydropower at the site had not been ruled out. Eventually, a 21 MW run-of-the-river hydropower facility was constructed that satisfied both the power cooperatives and the sportsmen [26].

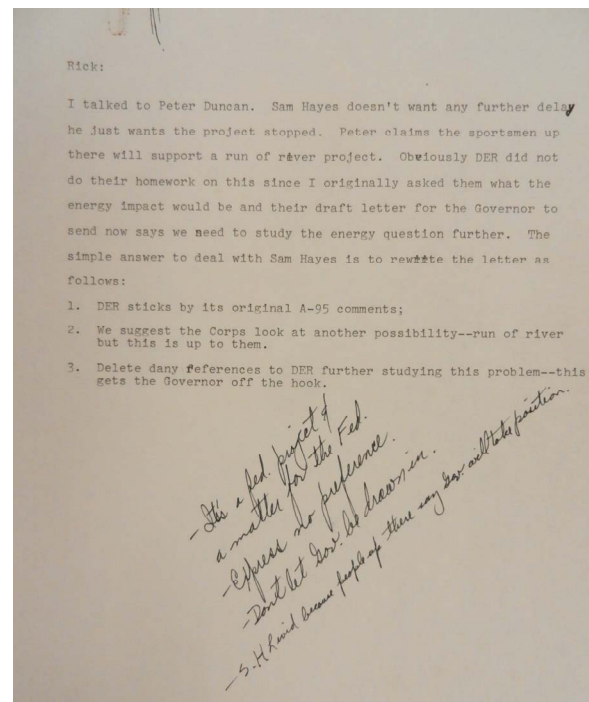


Fig. 2. Typical document found in archives

This case highlights the role of public opinion and special interests on public policy relative to the development of civil engineering infrastructure. It also illustrates how engineering solutions can facilitate political compromises that satisfy the interests of multiple constituencies.

### III. ASSIGNMENT IMPLEMENTATION AND RESULTS

The case history was incorporated into an undergraduate soil mechanics course. Students had already watched a video on dams from the PBS/ASCE Building Big video series [27] which highlighted the social and economic impact of large dams. Students were then given the Raystown dam archival documents in pdf format. The documents consisted of 18 separate documents of portions of documents for a total of 43 pages. Also provided was an overview of the Raystown dam project and a guide highlighting the chronology of the archival documents and a brief summary of what was felt to be significant in each of the archival materials. From their review of the archival materials, students wrote a short paper about the social, economic, and environmental significance of the Raystown dam project within the local community, as well as discuss any controversies surrounding the project.

Students generally discussed the advantages of the Raystown dam project and the socioeconomic influences it had on the surrounding community. Few however took the opportunity to discuss the hydropower controversy associated with Raystown in great detail, most just indicating that hydropower generation was one of the advantages of the Raystown Lake Dam. Of 39 students who completed the assignment, only 8 (20%) discussed in detail the controversy surrounding hydropower aspects of the project. Some provided considerable detail, while others only included a brief mention that any controversy was involved. Several students did

additional research and discovered a cultural resources issue surrounding the dam. The lake created by the newly constructed dam flooded a 16,000 year old prehistoric rock shelter site. Archeology excavation and studies at the Sheep Rock site were completed during the early 1960s, prior to dam construction and the site eventually being covered by 38 m (125 ft) of water [28].

Finally, two students noticed the connection between other events and the apparent end of correspondence found in the Governor's files on the Raystown project. When looking through Governor Thornburgh's archives, the file on Raystown Lake Dam contains documents up through March 28, 1979. A few days earlier, on March 23, the governor had finally made his decision and signed his letter to the ACOE indicating his administration's position on the Raystown project. The final signed letter stated that Pennsylvania was against a major pumped-storage hydropower facility at Raystown, but was open to consideration of a smaller run-of-the-river installation in the future. On March 28, Thornburgh's chief of staff, Walt Plosila, sent a memo clarifying for the governor, the content of the signed letter. Yet there was no follow up or response from the ACOE in the file. The only additional item was a March 20, 1980 newspaper editorial from the Johnstown Tribune-Democrat indicating a 21.8 MW facility was in the works at Raystown Lake [29]. Why wasn't there any more correspondence? On that same day, March 28, 1979, a partial meltdown at the Three Mile Island Nuclear Power Plant near Harrisburg occurred [30] and the correspondence on the Raystown project abruptly stopped. Governor Thornburgh had much more critical issues to deal with in the days and weeks ahead.

#### IV. STUDENT FEEDBACK

A survey assessed the assignment and its effectiveness in exposing students to the role public policy has on civil engineering practice. Survey statements used a 6 point Likert scale and average student responses and standard deviations are presented in Table 1.

The survey results indicate that students felt they had adequate background to read and understand the documents provided. They also thought the notes provided summarizing the archive materials helped them understand the issues involved to a considerable extent. The students felt the assignment using the Raystown Lake hydropower project was useful in helping improve their understanding of how public policy influences civil engineering projects. Finally, they felt very strongly that because the project was local it made the assignment more interesting.

In addition to the survey questions, students were also asked to comment on what they liked or found beneficial about the assignment, what they did not like or found difficult about the assignment, and any additional comments or suggestions to improve the assignment.

Students generally liked the assignment and thought it was worthwhile. Those who had personal experiences visiting the local area generally liked the assignment. A number of students thought the assignment was interesting and provided a good learning experience and saw a benefit in doing it. The

most common negative comment students had was the difficulty in sorting through the documents provided. They got confused, thought the amount of material was excessive, or had difficulty trying to decide what was most important.

TABLE I  
AVERAGE STUDENT RESPONSE TO SURVEY QUESTIONS

Question	Average Response n = 37 (SD)
To what extent do you feel you had adequate background to read and understand the documents provided on the Raystown Lake hydroelectric project? 1 = Very Little                      6 = Very Much	4.84 (0.75)
To what extent did the "Notes on Raystown Lake Hydroelectric Project" provided help you in understanding the issues involved in project? 1 = Very Little                      6 = Very Much	4.60 (0.75)
To what extent did the Raystown Lake hydroelectric case history assignment improve your knowledge or understanding of how public policy influences engineering projects? 1 = Very Little                      6 = Very Much	4.70 (1.04)
To what extent do you feel that using a LOCAL project like Raystown Lake hydroelectric project made the assignment more interesting? 1 = Very Little                      6 = Very Much	4.89 (1.16)

#### V. CONCLUSION

Archival materials of political figures can be used to develop case histories related to the influence of public policy on civil engineering practice. In this case, the archives of a former Pennsylvania governor provided a case of a controversial hydropower dam. Implemented in an undergraduate civil engineering technology course, the case illustrated the influence public policy decisions had on a local civil engineering project. One of the critical elements of the case was how the Governor had to weigh the interests of different constituencies and how his final decision involved a compromise that satisfied the different constituencies affected by the project. Many students had personal experiences at the lake and dam which helped create a stronger interest in the assignment. Overall, the archives provided a useful resource for exploring how public policy and the decisions of political administrations can influence local civil engineering projects.

#### ACKNOWLEDGMENTS

The author acknowledges the Dick Thornburgh Forum for Law & Public Policy for the financial support to discover, explore and utilize the Dick Thornburgh archives for this research. The assistance of Nancy Watson, curator of the Thornburgh Archives at Hillman Library of the University of Pittsburgh is gratefully acknowledged. The reviewers provided much constructive criticism and suggestions to improve the paper and their input is gratefully appreciated.

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