

**DELIVERING BETTER VALUE FOR MONEY:
DETERMINING OUTSOURCING FEASIBILITY
AND STANDARD PRICING METHODS**

Final Report

SPR 738



Oregon Department of Transportation

**DELIVERING BETTER VALUE FOR MONEY: DETERMINING
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METHODS**

Final Report

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16. Abstract <p>Two databases of engineering hours were developed to aid contract administrators in negotiating consultant hours for contracts for preliminary engineering (PE) and/or construction engineering (CE) services. The local agency projects database includes 181 projects. The OTIA III bridge projects database includes 124 bridge repair and replacement projects. Databases include estimated consultant hours by task for the projects, and descriptive information for the projects. The databases were analyzed to identify relationships between project characteristics and consultant contract hours required. Results of these analyses are presented. A procedure for use of the databases in the negotiation process is presented. In addition, general information relating to procurement of personal services contracts is presented. This information was obtained from a literature review, the Oregon Department of Transportation, and other transportation agency personnel.</p>					
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SI* (MODERN METRIC) CONVERSION FACTORS

APPROXIMATE CONVERSIONS TO SI UNITS

Symbol	When You Know	Multiply By	To Find	Symbol
<u>LENGTH</u>				
in	inches	25.4	millimeters	mm
ft	feet	0.305	meters	m
yd	yards	0.914	meters	m
mi	miles	1.61	kilometers	km
<u>AREA</u>				
in ²	square inches	645.2	millimeters squared	mm ²
ft ²	square feet	0.093	meters squared	m ²
yd ²	square yards	0.836	meters squared	m ²
ac	acres	0.405	hectares	ha
mi ²	square miles	2.59	kilometers squared	km ²
<u>VOLUME</u>				
fl oz	fluid ounces	29.57	milliliters	ml
gal	gallons	3.785	liters	L
ft ³	cubic feet	0.028	meters cubed	m ³
yd ³	cubic yards	0.765	meters cubed	m ³
NOTE: Volumes greater than 1000 L shall be shown in m ³ .				
<u>MASS</u>				
oz	ounces	28.35	grams	g
lb	pounds	0.454	kilograms	kg
T	short tons (2000 lb)	0.907	megagrams	Mg
<u>TEMPERATURE (exact)</u>				
°F	Fahrenheit	(F-32)/1.8	Celsius	°C

APPROXIMATE CONVERSIONS FROM SI UNITS

Symbol	When You Know	Multiply By	To Find	Symbol
<u>LENGTH</u>				
mm	millimeters	0.039	inches	in
m	meters	3.28	feet	ft
m	meters	1.09	yards	yd
km	kilometers	0.621	miles	mi
<u>AREA</u>				
mm ²	millimeters squared	0.0016	square inches	in ²
m ²	meters squared	10.764	square feet	ft ²
m ²	meters squared	1.196	square yards	yd ²
ha	hectares	2.47	acres	ac
km ²	kilometers squared	0.386	square miles	mi ²
<u>VOLUME</u>				
ml	milliliters	0.034	fluid ounces	fl oz
L	liters	0.264	gallons	gal
m ³	meters cubed	35.315	cubic feet	ft ³
m ³	meters cubed	1.308	cubic yards	yd ³
<u>MASS</u>				
g	grams	0.035	ounces	oz
kg	kilograms	2.205	pounds	lb
Mg	megagrams	1.102	short tons (2000 lb)	T
<u>TEMPERATURE (exact)</u>				
°C	Celsius	1.8C+32	Fahrenheit	°F

*SI is the symbol for the International System of Measurement

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EXECUTIVE SUMMARY

Oregon State University conducted research for the Oregon Department of Transportation to determine effective methodologies for estimating costs of, and negotiating personal services contracts. As the research evolved under the direction of the technical advisory committee, the focus of the research became the development of two databases to be used to aid ODOT contract administrators in negotiating hours of effort required for contracts for PE and CE services. One database utilizes 181 projects provided by ODOT's Local Governments Section, and the other database utilizes 124 projects from the OTIA III bridge repair and replacement program. It is intended that ODOT contract administrators use the databases to assist in the development of their independent government estimates of the costs of the consultant services. The estimates are used for negotiating the contract with the selected consultant. A procedure is provided for developing the estimates to be used for negotiation, and checking the result for consistency with norms for similar projects from the databases.

In addition to presentation of statistics and relationships from the two databases, information obtained from the literature review and from ODOT and other agency personnel relating to the topic of estimating and negotiating costs of personal services contracts is provided.

1.0 INTRODUCTION

1.1 OVERVIEW

This report summarizes a research project conducted by Oregon State University (OSU) for the Oregon Department of Transportation (ODOT) between January 1, 2011 and September 30, 2012. The major customers for the project within ODOT were the ODOT Procurement Office (OPO) and the Major Projects Branch (MPB).

1.2 PROBLEM STATEMENT

Mandates provided by Oregon House Bill 2867, effective January 2010, and by the Oregon Secretary of State's 2006 audit require that ODOT has an accurate and transparent methodology for cost estimating and comparative cost analyses between ODOT internal cost estimates of personal services contracts, including A/E contracts, and consultant cost estimates.

1.3 OBJECTIVES

The research goal is to obtain and synthesize the information necessary to assure that ODOT methodology for comparison of internal cost estimates and consultant cost estimates meets the mandate of Oregon House Bill 2867, and serves as a valuable tool for effectively managing outsourcing. To this end, the research objectives are as follows:

- Document current ODOT procedures for estimating costs, determining internal overhead, determining consultant profit rates, conducting comparative analyses, and integrating delay costs and utilization rates into cost estimates.
- Determine the cost estimating procedures of other DOT's and summarize normally accepted procedures for allocating internal overhead of public agencies to projects.
- Provide guidelines for ODOT procedures that will assure all stakeholders that the mandate of Oregon House Bill 2867 is being, or will be, met.

1.4 RESEARCH TASKS

To accomplish the objectives of the research, six research tasks were originally envisioned.

1. Document ODOT practice
2. Literature review
3. Agency surveys. Conduct surveys of DOTs to develop a summary of current practices relating to estimating costs of consultant services and agency overhead allocation.
4. Interview experts identified in Tasks 1-3.
5. Analysis and experimentation.
6. Generate final report.

Under the direction of the Technical Advisory Committee (TAC), after the literature review, a mini-survey of DOT's, and follow-up discussions with ODOT and other DOT personnel, the agency survey task was eliminated and research focused on developing two databases to aid in estimating costs of contracts for engineering and related services. One database utilized information from local agency projects and the other utilized information from the OTIA III bridge projects, where Oregon Bridge Delivery Partners (OBDP) served as program manager. Attempts to create a database to be used for estimating costs of IT contracts were unsuccessful.

1.5 REPORT ORGANIZATION

Chapter 2 discusses current ODOT procedures for procuring personnel services contracts and estimating costs of those services. Chapter 3 summarizes practices of other DOTs. Chapter 4 introduces the two database tools compiled as part of this research, and their intended use. It also provides some analyses of the databases. Chapter 5 presents guidelines for ODOT procedures. Conclusions and Recommendations are presented in Chapter 6. A list of cited references and six appendices are included.

2.0 CURRENT ODOT PROCEDURES FOR ESTIMATING COSTS OF PERSONAL SERVICES CONTRACTS

The first objective of the research project was to “document current ODOT procedures for estimating costs, determining internal overhead, determining consultant profit rates, conducting comparative analyses, and integrating delay costs and utilization rates into cost estimates.” To understand ODOT procedures for estimating costs, it is important to look at the broader context of how ODOT procures personal services contracts, and to look at findings of a 2006 Oregon Secretary of State audit, and at legislation enacted in the 2009 Oregon legislative session. The audit and the legislation are now summarized, followed by discussion of current ODOT personal services contracts procurement practices and cost estimating and overhead allocation procedures.

2.1 OREGON SECRETARY OF STATE 2006 AUDIT

This audit (*Oregon Secretary of State 2006*) stated two major findings:

- ODOT did not aggressively negotiate price with consultants.
- ODOT did not have cost information necessary to establish strong negotiating positions.

Based on these findings, three recommendations relevant to the current research project were made to ODOT:

- Implement processes to ensure evaluation of consultant overhead and direct labor, and negotiation of price.
- Designate sufficient staff to analyze consultant labor and overhead rates and prepare cost estimates.
- Capture cost information in reporting systems in categories that allow negotiation of best price.

ODOT was provided the opportunity to respond to findings and recommendations of the audit. The following “response” was provided by ODOT to the audit recommendation to “designate sufficient staff to prepare in-house cost estimates, using historical cost information.” “Section 16.5 of the Bridge Partners’ Program Procedures Manual describes” the process.

- ODOT “develops independent cost estimates and approves the scope and fee estimates negotiated . . .”
- ODOT “is creating a historical record of design fees for the OTIA III program.”
- ODOT will soon develop “standard process and format for internal cost estimates for design engineering services.”

ODOT’s responses to the audit recommendation to “compare in-house cost estimates to consultant proposals for each project” were that

- “A procedure will be implemented for OTIA III,” and that the
- Recommendation will be “implemented for work under a full-service design engineering contract for local agencies.”

2.2 OREGON HOUSE BILL 2867

Oregon House Bill (HB) 2867 was enacted in 2009, and applies to all Oregon government agencies, including ODOT (*Oregon Department of Administrative Services 2012*). However, after the research project was funded, it was determined that the legislation does not cover engineering and related services. For purposes of this research, HB 2867 is significant only because it does apply to IT contracts, which form the 2nd highest volume of personal services contracts after engineering and related services within ODOT.

The legislation requires that when the contract price for applicable personal services contracts exceeds \$250,000, and doesn’t qualify as a “special circumstance,” ODOT needs to demonstrate that outsourcing will cost less than using ODOT’s own personnel and resources, or ODOT must demonstrate that it is not feasible to perform the services with ODOT’s own personnel and resources.

To demonstrate that outsourcing will cost less, ODOT must estimate the cost of performing the services with its own personnel and resources and ODOT must estimate the cost a potential contractor would incur in performing the services. The legislation is specific in providing guidance for preparing cost estimates. The estimate of cost of performing the services by ODOT's own personnel and resources (*Oregon State Legislature 2009*) must include:

- A. "Salary or wage and benefit costs for contracting agency employees who are directly involved in performing the services, including employees who inspect, supervise or monitor the provision of the goods or the performance of the services;
- B. Material costs, including costs for space, energy, transportation, storage, raw and finished materials, equipment and supplies;
- C. Opportunity costs the contracting agency incurs by using personnel and resources that the contracting agency might otherwise dedicate to other tasks to provide the goods or perform the services;
- D. Costs incurred for planning, training, starting up, manufacturing or implementing, transporting and delivering the goods or services and costs related to stopping and dismantling a project or operation because the contracting agency intends to procure a limited quantity of goods or services or procure the goods or services within a defined or limited period of time; and
- E. Miscellaneous costs related to providing the goods or performing the services."

ODOT may not include in the cost analysis the contracting agency's indirect overhead costs for existing salaries or wages and benefits for administrators or for rent, equipment, utilities and materials except to the extent that the costs are attributable solely to performing the services and would not exist unless ODOT performs the services.

The estimate for the cost of performing the services by outside consultants (*Oregon Legislature 2009*) needs to include:

- A. “Average or actual salary or wage and benefit costs for contractors and employees who:
 - i. Work in the industry or business most closely involved in providing the goods or performing the services that the contracting agency intends to procure; and
 - ii. Would be necessary and directly involved in providing the goods or performing the services or who would inspect, supervise or monitor the provision of the goods or the performance of the services;
- B. Material costs, including costs for space, energy, transportation, storage, raw and finished materials, equipment and supplies;
- C. Costs incurred for planning, training, starting up, manufacturing or implementing, transporting and delivering specialized goods or services or goods or services required within a defined or limited period of time;
- D. Costs related to financing, taxes, insurance, bonding legal services and other expenses required to comply with ORSA chapters 279A, 279B and 279C and other applicable provisions of law; and
- E. Miscellaneous costs related to performing the services, . . .”

2.3 ODOT PROCUREMENT MANUAL

The ODOT Procurement Manual provides information and direction to obtain construction services, goods, trades services, public works services, personal and professional services, and agreements with other government entities. For the current research, the focus is the procurement of personal and professional services.

The ODOT Procurement Manual (*2011*) delineates three major categories of personal and professional services:

1. Architectural, Engineering and Land Surveying (A&E -- Brooks Act applies)
2. A&E Related Services
3. Non-Architectural and Non-Engineering Services (Non-A&E).

The largest category of ODOT personal services contract procurements is A&E contracts which are covered by the Brooks Act. The Brooks Act is federal legislation enacted in 1972. It established a qualifications-based selection (QBS) process for government agencies to follow when they award contracts to architecture and engineering businesses. The selection needs to be based on an individual firm’s competence and qualification, and the process must include negotiation that results in a fair and reasonable price. Under QBS procurement procedures, price is not considered in the selection process and price quotations are not made (*ACEC 2012*).

“There are seven basic steps involved in pursuing federal design work under QBS:

1. Public solicitation for architectural and engineering services
2. Submission of an annual statement of qualifications and supplemental statements of ability to design specific projects for which public announcements were made
3. Evaluation of both the annual and project-specific statements
4. Development of a short-list of at least three submitting firms in order to conduct interviews with them
5. Interviews with the firms
6. Ranking of at least three of the most qualified firms
7. Negotiation with the top ranked firm.” (*ACEC 2012*)

If the top-ranked firm and the agency cannot agree on a fair and reasonable price, the agency may discontinue negotiations with that firm and move to the second-ranked firm.

The Brooks act needs to be followed for procuring contracts for architectural and engineering (AE) contracts when projects are supported by federal funds. The Brooks Act does not specifically require estimating of costs of consultant services, but an agency cannot effectively negotiate without an independent estimate of effort required.

The vast majority of ODOT personal services contracts are covered by the Brooks Act. The largest volume of non-Brooks Act procurements are for information technology (IT) contracts.

Personal and professional services contracts are typically developed as either project specific or price agreements (PA). “Project specific is a type of contract to help accomplish a single or discrete project. Under this type of contract the needed services and the project are fully identified in a Statement of Work (SOW)”. PA’s are “used within ODOT for a series of projects where there is a need to acquire the same services repeatedly. In the PA, the specific services are identified, but not the projects.” “Under the PA, Work Order Contracts must be generated for each project or group of projects.” “The WOC describes the services needed and the work to be performed, and assigns the work to specific projects. Each WOC includes, among other things, the costs for each project and a complete and specific SOW. The services to be provided under the WOC must be within the scope of the services available through the PA” (*ODOT Procurement Manual 2011*).

If the estimated cost of the service is \$150,000 or above, a formal and competitive sealed proposal process must be used to obtain the service. This process includes the following steps:

1. Identify the services needed
2. Draft a statement of work or menu of services
3. Submit a request to OPO
4. OPO review and guidance
5. Prepare a request for proposal (RFP)
6. Advertise the RFP
7. Consultant response
8. Consultant evaluation
9. Interviews (if needed)
10. Reference checks (if needed)
11. Intent to Award notice
12. Billing rate and cost reviews
13. Preaward audits (if required)
14. Negotiations
15. Preparation of personal service contract
16. Signing the contract (*ODOT Procurement Manual 2011*)

2.4 ODOT PROCEDURES FOR ESTIMATING COSTS

ODOT estimates costs for personal services contracts for purposes of preparing budgets and for negotiating contracts. The personal service contracts with the highest dollar value for ODOT are contracts with consultants for PE and CE services. Contracts for IT services are of next greatest magnitude.

In addition to estimating costs for budgets and for negotiation, ODOT needs to look at estimating costs to compare costs of services insourced and outsourced. Historically, ODOT has made this type of decision based on availability of staff. Volume of work that exceeds staff capabilities must be outsourced or deferred. Although this is still true in the short term, a more strategic view requires comparison of costs for insourced and outsourced delivery as a long-term strategy. In addition, the Oregon Legislature's passage of HB 2867 provided additional impetus to develop procedures for this type of cost comparison.

An e-mail from Joe Messman, ODOT Major Projects Branch, to the head of the Contracting Services Unit (*Messman 2009*), shared with the research team, shared his concerns about the lack of standardization across ODOT for estimating costs of personnel services contracts. Because little of his work involved personal services contracts outside the realm of Brooks Act procurement, his comments should not be extrapolated outside of that environment. At the time of his e-mail, determination had not yet been made that HB 2867 was not an issue for these contracts, so his e-mail addressed the topic of comparing costs of consultant services delivered insourced to costs delivered outsourced.

Mr. Messman's e-mail notes problems of incorporating relevant ODOT overhead into cost comparisons. He notes that if projects need to be delayed in order to utilize limited agency capabilities, there are costs added to the project due to escalating costs of materials, labor and equipment. In addition, many projects are justified because of a savings to the motoring public resulting from their completion. Delays in completion of these projects reduce the return on investment. How should these costs be incorporated into any comparison of insourced and outsourced delivery of design services?

Mr. Messman's e-mail also notes that staff classifications and labor rates are different between ODOT and consultants and between the various consultants. This is not seen as a problem by the research team. Productivities will also vary between ODOT and consultants and between various consultants. All studies reviewed by the research team essentially assume identical productivity for insourced and outsourced work. Although this is highly unlikely, no documentation on actual productivities is available to those doing the estimating. They can either choose to ignore productivity by assuming it is the same, or attempt to make an educated guess based on no data. Assuming productivity is the same is the preferred choice unless actual productivities become available.

2.4.1 Estimating for Budgeting Purposes

For determining budgets for PE and CE services, PE and CE costs are estimated. In an email exchange on September 24, 2012 with John Turner, business analyst, ODOT Performance, Resource and Data Management, he said percent PE is percentage of preliminary engineering and is equal to the design cost divided by the sum of design costs and construction costs (*Turner 2012*). Percent CE is percentage of construction engineering and is equal to the construction engineering cost divided by the sum of construction engineering costs and construction costs.

Budgets for IT services are determined by anticipating major initiatives to be undertaken requiring IT services and the estimated numbers of hours of effort required. Estimating for determining budgets was not a focus of the current research. Estimating for the purpose of negotiating contracts is the focus of the current research.

2.4.2 Estimating for Negotiating Contracts for PE and CE Services

The research team's greatest exposure to ODOT practices for procuring consulting engineering services came through the Statewide Programs Unit, responsible for working with local agencies to delivery local projects. Long before the bond programs of OTIA I, II, and III, local agency liaisons were working with local governments to secure the services of engineering consultants

for capital improvement projects. Figure 2.1 provides an overview of the local agency process for project delivery (Foster 2011). The process is similar for all ODOT projects. Consultant services may be necessary for any of the Program Development, Project Development, or Construction Management portions of the project delivery lifecycle.

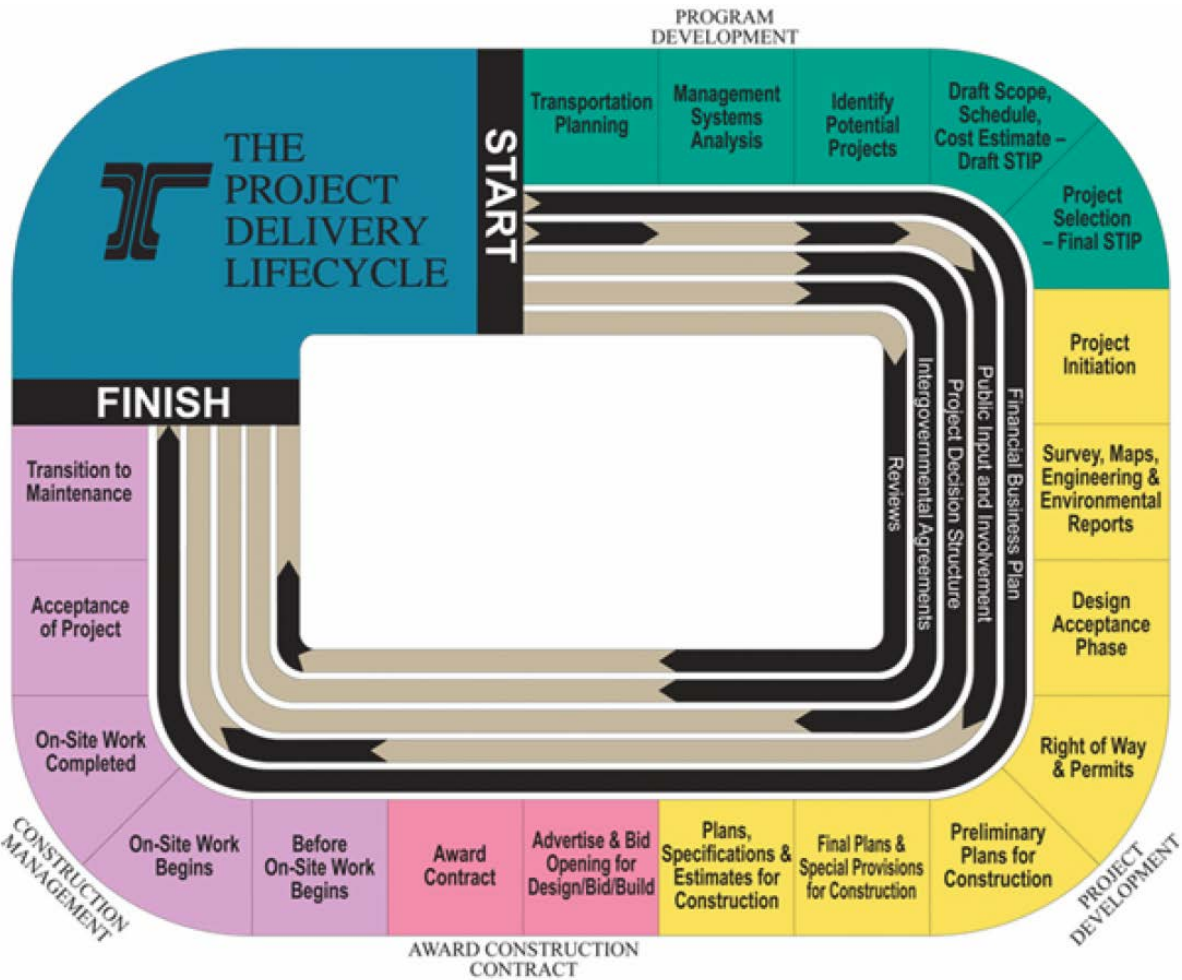


Figure 2.1: Local agency process for project delivery (after Foster 2011)

The ODOT Statewide Programs Unit website provides a wealth of information on the process (ODOT Statewide Programs Unit 2013). When a Statement of Work (SOW) is developed, the ODOT contract administrator is to prepare a breakdown of costs (BOC). It will be noted that the BOC includes estimated hours for each type of labor resource required for each of 19 PE or 6 CE tasks. An estimate of “other direct costs” is also required. The selected consultant, using the same form, is to prepare and submit a BOC based on their understanding of the SOW. The two BOC’s serve as a starting point for price negotiation. For the consultant’s BOC, the hourly rates should be the audited rates, which will include the consultant’s allowable overhead. A reasonable profit is calculated using ODOT’s “Profit (Fee) Worksheet.” ODOT’s Record of Negotiation (RON) form documents the negotiation process.

2.4.3 ODOT Procedures for Determining Consultant Profit Target

For consultant contracts covered by the Brooks Act, ODOT's Statewide Programs Unit has a Profit Fee Worksheet for developing ODOT's pre-negotiation position on profit for a given project (*Profit Fee Worksheet 2012*). Factors considered are "complexity", "delivery schedule", cost risk, assistance/oversight by ODOT, subcontracting, and cost of services. Points are assigned to each criteria and an overall profit objective is determined.

2.4.4 ODOT Procedures for Conducting Comparative Analyses

No established ODOT procedure for performing analyses to compare costs of providing services insourced to costs providing services outsourced could be found. This analysis appears to be at the discretion of the responsible manager. Oregon House Bill 2867 provides detailed instructions for making such comparisons, but during the early stages of this research project it was determined that contracts for PE and CE services are not covered by HB 2867. For purposes of this research, that means that the contracts of interest for HB 2867 are IT contracts. For IT contracts, a more specific ODOT procedure than that provided by HB 2867 could not be found. Procedures have been documented as applied to other DOTs and will be discussed in Chapter 3 of this report.

2.4.5 ODOT Procedures for Allocating Internal Overhead

If costs of providing services insourced are to be compared to costs of providing services outsourced, appropriate ODOT overhead costs must be added to the estimate of labor costs and other direct costs. In recent years, this comparison has seldom been made because the work load has far exceeded ODOT's ability to provide the services insourced and make scheduled commitments for delivery of work. No documentation of a standard ODOT procedure for allocating overhead could be found. In a telephone conversation with Shane Otteson, ODOT Region 2 project manager, he indicated that he had heard of a rule of thumb to multiply ODOT wage rate by 1.6 to determine a loaded cost to include ODOT overhead, but he did not know the source of that number (*Otteson 2011*). A search for the source of the rule of thumb was unsuccessful. Accepted procedures for allocating DOT agency overhead have been developed at other agencies, and are discussed in section 3.3.

2.4.6 ODOT Procedures for Integrating Delay Costs and Utilization Rates into Estimates

No evidence of ODOT procedures for formally integrating delay costs and utilization rates into cost estimates could be found. Apparently, the high level of uncertainty and complexity of such estimation is considered too great to justify the effort that would be required. Neither could documented procedures by other DOTs be found.

2.4.7 IT Contracts

Personal Services contracts for providing IT services are not covered by the Brooks Act. Next to contracts for A/E Services, IT contracts constitute the highest dollar value of personal services contracts for ODOT.

A large majority of IT contracts are work order contracts using price agreements (parent contracts) negotiated by Oregon's Department of Administrative Services (DAS). The price agreements are between DAS and a managed service provider (MSP). In a telephone conversation on March 14, 2011 with Ron Winterrowd, ODOT's Manager, Transportation Application Development, Ron said that these account for over 75% of IT contracts (*Winterrowd 2011*). For these contracts, ODOT's negotiation involves agreeing on the duration and hours required for each work order contract. In addition, each work order contract may be amended for changes in scope of work resulting in changes in contract duration, cost, or both.

Some IT contracts are procured through "deliverable-based contracts." An example would be a contract for a Statement of Work (SOW) to replace ODOT's contract payment system. For these types of contracts, an RFP is issued and selection is based on how well the proposers meet specific criteria listed in the RFP. The proposals are reviewed by an evaluation team that scores the proposals on each of the criteria. Cost is one of the criteria.

ODOT's IT group does some "staff augmentation" to temporarily increase their capacity for short-term shortfalls of staff capabilities. These contracts have maximum duration of ½ year.

As with estimating expected price of other personal services contracts, IT's estimating process consists of estimating hours required, multiplying by appropriate hourly rates, adding other direct costs for items such as travel, telephone, printing, etc., adding consultant overhead, and adding a reasonable profit.

3.0 PROCUREMENT PRACTICES OF OTHER DOT'S

3.1 OVERVIEW AND DATA-GATHERING PROCEDURES

The second research objective was to “determine the cost estimating procedures of other DOT’s and summarize normally accepted procedures for allocating internal overhead of public agencies to projects.” A traditional literature review provided much of the information required to accomplish this objective. In addition, Mike Jenkins, ODOT OPO, and Joe Messman, ODOT Major Projects Branch (MPB), provided accumulated information regarding procurement practices for personal services contracts, with the bulk of the material devoted to procurement of engineering services. This information was made available to the research team. Much of this information was unpublished and provided a helpful supplement to the literature review. In addition, a “mini instant survey” of state departments of transportation in the United States was undertaken..

In May of 2011, the research team conducted a brief survey of DOTs in the United States through the AASHTO Standing Committee on Research (SCOR). A copy of the mini-survey is included in Appendix A. The survey was conducted to identify sources of information relating to estimating costs of professional services contracts, and to determine whether a more comprehensive survey would be beneficial. Louisiana, Maine, Montana, New Mexico, South Dakota, and West Virginia responded to the survey.

Of the six states responding, five states indicated that they had “standard procedures for estimating costs of architectural and engineering services”. The respondent for the other state, South Dakota, could not accurately answer that question. Louisiana, Montana, and South Dakota indicated that they “have standard procedures for estimating costs of information technology services,” two states indicated that they did not, and the respondent for one state did not know. Louisiana, Montana, South Dakota, and West Virginia indicated that they “have a procedure for adding agency overhead costs to direct costs of insourced work to allow for an accurate comparison with costs of the service, if delivered outsourced,” one state responded that they do not, and one state was unable to accurately respond. Five states responded that they “have a negotiation/procurement manual to guide the procurement of professional services”.

After contacting individuals from the responding DOTs, the conclusion was reached that practices were similar to those documented in the literature review. Review with the TAC resulted in the decision not to conduct a more comprehensive survey. It was not thought to be an effective use of research team time.

3.2 COST ESTIMATING PRACTICES OF OTHER DOT'S

Contacts by ODOT OPO with other state DOT's indicated that none of the state DOT's have what they consider to be really effective systems for cost estimating of consultant work (*Jenkins 2011*). The most common approach is to base estimates on historic in-house performance or on data from past consultant projects. The estimates are computed manually or with spreadsheets. State DOT's have also paid for independent check estimates prepared by a consultant other than the consultant chosen to do the project, an approach that is costly and time-consuming, and from which it is not clear that value is added.

3.2.1 The Independent Government Estimate at Maine DOT

The Maine DOT "Consultant and Professional Services Procurement Manual, October 2009," (*Maine DOT 2012*) provided a succinct description of their process for estimating the cost of consultant services. "The Independent Government Estimate is an estimate of the work to be performed by the consultant to be hired, and is intended to be used to determine that the Consultant's price is fair and reasonable for the work to be performed. It is also intended to be used as a negotiating tool, so it is important that the Project Manager feel confident with the estimate, as it will be used to support their position when negotiating with the Consultant."

The manual notes that the estimate cannot be completed until a scope of work is developed. A methodical approach must be used. The estimate should include the number of work hours and other resources that would be needed if the work were to be performed with Maine DOT personnel. The estimating process will depend on the type of work and complexity of work involved. Breakdowns of direct labor by professional staff, overhead, and profit are recommended. Alternate methods that may be used estimate hours based on cost per plan, or cost per unit. "An estimate is valid as long as the methodology uses relevant data and terms that can easily express what the effort will cost."

3.2.2 Independent Government Estimates at the US Army COE

US Army COE Pamphlet No. 715-1-7 provides documentation on how the United States Army Corps of Engineers procures contracts for architect and/or engineering services (*US Army Corps of Engineers 2007*). Appendix X of the pamphlet provides a description for preparing "Independent Government Estimates". The intent of the IGE is "to determine a price for the required work which is fair and reasonable to the Government." It must be prepared from a detailed analysis of the statement of work (SOW). Estimating as a percentage of construction cost or to meet available funds is not acceptable.

The IGE will be "organized to correspond to each phase or sub-phase of work in the SOW. The estimate price for each phase or sub-phase will be itemized to show the direct labor costs, overhead costs, travel costs, other direct costs, and profit." Labor hours by type of position will be estimated by analysis of "required tasks and products in the SOW." Federal Acquisition Regulation (FAR) 31 provides "detailed guidance on overhead costs." For overhead (indirect) costs, a single percentage of total direct labor costs is added to cover overhead on direct labor and general and administrative costs. Overhead rates will be representative of the "class of A-E firms that have been selected as most highly qualified to perform the required work." Estimates

of travel expenses are based on analysis of the SOW for meetings and field investigations. “Other Direct Costs” are also estimated from analysis of the SOW. Profit will be applied to all costs, but redundant levels of profit (profit on profit) are not allowed. EFARS 15.404-73-101 provides guidance for determining appropriate profit percentages.

3.2.3 Estimating and Negotiating Operating Margin at Florida DOT

Florida DOT’s “Negotiation Handbook, Professional Services Contracts” (*Florida Department of Transportation 2011*) provides excellent documentation of their negotiation process. Of particular interest is the description of a very thorough and systematic method for negotiating “operating margin” for consultants for Florida DOT work. The process uses criteria of project complexity, degree of risk, project schedule, and cost control efforts, with specified percentage ranges for each, for negotiation purposes. For each criterion, a table designates what are considered low, medium, and high values in the ranges. The table provides this guidance for bridge inspection, CEI, design, geotechnical, PD&E, survey, planning, railroads, and traffic operations. The description of the process for negotiating operating margin concludes with a list of “Do’s” and a list of “Don’ts.”

3.2.4 Estimating Profit at Washington DOT

The Washington DOT Consultant Services Manual M 27-50.01 (*Washington Department of Transportation 2010*) addresses costs in its Appendix L, where the usual discussion of direct labor costs, fringe and overhead, fee, and direct non-salary costs is presented. For profit, it is noted that, “profit shall be negotiated separately and in accordance with 49 CFR 18.36 (f) (2),” which reads as follows: “(2) Grantees and subgrantees will negotiate profit as a separate element of the price for each contract in which there is no price competition and in all cases where cost analysis is performed (see 49 CFR 18.36(f) (1)). To establish a fair and reasonable profit, consideration will be given to the complexity of the work to be performed, the risk borne by the contractor, the contractor’s investment, the amount of subcontracting, the quality of its record of past performance, and industry profit rates in the surrounding geographical area for similar work.”

Section 230.01 of the Washington Consultant Services Manual, entitled “Negotiations,” presents procurement methods for personal services contracts not subject to the Brooks Act. “Proposed fees and/or costs are included in the consultant’s proposal for personal services agreements. Therefore, they are part of the scoring and selection criteria, and they carry a specified weight in contributing to the final selection and award.”

3.2.5 Factors Affecting CE Costs at Florida DOT

A paper by Ellis et al. (2000) did not attempt to estimate costs of engineering services provided insourced and outsourced, but did analyze a database of 580 FDOT projects between 1994 and 1999. For 141 of these projects, external consultants were used for Construction Engineering and Inspection (CEI). Regression analysis of the database resulted in the conclusion that CEI costs were influenced by the following factors:

- Outsourced or insourced
- Project size as measured by dollar amount of construction contract
- Project type
- Scope of consultant services
- Supplemental agreements (changes in project duration and contract amount)

This suggests that when developing procedures for estimating costs of construction engineering and inspection, these factors need to be addressed.

3.2.6 Simulation Approach to Cost Comparisons

A report by Deis (*Deis et al. 2008*) describes the use of simulation for cost comparisons. “The purpose of this project was to compare the cost of transportation engineering design services provided by private contractors versus services provided by state transportation agency staff for the Louisiana Department of Transportation and Development.” The authors reviewed seven previous studies comparing insourced and outsourced costs. Of those seven studies, four studies concluded that consultants were more expensive, one concluded that consultants were lower cost, and two studies concluded that there was no difference in cost.

The authors summarized the methodologies used in the earlier cost studies. In attempting to make valid comparisons, previous studies generally used one of three approaches:

1. “Compare the ratio of design cost over construction cost;
2. Pair similar projects, insourced and outsourced; or
3. Sample to establish similar mixes of types of projects for comparison of costs insourced and outsourced.”

The authors explain why these traditional approaches were problematic for their study. “Two interrelated problems can limit the usefulness of the approaches typically used to conduct the cost analysis. First, while the ratio of design cost over construction cost takes into account the influence that project size has on design cost, it does not capture the impact of important factors such as the number of plan changes, unique environmental conditions where the facility is to be constructed, and design complexity. A measure which is capable of canceling out these additional factors is the ratio of design costs by in-house staff divided by the design cost by

consultants for the similar projects. Finding similar projects, however, is difficult because it is commonplace to entirely outsource particular types of projects and retain others entirely in-house. Hence, pairing projects or drawing samples with a similar mix of projects is not possible.”

The authors chose to use a simulation approach to compare 22 insourced design projects and 17 outsourced design projects. For the insourced projects, they simulated the costs if those projects had been outsourced. For the outsourced projects, they simulated the costs if those projects had been insourced. They also simulated the cost of a “typical” hour of engineering design insourced and outsourced. The study concluded that insourced design costs were lower than outsourced design costs by an average of 17 to 19 percent.

3.2.7 Negotiation Tools at Texas DOT

A report describing research for TxDOT by the Texas Transportation Institute at Texas A&M University summarizes research directed to the task of developing tools for estimating costs of professional services firms (*Ford 2004*). The report also describes, without reference to any specific document, an earlier study at Texas A&M that developed a tool to estimate the effort-hours required for consultant services through regression analysis of data from completed projects. Unfortunately, the tool could not take into account specific features and characteristics of individual projects or services being estimated, and, after some experimentation, was “withdrawn.”

Because of the experience with the earlier TxDOT research, the research reported in the 2004 report set out to develop a tool that would report historical data, but would make no “recommendations, projections, or predictions of appropriate cost values.” The intent was to produce a database of past projects organized to aid TxDOT contract administrators in negotiating price on new contracts for consulting services. The tool would display ranges of fees and hours by project parameters such as lane miles. It would attempt to use TxDOT’s 14 “project types” in its organization. Effort-hours of project participants would be classified as “project managers,” “engineers,” “technical, but not engineers,” or “administrative.” Unfortunately, as the research progressed, TxDOT personnel reported that “needed data do not exist.” Consequently, the research changed direction to develop a tool that would work with a database that would be collected in the future. Two spreadsheets were produced, one for project specific engineering contracts, and one for work order authorization contracts. The spreadsheets were prototyped, but not adopted. Further work was not done because TxDOT procurement focus shifted based on results of an audit.

3.3 PROCEDURES FOR ALLOCATING INTERNAL OVERHEAD OF PUBLIC AGENCIES

The second part of the second research objective dealt with the challenge of allocating internal overhead of public agencies when making cost comparisons. Publications from analyses for Louisiana Department of Transportation and Development (DODT) by Louisiana State University and for TxDOT by Texas State University show that the challenge can be successfully addressed.

3.3.1 Louisiana DOTD Approach

For cost estimating procedures to compare the cost of outsourced PE and CE services to insourced services, Schneider et al. (1998) provide the best description for allocating agency overhead and including agency contract administration costs in the comparison.

Louisiana (DOTD) conducted research comparing the cost of using consultants and the cost of using in-house staff in designing transportation facilities in 1998. Although the focus of the study is cost, the authors stress that cost is not the only factor that should be considered. Other factors to consider include accommodating fluctuating design demand, being able to meet deadlines, having access to specialized expertise, having flexibility in workforce size, and supporting the state's consulting industry.

To estimate consultant costs, estimates of labor hours by type of labor resource (draftsman, technician, engineer, etc.) are made and total direct payroll costs are computed by multiplying the labor hours by the appropriate labor rate and summing them. Overhead is applied, and if necessary, costs are escalated to a future time period. Other direct costs and profit are added to determine a total contract amount. Additional costs for contract development and supervision are added.

For consultant overhead rates, "DOTD conducts audits of consultant records as part of DOTD's oversight of consultant contracts. From these audits, average overhead rates are determined. The average overhead rate serves as an estimate, or benchmark, for contracting with consultants."

Comparable costs for insourced delivery used LaDOTD labor rates and appropriate LaDOTD overhead rate. The overhead rate of DOTD is "calculated at several levels of the organization and allocated step-by-step to finally reach the individual sections that work directly on the project. Step 1 is to determine the DOTD-wide support services overhead and to assign this to each section in the department. Step 2 is to identify upper management supervision within the Directorate of Engineering and Program and Project Development and assign the cost to each section that it supervises. Step 3 is to determine supervision, clerical, and other indirect charges incurred in each section and add this to the cost estimates of the previous two steps to form actual indirect cost estimates for each section. An overhead rate is established by dividing total indirect costs for each section by the direct costs of that section. The end result is a single composite overhead rate for each section working directly on design projects that incorporates DOTD-wide support services, upper level management, and the section's own indirect costs."

This research found that in most cases, using consultants to do the design work is more expensive than using in-house staff to do the work. This difference is primarily due to the cost of consultant contract initiation and supervision.

Deis (*Deis et al. 2008*) reported results using the LaDOTD approach for the Road Design Section and for the Bridge Section. As may be seen in Table 3.1, the allocation of overhead added \$1,799,344 to the direct project charges of \$965,198, resulting in a blended overhead rate for the Road Design Section of 186% which produces a total loaded cost for the project of \$2,764,542, which is 2.86 times the direct project charges. Table 3.2 shows similar calculations for the Bridge Section. To illustrate the procedure for comparing costs of delivery of services insourced

and outsourced, Table 3.3 shows the result when the costs of LaDODT project procurement and administration costs are added to the costs of the consultant contracts themselves.

Table 3.1: LaDODT calculation of overhead for insourced design by Road Design Section (after Deis et al. 2008, Table 7.3)

<i>Description</i>	<i>Amount (\$)</i>
Section-specific indirect costs	1,210,774
Applied Overhead	
Allocated in-house supervision overhead costs	77,869
Insurance	179,953
Other support services	330,748
Total non-project charges and overhead	1,799,344
Divided by project charges	965,198
Section blended overhead rate	186 percent

Table 3.2: LaDODT calculation of overhead for insourced design by Bridge Design Section (after Deis et al. 2008, Table 7.4)

<i>Description</i>	<i>Amount (\$)</i>
Section-specific indirect costs	1,408,574
Applied Overhead	
Allocated in-house supervision overhead costs	85,337
Insurance	196,525
Other support services	361,207
Total non-project charges and overhead	2,051,643
Divided by project charges	967,786
Section blended overhead rate	212 percent

Table 3.3 LaDODT calculation of effective overhead, incorporating contract administration costs for outsourced design (after Deis et al. 2008, Table 7.5)

<i>Description</i>	<i>Bridge Projects (Percent)</i>	<i>Road Projects (Percent)</i>
Average consultant overhead rate	158	158
Net Effect of Other Factors on Overhead		
Thirteen percent profit factor	34	34
LaDOTD supervision		
Fifteen percent road design section	73	44
Twenty-five percent bridge design section		
Effective consultant overhead rates	265	236

3.3.2 Texas DOT Approach

Researchers from the Texas State University – San Marcos, in 2012, published a report summarizing direct and indirect costs for TxDOT personnel performing preliminary engineering and construction engineering activities (Morris et al. 2012). The study, funded by TxDOT, utilized a joint working group with membership from the Texas Consultant Engineering Council, TxDOT, and the researchers from the Texas State San Marcos Department of Accounting. The objective of the study was to “determine the cost of engineering design on an hourly basis using comparable direct and indirect cost definitions and allocations as used by external consulting engineering firms.” This determination of hourly cost could be used in making decisions to insource or outsource preliminary engineering and construction engineering activities. No

attempt was made to compare productivity of insourced and outsourced work. The study just looked at the fully loaded comparable hourly costs insourced and outsourced.

The researchers used two approaches. Approach 1 used statewide TxDOT data for PE and CE. Approach 1 also used total engineering costs and allocated indirect costs based on total direct engineering hours, the approach that engineering consultants would take. Approach 2 utilized data from a large metropolitan district, a mid-sized metropolitan district, and a rural district. Data from 2010 and 2011 fiscal years were used. Salary, retirement contributions, insurance, computers, software, equipment, office space, training, human resources, finance, supervision, public relations and other support costs, and costs of vacation, sick leave, and other leaves were included in computing the total loaded PE costs and CE costs for TxDOT employees. Table 3.4 reproduces a summary of the result for Approach 1 from the Morris study.

Table 3.4 Approach 1 computation of overhead rate for TxDOT PE and CE for fiscal year 2011 (after *Morris et al. 2012, Table 4*)

COST CATEGORY	PE	CE	Total PE and CE
Direct Labor Hours	1,557,576	2,437,970	3,995,546
Direct Labor (base rate)	\$ 47,726,122	\$ 59,368,921	\$ 107,095,043
Indirect Costs			
Benefits	\$ 26,905,985	\$ 33,469,706	\$ 60,375,691
Other	\$ 11,397,664	\$ 5,761,053	\$ 17,158,717
Space	\$ 1,946,970	\$ 3,047,463	\$ 4,994,433
Division & District G&A	\$ 78,700,375	\$ 97,899,350	\$ 176,599,726
Res Eng Overhead	\$ 20,528,338	\$ 27,609,442	\$ 48,137,780
Total Overhead	\$ 139,479,332	\$ 167,787,014	\$ 307,266,346
Total Engineering Costs	\$ 187,205,454	\$ 227,155,935	\$ 414,361,389
per Hour	\$ 120.19	\$ 93.17	\$ 103.71
Overhead Rate	292.25%	282.62%	286.91%

It may be seen that the hourly cost for PE by TxDOT in 2011 was \$120.19. The amount to be added to direct labor costs for PE to cover indirect costs is 292.25% of direct labor costs. The overhead rate for CE services is slightly less, at 282.62%. These rates are slightly higher than the rates shown in the previous section of this report, calculated by Deis (*Deis et al. 2008*). It should be noted that these rates start with a base of direct labor cost, whereas Deis starts with a base of “project charges,” likely including material and equipment costs in addition to direct labor costs. There may be differences in the administrative structure of the two different agencies as well.

If the issue to be addressed is determining comparable loaded total hourly costs for DOT personnel for comparison to loaded total hourly costs of consultant personnel, the Texas State San Marcos study provides adequate detail to provide procedures to make the analysis. It should be noted that this is as far as the study goes. It makes no attempt to account for the additional

contract management costs associated with outsourced projects. It makes no attempt to compare productivity.

The Texas State San Marcos study narrows the topic of comparing the cost of services insourced or outsourced to total hourly cost of employees with similar skill sets. Other published studies have attempted to address the insourcing-outsourcing decision in a broader perspective. Previously cited studies by Deis et al. (2002 and 2008) and Schneider et al. (1998) provide applicable methodology.

3.4 COST ESTIMATING IN THE BROADER CONTEXT OF OUTSOURCING DECISIONS

3.4.1 Outsourcing Models for the Louisiana DOTD

Dies, Watson, Wilmot, and Xu (*Dies et al. 2002*) performed research for the Louisiana DOTD. The objectives of the research were to:

- “develop a decision model to analyze outsourcing opportunities and alternatives,
- ensure that the decision model incorporates both quantitative and qualitative factors relevant to the outsourcing decision, and
- apply the decision model to one or more LaDOTD functions for which outsourcing potential is envisioned by the administration.”

It was concluded that the “outsourcing decision should be made with consideration given to the following five factors:

- economic impact,
- vendor service reliability and service quality,
- legal ramifications,
- impact on strategic core competencies, and
- sociological factors.”

Dies, Watson, and Wilmot reviewed a New Mexico study that summarized the outsourcing practice of agencies in Arizona, Connecticut, Florida, Idaho, Maryland, Michigan, North Carolina, Utah, Virginia, and Washington. These states had formally evaluated their outsourcing practices. Other studies reviewed by the researchers discussed practices in Pennsylvania and Texas.

In formulating their model, Dies, Watson, and Wilmot decided to concentrate on the qualitative models developed in Arizona, Pennsylvania, and Texas and a quantitative model develop by

Arizona DOT. Only Arizona was found to use a comprehensive, systematic approach toward all of its outsourcing decisions.

The researchers tested the Arizona Model and the Pennsylvania model with LaDOTD district managers and headquarters officials. They used the potential outsourced activity of pavement striping. Based on feedback from those tests, the researchers embarked on formulating a computer-based model to incorporate the strengths of the Arizona and Pennsylvania models. They also reviewed aspects of models in Virginia, Georgia, Illinois, Maryland, Michigan, Texas, and Virginia. The model that they developed was then tested with LaDOTD managers for rest area maintenance, highway markers, and highway striping. Based on the results of the test, a final computer model was developed and published” (*Wilmot et al. 2002*). For the qualitative part of the model developed by Dies, Watson, and Wilmot, managers rate the importance of six “perspectives” – customer, internal business, innovation and control, financial, employee, and contractor market. In addition, they rate the importance of 25 criteria assessment statements related to the “perspectives”, and indicate their level of agreement with those statements for the “function” (rest area maintenance, highway markers, highway striping, etc.) being evaluated.

For the quantitative part of the model, input of the following information is required:

- Insourcing costs
 - FTE of personnel by civil service rank
 - average salaries by civil service grade
 - payroll additive rate
 - support services rate
 - project term in months
 - new and existing equipment requirements
- Outsourcing costs
 - Contract amount for outside contractor
 - Contract monitoring and supervision costs
 - Any revenues lost or generated (negative cost) as a result of outsourcing

The computer model (*Wilmot et al. 2002*) calculates and displays graphically and in tabular format comparisons of insourced direct costs to outsourced costs, and direct plus indirect costs insourced to total outsourced costs. The computer model is available to other agencies and is intended to be adaptable for their use.

3.4.2 Outsourcing Decision Making Model.

The most recent publication identified in the literature review is a 2010 paper (*Eger and Samaddar 2010*) describing a “comprehensive, process-based evaluation linking DOT goals and managerial insight to competencies, a hierarchical evaluation to indicate a potential priority list based on management insight, a knowledge audit to address knowledge transfer and loss, a traditional cost collection and market analysis, and an evaluation of human resource expertise and utilization.” The comprehensive approach is beyond the scope of the current research, which is focused on cost and estimating. Although the paper includes a “cost analysis” section, for the current research, the studies conducted for the LaDOTD described above are considered more relevant.

Eger and Samaddar note that within the DOT, outsourcing decisions are “built off a pricing model, costs are less or more, and therefore the DOT may act on outsourcing.” However, they take issue with this “simple cost focus” approach, arguing that “Narrowness of the analytical process in the decision-making aspects of outsourcing may lead to undesired outcomes.” They continue that, “Outsourcing may enhance knowledge because of vendor transfer; however, it may also leave the DOT vulnerable if the entire outsourcing assessment excludes critical knowledge implications to the organization.”

4.0 DATABASE TOOLS FOR AIDING NEGOTIATION OF CONTRACTS FOR ENGINEERING SERVICES

4.1 OVERVIEW

Two groups within the Oregon Department of Transportation contributed negotiation and project data to the research project for the purpose of compiling databases to aid ODOT project managers in negotiating contracts with engineering consultants. In both cases, estimates of engineering effort required were provided rather than actual invoiced costs. Although actual invoiced cost data would have been preferred, discussions with ODOT led to the conclusion that obtaining invoiced data was not realistic, given constraints of ODOT staffing.

Both databases sort estimates of hours required by standard “tasks” and classify the hours as “engineering”, “technical, non-engineering”, and “administrative”. The lists of tasks are similar for the two databases, but because different estimating spreadsheets were standard for the two sets of data, they are not identical.

Direction from ODOT was to compile the databases to be user-friendly to ODOT contract administrators, rather than attempt sophisticated prediction models from regression analysis. However, when the databases were compiled, statistical analyses were performed in an attempt to identify relationships that could aid in determining the hours of effort required for engineering and related contracts. The two databases are identified as the “local agency projects database” and the “OTIA III database.” The following sections describe the compilation and analysis of those databases.

4.2 LOCAL AGENCY PROJECTS DATABASE

ODOT’s Statewide Programs Unit made available to the research team Breakdown of Cost (BOC) estimate spreadsheets prepared by consultants for negotiation of work-order contracts for local agency projects between 2006 and 2011. The contracts themselves were also provided. In some cases, records of negotiations (RONs) were provided. Data for 184 contracts were made available. Of these, 181 projects were usable in the final database. To form the database, these data were combined with descriptive information about the design and construction projects, including cost of construction contract and numbers of standard and non-standard drawings produced. The project data were made available by John Turner, business analyst, ODOT Performance, Resource and Data Management. The project drawings were provided by ODOT’s Lloyd Bledsoe.

The BOC is the electronic worksheet that ODOT uses to estimate the cost of consultant contracts. The document and instructions for its use are downloadable from the ODOT OPO website (<http://www.oregon.gov/ODOT/CS/OPO/Pages/AE.aspx>). A copy of a printout of the worksheet instructions is included in Appendix B. Rows represent tasks to be performed by the consultant, and columns represent resources to be expended by the consultant in performing those tasks. Based on the Statement of Work (SOW) provided by ODOT, the consultant and the

contract administrator for ODOT independently complete the BOC. During the negotiations, the BOC prepared by the consultant and the BOC prepared by the ODOT contract administrator are compared. Generally, this provides the basis for negotiation to determine a not-to-exceed (NTE) amount for the consultant's contract.

An e-mail from Joe Messman, ODOT Major Projects Branch, he shared ODOT's A&E Consultant Classification Study spreadsheet (*Messman 2011*). This database recorded using the 26 classifications of labor resources for engineering consultants which could be considered. Feedback from the research project TAC was that this would be too much detail and would be too confusing. Consequently, the research team condensed these 26 classifications into the 3 classifications described in the Texas A&M/TxDOT study (*Ford 2004*). Table 4.1 shows the condensation. Grades 1 – 6 engineers and scientists were classified as "Engineer." Grades A-D technicians, ROW specialists, and construction engineering inspectors were classified as "Tech; Non-Engineer." Office manager, bookkeeper, accounting clerk, IT systems manager, and similar were classified as "Administrative." Thus for the database, a labor hours total was generated for Engineer, Tech, Non-Engineer, and Administrative for each of 19 standard PE tasks and 5 standard CE tasks for each project. The consultant classification was used as a guide. In many cases, descriptions in the BOC spreadsheets did not fit exactly. The research team made judgments of which classification was most similar and entered the data accordingly.

The local agency projects database contains 181 projects managed by ODOT Local Governments Section. The projects' data were provided in June 2011 by Martin Andersen, who at the time was ODOT's Manager, Local Governments Section. The time range of the dates of the work order contracts is from August 2006 through June 2011. The number of projects for each year is shown in Figure 4.1. Nine primary consultants provided services for the 181 projects. Figure 4.2 shows numbers of projects for each consultant. Figure 4.3 shows the percentage of projects for each ODOT Region. Figure 4.4 summarizes the projects by ODOT's project type designation. Figure 4.5 shows the level of use of sub-consultants on the projects. Appendix C provides descriptions of the data fields in the database. The project type designations are defined in Table D.4 of Appendix D. This appendix also provides tables that present the data of Figure 4.1 to Figure 4.4 in tabular format.

Table 4.1: Summarizing consultant positions for the databases

	Consultant Classification
Engr	Grade 1 - Engineer
	Grade 2 - Staff Engineer
	Grade 3 - Project/Senior Engineer
	Grade 4 - Principal Engineer/Associate
	Grade 5 - Department Head, Senior Associate Principal
	Grade 6 - Senior Principal
Tech, Non-Engr	Grade A - Junior Laboratory/CAD/Field/Office Technician - Entry Level
	Grade B - Laboratory/CAD/Field/Office Technician
	Grade C - Senior Laboratory/CAD/Field/Office Technician
	Grade D - Supervisor Laboratory/CAD/Field/Office Technician
	Grade 1 - ROW Specialist
	Grade 2 - ROW Specialist
	Grade 1 - Construction Engineering Inspector
	Grade 2 - Construction Engineering Inspector
	Grade 3 - Construction Engineering Inspector
	Administrative
Bookkeeper	
Accounting Clerk	
IT Systems Manager	
Computer/Network Administrator	
Executive Assistant	
Administrative Assistant	
Senior Word Processor	
Word Processor	
Receptionist	
Office Clerk	

Pie Chart of Number of Projects for Each Year

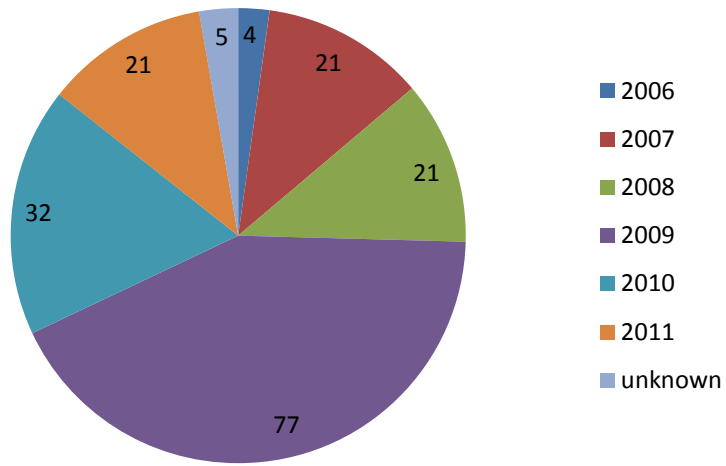


Figure 4.1: Local agency projects by year

Number of projects

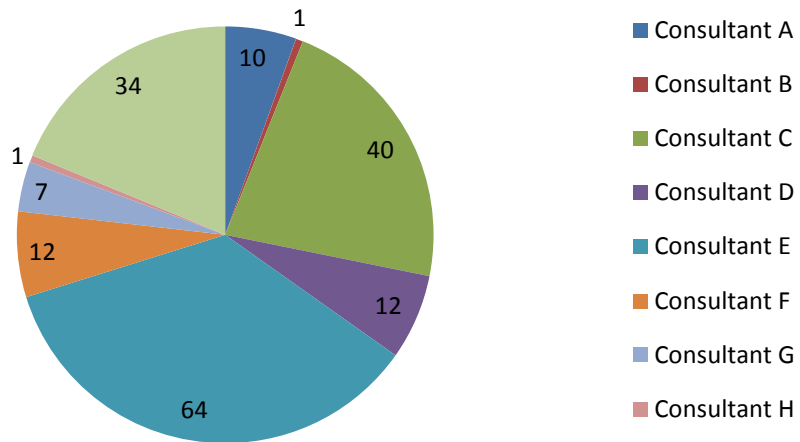


Figure 4.2: Number of projects by consultant

Pie chart of projects of each Region

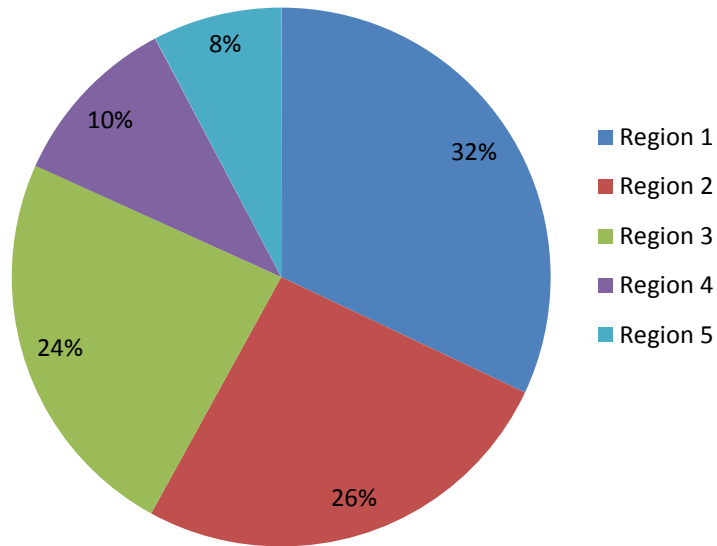


Figure 4.3: Percentage of projects by ODOT region

Pie chart of projects of each type

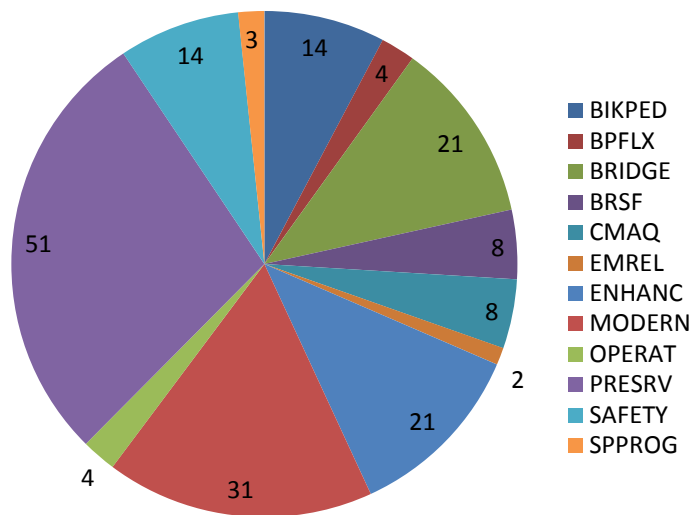


Figure 4.4: Percentage of projects by ODOT project type

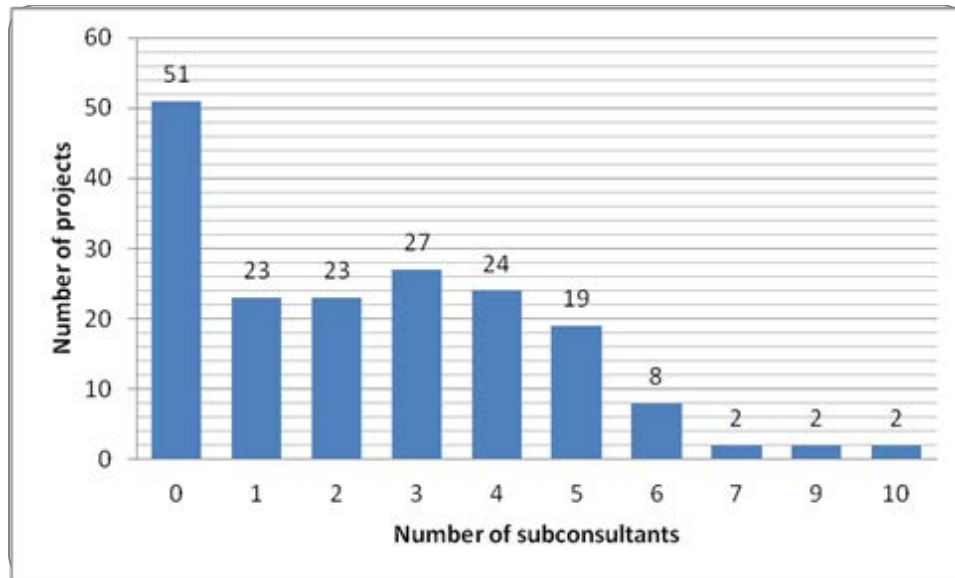


Figure 4.5: Numbers of projects with multiple sub-consultants

4.3 ANALYSES OF THE LOCAL AGENCY PROJECTS DATABASE

The majority of the analysis looks for relationships between total hours in the work order contract and other variables. Total PE hours or total CE hours is treated as the dependent variable and measurements considered to help determine the number of PE hours or CE hours required are treated as independent variables. The coefficient of determination, r-squared, is determined through linear regression analysis. If r-squared equals 1, it would indicate that the independent variable accounted for all of the variance of the dependent variable. A value of r-squared equal to zero would indicate that the independent variable explained none of the variance of the dependent variable. R-squared is used to determine the strength of relationship between the independent variable and the dependent variable (*Chalmer 1987*). An r-squared value of 0.8 indicates a strength of relationship twice as strong as an r-squared value of 0.4. For this report, R-squared values greater than 0.8 are indicative of a relationship that is potentially useful. R-squared values of 0.4 are indicative of a relationship that is potentially of interest.

Analysis indicates that strong relationships exist between total hours and task 1 (project management) hours for both CE and PE work. Analysis indicates that notable relationships exist between total hours and number of non-standard drawings for both PE and CE. Notable relationships exist between total hours and total project cost. Notable relationships exist between total hours and number of sub-consultants. Each of these relationships is now discussed.

4.3.1 Relationship of Total Consultant Hours and Consultant Project Management Hours

Figure 4.6 shows a plot of total consultant hours versus consultant project management (Task 1) hours by engineers. It may be seen that the relationship is strong (r -squared = 0.89). The slope of the regression line is 13.4, *indicating that there is one project management engineering hour added for every 13.4 total consultant hours added*. When reviewing a consultant's cost proposal, this value would provide a quick check to see if the consultant has estimated a reasonable amount of project management effort. If the ratio of total PE hours to project management engineering hours varies considerably from 13, further questioning would be in order.

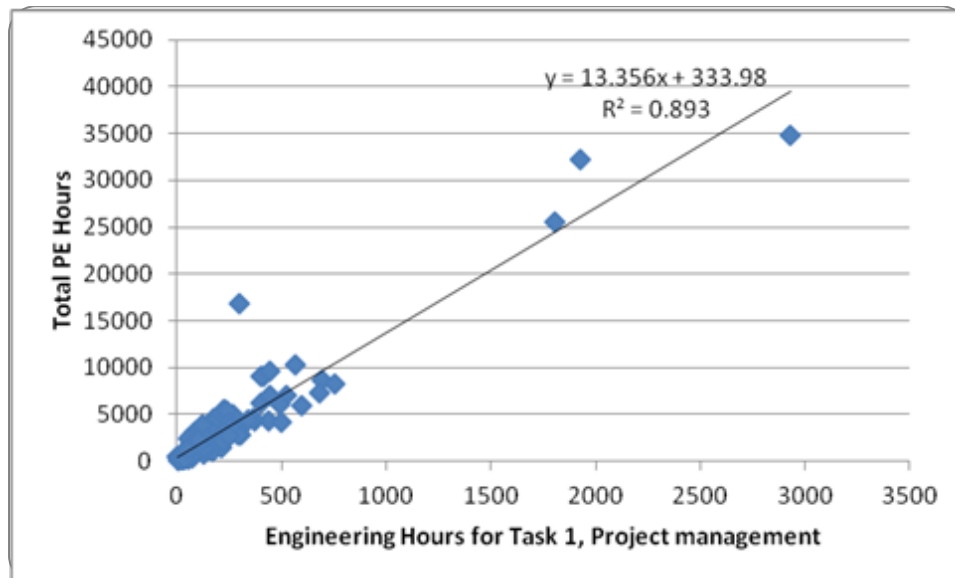


Figure 4.6: Total consultant PE hours versus engineering hours for PE task 1, project management

4.3.2 Relationship between Total Consultant PE Hours and Non-Standard Drawings

It was possible to obtain drawings for 120 of the projects. Drawings were classified as standard ODOT drawings and non-standard drawings. About 90% of the projects had fewer than 100 drawings total. Four projects had more than 150 drawings. The project with the most drawings had 384. Non-standard drawings were considered more indicative of effort required. About 90% of the projects had fewer than 50 non-standard drawings. Six projects generated more than 200 non-standard drawings, with the largest number being 314.

When compiling the database, it was not always clear to the research team what other engineering may have been done to produce the drawings associated with the project. In spite of that ambiguity, the relationship between engineering hours and number of drawings and number of non-standard drawings was examined. As would be expected, the relationship between non-standard drawings and total consultant PE hours was found to be stronger than the relationship between total drawings (including standard drawings) and total consultant PE hours. Figure 4.7

displays a plot of total PE hours versus number of non-standard drawings. R-squared is 0.41. The slope of the line is 65.5. For the projects in the database where number of non-standard drawings is known, addition of each non-standard drawing adds about 65 hours.

When breaking down contracts by project type, strongest relationships exist for modernization, preservation, enhancement, bridges, and safety projects. Weaker relationships exist for bike and pedestrian projects. See Figure 4.8, Figure 4.9, Figure 4.10, Figure 4.11, Figure 4.12, and Figure 4.13. There is virtually no relationship for CMAQ (congestion management air quality) projects.

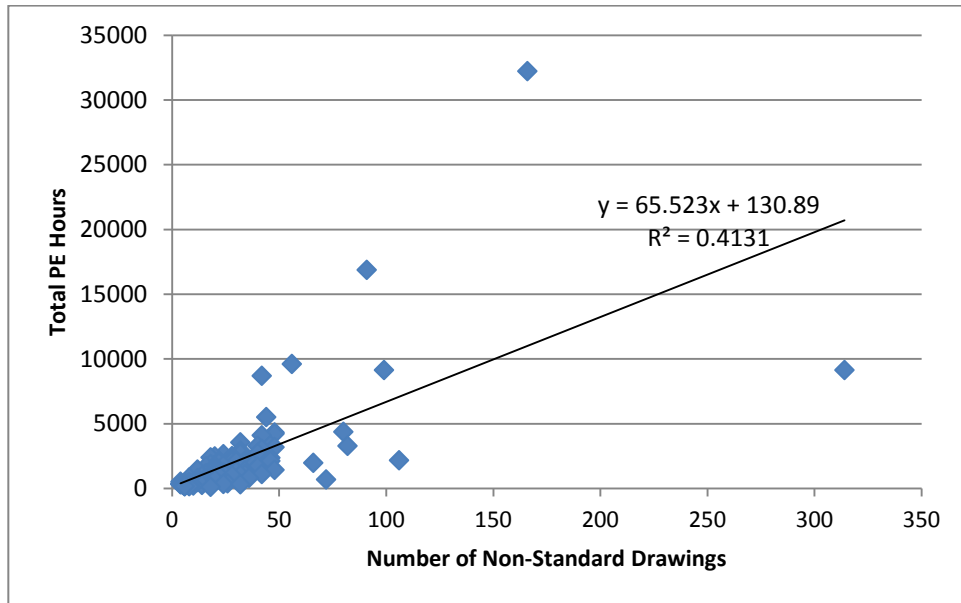


Figure 4.7: PE hours versus number of non-standard drawings

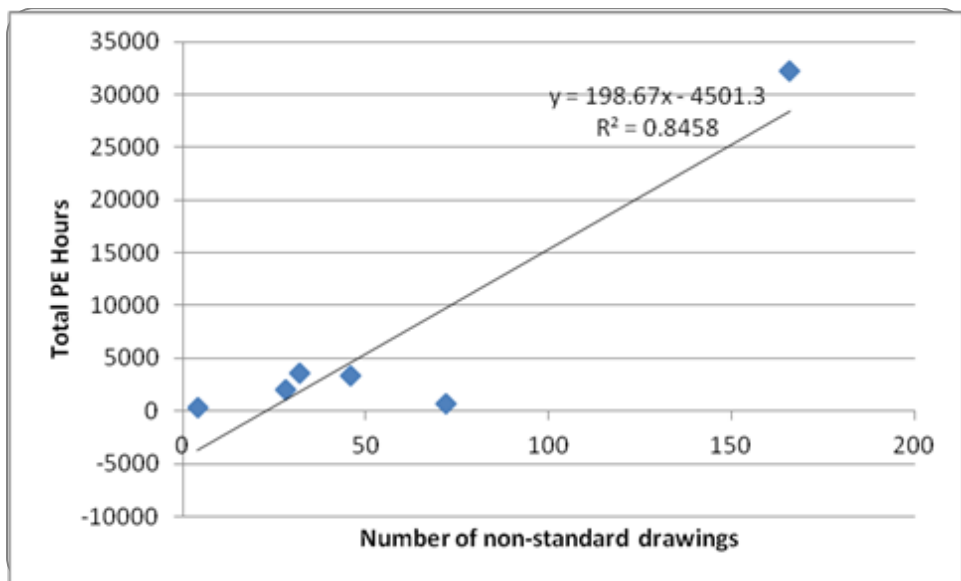


Figure 4.8: PE hours versus number of non-standard drawings for modernization projects

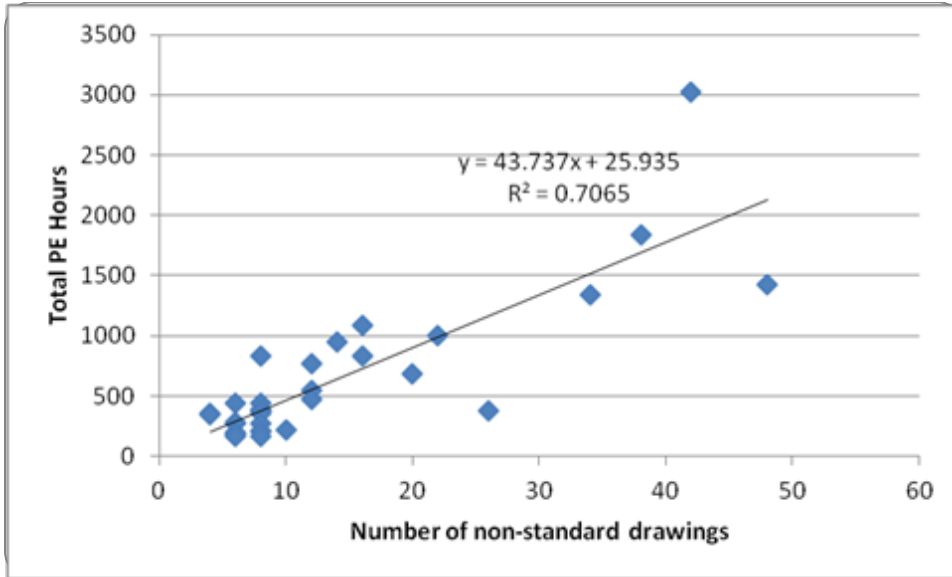


Figure 4.9: PE hours versus number of non-standard drawings for preservation projects

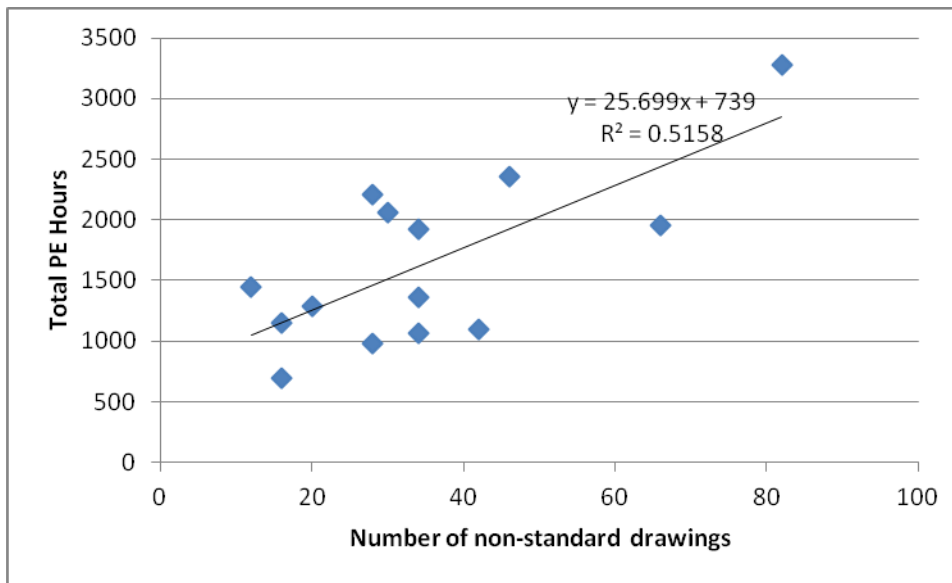


Figure 4.10: PE hours versus number of non-standard drawings for enhancement projects

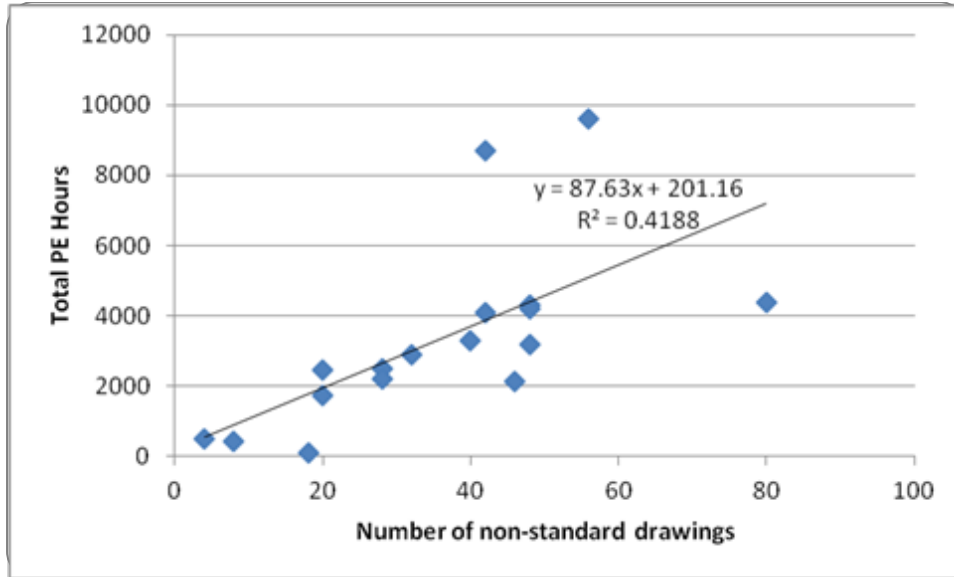


Figure 4.11: PE hours versus number of non-standard drawings for bridge and BRSF (bridge, small, off-system) projects

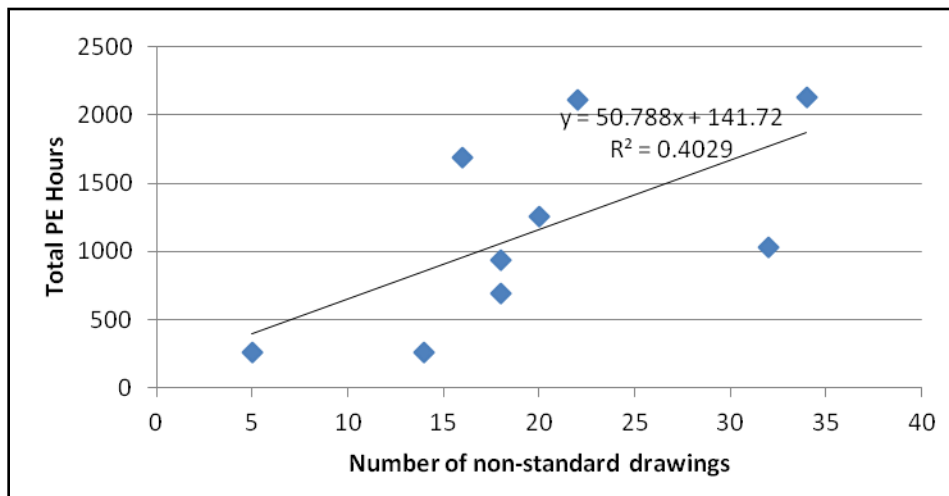


Figure 4.12: PE hours versus number of non-standard drawings for safety projects

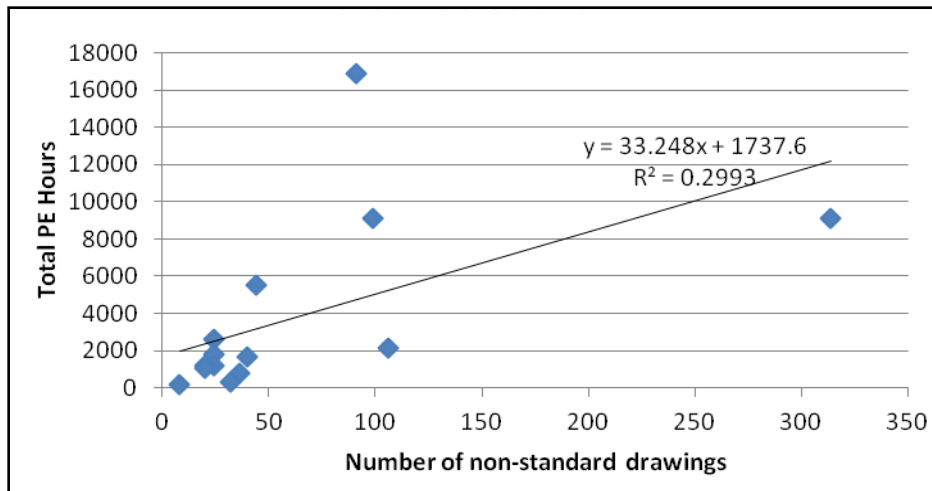


Figure 4.13: PE hours versus number of non-standard drawings for bike and pedestrian projects

4.3.3 Relationship between Total Consultant CE Hours and Non-Standard Drawings

The researchers were somewhat surprised to find that there is also a notable relationship between Total CE hours and number of non-standard drawings. Figure 4.14 shows this relationship. This relationship is actually stronger than the relationship to PE hours. R-squared is 0.46. The slope of the line is 26. The addition of each non-standard drawing requires about 26 consultant hours for CE.

When breaking down contracts by project type, strongest relationships exist for preservation, bike and pedestrian, modernization, and safety projects. A weaker relationship exists for bridges. See Figure 4.15, Figure 4.16, Figure 4.17, Figure 4.18, and Figure 4.19. CMAQ and enhancements projects show virtually no relationship between CE hours and number of non-standard drawings.

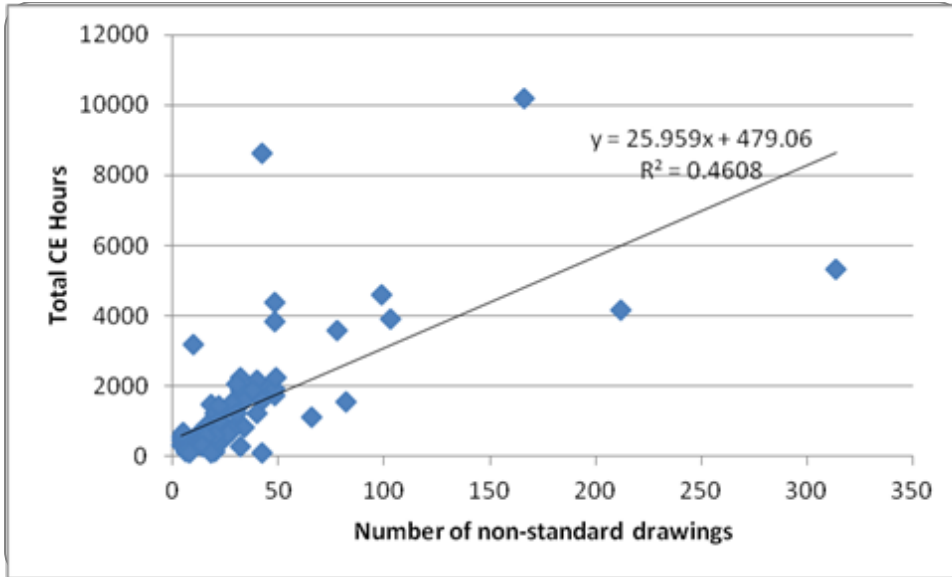


Figure 4.14: Total CE hours versus number of non-standard drawings

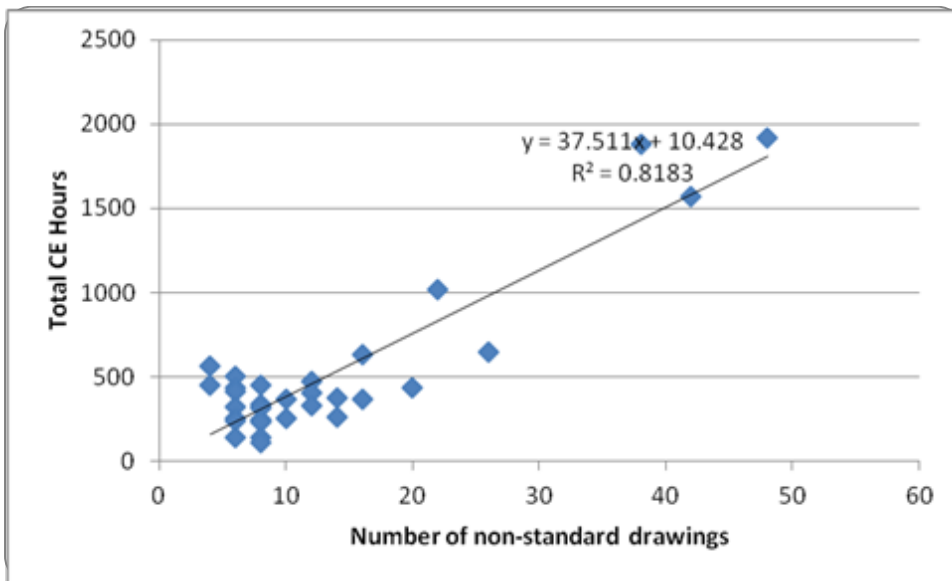


Figure 4.15: Total CE hours versus number of non-standard drawings for preservation projects

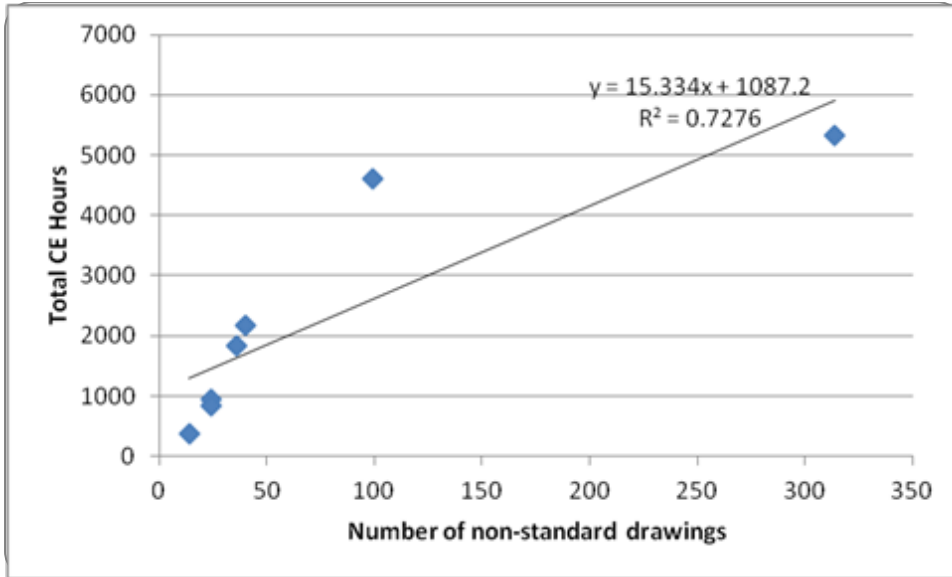


Figure 4.16: Total CE hours versus number of non-standard drawings for bike and pedestrian projects

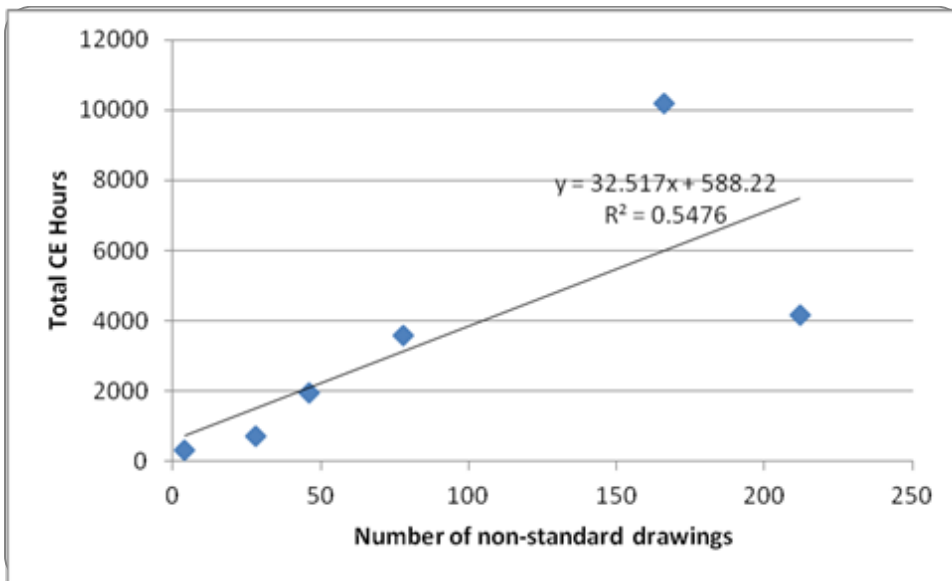


Figure 4.17: Total CE hours versus number of non-standard drawings for modernization projects

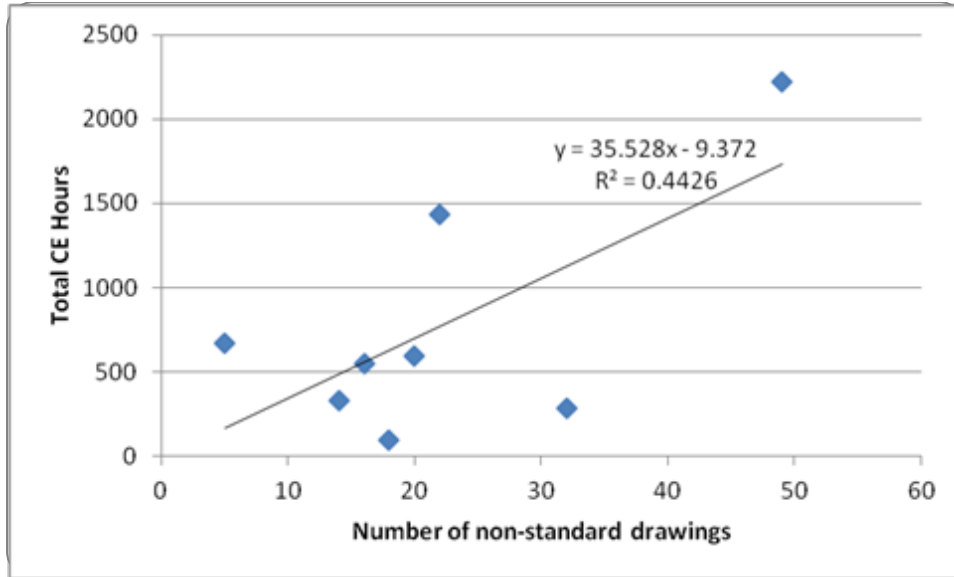


Figure 4.18: Total CE hours versus number of non-standard drawings for safety projects

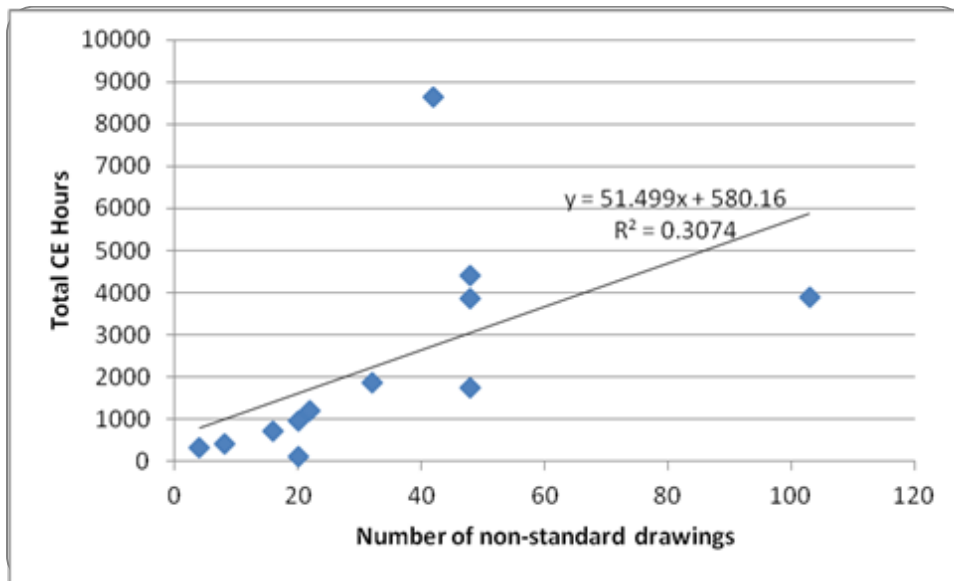


Figure 4.19: Total CE hours versus number of non-standard drawings for bridge & BRSF projects

4.3.4 Relationship between Total Consultant PE Hours and Total Project Cost by Project Type

It seems logical that there will be some type of relationship between PE hours required and construction contract value or total project cost, for each type of project, i.e. modernization, preservation, safety, etc. Since the focus of the database was on consultant hours rather than consultant contract value, the research team wanted to develop a measure that could relate consultant hours to contract value. Calculating hours per \$ of “Total Project Cost” produced values ranging from 0.0000762 to 0.0055 hrs/\$ for the local agency projects database. It is not easy to develop an intuitive feel for values this small. Using the inverse values was considered. Those minimum and maximum values translate into \$13,128 to \$182 Total Project Cost dollars/PE hour. This could be workable. However, a measure of consultant hours per million dollars of construction contract value was arbitrarily chosen. This produces a range of 76 to 5,500 hours/Total Project Cost in millions of dollars, with a mean value of 1606 hours/Total Project Cost in millions of dollars, or 1606 hours per million dollars. The median value is 1377 hours per million. Values vary greatly by ODOT project type, so those individuals who are estimating hours of effort required should use the tables of section 4.4 as a reality check rather than use an overall typical value of 1400-1600 hours per million dollars adjusted to the 2006 – 2011 timeframe.

Figure 4.20 displays a plot of total PE hours versus total project cost in millions of dollars for all projects in the database. R-squared is 0.69. The slope of the line is 1586 hours/cost in millions. In the 2006 – 2011 timeframe, each million dollars of additional total project cost required about 1600 PE hours.

When breaking down contracts by project type, strongest relationships exist for bridge, modernization, bike and pedestrian, and CMAQ projects. Weak relationships exist for preservation and enhancement projects. See Figure 4.21, Figure 4.22, Figure 4.23, Figure 4.24, Figure 4.25, and Figure 4.26. There is virtually no relationship for safety projects.

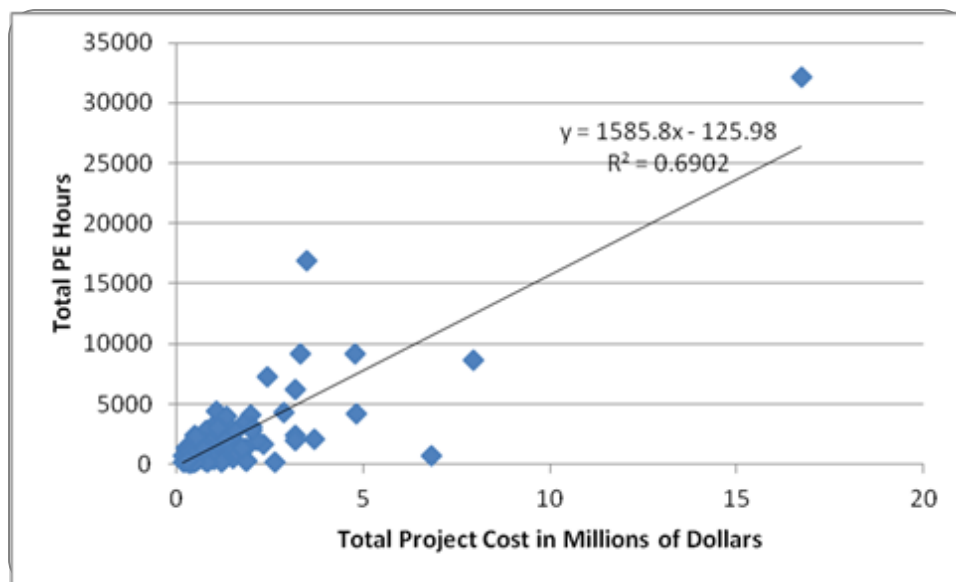


Figure 4.20: Total PE hours versus total project cost in millions of dollars for all projects

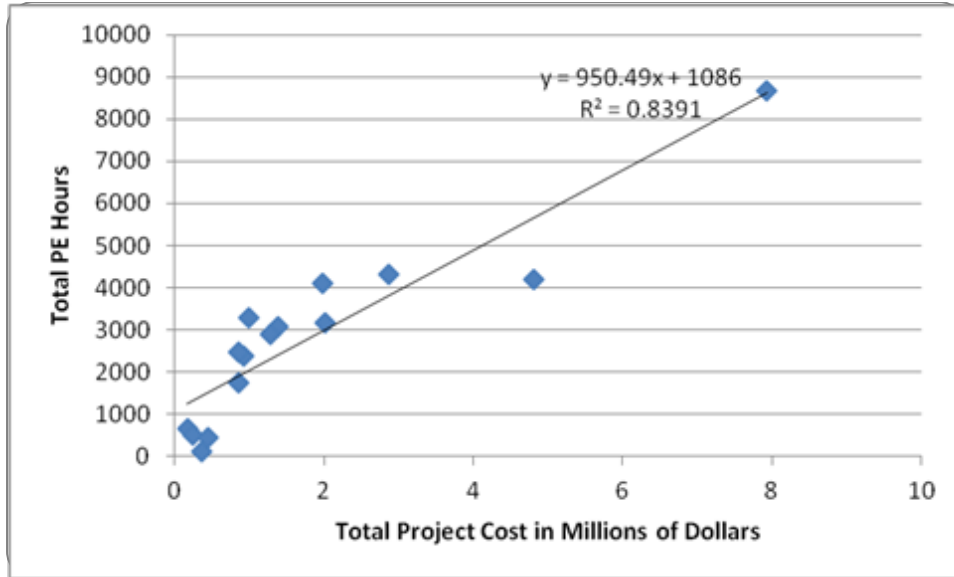


Figure 4.21: Total PE hours versus total project cost in millions of dollars for bridge & BRSF projects

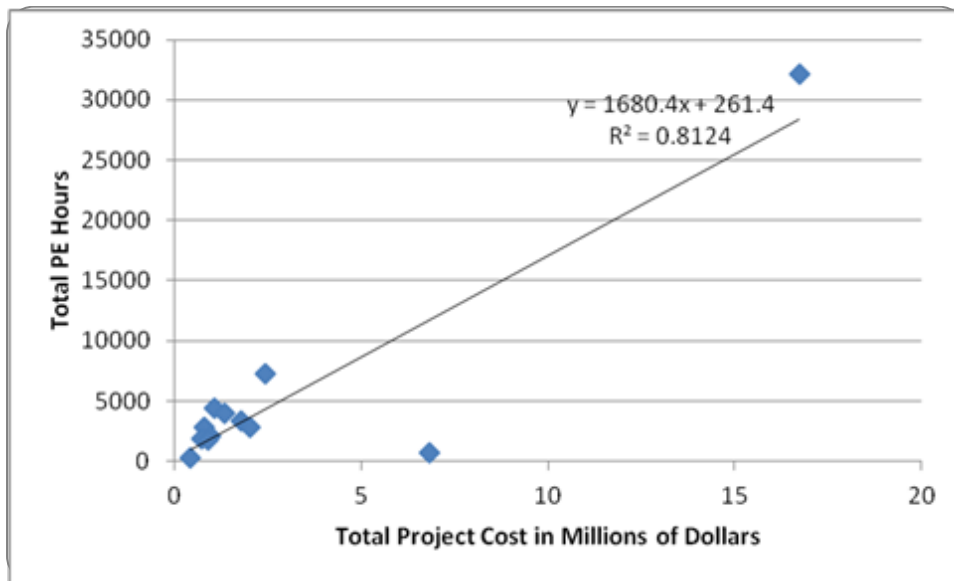


Figure 4.22: Total PE hours versus total project cost in millions of dollars for modernization projects

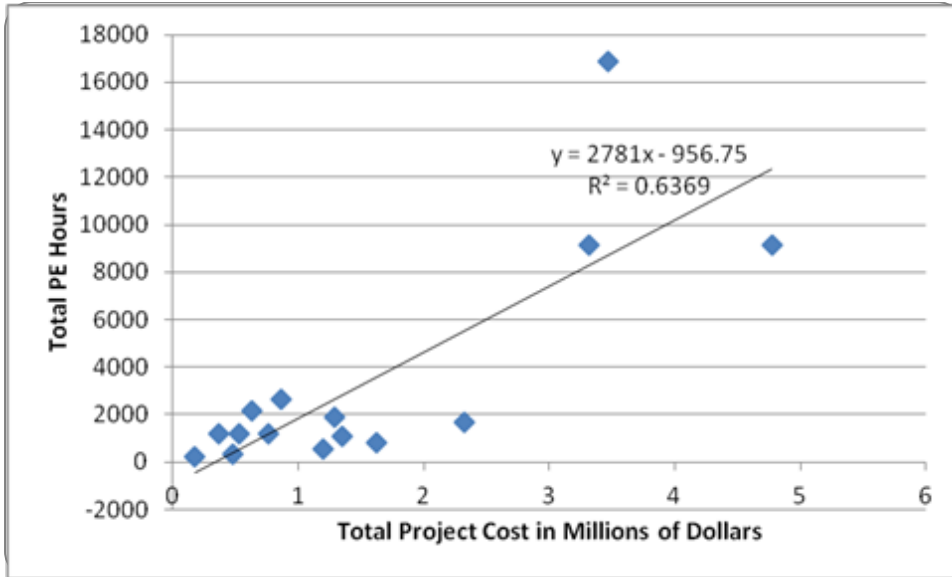


Figure 4.23: Total PE hours versus total project cost in millions of dollars for bike and pedestrian projects

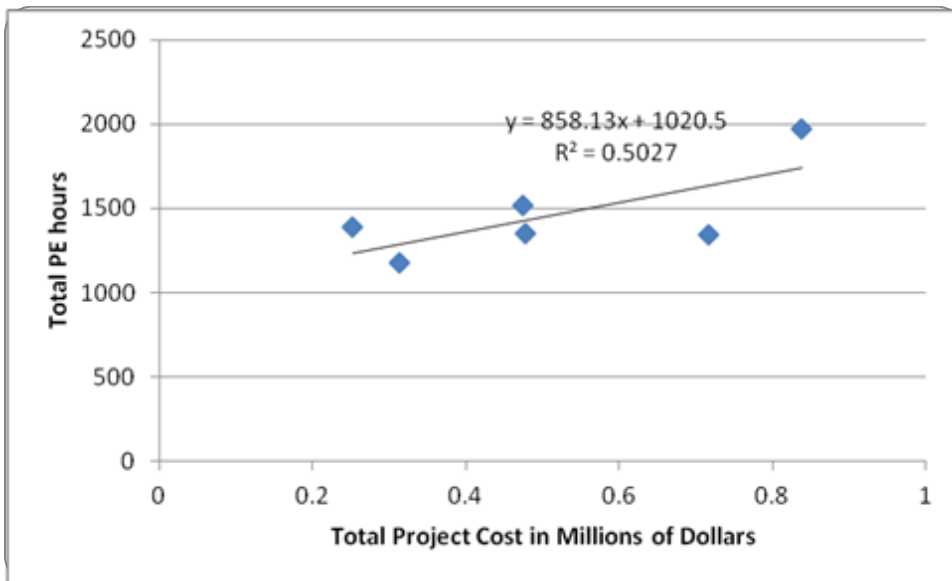


Figure 4.24: Total PE hours versus total project cost in millions of dollars for congestion management air quality projects

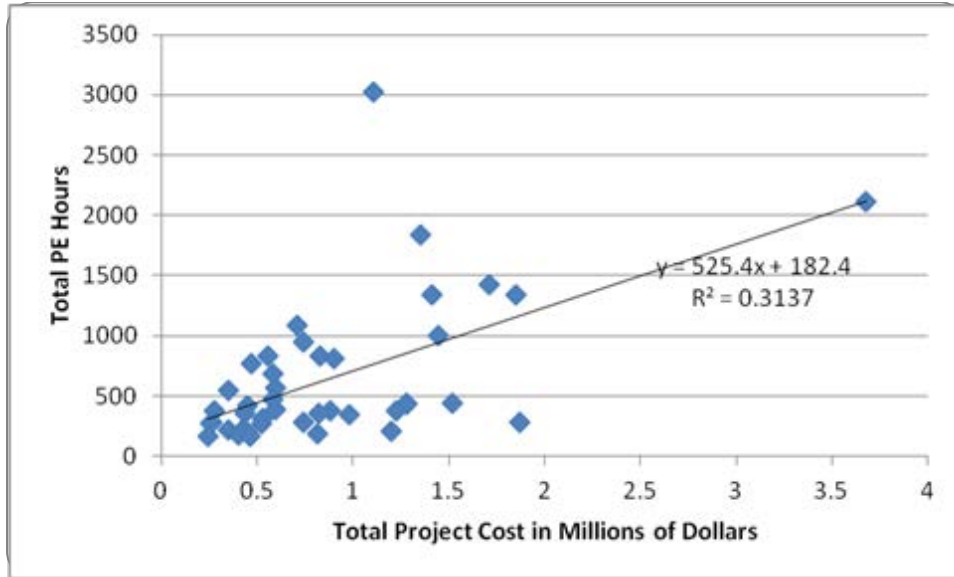


Figure 4.25: Total PE hours versus total project cost in millions of dollars for preservation projects

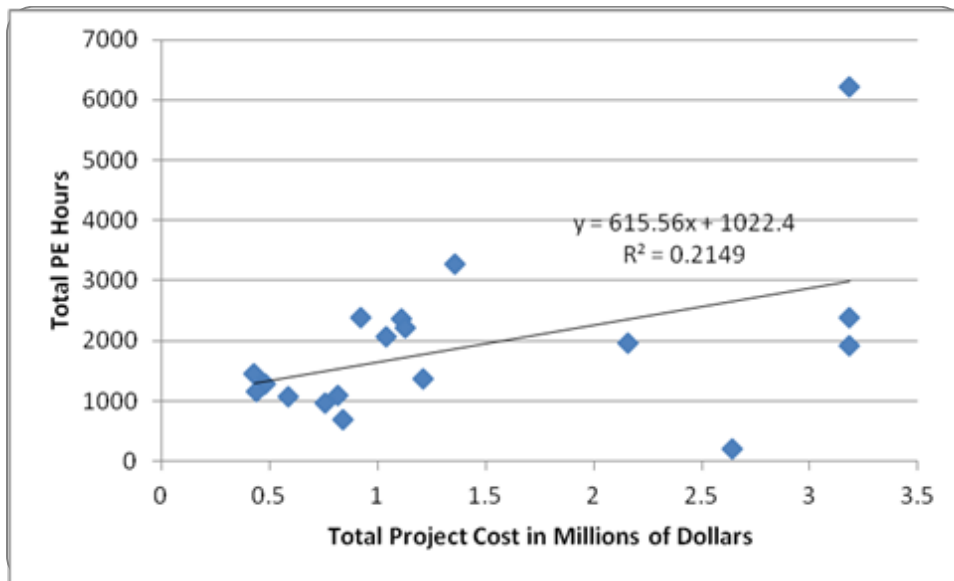


Figure 4.26: Total PE hours versus total project cost in millions of dollars for enhancement projects

Percent PE and Percent CE, commonly used for budgetary purposes, work to eliminate the effects of cost escalation in the marketplace, at least to the extent that costs of engineering and related services increase in cost at a similar rate to the increase in construction costs. Although there was undoubtedly some inflation in construction costs between the initial projects in the database in 2006 and the final projects in the database in 2011, no attempt was made to adjust for any inflation or deflation in construction contract costs. If consultant hours per million dollars of construction contract value is to be used over a larger database and a longer period of time, all construction costs will need to be adjusted to a “base” year to account for the effects of inflation.

Although the focus of the databases compiled in this study is hours rather than dollars, the availability of data did provide the opportunity to check how closely PE hours and costs and CE hours and costs are related. A plot of total PE cost versus total PE hours for the local agency projects database produces an r-squared value of 0.99. A similar plot of total CE costs versus total CE hours produces an r-squared value of 0.98. ***PE cost and CE cost are good surrogates for PE hours and CE hours.*** Percent PE and percent CE have the advantage of tending to compensate for escalation of costs over time. But hours are needed for any type of serious negotiation.

The r-squared values of 0.99 and 0.98 are extremely high. The research team pondered how this could be, and could not reach a conclusion. The research team could only speculate that since all the data are based on estimates of hours required to do the work, it may just mean that in preparing the BOC's, the consultant and ODOT are both starting with a traditional %PE or %CE estimate and then making the hours fit to that estimate.

4.3.5 Relationship between Total Consultant CE Hours and Total Project Cost by Project Type

There is also a notable relationship between Total CE hours and total project cost in millions of dollars. Figure 4.27 shows this relationship for all projects in the database. This relationship is stronger than the relationship to PE hours. R-squared is 0.78. The slope of the line is 711 CE hours/million dollars total project cost. Each million dollar increase in project cost requires about 711 consultant hours for CE.

When breaking down contracts by project type, strongest relationships exist for modernization, bike & pedestrian, bridge, and CMAQ projects. Weaker relationships exist for safety and preservation projects. See Figure 4.28, Figure 4.29, Figure 4.30, Figure 4.31, Figure 4.32, and Figure 4.33. Enhancement projects show virtually no relationship between CE hours and total project cost.

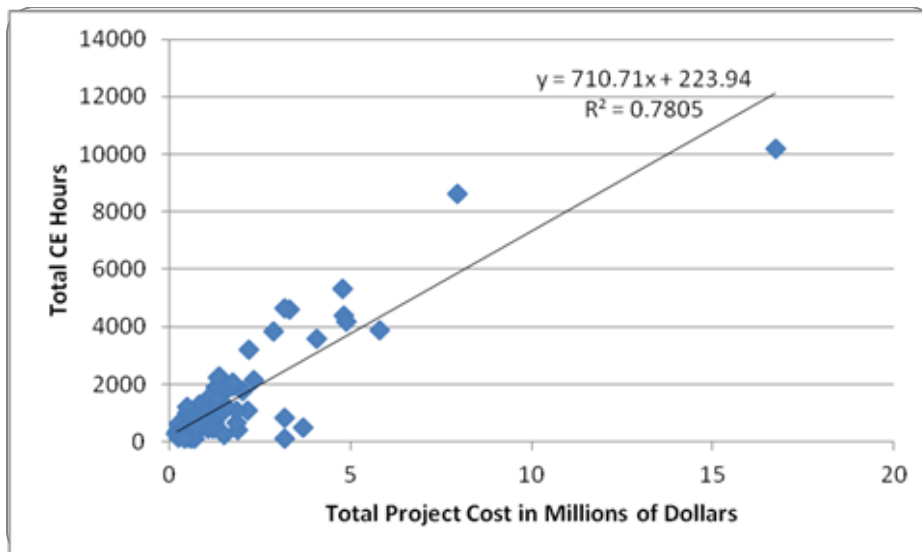


Figure 4.27: Total CE hours versus total project cost in millions of dollars for all projects

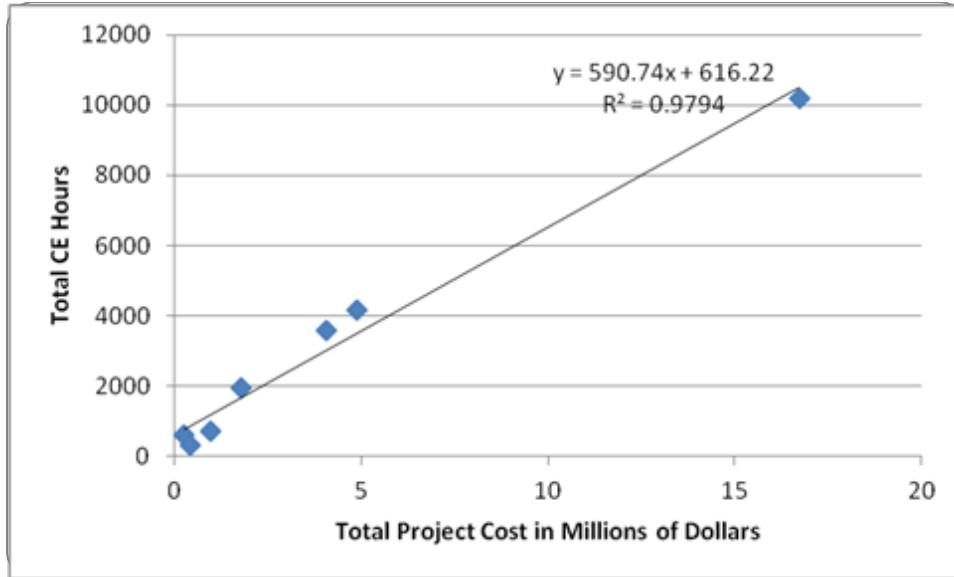


Figure 4.28: Total CE hours versus total project cost in millions of dollars for modernization projects

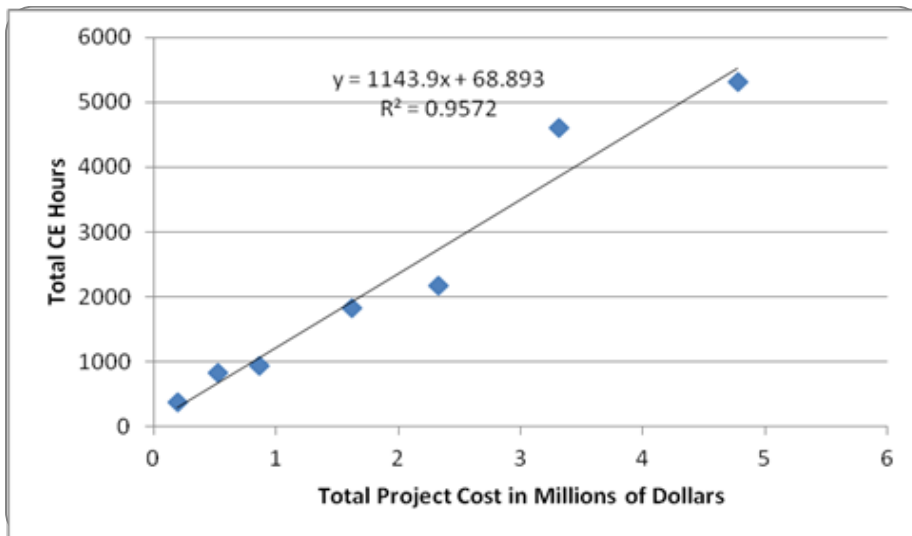


Figure 4.29: Total CE hours versus total project cost in millions of dollars for bike and pedestrian projects

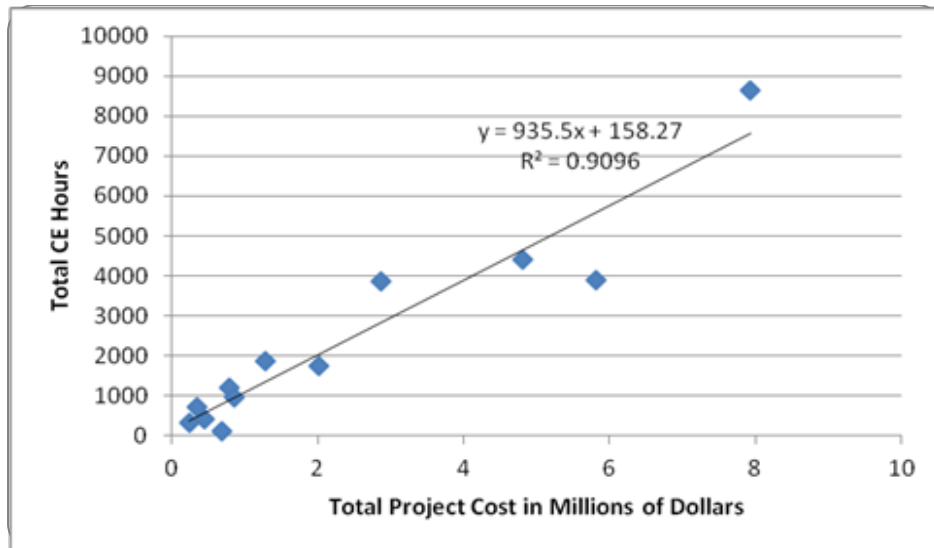


Figure 4.30: Total CE hours versus total project cost in millions of dollars for bridge and BRSF projects

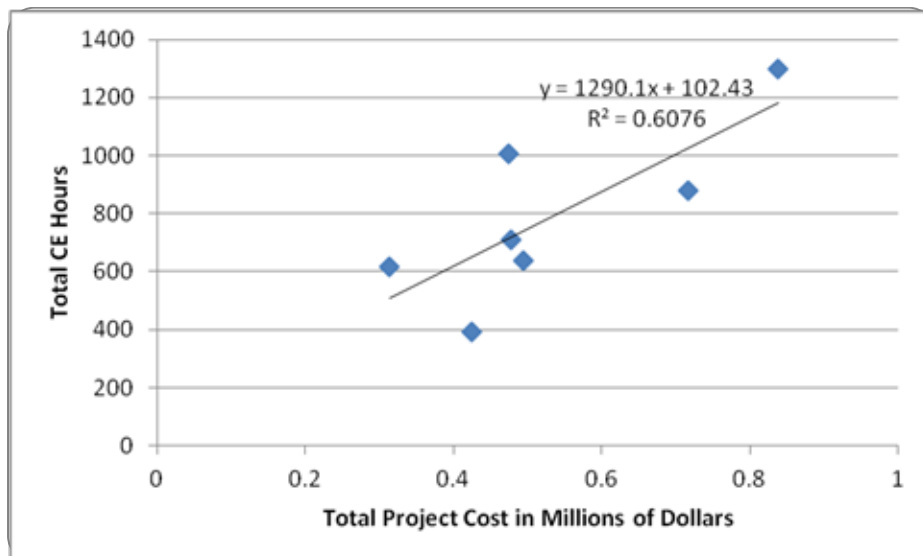


Figure 4.31: Total CE hours versus total projects cost in millions of dollars for CMAQ projects

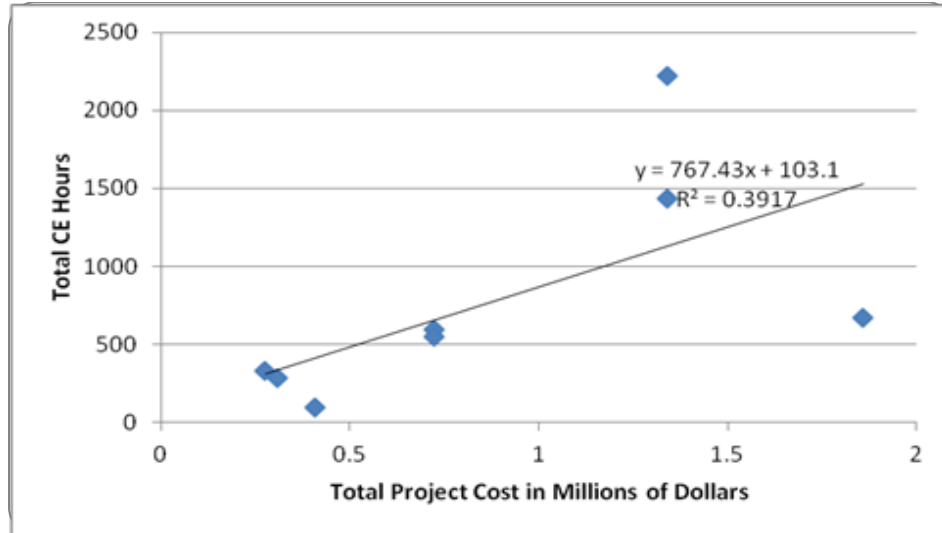


Figure 4.32: Total CE hours versus total project cost in millions of dollars for safety projects

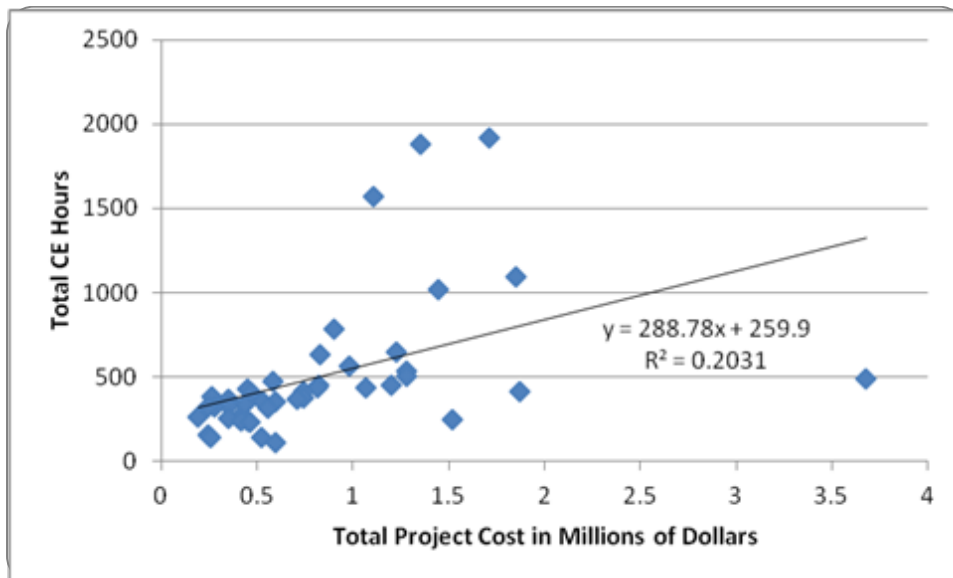


Figure 4.33: Total CE hours versus total project cost in millions of dollars for preservation projects

4.3.6 Relationship between Total Hours and Number of Sub-consultants

The relationships between number of sub-consultants and total PE hours and between number of sub-consultants and CE hours were investigated. As the number of sub-consultants increases, the number of PE hours and CE hours also increases. This is logical, but is not seen as particularly useful information for negotiating consultant contracts.

4.3.7 Summary of the Analyses of the Local Agency Projects Database

Of the relationships discussed in the previous sections, the relationships between hours and non-standard drawings and between hours and total project cost are of most interest. The R-squared values for these relationships are summarized in Table 4.2 and in Figure 4.34.

Table 4.2: Relationships between consultant hours and non-standard drawings and project cost, by project type

	R-Squared Values			
	Total PE Hours and Number of Non-Standard Drawings	Total CE Hours and Number of Non-Standard Drawings	Total PE Hours and Total Project Cost	Total CE Hours and Total Project Cost
All Projects	0.41	0.46	0.69	0.78
Bike and Ped	0.30	0.73	0.64	0.96
Bridge & BRSF	0.42	0.31	0.84	0.91
CMAQ	0.01	0.03	0.50	0.61
Enhancement	0.52	0.03	0.21	0.11
Modernization	0.85	0.55	0.81	0.98
Preservation	0.71	0.82	0.31	0.20
Safety	0.40	0.44	0.01	0.39

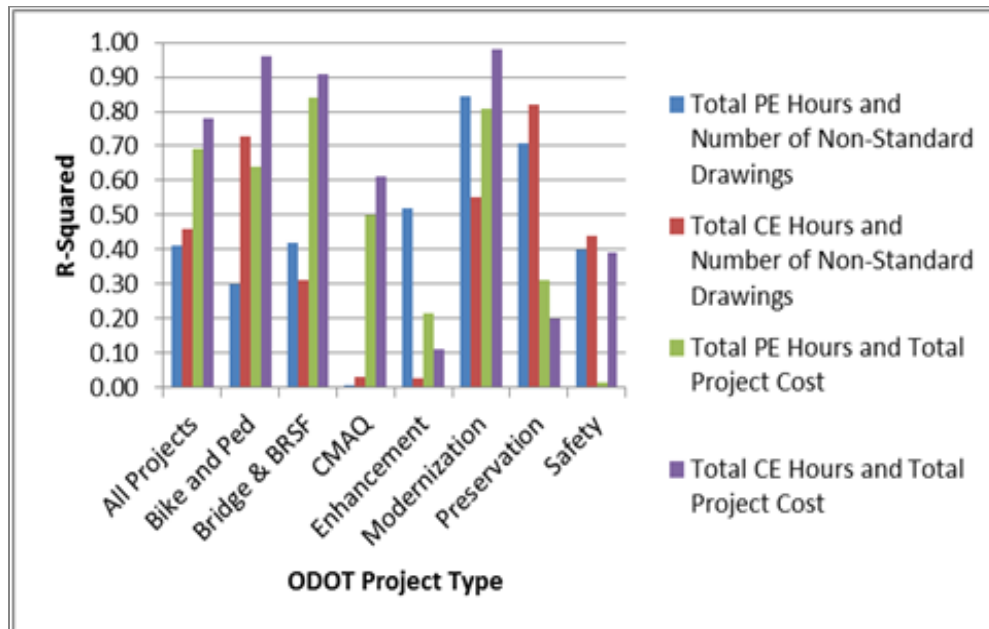


Figure 4.34: Relationships between consultant hours and non-standard drawings and project cost, by project type

4.4 SUMMARY STATISTICS FROM LOCAL AGENCY PROJECTS DATABASE

Based on the analysis of the previous section, five variables were identified as being potentially useful for aiding in negotiation of contracts. Table 4.3, Table 4.4, Table 4.5, Table 4.6, Table 4.7, Table 4.8, and Table 4.9 show minimum, 25th percentile, 50th percentile (median), 75th percentile, maximum, and mean values for five variables that may be helpful in checking total hours in preparing the independent government estimate and in negotiating the not-to-exceed amount for the work order or contract. It should be noted that construction costs were for projects active in the 2006 to 2012 time frame. When using the variables involving total project cost for checking estimates for future projects, total project costs should be adjusted back to that time frame. Minimum, maximum, mean and percentile values for the majority of fields in the database may be computed by the contract administrator as desired.

As will be noted in Section 4.8, the guidelines for use of the database, when estimating the hours for the independent government estimate, the ODOT contract administrator should work from values for hours from specific projects in the database that are most comparable to the project being estimated. When that estimate has been completed, comparison of total hours to the summary statistics for the five variables from the database will serve as a reality check and aid in resolving differences between the independent government estimate and the consultant's estimate.

Table 4.3: Descriptive statistics for five variables -- bike & pedestrian projects

	Bike & Pedestrian Projects					
	Minimum	25th Percentile	Median	75th Percentile	Maximum	Mean
Total Estimated Consultant PE hours per Million Dollars Total Project Cost	468	715	1,545	3,075	4,859	1,924
Total Estimated Consultant PE Hours per Non-Standard Drawing	10	25	52	97	185	64
Total Estimated Consultant PE Hours/Estimated Consultant Project Management Hours	4.3	12.7	17.4	22.3	187.3	28.5
Total Estimated Consultant CE Hours Per Million Dollars Total Project Cost	931.3	1100.3	1127.9	1576.1	1880.8	1302.6
Total Estimated Consultant CE Hours per Non-Standard Drawing	17	26	39	51	54	38

Table 4.4: Descriptive statistics for five variables -- bridge & BRSF

	Bridge and BRSF Projects					
	Minimum	25th Percentile	Median	75th Percentile	Maximum	Mean
Total Estimated Consultant PE hours per Million Dollars Total Project Cost	306	1,094	2,066	2,585	3,847	1,979
Total Estimated Consultant PE Hours per Non-Standard Drawing	6	60	88	110	207	92
Total Estimated Consultant PE Hours/Estimated Consultant Project Management Hours	8.4	13.2	17.8	26.9	42.1	20.5
Total Estimated Consultant CE Hours Per Million Dollars Total Project Cost	168.4	877.7	1108.4	1442.7	2157.9	1132.5
Total Estimated Consultant CE Hours per Non-Standard Drawing	6	40	53	80	206	66

Table 4.5: Descriptive statistics for five variables -- CMAQ projects

	Congestion Management Air Quality					
	Minimum	25th Percentile	Median	75th Percentile	Maximum	Mean
Total Estimated Consultant PE hours per Million Dollars Total Project Cost	1,879	2,238	3,016	4,192	5,500	3,254
Total Estimated Consultant PE Hours per Non-Standard Drawing	45	55	75	83	90	70
Total Estimated Consultant PE Hours/Estimated Consultant Project Management Hours	12.3	13.2	14.6	19.5	27.1	16.5
Total Estimated Consultant CE Hours Per Million Dollars Total Project Cost	924	1,226	1,482	1,962	2,121	1,509
Total Estimated Consultant CE Hours per Non-Standard Drawing	18	29	34	50	59	37

Table 4.6: Descriptive statistics for five variables -- enhancement projects

	Enhancements					
	Minimum	25th Percentile	Median	75th Percentile	Maximum	Mean
Total Estimated Consultant PE hours per Million Dollars Total Project Cost	76	887	1,884	2,459	3,371	1,690
Total Estimated Consultant PE Hours per Non-Standard Drawing	26	34	47	70	121	54
Total Estimated Consultant PE Hours/Estimated Consultant Project Management Hours	6.3	12.3	15.5	21.1	41.1	18.6
Total Estimated Consultant CE Hours Per Million Dollars Total Project Cost	30	794	1,307	1,497	2,528	1,210
Total Estimated Consultant CE Hours per Non-Standard Drawing	2	19	47	55	319	63

Table 4.7: Descriptive statistics for five variables -- modernization projects

	Modernization					
	Minimum	25th Percentile	Median	75th Percentile	Maximum	Mean
Total Estimated Consultant PE hours per Million Dollars Total Project Cost	101	1,509	2,086	3,002	4,139	2,205
Total Estimated Consultant PE Hours per Non-Standard Drawing	10	57	75	131	194	89
Total Estimated Consultant PE Hours/Estimated Consultant Project Management Hours	8.7	11.0	14.1	18.9	32.4	15.8
Total Estimated Consultant CE Hours Per Million Dollars Total Project Cost	609	730	854	1,101	2,415	1,048
Total Estimated Consultant CE Hours per Non-Standard Drawing	20	24	44	66	79	46

Table 4.8 Descriptive statistics for five variables -- preservation projects

	Preservation					
	Minimum	25th Percentile	Median	75th Percentile	Maximum	Mean
Total Estimated Consultant PE hours per Million Dollars Total Project Cost	152	416	676	1,049	2,725	802
Total Estimated Consultant PE Hours per Non-Standard Drawing	15	31	46	60	104	47
Total Estimated Consultant PE Hours/Estimated Consultant Project Management Hours	6.3	9.3	12.4	14.4	79.8	14.0
Total Estimated Consultant CE Hours Per Million Dollars Total Project Cost	134	502	590	870	1,429	693
Total Estimated Consultant CE Hours per Non-Standard Drawing	14	26	39	48	142	43

Table 4.9: Descriptive statistics for five variables -- safety projects

	Safety					
	Minimum	25th Percentile	Median	75th Percentile	Maximum	Mean
Total Estimated Consultant PE hours per Million Dollars Total Project Cost	142	956	1,705	2,330	2,649	1,585
Total Estimated Consultant PE Hours per Non-Standard Drawing	19	35	53	79	105	58
Total Estimated Consultant PE Hours/Estimated Consultant Project Management Hours	4.8	8.9	10.1	13.4	18.2	11.0
Total Estimated Consultant CE Hours Per Million Dollars Total Project Cost	237	460	868	1,165	1,659	878
Total Estimated Consultant CE Hours per Non-Standard Drawing	5	12	32	60	133	43

4.5 OTIA III BRIDGE PROJECTS DATABASE

ODOT's Major Projects Branch, through Oregon Bridge Delivery Partners, the program manager for the OTIA III projects, made available fee estimate spreadsheet templates (FESTs) from design-bid-build projects. Data from projects involving repair or replacement of 124 bridges were made available. Eighty-one of the projects were for bridge repair, and forty-three were for bridge replacement. Thirteen of the repair projects were cancelled and did not go to construction. They are retained in the database because the estimates can still be useful. The majority of existing bridges were reinforced concrete bridges. The most common span description is "reinforced concrete deck girder," with 59 of the 81 repair projects having this span description. To form the database, these data were combined with descriptive information about the design and construction of the bridges obtained from ODOT's bridge database, provided by Theresa Yih. A printout of the database field descriptions and the values for the first 4 records of the OTIA III database is provided in Appendix E.

The FEST is the Excel workbook used by OBDP and the consultants for the OTIA III bridge program. It is used to estimate the cost of consultant contracts and is similar to the previously discussed BOC provided by ODOT OPO. Rows in the main hours-entry spreadsheet represent tasks to be performed by the consultant, and columns represent resources to be expended by the consultant in performing those tasks. There are 9 types of worksheets in the workbook. The main hours-entry worksheet is present 10 times to allow for up to ten bridges in the contract. Printouts from a blank FEST are provided in Appendix F. These printouts are:

1. Instructions worksheet
2. Basic Input worksheet
3. Build-up worksheet
4. One of ten blank worksheets (one for each bridge in the contract) for entering labor resources to be employed and the number of hours of utilization of each. This is the worksheet for entry of hours by labor resource
5. Sub-consultants' total
6. Prime consultant total
7. A&E total by phase
8. Summary
9. Analysis

The FEST workbook produces worksheets 5 – 9 based on data entered in worksheets 2 – 4.

Based on the Statement of Work provided by ODOT, the consultant and the contract administrator for OBDP independently complete the FEST. During the negotiations, comparison of the two FESTs results in an estimate of cost for the scope of work described in the SOW as

performed by the consultant. Generally, this estimate is then used to determine a not-to-exceed (NTE) amount for the contract.

4.6 ANALYSES OF THE OTIA III BRIDGE DATABASE

The majority of the analysis looks for relationships between total hours in the consultant contract and other variables. Analysis indicates that mean values of total hours per million construction cost are different for bridge replacement and for bridge repair projects. Bridge repair projects resulted in higher values of PE hours per million dollars of construction cost than did bridge replacement projects. Relationships between total PE hours and project management task hours were examined. It was hypothesized that there would be a relationship between area of bridge deck and total PE hours, but this relationship is virtually non-existent.

4.6.1 Relationship between Total PE Hours and Project Management Hours

The relationship between total PE hours and project management hours for the bridge database is relatively weak. Figure 4.35 shows that relationship. R-Square is only 0.51. Splitting the database into repair projects and replace projects does not show notably stronger relationships. Figure 4.36 and Figure 4.37 show the plots.

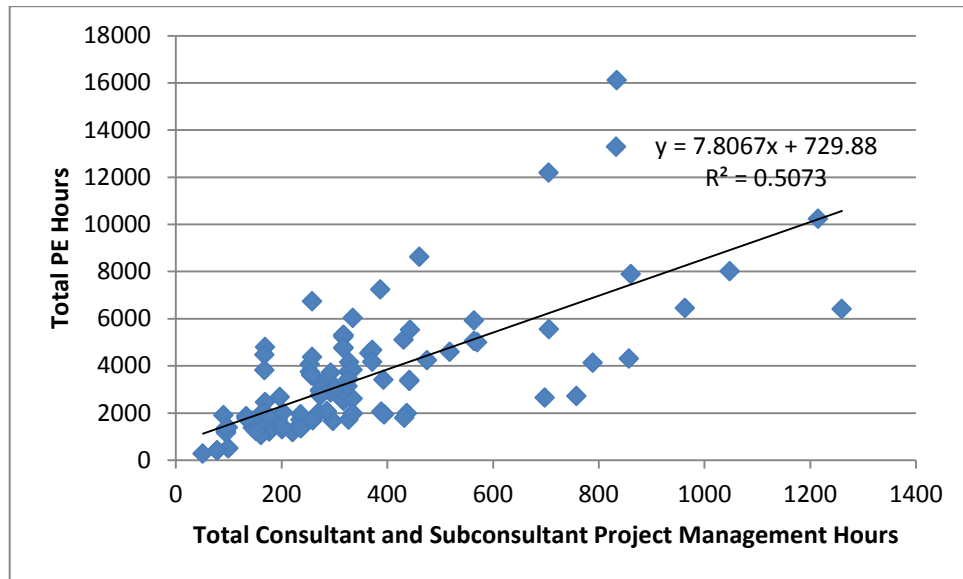


Figure 4.35: Total PE hours versus consultant and sub-consultant project management task hours -- entire OTIA III database.

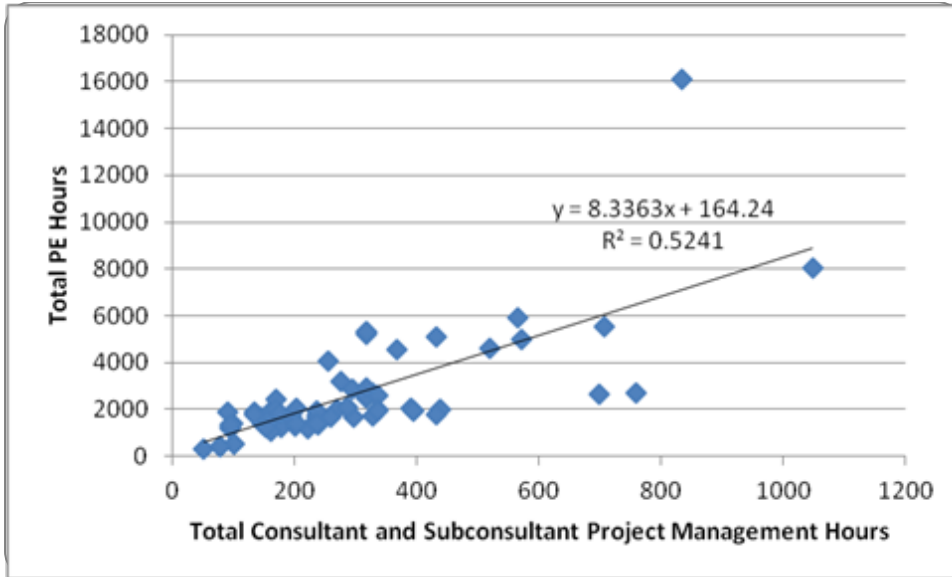
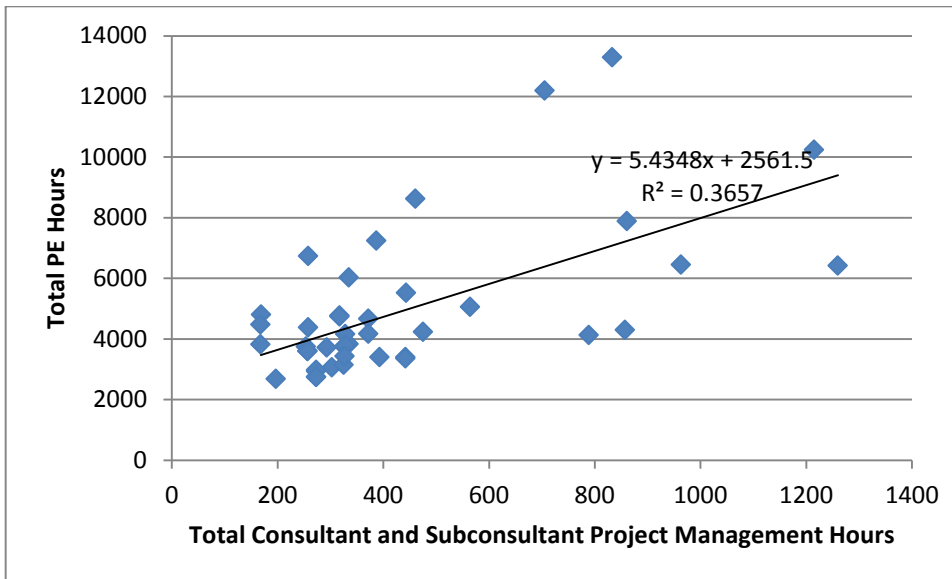


Figure 4.36: Total PE hours versus consultant and sub-consultant project management task hours -- OTIA III repair projects.



4.6.2 Relationship between Total PE Hours and Millions of Dollars of Construction Cost

The relationship between total PE hours and millions of dollars of construction cost is weak, as is shown in Figure 4.38, Figure 4.39, and Figure 4.40. R-Square values are 0.35 for all projects in the database, 0.31 for repair projects, and 0.04 for replacement projects. The usefulness of the bridge database for PE hours/million dollars construction cost will be derived from identification of a similar project in the database, and the tables of minimum, 25th percentile, median, 75th percentile, and maximum values presented later in this chapter for a reality check.

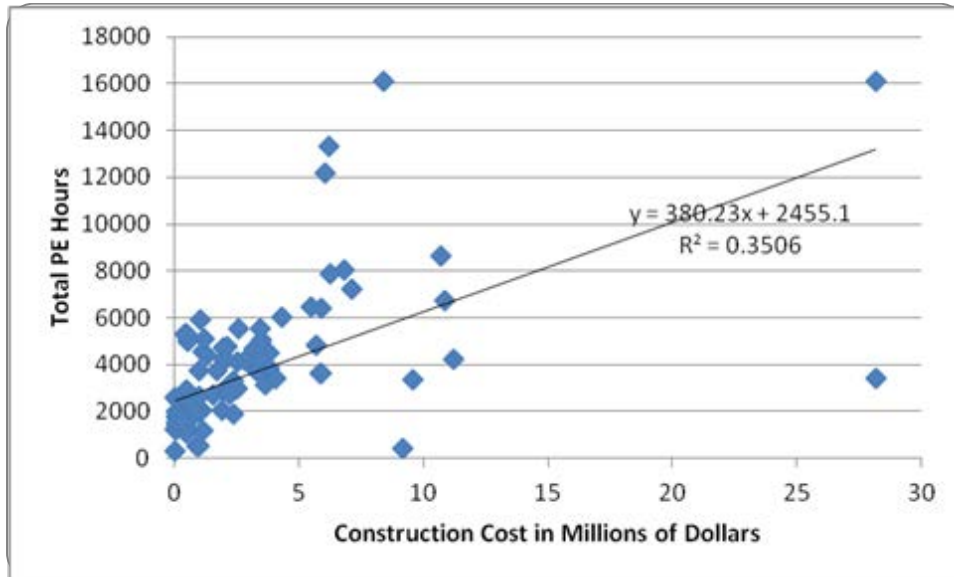


Figure 4.38: Total PE hours versus construction cost in millions of dollars -- all OTIA III projects.

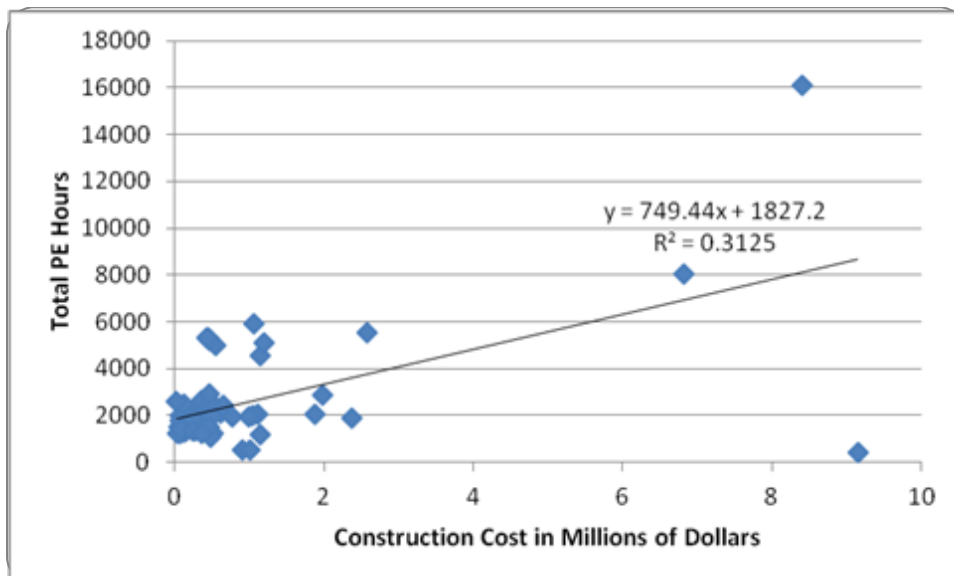


Figure 4.39: Total PE hours versus construction cost in millions of dollars --- OTIA III repair projects.

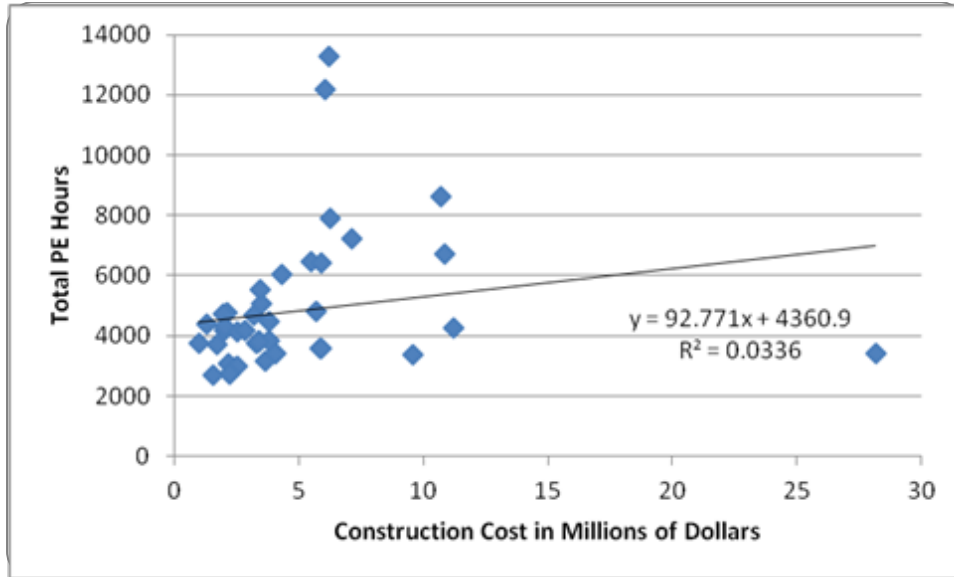


Figure 4.40: Total PE hours versus construction cost in millions of dollars -- OTIA III replacement projects.

4.6.3 Relationship between Total PE Hours and Square Feet of Bridge Deck Area

It was hypothesized that total PE hours would be related to the size of bridge deck being repaired or replaced. The numbers in the database do not bear this out. Figure 4.41, Figure 4.42, and Figure 4.43 show the plots for the entire bridge database, for repair projects, and for replacement projects. R-Square values are only 0.03, 0.05, and 0.01 respectively. There appears to be no relationship between size of bridge deck and engineering effort required.

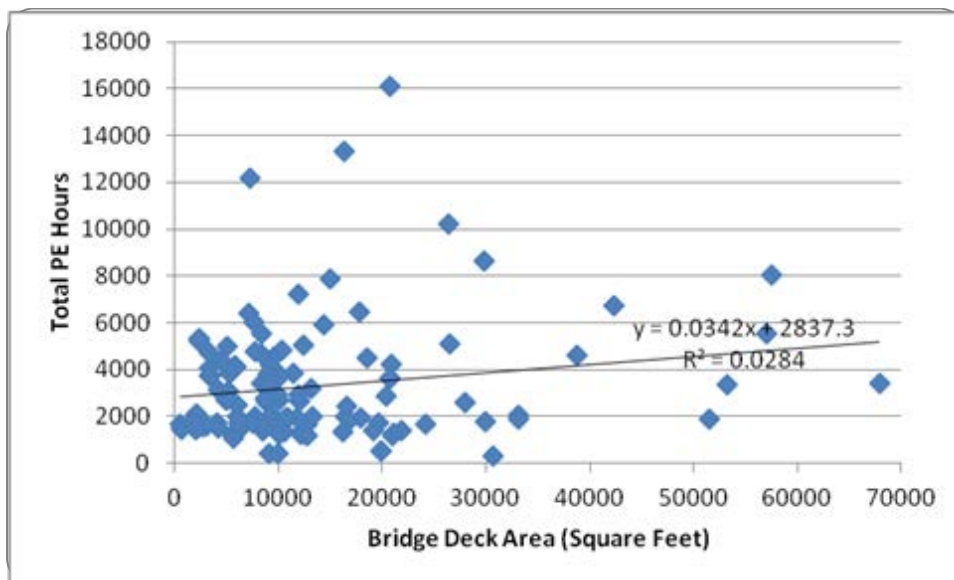


Figure 4.41: Total PE hours versus bridge deck area -- OTIA III projects.

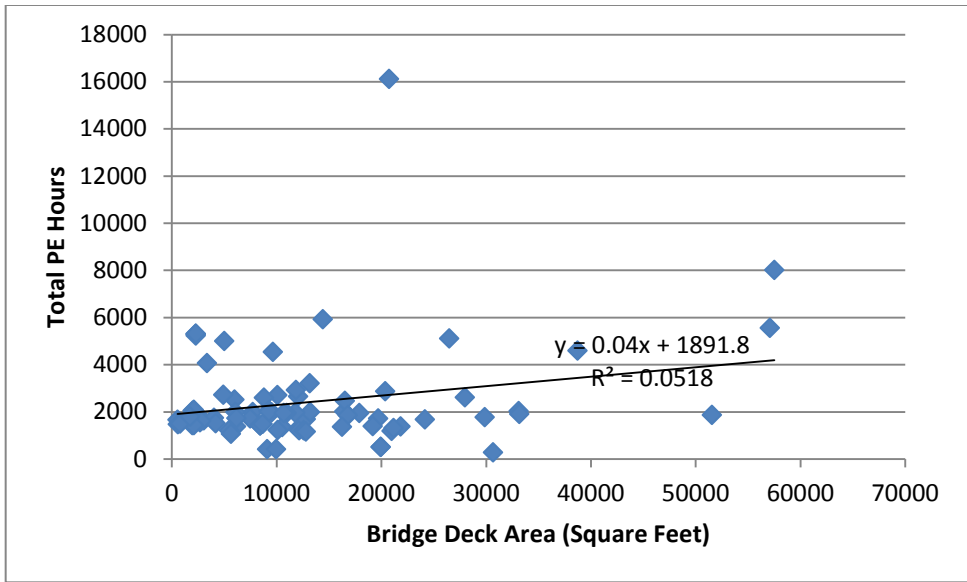


Figure 4.42: Total PE hours versus bridge deck area -- OTIA III repair projects.

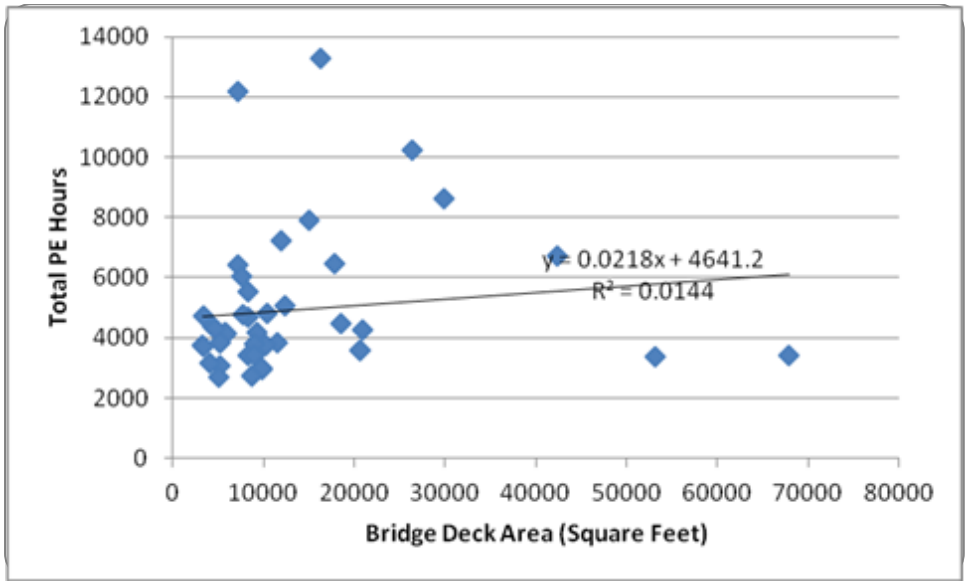


Figure 4.43: Total PE hours versus bridge deck area -- OTIA III replacement projects.

4.7 SUMMARY STATISTICS FROM OTIA III BRIDGE DATABASE

Based on the analysis of the previous section, two variables were identified as being potentially useful for aiding in negotiations of contracts for bridge repair and replacement projects. Table 4.10 and Table 4.11 show minimum, 25th percentile, 50th percentile (median), 75th percentile, maximum, and mean values for total estimated consultant PE hours per million dollars construction cost and total estimated consultant PE hours/estimated consultant project management hours, for bridge repair projects, and for bridge replacement projects. Minimum, maximum, percentile, and mean values for the majority of fields in the database may be computed by the database user as desired.

Table 4.10: Descriptive statistics for bridge repair projects from the OTIA III database.

	Bridge Repair Projects					
	Minimum	25th Percentile	Median	75th Percentile	Maximum	Mean
Total Estimated Consultant PE hours per Million Dollars Construction Cost	513	2,503	5,619	10,392	121,529	9,306
Total Estimated Consultant PE Hours/Estimated Consultant Project Management Hours	3.6	6.2	8.9	11.7	21.2	9.3

Table 4.11: Descriptive statistics for bridge replacement projects from the OTIA III database

	Bridge Replacement Projects					
	Minimum	25th Percentile	Median	75th Percentile	Maximum	Mean
Total Estimated Consultant PE hours per Million Dollars Construction Cost	106	864	1,185	1,607	16,804	1,928
Total Estimated Consultant PE Hours/Estimated Consultant Project Management Hours	5.0	9.2	11.5	15.1	28.4	13.0

4.8 USE OF THE DATABASES

A regression model for forecasting hours of effort required for engineering design, using the information in the database was considered. However, based on the TxDOT experience previously discussed (*Ford 2004*), and on the guidance of the research project's technical advisory committee, the decision was made to simply compile the database in an easily searchable Excel Spreadsheet. If a user prefers to work with Microsoft Access database software, the Excel database may be exported to an Access database. The databases may be used in either software application, depending on the preference of the user.

Table 4.12, displays the recommended procedure to be followed by the ODOT contract administrator for preparing their BOC, FEST, or similar spreadsheet for the project being negotiated:

Table 4.12: Procedure for using databases.

<p>1. Search databases for similar type projects</p> <ul style="list-style-type: none">a. Preservation, modernization, etc. for the local agency projects databaseb. Repair or replace and then type of repair or type of bridge for bridge projects database
<p>2. Sort the projects identified in step 1 by construction cost, looking for project construction cost or total project cost (adjusted for cost escalation or de-escalation from the 2006 – 2012 time frame of the databases) similar to the estimated project cost of the project being negotiated</p>
<p>3. Look at the project descriptions.</p>
<p>4. From the projects identified in steps 1-3, identify the most relevant projects in the database and review their data.</p>
<p>5. For selected project(s) from Step 4, look-up details in the contracts and in the BOC/FEST as needed.</p>
<p>6. Populate the cells of the BOC with estimated skill level and hours.</p>
<p>7. When the BOC or FEST has been populated with hours, perform reality checks to verify that the order of magnitude is reasonable. If not, more investigation is required:</p> <ul style="list-style-type: none">a. Check the total hours in the estimate against the total hours for the similar projects identified in step 4 above.b. check the total hours in the estimate against the values produced when using Tables 4.6 – 4.12 for local agency projects database and tables 4.13 – 4.14 for OTIA III database.
<p>8. When the contract administrator is comfortable with the hours, the estimate may be completed with appropriate audited hourly rates, estimate of other direct costs, and calculation of fee using the standard ODOT form.</p>
<p>9. When ODOT contract administrator and consultant negotiate the not to exceed amount, reference to relevant projects in the database should aid in resolution of differences.</p>

5.0 GUIDELINES FOR ODOT PROCEDURES

The final research objective for the current research is to “provide guidelines for ODOT procedures that will assure all stakeholders that the mandate of Oregon House Bill 2867 is being, or will be met.” This chapter proposes guidelines.

Early in the research the research team was informed that ODOT had determined that personal services contracts for engineering services were not subject to the restraints of Oregon HB 2867. That decision excludes the majority of highest cost ODOT personal services contracts from concerns about HB 2867. The most significant ODOT personal services contracts remaining under the mandate of HB 2867 are contracts for information technology (IT) services. HB 2867 is very specific in how costs are to be compared. It is not clear on how to allocate agency overhead. To address that challenge, the methodology of the Texas State San Marcos study (*Morris et al. 2012*) or the LaDOTD study (*Deis, et al. 2002*) may be used. In the budgetary and staffing environment of recent years, outsourcing has been required for ODOT because it has not been feasible to meet legislatively mandated delivery schedules without doing so.

5.1 GUIDELINES FOR ESTIMATING COSTS FOR BUDGET PURPOSES

The current practice of estimating cost for PE and CE services as a percentage of the total of design costs plus construction costs is a practice commonly used by transportation and public works agencies. It enjoys the benefits of simplicity and a large history of data. No obviously better approach has been found. This practice should be continued. Although it would seem easier to estimate as a percentage of expected construction contract cost, since the historical data is based on percent of total design and construction cost, it is best to stick with the approach with the best database.

5.2 GUIDELINES FOR ESTIMATING COSTS FOR PURPOSES OF NEGOTIATION

Whether procurement is subject to the Brooks Act or not, the research process led to the conclusion that the model practice for negotiated procurement of professional services involves preparation of an independent government estimate (IGE) for comparison with estimates provided by the consultant.

The steps in preparing the IGE are:

1. Determine the scope of work
2. From the statement of work, determine the tasks that must be accomplished
3. For each required task, estimate the hours of each type of resource (structural engineer, drafter, administrative assistant, etc.) required. Unless a better spreadsheet is developed, the BOC worksheet should be used.
4. Multiply hours required by appropriate hourly rates to determine total labor cost. The audited hourly rates for the consultant with whom the contract is being negotiated should be used in the estimate.
5. Add estimates of costs for other direct costs such as travel, printing, telephone, etc.
6. Add estimate for reasonable profit. Worksheets have been developed (Florida, Maine, Oregon) for formulating a reasonable profit based on factors such as degree of risk, relative difficulty of project, size of job, period of performance, consultant's investment, assistance by DOT, and level of subcontracting. The authors see no compelling reason for ODOT to change from the worksheet currently in use.

After completing the IGE, a reality check is in order. This is where the databases produced by this research project can be helpful. For most project types, the local agency projects database may be applicable. For bridge projects, the OTIA III database is most likely to be useful. Following the procedures of section 4.8 of this report, the ODOT contract administrator may determine whether her or his estimate is in line with the values in the estimate for total hours, and for types of hours by tasks. Where discrepancies are found, the ODOT contract administrator should adjust their hours accordingly.

When the IGE is complete, the ODOT contract administrator has a detailed estimate to check against the consultant's detailed proposal. If necessary, they may go down through the estimate task by task and line by line. When significant differences in hours are found, the ODOT contract administrator may again wish to consult the databases and discuss the values in the database with the consultant in negotiating a price.

5.3 GUIDELINES FOR CONDUCTING COMPARATIVE COST ANALYSIS

As described by Deis (*Deis et al. 2008*) and Wilmot (*Wilmot et al. 2002*), comparison of providing a service insourced and outsourced should include factors other than cost. For the cost part of the comparison, all costs to the agency for each alternative must be included. For insourced costs, that means totaling all of the direct labor, material, and equipment costs to do the work, and adding an allocation of agency overhead from all levels above the performing unit. For outsourced costs, that means totaling all costs of direct labor, material and equipment costs for the consultant to do the work, plus addition of the consultant's audited overhead rates, plus a reasonable allowance for profit. To this "contract" cost, the direct labor, material, and equipment

cost for ODOT to procure and administer the contract, and addition of overhead from all levels above the administering unit must be added to obtain a comparable number.

For purposes of comparing costs of services insourced and outsourced, preparing one BOC for insourced work with known ODOT classifications and hourly rates, and another BOC for outsourced work with typical consultant classifications and hourly rates provides a good starting point. The BOC's include direct labor costs and other direct costs. For the outsourced cost, typical consultant audited overhead rate and profit based on the ODOT Profit (Fee) Worksheet should be added. Also to be added should be an estimate of ODOT contract management cost, loaded with appropriate overhead costs (*Schneider 1998*). For the insourced costs, the costs from the BOC would need to be loaded with appropriate overhead costs (*Schneider 1998*) to develop a comparable \$ value.

In addition, it is the authors' opinion that the comparison should further be adjusted for costs of project delay due to restraints of agency staffing levels and for cost of underutilization of agency personnel due to outsourcing of their workload. The next three sections of this report address these three topics.

This comparison will indicate the lower long-term cost for insourcing and outsourcing the service. It does not take into account the impact of other factors such as accommodating fluctuating design demand, having flexibility in workforce size, being able to meet deadlines, having access to specialized design expertise, retaining agency technical expertise, and other non-cost-of-the-service factors.

For preparation of estimates of this type, it may not be reasonable to expect every ODOT project manager, CPM, or other contract administrator to be skilled in preparing these estimates. It may be appropriate to assign this responsibility to a specific individual, or to develop a cost engineering group similar to such organizations in large corporations and public utilities with regular large-scale capital spending projects. ODOT already has a senior cost engineer in the office of project letting (OPL) who oversees all estimates of construction costs. For genuine standardization and consistency, something similar is needed for estimates of major professional services contracts, including consultant services for engineering services and for IT services.

5.4 GUIDELINES FOR ALLOCATING AGENCY OVERHEAD FOR COMPARISONS OF COST OF SERVICES DELIVERED INSOURCED AND OUTSOURCED.

As discussed previously, the best documentation of this overhead allocation process is found in the papers of Deis (*Deis et al. 2008*) Schneider (*Schneider et al. 1998*) and Morris (*Morris et al. 2012*). Deis and Schneider speak to LaDODT procedures and Morris's work was with TxDOT. Since Morris used two approaches, these documents actually provide three methods to choose from. Approach one used by Morris is quite similar to the Deis and Schneider approach.

For relative simplicity, the approach of Deis and Schneider for the LaDODT is preferred. The agency allocation procedure for the LaDODT starts with the direct costs of the performing unit. Appropriate indirect costs of the performing unit are added. Additional overhead is allocated for every level above the performing unit in the organizational chart. To illustrate, assume that an

ODOT project is to be designed by the Roadway Unit in Region 1. Individuals working on the project charge their time to the project. Other costs incurred by the Roadway unit would be allocated based on the dollars of project chargeable in the Roadway unit. The Roadway Unit is part of the Region 1 Tech Center, so all costs incurred by the Tech Center not chargeable to projects would be proportioned to projects. The project hours would also receive their proportionate share of Region 1 administrative costs. Region 1 is part of the Highway Division, so a proportionate share of Highway Division administrative costs would be assigned. Finally, the project would receive its proportionate share of the expenses incurred by the ODOT Director's office in administering the divisions and others reporting to the Director.

5.5 GUIDELINES FOR ESTIMATING COSTS OF DELAY DUE TO RESTRAINTS OF AGENCY STAFFING LEVELS

In the short term, agency staffing levels are fixed. When work load exceeds the capabilities of that staffing level, the agency must either contract to provide the services in a timely fashion, or delay the lowest priority services until they can be performed by the agency staff. The services being provided add value, and delays in providing those services delay the receipt of that value. So there is obviously a cost of delay due to restraints of agency staffing levels. If the cash flow is known for each bundle of services (project), the costs of those delays can be determined by present worth analysis, equivalent annual cost analysis, or rate of return analysis. Any qualified cost engineer or business analyst should be able to perform the analysis. The difficult part is determining the cash flows over time. The literature review did not produce any documentation of specific examples of performing this analysis.

5.6 GUIDELINES FOR ESTIMATING COSTS OF UNDERUTILIZATION OF AGENCY PERSONNEL DUE TO OUTSOURCING OF THEIR WORKLOAD

If the need for services is such that outsourcing leaves the need for insourced services at a level below the capacity of the agency staff, the cost of agency staff remains and is spread over a lower volume of service provision, driving up the unit cost of providing the service. The longer-term solution is a reduction in agency staff, assuming the level of outsourcing is expected to continue. Again the cost estimation is straightforward. The capacity of agency staff to perform the services must be determined. The cost of agency staff is known. The unit cost is the capacity divided by the cost. If the actual service level is less than capacity, the unit cost is computed by dividing the actual service level by the cost. Any qualified cost engineer or business analyst should be able to perform the analysis. The literature review did not produce any documentation of specific examples of performing this analysis.

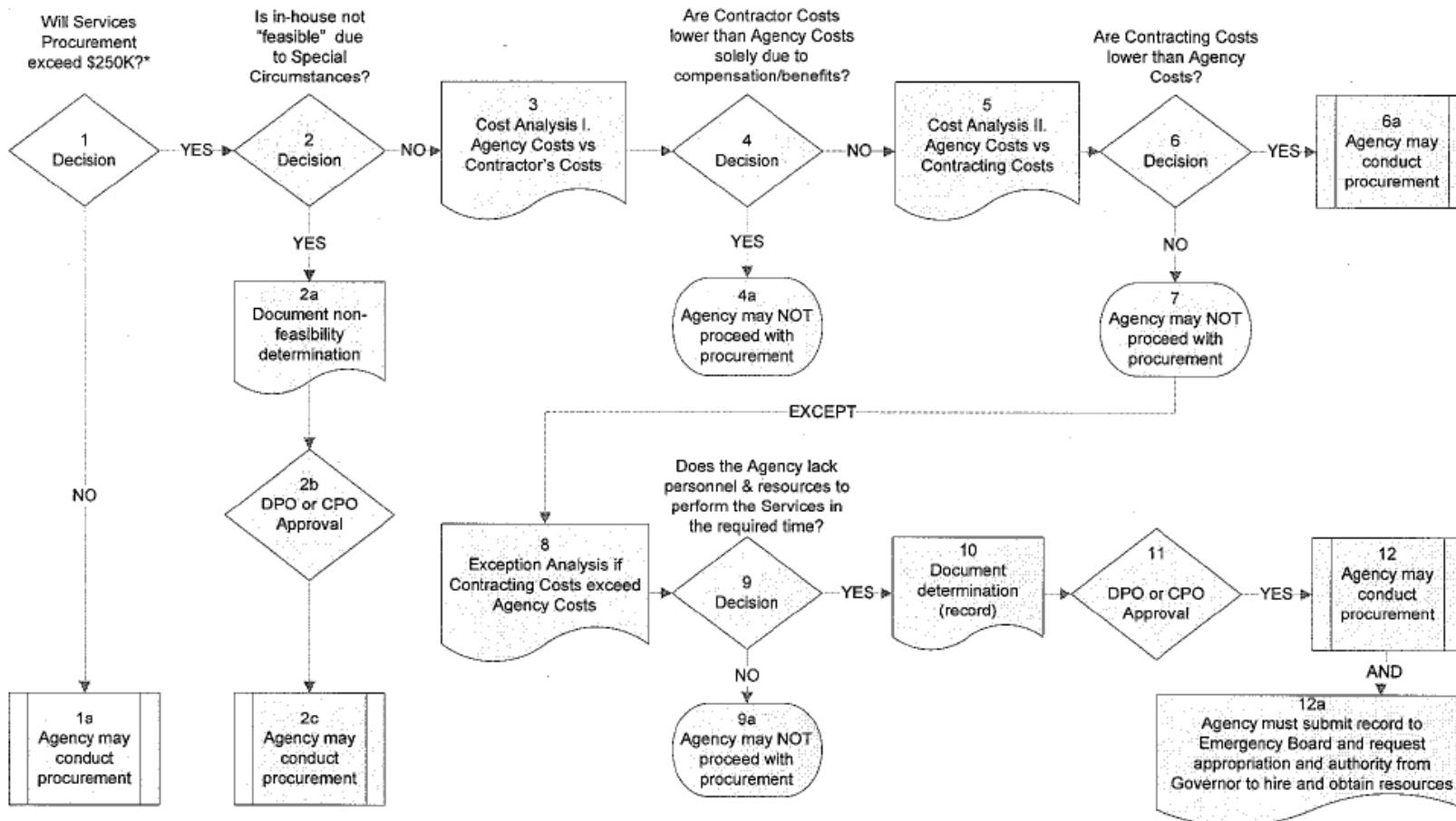
5.7 GUIDELINES FOR COMPLIANCE WITH OREGON HB 2867

The legislation itself is detailed on procedures for making cost comparisons. The State of Oregon Department of Administrative Services website (*Oregon Department of Administrative Services 2012*) provides five documents intended to assure that compliance will be achieved, if procedures are followed. Those five documents include the text of HB2867, the Oregon Department of Justice Outline and Rules for the law, a flow chart for implementation, a form to

document that procedures have been followed, and a Power Point slide presentation overview of the requirement of the legislation. Appendix G, reproduces the “Feasibility Determination, Cost Analysis & Evaluation Form” (*Oregon Department of Administrative Services 2012*). The flow chart is reproduced below as Figure 5.1.

The services comprising the overwhelming majority of ODOT’s personal services contracts do not fall under the rules of HB 2867. Section (2)(e)(A) of the Rules for OAR 125-247-0110 (*Oregon Department of Administrative Services 2012*) specifically exclude “. . . the services of an Architect, Engineer, Photogrammetrist, Transportation Planner, Land Surveyor or Provider of Related Services as defined in ORS 279C.100;”. “Client Services” are also excluded from the legislation, but these are not types of services procured by, or for, ODOT. The largest dollar volume of personal services contracts procured by ODOT that is covered by HB 2867 is for contracts for information technology (IT) contracts.

Figure 5.1 (*Oregon Department of Administrative Services 2012*) is the official flow chart for determining whether outsourcing is permitted for procurements covered by the legislation. For purposes of this research project, the focus is IT contracts, since the larger volume of engineering and related services is not covered by the law.



* This Chart assumes that the Agency has procurement authority and the law applies to the Services. This is the SPO Flow Chart, dated 01-08-10. Please contact Karen.Hartley@state.or.us.

Figure 5.1 Flow chart for OAR 125-247-01100 (after Oregon Department of Administrative Services 2012).

This discussion concerns the cost analyses of nodes 3 to 7 of the flow chart. These analyses are also covered in section 3 of the “Feasibility Determination, Cost Analysis and Evaluation Form.” This discussion concerns the cost analyses of nodes 3 to 7 of the flow chart. These analyses are also covered in section 3 of the “Feasibility Determination, Cost Analysis and Evaluation Form.”

After determination that insourced delivery is not “feasible” due to “special circumstances,” cost comparison begins. The first step is comparison of ODOT “costs” to contractor “costs.” This comparison is represented by nodes 3 and 4 in the flow chart, and section 3 of the form.

For ODOT costs, “Salary or Wage & Benefit costs,” “Material Costs,” “Related Costs,” and “Other Information” are totaled to a total agency cost. OAR 125-247-0110 (*Oregon Secretary of State 2012*) describes these costs. Wages & benefit costs and material costs are the costs incurred by those employees doing the work. Related costs include “costs incurred in planning for, training for, starting up, implementing, transporting and delivering the services.” Other related costs are “any costs related to stopping and dismantling a project or operation” because it is intended “to procure a limited quantity of Services or to procure the Services within a defined or limited period of time.” Other related costs include anticipated escalation of prices, and the “Authorized Agency’s indirect overhead costs for existing salaries or wages and benefits for administrators and exclude costs for rent, equipment, utilities and materials, except to the extent the costs items identified in this sentence are attributed solely to performing the Services and would not be incurred unless the Authorized Agency performed the Services.” Apparently, the assumption is that these overhead expenses would be incurred whether the agency performed the service or not. In the short term, this is true. What is meant by “Other Information” is not clear, but appears to imply that the total agency cost may be inferred from actual cost data for a “recent” similar project.

The comparable cost for contractor costs for nodes 3 and 4 in the flow chart is the sum of “Salary or Wage & Benefit Costs,” “Material Costs,” “Miscellaneous Costs,” and “Other Information.” Salaries or Wages and Benefits are the costs of the labor “necessary and directly involved in performing the Services or who would inspect, supervise, or monitor the performance of the Services.” Material Costs include the “costs for space, energy, transportation, storage, raw and finished materials, equipment and supplies used or consumed in the provision of the Services.” “Related Costs” include miscellaneous costs and “reasonably foreseeable fluctuations in the costs.” Finally, “Other Information” is any “reliable information that bears on the costs a potential Contractor would incur.”

The first question as shown for Node 4 in the flow chart is, “Are Contractor Costs lower than Agency Costs solely due to compensation/benefits?” If the answer is “Yes”, ODOT may not proceed with procurement of a contractor. If the answer is “No,” further cost analysis is required.

This analysis is described in nodes 5 – 7 and in sections 3, 4, and 5 of the “Feasibility Determination, Cost Analysis and Evaluation Form.” This further cost analysis makes no adjustment to the previously calculated total agency cost, and adds profit to the previously calculated contractor cost. After this adjustment, the question is asked, “Are Contracting Costs lower than Agency Costs?” If the answer is yes ODOT may proceed with the procurement. If the answer is “no,” ODOT may not procure unless ODOT lacks the “personnel and resources to perform the Services in the required time.” It should be noted that this comparison compares a fully loaded Contractor Cost against an ODOT cost that specifically excludes any allocation of agency overhead. It should also be noted that ODOT’s cost to procure and administer the contract is left out of the comparison. Both of these omissions contradict the model procedure for comparing insourced to outsourced costs described for the International Handbook of Public Procurement (*Deis et al. 2008*).

6.0 CONCLUSIONS AND RECOMMENDATIONS

6.1 CONCLUSIONS

The research led to the following conclusions:

1. **Estimating costs for budget purposes:** ODOT and other transportation agencies estimate costs of personal services contracts for design and construction administration and inspection services for budgeting purposes as a % of total project costs. For budgets for IT contracts, major initiatives to be undertaken are anticipated, and numbers of hours at a fully-loaded rate are estimated.
2. **Estimating costs for negotiation:** ODOT and other transportation agencies estimate costs of personal services contracts by developing a written scope of work document, estimating the hours of work by different classifications of workers, multiplying hours by appropriate hourly rates, adding estimated costs of “other direct costs” (printing, handling, communications, etc.), adding an audited overhead rate, and estimating amount of profit. For contracts for engineering and related services, a standardized electronic spreadsheet is used to facilitate estimating labor costs and other direct costs, and to determine a fair profit, a spreadsheet of complexity and risk factors and corresponding ranges of profit is used. ODOT’s program manager for the OTIA III projects used a slightly different, but similar electronic spreadsheet.
3. **Determining internal overhead allocation:** A defined procedure for allocating ODOT overhead to estimates of costs of labor and other direct costs for specific projects, to determine a total cost comparable to the cost of a personal services contract could not be found. The literature review produced documentation used at other DOTs. The procedure for the Louisiana DODT documented in the “International Handbook of Public Procurement” provides a good guideline for allocation (*Deis et al. 2008*). The study conducted at the accounting department of Texas State University for the TxDOT provides another good example (*Morris et al. 2012*).
4. **Determining consultant profit target:** ODOT’s “Profit (Fee) Worksheet” (*ODOT Procurement Office 2012*) provides a rational approach to estimating fair profit for design services contracts. This is part of the process of assuring that the cost to the government is “fair and reasonable.” Similar procedures and worksheets are in use at other DOTs.
5. **Integrating delay costs and utilization rates:** No evidence could be found of documented procedures for estimating the effects of project delays and internal resource utilization into comparisons of insourced and outsourced costs for transportation agencies.
6. **Conducting comparative analyses:** Some attempts at comparing costs of services delivered insourced with costs of services delivered outsourced compare the hourly or annual cost of an agency engineer to that of a consultant engineer working under a personal services contract. These comparisons make no attempt to compare productivity

or effectiveness. Broader models for choosing between delivering services insourced or outsourced generally agree that cost is only one important factor in the decision. The most convincing documentation of a model incorporating multiple factors, including cost, is that developed for the LaDODT by faculty at Louisiana State University (*Schneider et al. 1998, Deis et al. 2002, Wilmot et al. 2002, Deis et al. 2008*). The 1998 study found that in most cases for the LaDODT, using consultants to do the design work is more expensive than using in-house staff, primarily because of the cost of consultant contract initiation and supervision. The 2008 study concluded that for LaDODT, insourced design costs were lower than outsourced design costs by an average of 17 to 19 percent.

7. **Databases:** Two databases were compiled to aid ODOT contract administrators during the process of negotiating contracts for engineering and related services. One database used information by ODOT for local agency projects administered by ODOT. One database used information from ODOT's program manager for OTIA III bridge projects. For both databases, the values for hours of effort required came from estimates of consultant effort made prior to initiation of contract rather than from invoices of actual hours charged. This was the best information available. The databases are intended to assist ODOT contract administrators in estimating hours for future projects, and to serve as aids in negotiation.
8. **Oregon House Bill 2867:** This legislation does not apply to the majority of ODOT personal services contracts, those for engineering and related services. It does apply to contracts for information technology. Very specific documentation is provided by the Oregon Secretary of State and by the Oregon Department of Administrative Services for performing cost comparisons in compliance with the law. It should be noted that the law itself, in some cases, contradicts recommended cost comparison practice in the literature.
9. **Non Brooks Act Procurement:** For personal services contracts not subject to the Brooks Act, such as contracts for IT services, price may be bid or included in a competitive proposal process. For such proposals, the State of Washington requires that costs and fees be included in the scoring and selection criteria, with specified weights.
10. **Bridge Deck Area versus Engineering Hours:** It was hypothesized that there would be a positive correlation between area of bridge deck and engineering hours required. Analysis of the OTIA III database indicated that there is no relationship between area of bridge deck and engineering hours required.

6.2 RECOMMENDATIONS

Based on the research, the following recommendations are made:

1. ODOT personnel negotiating contracts for consultants to provide services for PE and CE should be made aware that the local agency projects database and the OTIA III bridge projects database are now available to aid in that process. The recommended procedure for their use is presented in Figure 4.15.
2. ODOT provided lists of tasks in the BOC and FEST documents which were slightly different in description and enumeration. It is recommended that ODOT agree on a standard list of PE and CE tasks that could be available for all projects; much like standard bid items are available for all construction contracts.
3. ODOT provided both BOC and FEST Excel spreadsheets to the research team. The information provided in both spreadsheets was essentially the same, but the organization was slightly different. It is recommended that ODOT standardize on one form or the other, or on a similar form derived from both.
4. For the local agency projects database to remain current, each new contract that is executed needs to be added to the database. With current ODOT staffing levels, it seems unlikely that this will occur unless the process can be highly automated. A logical form of automation would be web-based entry of OPO's Breakdown of Cost (BOC) document by each consultant. When agreed upon, the data could be added as a record in the database.
5. The usefulness of the databases could potentially be improved with the addition of a rating of design quality and effect of design on the success of the overall project.
6. The two databases produced by the research were compiled from estimates made during the negotiation process of hours of engineering effort required to perform PE or CE services. If actual invoiced hours could be compiled for the projects in the database, the database would be more accurate, and it would provide a great opportunity to determine how closely the estimate relates to the final expenditure of effort billed.
7. ODOT should consider providing a central resource for estimating costs of engineering and related services, similar to the senior cost engineer resource for construction estimates in ODOT's Office of Project Letting.

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APPENDIX A: MINI-SURVEY FORM

DELIVERING BETTER VALUE FOR MONEY: DETERMINING OUTSOURCING FEASIBILITY AND STANDARD PRICING METHODS

Short Survey on Services Costs Estimating

Title: Services cost estimating

Survey details/results: This survey was conducted in May 2011. The purpose of the survey was to determine DOTs' current practices in services cost estimating, to aid Oregon DOT to develop a cost estimating tool for procurement of professional services.

The following information was requested in the survey:

1. Does your agency have standard procedures for estimating costs of Architectural and Engineering services? If so, please provide contact information for a knowledgeable individual and/or for relevant documents, or a link to them;
2. Does your agency have standard procedures for estimating costs of Information Technology services? If so, please provide contact information for a knowledgeable individual and/or for relevant documents, or a link to them;
3. Does your agency have a procedure for adding agency overhead costs to direct costs of insourced work to allow for an accurate comparison with costs of the service, if delivered outsourced? If so, please provide contact information for a knowledgeable individual and/or for relevant documents, or a link to them;
4. Does your agency have a negotiation/procurement manual to guide the procurement of professional services? If so, could you make this manual available to the research team by providing a link to us?

Contact Information: This survey was conducted by Oregon DOT and Oregon State University Civil and Construction Engineering. Questions or comments should be directed to Dr. David F. Rogge at 541-737-4351 or david.rogge@oregonstate.edu.

APPENDIX B: ODOT OPO BREAKDOWN OF COST (BOC) DOCUMENT

Go to BOC

1. Contract Numbers and Project Name
Info comes from Project Specific Contract or Work Order Contract.

2. Job Classifications
Job classifications come from Consultant's currently approved Escalated Salary Rate Schedule or Negotiated Billing Rate schedule.

3. Direct Salary Rate for Current Year
Direct rates must not exceed the maximum direct rates on Consultant's approved Escalated Salary Rate Schedule. If Consultant uses Negotiated Billing rates, enter zero.

4. Annualized Direct Salary Rate
Calculates the direct salary rates with escalation for multi-year contracts. If Consultant uses Negotiated Billing Rates, manually enter the negotiated billing rate instead.

5. Task Numbers and Names
Info comes from the negotiated Statement of Work.

6. Level of Effort
Enter estimated number of labor hours for each Job Classification for each subtask (yellow cells). The task totals will calculate automatically (green cells).

7. Contingency Tasks/Deliverables
Estimated costs for Contingency Tasks must be separate from estimated costs for Non-contingency tasks (also called Required

8. Deleting rows and columns on spreadsheet
Recommend **hiding** rows and columns that are not needed instead of deleting. If deleting rows/columns, make sure applicable subtotals and totals still calculate correctly.

9. Enter Date of Final BOC
After negotiations are complete, enter date of final agreed to BOC.

10. Multipliers for Escalation
If current phase of contract covers multiple years, enter the estimated percentage of work to be completed for each year.

11. Multipliers for NBR
For Primes or subconsultants using Negotiated Billing Rates, enter zero for ALL the multipliers.

12. Multipliers for Escalated Billing Rates
Obtain current Overhead and FCCM rates from ODOT Procurement Office. Overhead and FCCM rates are specific to the Prime or sub.

13. Profit for Escalated Billing Rates
ODOT negotiates profit rate with the Prime Consultant. The same profit rate is applied to Prime and all subconsultants under the contract.

14. Direct Expenses
Enter total estimate of direct expenses for each task or subtask. Show detailed breakdown of direct expenses on separate worksheet.

Breakdown of Costs - Dated: [enter date of final]

DATA or Contract Num: #####	% of budget in Current Year (CY)	20.00%	Accepted Overhead	150.00%
WOC Num: ##	% of budget in CY+1	60.00%	FCCM	0.30%
PROJECT NAME: [Enter Project Name]	% of budget in CY+2	20.00%	Negotiated Profit	9.00%
	% of budget in CY+3	0.00%	Annual Escalation Rate	4.50%
	Weighted Escalation Factor	1.045		

MULTIPLIERS			
% of budget in Current Year (CY)	20.00%	Accepted Overhead	150.00%
% of budget in CY+1	60.00%	FCCM	0.30%
% of budget in CY+2	20.00%	Negotiated Profit	9.00%
% of budget in CY+3	0.00%	Annual Escalation Rate	4.50%
Weighted Escalation Factor	1.045		

Cell Color Legend	
Yellow cells	are for data entry
Green cells	have formulas (no data entry unless specified)
Gray cells	are section dividers (no data entry unless specified)

[Enter Prime Consultant's Name]												Certification: Not Certified																	
DATA ENTRY SECTION												CALCULATION SECTION																	
Job Classification (Individual)	Job Classification (Individual)	Job Classification (Individual)	Job Classification (Individual)	Job Classification (Individual)	Job Classification (Individual)	Job Classification (Individual)	Job Classification (Individual)	Job Classification (Individual)	Job Classification (Individual)	Job Classification (Individual)	Job Classification (Individual)	Hours	Escalated Direct Labor or NBR \$	Overhead	FCCM	Direct Expenses	Total Cost	Profit											
Direct Salary Rate (Avg. Actual, Max. Current Year)	\$100.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00			150.00%	0.30%			9.00%											
Annualized Direct Salary Rate (OR enter Negotiated Billing Rate)	\$104.54	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00																			
Fully Burdened Billing Rate	\$285.19	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00																			
NON-CONTINGENCY TASKS/DELIVERABLES																													
1	TASK 1 NAME	40	0	0	0	0	0	0	0	0	0	40	\$ 4,182	\$ 6,272	\$ 13	\$ 100	\$ 10,567	\$ 941											
1.1	Subtask name	10										10	\$ 1,045	\$ 1,568	\$ 3	\$ 100	\$ 2,717	\$ 235											
1.2	Subtask name	10										10	\$ 1,045	\$ 1,568	\$ 3	\$ 100	\$ 2,717	\$ 235											
1.3	Subtask name	10										10	\$ 1,045	\$ 1,568	\$ 3	\$ 100	\$ 2,717	\$ 235											
1.4	Subtask name	10										10	\$ 1,045	\$ 1,568	\$ 3	\$ 100	\$ 2,717	\$ 235											
2	TASK 2 NAME	0	0	0	0	0	0	0	0	0	0	0	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -											
2.1	Subtask name	0										0	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -											
2.2	Subtask name	0										0	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -											
2.3	Subtask name	0										0	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -											
2.4	Subtask name	0										0	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -											
TOTAL Non-Contingency		40	0	0	0	0	0	0	0	0	0	40	\$ 4,182	\$ 6,272	\$ 13	\$ 100	\$ 10,567	\$ 941											
CONTINGENCY TASKS/DELIVERABLES																													
C1	CONTINGENCY TASK NAME 1	100	0	0	0	0	0	0	0	0	0	100	\$ 10,454	\$ 15,681	\$ 31	\$ 100	\$ 26,266	\$ 2,352											
C1.1	Subtask name	100										100	\$ 10,454	\$ 15,681	\$ 31	\$ 100	\$ 26,266	\$ 2,352											
C1.2	Subtask name											0	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -											
C1.3	Subtask name											0	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -											
C1.4	Subtask name											0	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -											
TOTAL Contingency		100	0	0	0	0	0	0	0	0	0	100	\$ 10,454	\$ 15,681	\$ 31	\$ 100	\$ 26,266	\$ 2,352											
TOTAL Non-Contingency + Contingency																													
												\$ 140	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 140	\$ 14,636	\$ 21,954	\$ 44	\$ 200	\$ 36,833	\$ 3,293

16. Total Profit

The total estimated profit can be used as the basis for negotiating the fee on Cost Plus Fixed Fee contracts.

17. Total Cost + Profit

The total estimated cost + profit is the basis for the contract's Not To Exceed amount for Time & Materials contracts and Fixed Fee contracts.

Additional information regarding BOC is available at the link below:

[BOC Requirements](#)

Project Summary								
GRAND TOTAL CALCULATION SECTION								
Hours	Escalated Direct Labor or NBR \$	Overhead	FCCM	Direct Expenses	Total Cost	Profit	Cost + Profit	% of Total Non-Contingency Labor Costs
40	\$ 4,182	\$ 6,272	\$ 13	\$ 100	\$ 10,567	\$ 941	\$ 11,507	100.0%
10	\$ 1,045	\$ 1,568	\$ 3	\$ 100	\$ 2,717	\$ 235	\$ 2,952	25.0%
10	\$ 1,045	\$ 1,568	\$ 3	\$ -	\$ 2,617	\$ 235	\$ 2,852	25.0%
10	\$ 1,045	\$ 1,568	\$ 3	\$ -	\$ 2,617	\$ 235	\$ 2,852	25.0%
10	\$ 1,045	\$ 1,568	\$ 3	\$ -	\$ 2,617	\$ 235	\$ 2,852	25.0%
0	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	0.0%
0	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	0.0%
0	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	0.0%
0	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	0.0%
0	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	0.0%
40	\$ 4,182	\$ 6,272	\$ 13	\$ 100	\$ 10,567	\$ 941	\$ 11,507	
\$ 100	\$ 10,454	\$ 15,681	\$ 31	\$ 100	\$ 26,266	\$ 2,352	\$ 28,619	
\$ 100	\$ 10,454	\$ 15,681	\$ 31	\$ 100	\$ 26,266	\$ 2,352	\$ 28,619	
\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	
\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	
\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	
100	\$ 10,454	\$ 15,681	\$ 31	\$ 100	\$ 26,266	\$ 2,352	\$ 28,619	
\$ 140	\$ 14,636	\$ 21,954	\$ 44	\$ 200	\$ 36,833	\$ 3,293	\$ 40,126	

**APPENDIX C: LOCAL AGENCY PROJECTS DATABASE FIELD
DESCRIPTIONS**

Each row is a record for a project. Each row (project) has the fields (columns) shown in the table below for each project. There are 181 projects in the database.

Columns	Description
ID	a number given to mark the project, based on the order of price agreement number and WOC number.
ODOT Key #	ODOT Key #, some projects don't have key numbers, some projects include multiple key numbers, some WOCs have the same key number
Price Agreement #	Price Agreement #
WOC #	WOC #
Project Description	Project name
Consultant	Primary consultant
Date WOC signed	The date of original WOC signed (not the amendments)
Date WOC expired	The WOC expired date, based on the information on the latest amendment
Total PE cost	the total contract cost for PE services, including amendments
Total CE cost	the total contract cost for CE services, including amendments
PE average hourly rate	direct labor cost/total labor hours for PE services
CE average hourly rate	direct labor cost/total labor hours for CE services
Total project cost	PE+CE+construction cost
Project cost status	final-construction is finished; current-construction is ongoing and cost is current; construction budget-the cost is the budget cost for construction only; project budget-the cost is the budget cost for the project including PE, CE and construction
%PE	PE cost/PE+CE+construction cost
%CE	CE cost/PE+CE+construction cost
PE other direct cost	Other direct cost for PE contract
CE other direct cost	Other direct cost for CE contract
Profit	profit rate
Overhead	overhead rate
# of sub-consultants	number of sub-consultants used for the project, not including primary consultant
ODOT Region	ODOT Region
type:	Project types, based on ODOT project delivery guide, Modernization/Preservation/Operations/Bridge/Safety/etc.
drawing set ID	drawing set ID
total # of drawings	total # of drawings
# of non-standard drawings	# of non-standard drawings
type of bridge	
sf of bridge deck	
1-E	PE Project Management -- hours, Engr
1-T	PE Project Management -- hours, Tech, non-engr
1-A	PE Project Management -- hours, admin

Columns	Description
2-E	PE Survey and Mapping -- hours, Engr
2-T	PE Survey and Mapping -- hours, Tech, non-engr
2-A	PE Survey and Mapping -- hours, admin
3-E	Environmental Services -- hours, Engr
3-T	Environmental Services -- hours, Tech, non-engr
3-A	Environmental Services -- hours, admin
4-E	Public Involvement - Public Information -- hours, Engr
4-T	Public Involvement - Public Information -- hours, Tech, non-engr
4-A	Public Involvement - Public Information -- hours, admin
5-E	Utilities & Railroad Coordination -- hours, Engr
5-T	Utilities & Railroad Coordination -- hours, Tech, non-engr
5-A	Utilities & Railroad Coordination -- hours, admin
6-E	Geotechnical/Geologic Services -- hours, Engr
6-T	Geotechnical/Geologic Services -- hours, Tech, non-engr
6-A	Geotechnical/Geologic Services -- hours, admin
7-E	Hydraulics Related Services -- hours, Engr
7-T	Hydraulics Related Services -- hours, Tech, non-engr
7-A	Hydraulics Related Services -- hours, admin
8-E	Traffic Engineering & Management -- hours, Engr
8-T	Traffic Engineering & Management -- hours, Tech, non-engr
8-A	Traffic Engineering & Management -- hours, admin
9-E	Pavement Design -- hours, Engr
9-T	Pavement Design -- hours, Tech, non-engr
9-A	Pavement Design -- hours, admin
10-E	Roadway Design -- hours, Engr
10-T	Roadway Design -- hours, Tech, non-engr
10-A	Roadway Design -- hours, admin
11-E	Bridge Design -- hours, Engr
11-T	Bridge Design -- hours, Tech, non-engr
11-A	Bridge Design -- hours, admin
12-E	Interchange Design -- hours, Engr
12-T	Interchange Design -- hours, Tech, non-engr
12-A	Interchange Design -- hours, admin
Other Design - E	other design work (not broken out by task), Engr
Other Design - T	other design work (not broken out by task), Tech, non-engr
Other Design - A	other design work (not broken out by task), admin
13-E	Design Acceptance & Land Use Permits -- hours, Engr
13-T	Design Acceptance & Land Use Permits -- hours, Tech, non-engr
13-A	Design Acceptance & Land Use Permits -- hours, admin
14-E	Right-of-Way -- hours, Engr
14-T	Right-of-Way -- hours, Tech, non-engr
14-A	Right-of-Way -- hours, admin
15-E	Plans, Specifications and Estimate (PS&E) -- hours, Engr
15-T	Plans, Specifications and Estimate (PS&E) -- hours, Tech, non-engr

Columns	Description
15-A	Plans, Specifications and Estimate (PS&E) -- hours, admin
16-E	Bid Assistance -- hours, Engr
16-T	Bid Assistance -- hours, Tech, non-engr
16-A	Bid Assistance -- hours, admin
17-E	Construction Phase -- hours, Engr
17-T	Construction Phase -- hours, Tech, non-engr
17-A	Construction Phase -- hours, admin
18-E	Manual and Web Page Development -- hours, Engr
18-T	Manual and Web Page Development -- hours, Tech, non-engr
18-A	Manual and Web Page Development -- hours, admin
19-E	Facilities A&E -- hours, Engr
19-T	Facilities A&E -- hours, Tech, non-engr
19-A	Facilities A&E -- hours, admin
CE1-E	Project Management -- hours, Engr
CE1-T	Project Management -- hours, tech, non-engr
CE1-A	Project Management -- hours, admin
CE2-E	Construction Contract Administration / Construction Engineering and Inspection (CA / CEI), Engr
CE2-T	Construction Contract Administration / Construction Engineering and Inspection (CA / CEI), Tech, non-engr
CE2-A	Construction Contract Administration / Construction Engineering and Inspection (CA / CEI), admin
CE3-E	Construction Monitoring / Inspection -- hours, Engr
CE3-T	Construction Monitoring / Inspection -- hours, Tech, non-engr
CE3-A	Construction Monitoring / Inspection -- hours, admin
CE4-E	Construction Surveying -- hours, Engr
CE4-T	Construction Surveying -- hours, Tech, non-engr
CE4-A	Construction Surveying -- hours, admin
CE5-E	Project Close-out -- hours, Engr
CE5-T	Project Close-out -- hours, Tech, non-engr
CE5-A	Project Close-out -- hours, admin
PE Engr hours	total PE Engr hours
PE Tech hours	total PE Tech hours
PE Admin hours	total PE Admin hours
Total PE hours	Total PE hours
CE Engr hours	total CE Engr hours
CE Tech hours	total CE Tech hours
CE Admin hours	total CE Admin hours
Total CE hours	total Total CE hours

**APPENDIX D: LOCAL AGENCY DATABASE PROJECT
CHARACTERISTICS**

Table D.1 Local agency database projects by year.

Years	Number of Projects
2006	4
2007	21
2008	21
2009	77
2010	32
2011	21
unknown	5

Table D.2 Number of projects by consultant.

Consultants	Number of projects
Consultant A	10
Consultant B	1
Consultant C	40
Consultant D	12
Consultant E	64
Consultant F	12
Consultant G	7
Consultant H	1
Consultant I	34
Total	181

Table D.3 Number of projects by ODOT region.

ODOT Regions	Number of projects
Region 1	58
Region 2	47
Region 3	43
Region 4	19
Region 5	14
Total	181

Table D.4 Number of projects by ODOT project type.

Project types	Number of projects
BIKPED = Bike & Pedestrian	14
BPFLX = Bike & Pedestrian, Flexible Funds	4
BRIDGE	21
BRSF = Bridge, Small, Off System	8
CMAQ = Congestion Mgmt. Air Quality	8
EMREL = Emergency Relief	2
ENHANC = Enhancement	21
MODERN = Modernization	31
OPERAT = Operations	4
PRESRV = Preservations	51
SAFETY	14
SPPROG = Special Programs	3
Total	181

APPENDIX E: OTIA III BRIDGE DATABASE DESCRIPTION

	Record #	1	2	3	4
	ODOT Bridge Number	308A	00338A	00449A	00559B
	Repair or Replace?	replace	repair	repair	repair
	New ODOT Bridge Number	20875			
	OBDP Bundle Number	207	415	206	405
	ODOT Key Number	14029	14609	14028	14225
	Comment				
	Date of Fee Estimate		11/2/2007	2/15/2005	1/16/2008
3.1 Project Management	3.1.1 - Coordination - Engr	230	68	69.7	28
	3.1.1 - Coordination - Tech		2	3.1	
	3.1.1 - Coordination - Admin	20	20	14.3	22
	3.1.1 - Coordination - Sub	34	14	17.5	
	3.1.2 Quality - Engr	104	42	1.9	9
	3.1.2 Quality - Tech				
	3.1.2 Quality - Admin	16	18	0.7	3
	3.1.2 Quality - Sub		43		
	3.1.3 Review Mtgs - Engr	182	32	29.9	18
	3.1.3 Review Mtgs - Tech				
	3.1.3 Review Mtgs - Admin	48	12	5.9	6
	3.1.3 Review Mtgs - Sub		15	14.8	
	3.1.4 Communications - Engr	182	7	4.1	22
	3.1.4 Communications - Tech				
	3.1.4 Communications - Admin	46	4	0.3	12
	3.1.4 Communications - Sub				
	3.1.5 ConstrEst/Sched - Engr	170	27	47	6
	3.1.5 ConstrEst/Sched - Tech				6
	3.1.5 ConstrEst/Sched - Admin	14	30		
	3.1.5 ConstrEst/Sched - Sub	17	2		
	3.1.6 ProjectFiles - Engr	18	16	0.8	4
	3.1.6 ProjectFiles - Tech				
	3.1.6 ProjectFiles - Admin	100	30	9.3	6
	3.1.6 ProjectFiles - Sub		2	1.5	
	3.1.7.1 Econ Dev - Engr	10			
	3.1.7.1 Econ Dev - Tech				
	3.1.7.1 Econ Dev - Admin	2			
	3.1.7.1 Econ Dev - Sub	5			
	3.1.7.2 Diversity - Engr	10			
	3.1.7.2 Diversity - Tech				
3.1.7.2 Diversity - Admin	2				
3.1.7.2 Diversity - Sub	5				

	Record #	1	2	3	4
	3.1.8 Specifications - Engr		33		4
	3.1.8 Specifications - Tech				
	3.1.8 Specifications - Admin		20		
	3.1.8 Specifications - Sub				
	3.1.9 Safety Plan - Engr				
	3.1.9 Safety Plan - Tech				
	3.1.9 Safety Plan - Admin				
	3.1.9 Safety Plan - Sub				
3.2 Surveying, Mapping, and Right-of-Way Engineering	3.2.1 Start-up - Engr	14		1.8	5
	3.2.1 Start-up - Tech			1.2	
	3.2.1 Start-up - Admin	2			
	3.2.1 Start-up - Sub				2
	3.2.2 Design Accept Package - Engr	400	4		1
	3.2.2 Design Accept Package - Tech	384	4		
	3.2.2 Design Accept Package - Admin	4			
	3.2.2 Design Accept Package - Sub	68			34
	3.2.3 Progress Plans - Engr	42			
	3.2.3 Progress Plans - Tech	24			
	3.2.3 Progress Plans - Admin				
	3.2.3 Progress Plans - Sub				
	3.2.4 Advanced Plans - Engr				
	3.2.4 Advanced Plans - Tech				
	3.2.4 Advanced Plans - Admin				
	3.2.4 Advanced Plans - Sub				
	3.2.5 Final PS&E - Engr				
	3.2.5 Final PS&E - Tech				
3.2.5 Final PS&E - Admin					
3.2.5 Final PS&E - Sub					
3.3 Environmental Studies	3.3.1 Start-up - Engr	98		1.4	4
	3.3.1 Start-up - Tech	4			
	3.3.1 Start-up - Admin	10			
	3.3.1 Start-up - Sub	23	80	41	97
	3.3.2 Design Accept Package - Engr	110		2.1	7
	3.3.2 Design Accept Package - Tech				20
	3.3.2 Design Accept Package - Admin	6			
	3.3.2 Design Accept Package - Sub	7	169	18	52
	3.3.3 Progress Submittal - Engr	148		2.1	16
	3.3.3 Progress Submittal - Tech	18			14
	3.3.3 Progress Submittal - Admin	12			
	3.3.3 Progress Submittal - Sub	10	84	15	54
	3.3.4 Advanced Plans - Engr	148		1	7
	3.3.4 Advanced Plans - Tech	46			14
	3.3.4 Advanced Plans - Admin	14			
3.3.4 Advanced Plans - Sub	3	60	12	38	

	Record #	1	2	3	4
	3.3.5 Final PS&E - Engr	112		0.5	6
	3.3.5 Final PS&E - Tech	56			4
	3.3.5 Final PS&E - Admin	8			
	3.3.5 Final PS&E - Sub	4	12	8	6
3.4 Geotechnical Investigations	3.4.1 Start-up - Engr	5		1.4	
	3.4.1 Start-up - Tech				
	3.4.1 Start-up - Admin	1			
	3.4.1 Start-up - Sub	213			
	3.4.2 Design Accept Package - Engr	18			
	3.4.2 Design Accept Package - Tech				
	3.4.2 Design Accept Package - Admin	1			
	3.4.2 Design Accept Package - Sub	78			
	3.4.3 Progress Submittal - Engr	17			
	3.4.3 Progress Submittal - Tech				
	3.4.3 Progress Submittal - Admin	1			
	3.4.3 Progress Submittal - Sub	10		0.2	
	3.4.4 Advanced Plans - Engr	9			
	3.4.4 Advanced Plans - Tech				
	3.4.4 Advanced Plans - Admin				
	3.4.4 Advanced Plans - Sub	8			
	3.4.5 Final PS&E - Engr	1			
	3.4.5 Final PS&E - Tech				
3.4.5 Final PS&E - Admin					
3.4.5 Final PS&E - Sub	6				
3.5 Bridge Hydraulics and Scour Analysis	3.5.1 Start-up - Engr	6			
	3.5.1 Start-up - Tech				
	3.5.1 Start-up - Admin				
	3.5.1 Start-up - Sub	15			
	3.5.2 Design Accept Package - Engr				
	3.5.2 Design Accept Package - Tech				
	3.5.2 Design Accept Package - Admin				
	3.5.2 Design Accept Package - Sub				
	3.5.3 Progress Submittal - Engr				
	3.5.3 Progress Submittal - Tech				
	3.5.3 Progress Submittal - Admin				
	3.5.3 Progress Submittal - Sub				
	3.5.4 Advanced Plans - Engr				
	3.5.4 Advanced Plans - Tech				
	3.5.4 Advanced Plans - Admin				
	3.5.4 Advanced Plans - Sub				
	3.5.5 Final PS&E - Engr				
	3.5.5 Final PS&E - Tech				
3.5.5 Final PS&E - Admin					
3.5.5 Final PS&E - Sub					
	3.6.1 Start-up - Engr	28		0.7	
	3.6.1 Start-up - Tech				
	3.6.1 Start-up - Admin	6			
	3.6.1 Start-up - Sub				

	Record #	1	2	3	4
3.6 Stormwater	3.6.2 Design Accept Package - Engr	62			
	3.6.2 Design Accept Package - Tech	4			
	3.6.2 Design Accept Package - Admin	6			
	3.6.2 Design Accept Package - Sub				
	3.6.3 Progress Submittal - Engr	64			
	3.6.3 Progress Submittal - Tech	4			
	3.6.3 Progress Submittal - Admin	2			
	3.6.3 Progress Submittal - Sub				
	3.6.4 Advanced Plans - Engr	42			
	3.6.4 Advanced Plans - Tech	4			
	3.6.4 Advanced Plans - Admin	2			
	3.6.4 Advanced Plans - Sub				
	3.6.5 Final PS&E - Engr	50			
	3.6.5 Final PS&E - Tech	4			
	3.6.5 Final PS&E - Admin	2			
	3.6.5 Final PS&E - Sub				
3.7 Traffic Mobility - TMP/Traffic Control Plans	3.7.1 Start-up - Engr	8		0.7	16
	3.7.1 Start-up - Tech				
	3.7.1 Start-up - Admin	2			6
	3.7.1 Start-up - Sub		13	1.7	
	3.7.2 Design Accept Package - Engr	42		5	20
	3.7.2 Design Accept Package - Tech	2		8	8
	3.7.2 Design Accept Package - Admin	3			2
	3.7.2 Design Accept Package - Sub		48	30.1	
	3.7.3 Progress Submittal - Engr	121		5	4
	3.7.3 Progress Submittal - Tech	84		8	2
	3.7.3 Progress Submittal - Admin	2			
	3.7.3 Progress Submittal - Sub		12		
	3.7.4 Advanced Plans - Engr	122		3	4
	3.7.4 Advanced Plans - Tech	84		2	1
	3.7.4 Advanced Plans - Admin	3			
	3.7.4 Advanced Plans - Sub		20		
	3.7.5 Final PS&E - Engr	68		2	2
	3.7.5 Final PS&E - Tech	40		1	1
3.7.5 Final PS&E - Admin	3				
3.7.5 Final PS&E - Sub		12			
	3.8.1 Start-up - Engr	124	11	7.4	58
	3.8.1 Start-up - Tech	40			
	3.8.1 Start-up - Admin	4		2	
	3.8.1 Start-up - Sub				

	Record #	1	2	3	4
3.8 Roadway Design	3.8.2 Design Accept Package - Engr	172			16
	3.8.2 Design Accept Package - Tech	60			28
	3.8.2 Design Accept Package - Admin	4			
	3.8.2 Design Accept Package - Sub				
	3.8.3 Progress Submittal - Engr	328	30	3	10
	3.8.3 Progress Submittal - Tech	320	8		30
	3.8.3 Progress Submittal - Admin	2		1	
	3.8.3 Progress Submittal - Sub	19			
	3.8.4 Advanced Plans - Engr	628	6	2	8
	3.8.4 Advanced Plans - Tech	400	2		28
	3.8.4 Advanced Plans - Admin	2		1	
	3.8.4 Advanced Plans - Sub				
	3.8.5 Final PS&E - Engr	364	6	4	6
	3.8.5 Final PS&E - Tech	120	2		14
	3.8.5 Final PS&E - Admin	2			
3.8.5 Final PS&E - Sub					
3.9 Bridge Design	3.9.1 Start-up - Engr	128	52	65	192
	3.9.1 Start-up - Tech	60			
	3.9.1 Start-up - Admin	24			2
	3.9.1 Start-up - Sub				
	3.9.2 Design Accept Package - Engr	552	288	224.3	56
	3.9.2 Design Accept Package - Tech	200	40	23.4	36
	3.9.2 Design Accept Package - Admin	40	4	4.8	
	3.9.2 Design Accept Package - Sub				
	3.9.3 Progress Submittal - Engr	462			52
	3.9.3 Progress Submittal - Tech	240			40
	3.9.3 Progress Submittal - Admin	20			
	3.9.3 Progress Submittal - Sub				
	3.9.4 Advanced Plans - Engr	374	292	219.1	44
	3.9.4 Advanced Plans - Tech	220	80	80	36
	3.9.4 Advanced Plans - Admin	20	14	5.5	4
	3.9.4 Advanced Plans - Sub				
	3.9.5 Final PS&E - Engr	190	37	21.5	30
3.9.5 Final PS&E - Tech	80	12		16	
3.9.5 Final PS&E - Admin	16	16	4.2	2	
3.9.5 Final PS&E - Sub		38			
3.10 Utilities	3.10.1 Start-up - Engr	5	4	11.1	4
	3.10.1 Start-up - Tech				
	3.10.1 Start-up - Admin	1			
	3.10.1 Start-up - Sub				
	3.10.2 Design Accept Package - Engr	8			2
	3.10.2 Design Accept Package - Tech				
	3.10.2 Design Accept Package - Admin	1			
	3.10.2 Design Accept Package - Sub				
	3.10.3 Progress Submittal - Engr	16			
	3.10.3 Progress Submittal - Tech				
	3.10.3 Progress Submittal - Admin	1			
	3.10.3 Progress Submittal - Sub				

	Record #	1	2	3	4
	3.10.4 Advanced Plans - Engr	11	4		4
	3.10.4 Advanced Plans - Tech				
	3.10.4 Advanced Plans - Admin	1			
	3.10.4 Advanced Plans - Sub				
	3.10.5 Final PS&E - Engr	3			
	3.10.5 Final PS&E - Tech				
	3.10.5 Final PS&E - Admin	1			
	3.10.5 Final PS&E - Sub				
3.11 Railroad	3.11.1 Start-up - Engr	6		8	
	3.11.1 Start-up - Tech	4			
	3.11.1 Start-up - Admin	1			
	3.11.1 Start-up - Sub			14.1	
	3.11.2 Design Accept Package - Engr	10		7.4	
	3.11.2 Design Accept Package - Tech	16			
	3.11.2 Design Accept Package - Admin	1			
	3.11.2 Design Accept Package - Sub			39.5	
	3.11.3 Progress Submittal - Engr	2			
	3.11.3 Progress Submittal - Tech				
	3.11.3 Progress Submittal - Admin	1			
	3.11.3 Progress Submittal - Sub			10	
	3.11.4 Advanced Plans - Engr	2			
	3.11.4 Advanced Plans - Tech				
	3.11.4 Advanced Plans - Admin	1			
	3.11.4 Advanced Plans - Sub			5	
	3.11.5 Final PS&E - Engr	2			
	3.11.5 Final PS&E - Tech				
3.11.5 Final PS&E - Admin	1				
3.11.5 Final PS&E - Sub			3		
3.12 Public Involvement	3.12.1 Start-up - Engr	9		1.8	4
	3.12.1 Start-up - Tech				
	3.12.1 Start-up - Admin	2			
	3.12.1 Start-up - Sub	31	42	5.6	17
	3.12.2 Design Accept Package - Engr	29		1.7	
	3.12.2 Design Accept Package - Tech	6		0.7	
	3.12.2 Design Accept Package - Admin	5		0.3	
	3.12.2 Design Accept Package - Sub	47	7	10	
	3.12.3 Progress Submittal - Engr	32		1	
	3.12.3 Progress Submittal - Tech	1		1.4	
	3.12.3 Progress Submittal - Admin	2			
	3.12.3 Progress Submittal - Sub	26	20	1.4	1
	3.12.4 Advanced Plans - Engr	31			
	3.12.4 Advanced Plans - Tech	1			
	3.12.4 Advanced Plans - Admin	2			
	3.12.4 Advanced Plans - Sub	34	8		
	3.12.5 Final PS&E - Engr	15			2
	3.12.5 Final PS&E - Tech	1			
	3.12.5 Final PS&E - Admin	2			
	3.12.5 Final PS&E - Sub	24	4		2

	Record #	1	2	3	4
3.13 Right-of-Way	3.13.1 Start-up - Engr	7		1.4	
	3.13.1 Start-up - Tech				
	3.13.1 Start-up - Admin			0.3	
	3.13.1 Start-up - Sub				
	3.13.2 Design Accept Package - Engr	14			
	3.13.2 Design Accept Package - Tech	16			
	3.13.2 Design Accept Package - Admin				
	3.13.2 Design Accept Package - Sub				
	3.13.3 Progress Submittal - Engr	4			
	3.13.3 Progress Submittal - Tech	4			
	3.13.3 Progress Submittal - Admin				
	3.13.3 Progress Submittal - Sub				
	3.13.4 Advanced Plans - Engr				
	3.13.4 Advanced Plans - Tech				
	3.13.4 Advanced Plans - Admin				
	3.13.4 Advanced Plans - Sub				
	3.13.5 Final PS&E - Engr	3			
	3.13.5 Final PS&E - Tech	2			
	3.13.5 Final PS&E - Admin				
	3.13.5 Final PS&E - Sub				
3.14 Prebid Assistance	3.14.1 Pre-Bid Meeting - Engr				
	3.14.1 Pre-Bid Meeting - Tech				
	3.14.1 Pre-Bid Meeting - Admin				
	3.14.1 Pre-Bid Meeting - Sub				
	3.14.2 Questions During Bidding - Engr				4
	3.14.2 Questions During Bidding - Tech				
	3.14.2 Questions During Bidding - Admin				
	3.14.2 Questions During Bidding - Sub				
	3.14.3 Addenda to Bid Documents - Engr				4
	3.14.3 Addenda to Bid Documents - Tech				2
3.14.3 Addenda to Bid Documents - Admin					
3.14.3 Addenda to Bid Documents - Sub					
3.15 CSSS	3.15 Context Sensitive & Sustainable Soln - Engr	5			8
	3.15 Context Sensitive & Sustainable Soln - Tech				
	3.15 Context Sensitive & Sustainable Soln - Admin				10
	3.15 Context Sensitive & Sustainable Soln - Sub	22			
Contingency	Contingency - Engr	144			
	Contingency - Tech	42			
	Contingency - Admin	4			
	Contingency - Sub	120			12

	Record #	1	2	3	4	
Bridge and Project Characteristics	Bridge Type/Work	PCPS BT85	Install external Post-tensioning bent cap flexural strengthening.	Rail retrofit, MC deck overlay, column repair and install protective screening	Went to no work	
	Span Description	2 spans, 150'-150'	4 spans, 56'-70'-56'-40' RCDG	5 spans, 41.5'-41.5'-52'-65'-52' RCDG	3 spans, 45'-56'-45' CIP RCDG	
	Str Length	300	222	253	141	
	Deck Width	88	34.83	82.92	43.5	
	Year Built	2010	1958	1957	1948	
	Prof. Svcs					
	PE Cost	\$2,732,818	\$300,732	\$137,955	\$168,942	
	CE Cost	\$1,150,597	\$32,351	\$155,220	\$0	
	Constr Cost	\$9,153,432	\$69,290	\$1,137,028	\$0	
	Constr Auth w/o CE	\$9,347,311	\$69,290	\$1,137,028		
	Contract	C14019	C13998	C13298	No Work	
	Let date	05/07/09	04/09/09	10/26/06		
	Note	Active contract Sep 2012		\$400,000+929 2 non OTIA work are split among 6 lrs based on deck area		
	Square Feet of Bridge Deck	26400	7732.26	20978.76	6133.5	
	Totals	Total PE Hours	10240	1982	1185.6	1377
	Project Mgmt Hours	1215	437	220.8	146	
	Total Hours Per Million Construction Cost	1096	28604	1043		

APPENDIX F: FEE ESTIMATE SPREADSHEET TEMPLATE (FEST)

INSTRUCTION ON FEST SPREADSHEET:

Click on the **Basic Data** worksheet tab. Red text requires user input, fill in appropriate information, changing names as necessary. If there are extra cells you do not need, simply ignore them.

Click on the **Buildup** worksheet tab. Information from **Basic Data** will be automatically filled in here, for the cells that you do not need, ignore them. The AE Firm will populate the yellow cells with project specific job classifications, wage rates, and OH and Profit for each firm. Each sub-consultant will find the block of cells designated with its name, and fill in the appropriate information in light yellow cells. You will need to input your overhead and profit, profit will be **7.5% percent**. Rates for Overhead (OH) calculations must have been previously accepted by OBDP Procurement.

For **AE and Sub Summary – Bridge (X)** worksheet tabs: All previous user supplied information will be build into the worksheets. The AE firm and sub-consultants should have sufficient columns for the project; **do not add more columns**. If there are more columns than needed, please ignore or hide them. Simply input labor hours in the yellow cells for each employee or position by task. **Do not add rows to the worksheet**, but you may input names of contingency tasks in the contingency task subsection. To include approved Other Direct Costs, input estimated dollar amounts for each type of cost by task or input the number of units if a cost per unit was established in the **Buildup** sheet.

When printing, it is recommend that the “Black and White” box be checked under the “Sheet” tab in Page Setup in order to hide the shading.

Firm Name: **ABC Consulting**
 Prepared By: **John Smith**
 Date: **11/11/2006**
 Project Name: **I-5/OR-42: Winston - McLain Ave - Bundle XXX**
 Project Location: **Douglas County, ODOT Region 3**
 Project No. **K14123**
 Bundle No. **123**
 ATA No. **23856**
 Stage No. **3**

DMWESB: (Yes or No)
No

Bridge Name:	Bridge Number	Unique ID	Scope	EA
Bridge 1	1	12345	121 Repair	1 12311121
Bridge 2	2	0	122 Replace	2 12321122
Bridge 3	3	0	123 Replace	2 12321123
Bridge 4	4	0	124 Replace	2 12321124
Bridge 5	5	0	125 Replace	2 12321125
Bridge 6	6	0	126 Repair	1 12311126
Bridge 7	7	0	127 Replace	2 12321127
Bridge 8	8	0	128 Repair	1 12311128
Bridge 9	9	0	129 Replace	2 12321129
Bridge 10	10	0	130 Repair	1 12311130

Sub-Consultants: DMWESB: (Yes or No)

Sub-Consultant 1	Subconsultant 1	Yes
Sub-Consultant 2	Subconsultant 2	No
Sub-Consultant 3	Subconsultant 3	No
Sub-Consultant 4	Subconsultant 4	No
Sub-Consultant 5	Subconsultant 5	No
Sub-Consultant 6	Subconsultant 6	No
Sub-Consultant 7	Subconsultant 7	No
Sub-Consultant 8	Subconsultant 8	No
Sub-Consultant 9	Subconsultant 9	No
Sub-Consultant 10	Subconsultant 10	No

Distribution of DAP Effort
76% Draft DAP
25% Final DAP

Constructed Value of Bundle
\$ 10,000,000.00

Allowable Other Direct Costs Categories(ODC)*

ODC Example Categories

Printing
 Plotting
 Mileage
 Lodging
 Meals
 Personal Computer Time
 Railroad Flagging
 Land Use Permits
 Geotechnical Drilling
 Traffic Control
 GPS
 Total Station

ABC Consulting

	Mileage	Printing	PC Time	Spec Equip	Railroad Flagging	Land Use Permits	GPS
Subconsultant 1	xyz	xyz	xyz	xyz	xyz	xyz	xyz
Subconsultant 2	xyz	xyz	xyz	xyz	xyz	xyz	xyz
Subconsultant 3	xyz	xyz	xyz	xyz	xyz	xyz	xyz
Subconsultant 4	xyz	xyz	xyz	xyz	xyz	xyz	xyz
Subconsultant 5	xyz	xyz	xyz	xyz	xyz	xyz	xyz
Subconsultant 6	xyz	xyz	xyz	xyz	xyz	xyz	xyz
Subconsultant 7	xyz	xyz	xyz	xyz	xyz	xyz	xyz
Subconsultant 8	xyz	xyz	xyz	xyz	xyz	xyz	xyz
Subconsultant 9	xyz	xyz	xyz	xyz	xyz	xyz	xyz
Subconsultant 10	xyz	xyz	xyz	xyz	xyz	xyz	xyz

*Costs that are included in OH calculations are not permitted as ODCs. All expenses must comply with ODOT policy. Specific requirements for travel are available and must be followed.

AE FIRM

Overhead:									
Negotiated Profit (%):									
Insert Appropriate Position Titles									
Actual Direct Rate	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Overhead	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Profit	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total Rate	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

AE Firm ODCs

	Mileage	Printing	PC Time	Spec Equip	Railroad Flagging	Land Use Permits	GPS
Rate (If applicable)	0.505	0.025	4.11	1.00	1.00	1.00	1.00
Units	mile	page	hour				

Subconsultant ODCs

Subconsultant 1							
	xyz	xyz	xyz	xyz	xyz	xyz	xyz
Rate (If applicable)	1.000	1.00	1.00	1.00	1.00	1.00	1.00
Units							

SUBCONSULTANTS

Subconsultant 1									
Overhead:									
Negotiated Profit (%):									
Insert Appropriate Position Titles									
Actual Direct Rate	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Overhead	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Profit	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total Rate	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

1 1 0 0 0 0 0 0 0 0

Total Number on Project: 0

Bridge Name and Number:
 Project Location:
 Project Number:

1
 Douglas County, ODOT Region 3
 K14123

12345

Total with Contingencies \$ -

Task	Work Element	0	0	0
		\$0.00/hr	\$0.00/hr	\$0.00/hr
3	DESCRIPTION OF WORK - SPECIFIC	\$0.00/hr	\$0.00/hr	\$0.00/hr
3.1	Project Management	\$ -	\$ -	\$ -
		0	0	0
3.1.1	Coordination			
3.1.2	Quality Plan			
3.1.2	Quality Audit			
3.1.3	Review Meetings			
3.1.4	Communications			
3.1.5	Construction Estimates and Construction Schedule			
3.1.6	Project Files			
3.1.8	Specifications			
3.1.9	Safety Plan			
3.2	SURVEY, MAPPING, AND RIGHT OF WAY ENGINEERING	\$ -	\$ -	\$ -
		0	0	0
3.2.1	Startup			
3.2.2	Design Acceptance Package			
3.2.3	Progress Plans			
3.2.4	Advanced Plans			
3.2.5	Final Plans, Specifications, and Estimate			
3.3	ENVIRONMENTAL STUDIES	\$ -	\$ -	\$ -
		0	0	0
3.3.1	Startup			
3.3.2	Design Acceptance Package			
3.3.3	Progress Plans			
3.3.4	Advanced Plans			
3.3.5	Final Plans, Specifications, and Estimate			
3.4	GEOTECHNICAL INVESTIGATIONS	\$ -	\$ -	\$ -
		0	0	0
3.4.1	Startup			
3.4.2	Design Acceptance Package			
3.4.3	Progress Plans			
3.4.4	Advanced Plans			
3.4.5	Final Plans, Specifications, and Estimate			
3.5	BRIDGE HYDRAULICS AND SCOUR ANALYSIS	\$ -	\$ -	\$ -
		0	0	0
3.5.1	Startup			
3.5.2	Design Acceptance Package			
3.5.3	Progress Plans			
3.5.4	Advanced Plans			
3.5.5	Final Plans, Specifications, and Estimate			
3.6	STORMWATER	\$ -	\$ -	\$ -
		0	0	0
3.6.1	Startup			
3.6.2	Design Acceptance Package			
3.6.3	Progress Plans			
3.6.4	Advanced Plans			
3.6.5	Final Plans, Specifications, and Estimate			
3.7	TRAFFIC MOBILITY - TMP/TRAFFIC CONTROL PLANS	\$ -	\$ -	\$ -
		0	0	0
3.7.1	Startup			
3.7.2	Design Acceptance Package			
3.7.3	Progress Plans			
3.7.4	Advanced Plans			
3.7.5	Final Plans, Specifications, and Estimate			
3.8	ROADWAY DESIGN	\$ -	\$ -	\$ -
		0	0	0
3.8.1	Startup			
3.8.2	Design Acceptance Package			
3.8.3	Progress Plans			
3.8.4	Advanced Plans			
3.8.5	Final Plans, Specifications, and Estimate			
3.9	BRIDGE DESIGN	\$ -	\$ -	\$ -
		0	0	0
3.9.1	Startup			
3.9.2	Design Acceptance Package			
3.9.3	Progress Plans			
3.9.4	Advanced Plans			
3.9.5	Final Plans, Specifications, and Estimate			
3.10	UTILITIES	\$ -	\$ -	\$ -

Total of Subs by Bridge and Task

	1		2		3		4		5		6
	Hours	Dollars	Hours	Dollars	Hours	Dollars	Hours	Dollars	Hours	Dollars	Hours
Task 3.1	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0
Task 3.2	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0
Task 3.3	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0
Task 3.4	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0
Task 3.5	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0
Task 3.6	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0
Task 3.7	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0
Task 3.8	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0
Task 3.9	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0
Task 3.10	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0
Task 3.11	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0
Task 3.12	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0
Task 3.13	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0
Task 3.14	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0
Task 3.15	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0
Total	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0
Direct Labor		\$ -		\$ -		\$ -		\$ -		\$ -	

Total of Subs per Bridge by Sub

	1		2		3		4		5		6
	Hours	Dollars	Hours	Dollars	Hours	Dollars	Hours	Dollars	Hours	Dollars	Hours
Subconsultant 1	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0
Subconsultant 2	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0
Subconsultant 3	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0
Subconsultant 4	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0
Subconsultant 5	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0
Subconsultant 6	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0
Subconsultant 7	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0
Subconsultant 8	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0
Subconsultant 9	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0
Subconsultant 10	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0

AE Phase Total

Total per Bridge by Phase (Prime+Subs)

Phase:	Start-up Tasks		DAP		Progress Plans		Advanced Plans		Final PS&E		Project Management		Duration Activities		Post Design		Subtotal w/o Cont.		Contingency			
	Hours	Dollars	Hours	Dollars	Hours	Dollars	Hours	Dollars	Hours	Dollars	Hours	Dollars	Hours	Dollars	Hours	Dollars	Hours	Dollars	Hours	Dollars		
1	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -		
2	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -		
3	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -		
4	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -		
5	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -		
6	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -		
7	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -		
8	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -		
9	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -		
10	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -		
	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -

Total per Bridge by Phase (ODC's)

Phase:	Start-up Tasks		DAP		Progress Plans		Advanced Plans		Final PS&E		Project Management		Duration Activities		Post Design		Subtotal w/o Cont.		Contingency	
	Hours	Dollars	Hours	Dollars	Hours	Dollars	Hours	Dollars	Hours	Dollars	Hours	Dollars	Hours	Dollars	Hours	Dollars	Hours	Dollars	Hours	Dollars
1		\$ -		\$ -		\$ -		\$ -		\$ -		\$ -		\$ -		\$ -		\$ -		\$ -
2		\$ -		\$ -		\$ -		\$ -		\$ -		\$ -		\$ -		\$ -		\$ -		\$ -
3		\$ -		\$ -		\$ -		\$ -		\$ -		\$ -		\$ -		\$ -		\$ -		\$ -
4		\$ -		\$ -		\$ -		\$ -		\$ -		\$ -		\$ -		\$ -		\$ -		\$ -
5		\$ -		\$ -		\$ -		\$ -		\$ -		\$ -		\$ -		\$ -		\$ -		\$ -
6		\$ -		\$ -		\$ -		\$ -		\$ -		\$ -		\$ -		\$ -		\$ -		\$ -
7		\$ -		\$ -		\$ -		\$ -		\$ -		\$ -		\$ -		\$ -		\$ -		\$ -
8		\$ -		\$ -		\$ -		\$ -		\$ -		\$ -		\$ -		\$ -		\$ -		\$ -
9		\$ -		\$ -		\$ -		\$ -		\$ -		\$ -		\$ -		\$ -		\$ -		\$ -
10		\$ -		\$ -		\$ -		\$ -		\$ -		\$ -		\$ -		\$ -		\$ -		\$ -
		\$ -		\$ -		\$ -		\$ -		\$ -		\$ -		\$ -		\$ -		\$ -		\$ -

Invoicing Worksheet

Project Name: I-5/OR-42: Winston - McLain Ave - Bundle XXX
 Project Location: Douglas County, ODOT Region 3
 Project No. K14123

Firm Name: ABC Consulting
 Date: 11/11/08
 Bundle No. 123

ATA No. 23858
 Stage No. 3
 Prepared By: John Smith

Summary of Hours

GRAND TOTALS FOR BUNDLE	Labor Costs Direct Costs Total Costs	Dollars					Hours		
		Consultant Labor		DMWESS	Consultant ODCs		% Diff.	Consultant	
		Dollars	% of Grand Total	Dollars	Dollars	% of ODC Total		Hours	% of Grand Total
	\$ -	#DIV/0!					0	#DIV/0!	
	\$ -	#DIV/0!							
	\$ -	#DIV/0!							
By Bridge (Labor Costs only; separate Bundle Wide Activities)									
1	\$ -	#DIV/0!		\$ -	#DIV/0!		0	#DIV/0!	
2	\$ -	#DIV/0!		\$ -	#DIV/0!		0	#DIV/0!	
3	\$ -	#DIV/0!		\$ -	#DIV/0!		0	#DIV/0!	
4	\$ -	#DIV/0!		\$ -	#DIV/0!		0	#DIV/0!	
5	\$ -	#DIV/0!		\$ -	#DIV/0!		0	#DIV/0!	
6	\$ -	#DIV/0!		\$ -	#DIV/0!		0	#DIV/0!	
7	\$ -	#DIV/0!		\$ -	#DIV/0!		0	#DIV/0!	
8	\$ -	#DIV/0!		\$ -	#DIV/0!		0	#DIV/0!	
9	\$ -	#DIV/0!		\$ -	#DIV/0!		0	#DIV/0!	
10	\$ -	#DIV/0!		\$ -	#DIV/0!		0	#DIV/0!	
By Firm (Labor Costs with Bundle Wide Activities)									
Prime	\$ -	#DIV/0!					0	#DIV/0!	
Subconsultant 1	\$ -	#DIV/0!		0			0	#DIV/0!	
Subconsultant 2	\$ -	#DIV/0!					0	#DIV/0!	
Subconsultant 3	\$ -	#DIV/0!					0	#DIV/0!	
Subconsultant 4	\$ -	#DIV/0!					0	#DIV/0!	
Subconsultant 5	\$ -	#DIV/0!					0	#DIV/0!	
Subconsultant 6	\$ -	#DIV/0!					0	#DIV/0!	
Subconsultant 7	\$ -	#DIV/0!					0	#DIV/0!	
Subconsultant 8	\$ -	#DIV/0!					0	#DIV/0!	
Subconsultant 9	\$ -	#DIV/0!					0	#DIV/0!	
Subconsultant 10	\$ -	#DIV/0!					0	#DIV/0!	
By Task (Labor Costs)									
Task 3.1 PROJECT MANAGEMENT	\$ -	#DIV/0!					0	#DIV/0!	
Task 3.2 SURVEY, MAPPING, AND RIGHT OF WAY ENGINEERING	\$ -	#DIV/0!					0	#DIV/0!	
Task 3.3 ENVIRONMENTAL STUDIES	\$ -	#DIV/0!					0	#DIV/0!	
Task 3.4 GEOTECHNICAL INVESTIGATIONS	\$ -	#DIV/0!					0	#DIV/0!	
Task 3.5 BRIDGE HYDRAULICS AND SCOUR ANALYSIS	\$ -	#DIV/0!					0	#DIV/0!	
Task 3.6 STORMWATER	\$ -	#DIV/0!					0	#DIV/0!	
Task 3.7 TRAFFIC MOBILITY - TMP/TRAFFIC CONTROL PLANS	\$ -	#DIV/0!					0	#DIV/0!	
Task 3.8 ROADWAY DESIGN	\$ -	#DIV/0!					0	#DIV/0!	
Task 3.9 BRIDGE DESIGN	\$ -	#DIV/0!					0	#DIV/0!	
Task 3.10 UTILITIES	\$ -	#DIV/0!					0	#DIV/0!	
Task 3.11 RAILROAD	\$ -	#DIV/0!					0	#DIV/0!	
Task 3.12 PUBLIC INVOLVEMENT	\$ -	#DIV/0!					0	#DIV/0!	
Task 3.13 RESERVED	\$ -	#DIV/0!					0	#DIV/0!	
Task 3.14 PREBID ASSISTANCE	\$ -	#DIV/0!					0	#DIV/0!	
Task 3.15 CONTEXT SENSITIVE AND SUSTAINABLE SOLUTIONS	\$ -	#DIV/0!					0	#DIV/0!	
By Milestone (Labor Costs Only)									
Startup Tasks	\$ -	#DIV/0!					0	#DIV/0!	
Design Acceptance Package (DAP)	\$ -	#DIV/0!					0	#DIV/0!	
Progress Submittal	\$ -	#DIV/0!					0	#DIV/0!	
Advance PS&E	\$ -	#DIV/0!					0	#DIV/0!	
Final PS&E	\$ -	#DIV/0!					0	#DIV/0!	
Program Management	\$ -	#DIV/0!					0	#DIV/0!	
Duration Activities	\$ -	#DIV/0!					0	#DIV/0!	
Post Design	\$ -	#DIV/0!					0	#DIV/0!	
Total of Labor Costs									
Prime	\$ -	#DIV/0!					0	#DIV/0!	
Sube	\$ -	#DIV/0!					0	#DIV/0!	
Total	\$ -	#DIV/0!					0	#DIV/0!	

Constructed Value of bundle \$ 10,000,000.00
 Total Direct Labor \$ - 0.00%
 Average Direct Labor Rate #DIV/0!
 Average Loaded Hourly Rate \$ -
 Number of People Involved 0
 Number of Full Time Equivalents Months 0.0
 Direct Costs (ODCs) 0
 Percent of Costs to Prime #DIV/0!
 Percent of Costs to Subs #DIV/0!
 Percent Labor Costs to DMWESB #DIV/0!

Average Loaded Hourly Rate for Subconsultants:	Base Scope	Contingencies
Subconsultant 1	\$0.00/hr	\$0.00/hr
Subconsultant 2	\$0.00/hr	\$0.00/hr
Subconsultant 3	\$0.00/hr	\$0.00/hr
Subconsultant 4	\$0.00/hr	\$0.00/hr
Subconsultant 5	\$0.00/hr	\$0.00/hr
Subconsultant 6	\$0.00/hr	\$0.00/hr
Subconsultant 7	\$0.00/hr	\$0.00/hr
Subconsultant 8	\$0.00/hr	\$0.00/hr
Subconsultant 9	\$0.00/hr	\$0.00/hr
Subconsultant 10	\$0.00/hr	\$0.00/hr

Weighted Average Loaded Hourly for Subconsultants \$0.00/hr

Weighted Average Hourly Rate for Prime by Bridge	
1	\$0.00/hr
2	\$0.00/hr
3	\$0.00/hr
4	\$0.00/hr
5	\$0.00/hr
6	\$0.00/hr
7	\$0.00/hr
8	\$0.00/hr
9	\$0.00/hr
10	\$0.00/hr

Hours Per Bridge	Sub	Prime	Total
1	0	0	0
2	0	0	0
3	0	0	0
4	0	0	0
5	0	0	0
6	0	0	0
7	0	0	0
8	0	0	0
9	0	0	0
10	0	0	0

Level of Effort per Bridge by Task	Bridge 1		Bridge 2		Bridge 3		Bridge 4		Bridge 5		Bridge 6		Bridge 7		Bridge 8		Bridge 9		Bridge 10	
	Hours	No. People	Hours	No. People	Hours	No. People	Hours	No. People	Hours	No. People	Hours	No. People	Hours	No. People	Hours	No. People	Hours	No. People	Hours	No. People
3.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3.4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3.6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3.7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3.8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3.9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3.10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3.11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3.12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3.13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3.14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3.15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

**APPENDIX G: “FEASIBILITY DETERMINATION, COST ANALYSIS &
EVALUATION FORM” (OREGON DEPARTMENT OF
ADMINISTRATIVE SERVICES. 2012)**

FEASIBILITY DETERMINATION, COST ANALYSIS AND EVALUATION FORM

(For OAR 125-247-0110; Oregon Laws 2009, Chapter 880 (HB 2867))

Overview: Before conducting a Procurement for certain Services exceeding \$250,000, the Authorized Agency (Agency) may be required to complete a written Cost Analysis under OAR 125-247-0110. Architectural et al. and Client Services are excluded. This form helps the Agency summarize its determinations and evaluation.

Date:	Project Name/Location:
Type of Service:	

1. OAR 125-247-0110 (Rule) instructs the Agency on how to use this Form. **I have read this Rule.**

2. A Feasibility Determination has been made instead of a Cost Analysis for this Procurement, based on the following Special Circumstance(s) (Rule Sec. 3):

- | | |
|---|---|
| <input type="checkbox"/> Lack Specialized Technical Expertise
Rule Sec. (3)(b)(A) | <input type="checkbox"/> Conflict of Interest; Unbiased Review
Rule Sec. (3)(b)(E) |
| <input type="checkbox"/> Grant or Other Funding
Rule Sec. (3)(b)(B) | <input type="checkbox"/> Emergency Procurement
Rule Sec. (3)(b)(F) |
| <input type="checkbox"/> State or Federal Law Requirements
Rule Sec. (3)(b)(C) | <input type="checkbox"/> Delay
Rule Sec. (3)(b)(G) |
| <input type="checkbox"/> Incidental Services for Real or Personal Property, Rule Sec. (3)(b)(D) | <input type="checkbox"/> Services Completed within Six Months
Rule Sec. (3)(b)(H) |

Other Special Circumstance, Rule Sec. (3)(b)

Written Findings are required. Rule Sec. (3). The Written Findings are attached or located at:

APPROVAL OF THE DPO OF THE FEASIBILITY DETERMINATION (Rule Sec. (3)):

DPO Signature

Date

Name:
Title:

3. A Cost Analysis has been made instead of a Feasibility Determination for this Procurement, and documentation is attached for the following requirements:

Agency Estimate to Perform the Services:		Agency Estimate to Contract Out the Services:	
Agency Costs, Rule Sec. (4)(a)		Contractor Costs, Rule Sec. (4)(b)	
A. Salary or Wage & Benefit Costs Rule Sec. (4)(a)(A)	\$	A. Salary or Wage & Benefit Costs Rule Sec. (4)(b)(A)	\$
B. Material Costs Rule Sec. (4)(a)(B)	\$	B. Material Costs Rule Sec. (4)(b)(B)	\$
C. Related Costs Rule Sec. (4)(a)(C)	\$	C. Miscellaneous Costs Rule Sec. (4)(b)(C)	\$
D. Other Information Rule Sec. (4)(a)(D)	\$	D. Other Information Rule Sec. (4)(b)(D)	\$
(Costs the Agency would incur)		(Costs the Contractor would incur)	
Total:		Subtotal:	
4. Agency compared the above Data and Made the Decision described in the Rule, Sec. (5)			
(No entry)		E. Estimated profit incurred by Agency Rule Sec. (6)(b)	
TOTAL: (Costs the Agency would incur to perform the Services.)	\$	(Contractor Price) TOTAL: (Costs the Agency would incur to contract out the Services)	\$
5. Agency compared the above Totals and Made the Decision described in the Rule, Sec. (6)			

6. AGENCY DETERMINATIONS AND DECISION UNDER SECTIONS (5) AND (6), IF APPLICABLE

A. Agency intends to perform the Services. Describe the decision made under the Rule, Sections (5) and (6).

Provide the determinations that explain and support the decision.

Determination (Required) (attach additional pages as needed):
--

B. Agency intends to contract out the Services. Describe the decision made under the Rule, Sections (5) and (6). Provide the determinations to explain and support the decision.

Determination (Required) (attach additional pages as needed):
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7. APPROVAL OF THE DPO (Rule Sec. (6)(e)):

DPO Signature

Date

Name:
Phone No.:
Email:

PROCESS EVALUATION

1. Did meeting the requirements of OAR 125-247-0110 aid the Agency in making its sourcing decision?

A. Yes Provide explanation:

B. No Provide explanation:

2. How much time was spent in complying with OAR 125-247-0110, including performing the Feasibility Determination or Cost Analysis, over and above the time that would have been spent doing the level of analysis the Agency would have previously done for a Procurement of this type and size?

3. What was the impact to the procurement process as a result of meeting the requirements of OAR 125-247-0110? (If there was a delay, provide an estimate of the cost and time impact to the Agency.)

To the best of my knowledge, the information entered on this form is true and accurate.

Preparer Name:

Phone No.:

Email:

**** SUBMIT THIS FORM AND ANY SUPPORTING DOCUMENTATION TO THE AGENCY DPO.**