

**COST COMPARISON OF WASHINGTON SAFETY REST AREA
OPERATIONS WITH OTHER STATES**

2020 – 2022

DRAFT FINAL REPORT

By

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16. Abstract Safety Rest Areas (SRAs) provide rest to highway users. State departments of transportation (DOTs) operate their SRAs using several methods. The Washington State DOT uses an in-house workforce, while some states outsource to private contractors. SRAs are one type of highway roadside infrastructure designed to reduce driver fatigue-related crashes. However, some states have shut down some of their SRAs; therefore, analyzing and managing their operation costs is necessary. The principal objective of this study was to compute the annual operating costs of Washington SRAs in comparison to other states. The findings of this study showed that the average annual cost of SRAs in Washington was significantly less than those of other states. However, the study had major limitations that restrict generalizing the findings. Responses from states were limited (16 states), and data were unavailable related to certain factors that may differ significantly from state to state, such as staffing hours, average rest area size, total visitors per SRA, SRA type, the quality of work output, and amenities offered by SRAs. The study's findings also showed that labor costs represented over half of the total expense in operating Washington SRAs. For future research, a more in-depth study is recommended, collecting more data from states related to the factors mentioned above to make the cost comparison more accurate.			
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EXECUTIVE SUMMARY

Safety Rest Areas (SRAs) are facilities along highways that provide weary drivers safe places to rest. To operate SRAs, most state departments of transportation (DOTs) use three methods and their combinations: an in-house workforce; outsourcing with traditional contracting; and outsourcing with performance-based contracting.

This study used national surveys of many U.S. states to collect SRA data from 2010 to 2020. In this survey, states using the above three methods to operate their SRAs were invited to participate. Twenty-one states (except Washington) accepted the invitation to participate in the survey. Of the 21 states, 18 completed the survey, with a response rate of 86 percent. The survey results showed that an in-house workforce and traditional contracting methods were widely used in the United States. Of the 18 responses received, ten states used an in-house workforce, including Washington, Alabama, Delaware, Louisiana, Minnesota, and South Dakota. Additionally, nine states used traditional contracting, including California, Louisiana, Minnesota, Utah, and Vermont, while three states used performance-based contracting: Texas, Virginia, and Arizona. Louisiana and Vermont used both an in-house workforce and traditional contracting, and Iowa and Minnesota used a combination of an in-house workforce and traditional contracting.

Computing the average annual cost of operating Washington's SRAs and then comparing this with the costs of other states was the key objective of this study. However, in-depth cost components such as the number of visitors per SRA, size, and amenities offered at SRAs were not available for more accurate cost comparison. From the national survey data, the average annual operating costs of SRAs were computed for each of the different operating methods used by the states. The study findings showed that the average annual cost of SRAs using an in-house workforce (excluding Washington) was \$325,824.30, that of traditional contracting was \$206,209.49, and performance-based contracting was \$289,883.09. However, because of a lack of data, this study did not normalize the costs due to type and size of SRAs, amenities offered at SRAs, and more, even though these elements may have affected the states' operating costs. Therefore, this comparison should not be generalized. Washington state used an in-house workforce to operate its 39 regular SRAs (eight SRAs are seasonal, with a total of 47 SRAs). The average annual cost of operating these facilities was calculated to be \$148,198.22, which was less than the costs of the other methods used by other states. T-test results showed that

Washington's average annual cost was statistically significantly less than that of other states. All costs were adjusted for location by transferring the costs to the state of Washington using the City Cost Index (CCI) RSMMeans Data, and they were adjusted for time (the base cost of 2020) for the cost comparison. The data analysis also revealed that in all the surveyed states, SRA operating costs increased linearly over the study period of 2010 to 2020.

In the state of Washington, when the cost data were analyzed, the highest expenditure cost category was found to be Labor, which was approximately 60 percent of the total cost. This indicates that the number of staff, as well as how long they are staffed at SRA sites, greatly affect the total cost of SRA operations. The Labor category was followed in cost by the Other Services (22 percent), Materials and Supplies (9 percent), and Equipment (9 percent) categories.

In conclusion, SRAs can be operated in various ways. In the state of Washington, SRAs are operated by using an in-house workforce, which seems to be cost effective in comparison to the costs of other states (which used an in-house workforce, traditional contracting, and performance-based contracting). However, the findings should not be generalized because several cost factors were not available to consider or normalize, such as type and size of SRAs, amenities offered at SRAs, and more.

Louisiana and Vermont used both an in-house workforce and traditional contracting at the same time for operating their SRAs. Louisiana used an in-house workforce to operate half of its SRAs (ten SRAs in 2018 and 2019; in other years the number fluctuated) and traditional contracting for another half of its SRAs. Vermont operated about 75 percent of its SRAs by using an in-house workforce and about 25 percent by using a traditional contracting. In Vermont, the average annual cost of SRAs operated by private contractors decreased by about 23 percent in comparison to the costs when they were operated by an in-house workforce. It is important to also keep in mind that the number of visitors per SRA operated by private contractors was also 23 percent less than that of SRAs operated by an in-house workforce. In Louisiana, the average annual operation costs of SRAs operated by private contractors were half of the costs of those operated by an in-house workforce. However, visitor numbers and other factors that may have affected operations costs were not available to consider for an accurate comparison.

For future study, it is recommended that the number of responses from states be increased and that in-depth data be collected on factors that may affect the average annual operations cost

of SRAs, such as type and size of SRAs, amenities offered at SRAs, total annual visitors per SRA, and quality of operations work delivered, for more accurate cost comparisons.

CHAPTER 1: INTRODUCTION

1.1 Research Background

The United States introduced Safety Rest Areas (SRAs) in the mid 1900s (Cardone 1965) as part of the Interstate Highway System, after the highway system began construction in 1956. The SRAs were envisioned as important facilities where highway users could take restroom breaks and rest safely, especially tired and weary drivers, before continuing their journeys. A full-size SRA may provide several services, including, but not limited to, restroom facilities, parking, drinking water, picnic tables, free coffee, and tourist information. States operate their SRAs using three basic methods: an in-house workforce; outsourcing with traditional contracting; and outsourcing with performance-based contracting.

1.1.1. In-House Workforce Method

States use their own workforce, materials, and supplies to operate SRAs when using an in-house workforce (Shrestha 2016). With this method, states operate SRAs in their own way, paying their staff per their input. The total operating costs of SRAs may include the costs or depreciation of equipment used, as well as utilities, labor costs, materials, and supplies. Figure 1.1 shows one of Washington's SRAs along Interstate 90 operated with an in-house workforce.



Figure 1.1 A Washington SRA (along I-90) operated by an-house workforce

Washington state operates its 47 SRAs with an in-house workforce. Figure 1.2 shows all the 47 SRA locations (green dots) on the Washington state map, with the major Interstate highways: I-5, I-82, and I-90. Larger dots indicate higher numbers of SRA visitors, and smaller dots indicate lower numbers of visitors in 2018.

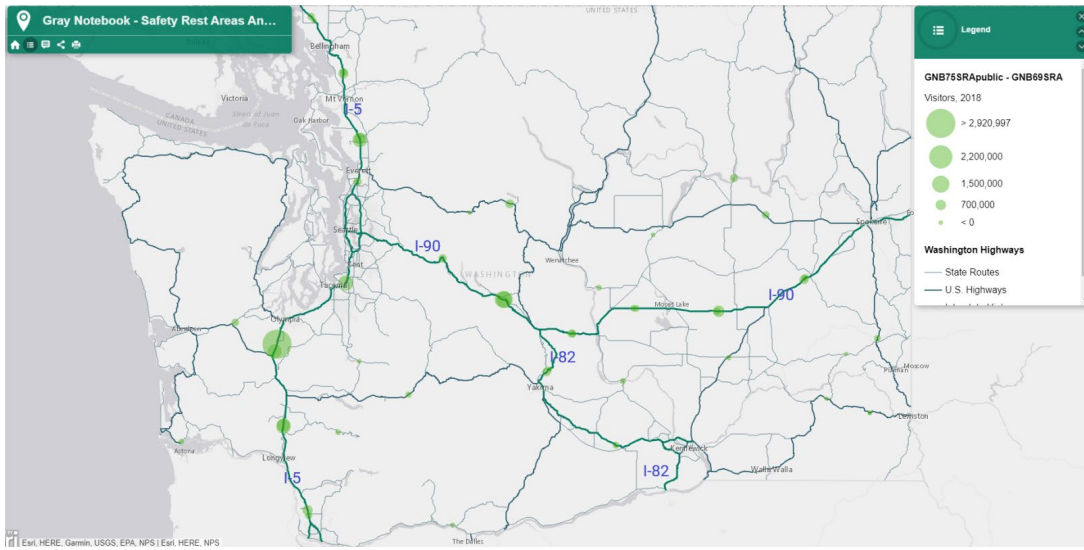


Figure 1.2 SRA locations on a Washington state map

1.2.2 Outsourcing with Traditional Contracting

The most common method when state departments of transportation (DOTs) select outsourcing is to hire private contractors with traditional contracting (NCHRP 2003). Traditional method-based specifications (NCHRP 2003) describe to the contractor “what to do, when to do, and how to do” work (Stankevich et al. 2009, 3); furthermore, they require materials and/or supplies with specific qualities. Under this method, a contract is granted to the lowest responsive bidder as prescribed by statute law. The contractor is paid on the basis of bid items. A study showed that the top three reasons for outsourcing maintenance works were a lack of skilled or knowledgeable workers familiar with DOT staff policies, a lack of workforce, and time constraints (Shrestha and Shrestha 2014). A different study showed that SRA facilities operated by contractors were more highly rated by SRA visitors than those operated by an in-house workforce (AASHTO 1990).

1.2.3 Outsourcing with Performance-Based Contracting

Performance-based contracting is a newer method by which state DOTs can outsource their work by hiring private contractors. This contracting method uses result-oriented specifications, focusing more on the results delivered by the contractor (Stankevich et al. 2009). Therefore, the quality of the performance contractor’s work is considered important in paying the contractor (Shrestha 2016; Popescu and Monismith 2006; Schexnayder and Ohrn 1997; Zietsman

2004; Gharaibeh et al. 2011). The agency usually pays the contractor every month if it meets performance targets (Shrestha 2016). Studies have shown that this contracting method produces a higher-level quality of work, as risks are shared with the contractor, with increasing user satisfaction levels. (Shrestha 2016). With this method, in addition to caretaker costs, states incur costs at SRAs for major maintenance and repairs, as stated in the contract document.

1.2.3.1 SRA Operations Costs

State DOTs operate SRAs. The operating costs of SRAs may be affected by various factors: operating method (in-house or outsourced), amenities offered, SRA size and type (regular SRA or welcome center), location (state to state and urban or rural), facility building's footprint and age, labor costs, sewage disposal service and utilities, and parking slot number (Shrestha and Powers 2018; Carson et al. 2011; Garder and Bosonetto 2002; NCHRP 1989). To reduce the costs of operation, some states have changed the way they operate SRAs from using an in-house workforce to various types of outsourcing. Some states, when they determined that they could not afford to operate SRAs, decided to shut them down. For example, in October 2016, because of funding issues, the Connecticut DOT reduced the number of SRA staff and hours of operation for all seven Interstate SRAs; later, the Connecticut DOT closed all its SRAs (Bergal 2017; Polansky and Gala 2019). In the last two decades, many states have faced funding challenges to operate their SRAs, and some have determined that the best course of action has been to shut down a significant number of them. Virginia closed 18 SRAs out of

42 (Utt 2009). When states have decided to shut SRAs down, they have used criteria to identify which SRAs to close for the least adverse effects to the traveling public. In general, states have closed SRAs that served the lowest numbers of users and were located near gas stations or cities (Boyd 2010). Two cases of SRA closures are explained briefly below.

Maine DOT (Lynds 2010): In June 2009, Maine's DOT planned to shut down the Pittsfield SRAs. At the Pittsfield location, the SRAs consisted of facilities on both sides of the Interstate. The Maine DOT also planned to outsource cleaning services to private contractors at various other SRA locations along I-95 and I-295. The Maine DOT estimated that it would save more than \$690,000 with the planned shutdown of the Pittsfield SRAs over a two-year period.

New Mexico (Eaves 2010): The New Mexico DOT operates 32 SRAs. Because of the state's budget shortfalls, New Mexico's DOT considered shutting down approximately half of its SRAs. The estimated savings from closing the SRAs was more than \$1.5 million.

1.2 Problem Statement

Across the United States, there are over 2,700 SRAs, including 47 SRAs in the state of Washington (WSDOT 2021). Out of these 47 SRAs, 39 are regular SRAs, open year-round, and the other eight SRAs are seasonal, open three to six months annually. Of the 39 SRAs, 27 are placed on the National Highway System (I-820, I-90, I-82, and I-5), and there are 12 SRAs placed on state routes (SR 26, SR 21, SR 8, SR 7, US 195, US 82, and US 12, etc.) (WSDOT 2020). In 2017, Washington SRAs served more than 24.40 million users, an increase of 4.4 million more users than in 2008 (WSDOT 2008; WSDOT 2018).

In the United States, vehicle miles traveled (VMT) have increased every year. In Washington state, VMT increased by over 7 percent in the last decade (PSRC 2018). The increase in VMT places more demand on SRAs and creates wearier drivers on highways. Therefore, over the last few decades, many SRAs have been introduced along highways across the United States, including in Washington, to improve road safety. As some states have added additional SRAs, their total operating costs have also increased proportionally. To save on expenses, along with other reasons, states sometimes outsource SRA operations to private contractors (Shrestha 2016). Nevertheless, the cost of operating SRAs has continued to increase annually. On the other hand, state funding to operate SRAs has not increased enough, which has resulted in states facing budget issues, and some SRAs have been closed (Helber 2012). Arizona, Georgia, New Mexico, Michigan, Louisiana, and Virginia are examples of states that have closed some SRAs because of funding issues.

Closing SRA facilities can save a state some money immediately, but it creates short-term and long-term negative impacts that can last into the coming years. As an example, after closing SRAs to save money, Connecticut reopened its closed SRAs to make travel within the state more attractive to visitors (Bergal 2017; Polansky and Galal 2019). In addition, when SRAs are closed, it increases the distance between rest facilities, which may result in not meeting the recommended spacing between SRAs. This, in turn, forces tired or weary drivers to continue driving for a longer time to reach another rest stop area. A study conducted in Minnesota determined that spacing Interstate SRAs 30 miles (or less) apart reduced tired driving-related

crashes, as well as the costs associated with those crashes (SRF 2007). Therefore, increasing the spacing between SRAs may increase fatigue-related crashes and costs associated with crashes. Figure 1.3 shows an SRA closed in North Carolina because of state budget shortfalls (Helber 2012), with two sign boards to inform highway users that the rest area is closed.



Figure 1.3 SRA closed in North Carolina because of budget shortfalls (Helber 2012)

Parking and having a rest are critical for truck drivers' safety. By federal law, truck drivers are limited to driving only up to 11 hours without having a rest (FMCSA 2015). Therefore, to comply with federal law, tired drivers may have to park illegally (at closed rest stop entrances/exits, or on the shoulder of the road), which poses a threat to the safety of roadway users. They may also have to drive longer hours, beyond the federal law, seeking places to rest, which is not only dangerous to the tired truck drivers but also to other highway users. Figure 1.4 shows a rest area closed sign and a truck parked illegally on the shoulder along I-64 in Kentucky. Such shoulder parking is a risk that could lead to highway accidents.



Figure 1.4 Illegal and unsafe truck parking due to a safety rest area closed in Kentucky (Hitchcock 2018)

One-fifth of crashes and 12 percent of all near crashes have been reported as caused by sleepy or fatigued drivers (Feldman 2009). SRAs are one of the tools designed to keep highway users safe and help them reach their destinations safely. They reduce drowsiness, distracted driving, and unsafe/illegal parking along the roadside (Caltrans 2020). Therefore, closing SRAs increases the number of tired drivers on roadways for longer periods of time, potentially causing more highway fatalities and injuries, as well as increasing costs associated with crashes. Thus, identifying a cost-effective method for maintaining SRAs will be key for states to not shut down their SRAs in the future.

1.3 Research Objectives

The main research objective of this study was to compute the average annual operating costs of Washington's SRAs and compare them with other states. While computing the average annual costs, this study did not consider the details that made up those costs, including the amenities that are offered by SRAs, size and type of SRAs, number of visitors per SRA, and quality of operation work delivered at SRAs, which may differ from state to state. With this comparison the Washington State Department of Transportation (WSDOT) may have an opportunity to know whether WSDOT is operating its SRAs cost effectively.

CHAPTER 2: LITERATURE AND STATE OF PRACTICE REVIEW

An intensive literature review was conducted for this project. The intent of reviewing previous work was to gather information regarding SRA operation cost calculations and make a comparison. A summary of the review of previous work is below.

2.1 SRA Operation Cost

A study conducted by NCHRP (1989) calculated the benefits and costs of SRAs. The data were collected in various ways: a national survey with transportation agencies, phone calls with SRA users, meetings with SRA staff, site visits, and analysis of accidents. This study found a benefit/cost (B/C) ratio that was higher than 3.0. This study also found that SRA operation costs were affected by a number of factors, such as obtaining potable water, SRA location, utility and sewage disposal, use amount, site area, labor costs, and parking slot number. The survey results showed that SRA operation costs ranged from approximately \$25,000 to \$80,000 per year in the late 1980s. The total operation costs were calculated by adding four cost categories: labor, materials, equipment, and other costs. This study also computed that average labor costs constituted over half of total operations costs.

In another study conducted by the TRB (1982), operations costs for SRAs were computed. This study calculated that the annual average operations costs of SRAs varied from \$16,000 to \$60,000 per SRA. The SRA operations costs included building repairs, ground maintenance, and utilities expenditures. This study also revealed that various factors affected SRAs' operations costs: SRA site size, amenities provided, location, and service level. Primarily, the way SRAs were operated was divided into two categories: an in-house workforce or outsourcing to private contractors.

Garcia-Diaz et al. (1988) conducted a study to compare the operations costs of SRAs, including other routine maintenance work in Texas. For the cost comparison, 403 project data points were collected. This cost comparison was conducted to compare work performed by an in-house workforce versus private contractors. This study's findings showed that the costs of operating Texas SRAs operated by an in-house workforce was 34.70 percent higher. The total operations costs of SRAs included both direct and indirect costs incurred.

The average annual operating costs and number of SRAs in six states are summarized in table 2.1. This SRA operations cost information was collected from various reports and news sources, rather than directly from states. The annual operations costs varied from \$130,000 to

\$315,000, with an average of \$230,000. The cost of SRA operations in New Mexico was the least (\$130,000), and the highest cost was in the state of Vermont (\$315,000). The collected costs were adjusted on the basis of 2016 costs using the *Engineering News Record* (ENR) cost index but were not adjusted for location.

Table 2.1 Annual SRA operations costs in six states

S.N.	States	No. of SRAs	Avg. Cost per SRA	Year	Sources
1.	Arizona	28	\$140,000	2016	(SAOG 2017)
2.	California	86	\$270,000	2016	(Bergal 2017)
3.	Georgia	26	\$220,000	2016	(NBC 2009; Eaves 2010)
4.	Vermont	22	\$315,000	2016	(Boyd 2010)
5.	New Mexico	32	\$130,000	2016	(Eaves 2010; Boyd 2010)
6.	Florida	57	\$300,000	2016	(Bergal 2017)

2.2 Factors Affecting SRA Operation Cost

Carson et al. (2011) identified various factors that affected the total costs of operating SRAs in Texas. They were the methods used to operate SRAs (in-house workforce or outsourced to private contractors), availability of potable water, size of facility, and the number of parking spaces available, as well as sewage disposal service and utilities. This study also analyzed the benefits of having SRAs open along highways.

CHAPTER 3: RESEARCH APPROACH

After the review of previous work, this study collected SRA data from the Washington DOT. A national survey was also conducted to collect SRA operations data from various other states. Figure 3.1 presents an overview of the research approach used in this study. The collected SRA data were analyzed, and then the average annual operations cost of Washington SRAs was calculated. Finally, the Washington SRA operations cost was compared with that of other states to draw conclusions and make recommendations.

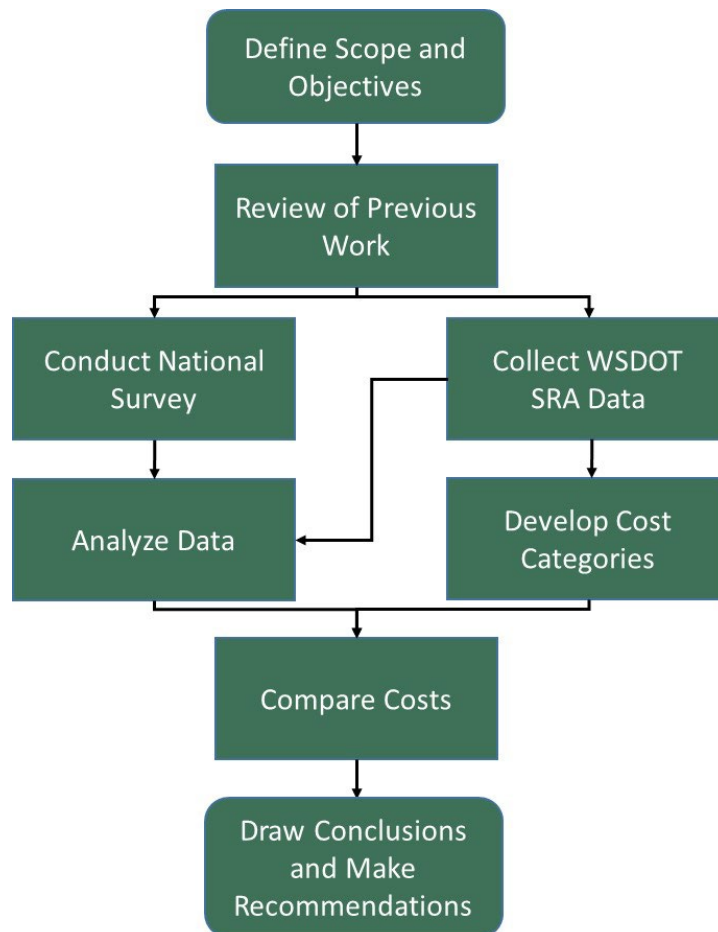


Figure 3.1 An overview of the research approach

3.1 Washington SRA Data Collection

The research team collected cost data of SRA operations from the WSDOT Headquarters Office, in Olympia, Washington. There are 47 SRAs in six regions of Washington state: eight in the Northwest, six in the North Central region, four in Olympia, eight in the Southwest, twelve in

the South Central region, and nine in the Eastern region. Figure 3.2 presents these six regions of Washington state. Out of 47 SRAs, 39 of them are regular SRAs open year-round, and eight are seasonal SRAs, which are open for three to six months. Therefore, only the regular SRAs were considered in this study. The list of 39 SRAs is presented in table 3.1.

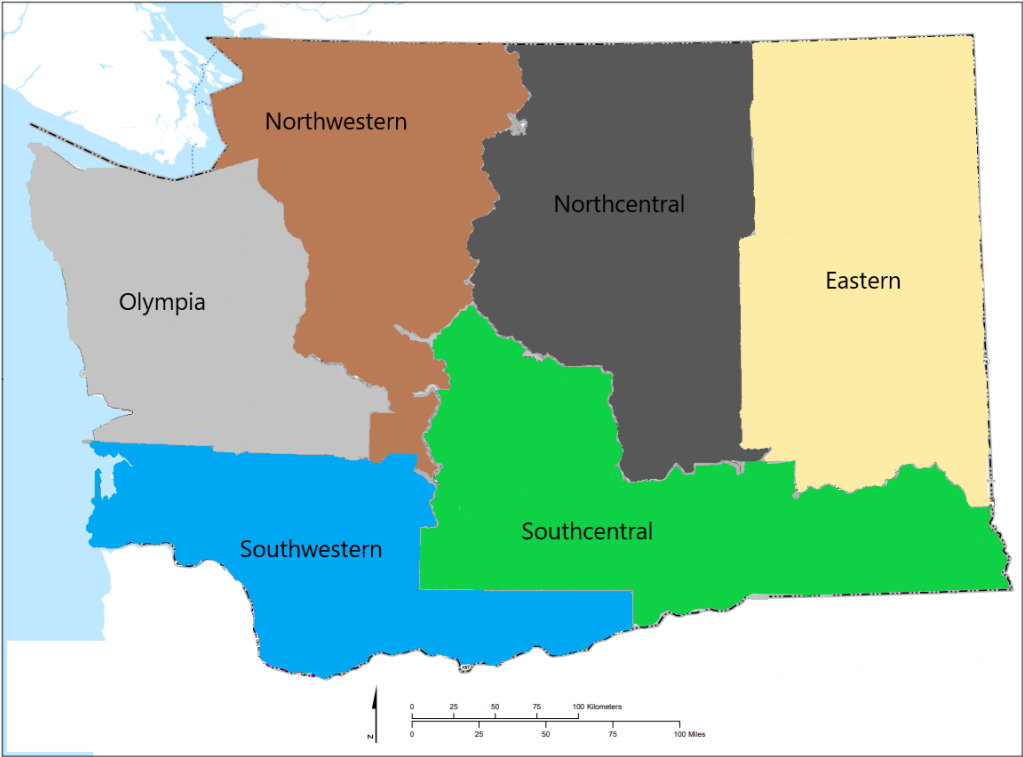


Figure 3.2 Six regions in Washington state

The research team collected raw cost data for each of the SRAs from July 2012 to June 2020. The collected cost data were broken down into monthly costs. The 2012 cost data consisted of cost data from July to December, and the 2020 cost data consisted of data from January to June. Because these data sets were not complete, this study did not use the cost data from 2012 and 2020.

Table 3.1 A list of 39 regular SRAs in Washington state

Region	Name of SRAs
Northwest (NW)	Bow Hill NB; Bow Hill SB; Custer SB; Custer NB; Smokey Point SB; Smokey Point NB; Silver Lake; Sea tac
North Central (NC)	Nason Creek; Winchester WB; Winchester EB; Quincy Valley
Olympic (OL)	Maytown SB; Scatter Creek NB; Elma
Southwest (SW)	Gee Creek SB; Gee Creek NB; Toutle River SB; Toutle River NB; Bevin Lake; Dismal Nitch; Chamberlain LK
South Central (SC)	Indian John Hill WB; Indian John Hill EB; Ryegrass WB; Ryegrass EB; Travelers Rest; Vernita; Selah Creek EB; Selah Creek WB; Prosser
Eastern (EA)	Horn School; Schrag WB; Schrag EB; Hatton Coulee; Sprague Lake WB; Sprague Lake EB; Telford; Keller Ferry

3.2 National Survey

The research team developed a national survey to collect SRA operations costs from states other than Washington. The national survey consisted of two phases. The first phase survey was conducted to identify the qualified states/individuals who were interested in participating in this study. The qualified states were those states that used the basic three SRA operating methods (in-house workforce, traditional contracting, and performance-based contracting) to maintain their sites. The second phase of the survey collected in-depth information regarding SRA operations costs, for example, the total cost of SRA operations, number of SRAs operated, number of SRA visitors, and total site areas of SRAs from 2010 to 2020. If the states were using more than one method to operate their SRAs, they were asked to provide the above requested information separately.

The first phase survey was distributed to the states in the months of November/December 2020, and their responses were collected. Twenty-one states were interested in participating in the second phase of this study. This second phase survey was distributed through email attachment to those individuals who responded and showed interest in participating. The second phase survey was distributed in the months of February/March 2021, and the responses were collected until the month of December. The survey questionnaires were reviewed by WSDOT staff before they were dispatched to the states. The survey is presented in Appendix A. Some individuals were not able to participate in the second phase survey because of role changes in their job, lack of access to the cost data as they worked from home because of the Covid-19 pandemic, and/or being short of staff in their departments.

3.3 Develop Cost Categories

The expenditures required to operate Washington’s SRAs were categorized into four main cost components. They were Materials and Supplies, Labor, Equipment, and Other Services. The NCHRP study (1989) also categorized the SRAs’ operations costs into these four cost categories. Therefore, the researcher requested and collected Washington’s SRA cost data in the format of these categories in a separate spreadsheet for each of the SRAs. Table 3.2 presents the cost components under these categories. All the expenditures for Materials and Supplies were included in this category. Under the Labor category, there were two types of labor charges: regular work time and overtime work charges. There were a few types of charges under the Equipment category. Although the equipment used was owned by the state, the rental costs were charged as ownership cost of the equipment. The Other Services category included the costs of utilities, equipment fuel, garbage collection, testing services, general repair, and other services. After the total costs of these four cost categories had been calculated for each year for each of the SRAs, the percentage of funds spent in each of these four categories was calculated.

Table 3.2 Cost components of SRA operations activity

Cost Components	Categorizes	Total Cost
EA01 Supplies and Materials;	Materials and Supplies	
TA11, Regular work time charges, TA10 Overtime charges	Labor	
EH02 Tef Equip Rental-Oper Tef Equip; GN02 Tef Equip Rental-Per W/Equip; ER13 Svcs Rendered By Tef To Mvf	Equipment	
ES67 Motor fuel for mowing, EC01 Utilities general, garbage collection; EC05 Utilities electricity; EZ10 Protective and Safety Clothing; ER18 Private Testing Services;	Other Services	Total Operating Cost
EH02 Tef Eq Rental oper Tef Eq., EE01 Gen repair; EC06 Utilities Sewage Pumping; ER06 Other services		

3.4 Cost Calculation

The annual operating cost of each of the Washington SRAs was calculated. To calculate the annual cost, first, the total costs in the four categories were calculated. These four cost categories were added to calculate the annual total operating costs of the SRAs. The mathematical equation used to calculate the total annual operating costs is presented below (Equation 1).

$$\text{Annual Cost} = \text{Material and Supplies} + \text{Labor} + \text{Equipment} + \text{Other Services} \text{ (Equation 1)}$$

After the yearly costs of each SRA had been calculated, since these costs were incurred in various years, they were adjusted (time adjustment) to the 2020 base cost by using the *Engineering News Record (ENR)* cost index. The adjusted costs were used to calculate the average cost of each SRA, the average cost of SRAs in each region, and the average annual SRA cost in the state of Washington.

From the national survey, the total costs of operating SRAs in other states were also collected. States provided the total costs spent in specific years from 2010 to 2020; however, some provided the total costs in the most recent five years or three years. First, the annual cost of operating each SRA was calculated by dividing the total cost by the number of SRAs the state operated. These costs were then adjusted for time to calculate the average annual cost of that state. Then the average annual costs of specific states were also adjusted for location to compare these costs with Washington's average costs. The average operating costs of the states were transferred to Washington state by using the CCI of RSMeans Data.

CHAPTER 4: FINDINGS AND DISCUSSION

In this study, to collect and compare the SRA operating costs of Washington state with those of other states, surveys were conducted. First, data were collected from Washington state and then from other participating states. The surveys were conducted in Fall 2020 through Fall 2021.

The operations costs of SRAs, as well as the number of SRAs, were also collected from states. States used an in-house workforce, outsourcing with traditional contracting, outsourcing with performance-based contracting, and a combination of these methods to operate their SRAs. The data regarding SRA operations using different methods were collected separately to calculate the annual operations costs of SRAs. The data from 2010 to 2020 were gathered to compute the average annual costs of operating SRAs in the various states. The findings of the surveys are explained below.

4.1 Findings from Washington State Data

The annual operations costs of individual SRAs were calculated by using Equation 1 (see the Research Approach section). Then, the annual costs were averaged to calculate average annual operations costs of each of the six regions in Washington. Figure 4.1 shows the annual operations costs of SRAs from 2013 to 2019. These costs were not adjusted for time to see the real cost trend. Figure 4.1 also presents the six trend lines for the six regions, which indicated that SRA operations costs increased in all six regions during the study period between 2013 and 2019.

The trend lines also indicated that the cost increase was highest in the Olympia region and lowest in the North Central region. This may have been due to higher numbers of SRA visitors in the Olympia region than in the North Central and other regions. The average number of SRA visitors to the Olympia region in 2019 was close to 1.50 million per SRA, whereas in the North Central region, the number was just over 0.30 million visitors per SRA in 2019, less than one-fourth. In the Olympia region, Maytown Southbound and Scatter Creek Northbound were found to be the busiest SRAs, with 3.02 million and 0.92 million visitors in 2019, respectively. The average number of visitors per SRA in the Olympia region was 1.47 million, in the Northwest region was 0.68 million, and the numbers were 0.59 million for the Southwest, 0.57 million for the Eastern, 0.55 million for the South Central, and 0.25 million in the North Central

regions in 2019. The amenities and staffing hours may also have contributed to the differences in cost.

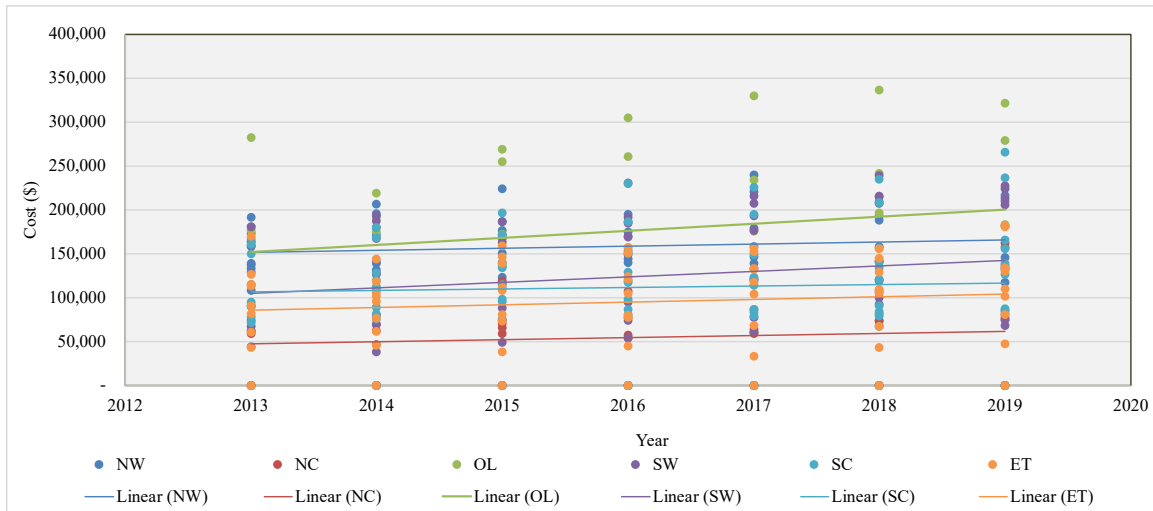


Figure 4.1 SRA operations costs in the six regions from 2013 to 2019

Table 4.1 presents the annual operating costs of individual SRAs in the six regions, along with their region-wide average costs from 2013 to 2019. On the basis of the average annual costs, the two highest region-wide average annual costs of SRAs were in the Olympia and Northwest regions. In Olympia from 2013 to 2019 they were \$207,183, \$195,315, \$232,137.22, \$240,564, \$246,506, \$258,277, and \$261,345, respectively. In the Northwest from 2013 to 2019 average annual costs were \$146,042, \$152,677, \$153,231, \$171,548, \$166,900, \$154,268, and \$162,230, respectively. These two regions were followed by the Southwest, South Central, Eastern, and North Central regions.

Table 4.1 Annual operations costs of WSDOT SRAs in the six regions

Region	SRA Code	2013	2014	2015	2016	2017	2018	2019
NW	29VA00	108,467	110,492	109,576	139,610	119,886	106,255	117,261
	29VB00	138,883	131,303	139,970	174,748	158,328	141,282	157,077
	37VA00	136,803	126,617	115,718	143,869	138,586	118,566	133,695
	37VB00	128,781	138,690	122,706	153,376	132,757	120,167	136,482
	31VA00	172,724	140,543	150,798	148,768	145,996	158,141	145,553
	31VB00	158,307	206,756	186,563	194,699	178,637	187,851	181,772
	31VC00	133,034	171,355	176,788	186,638	220,891	192,677	209,948
	17VA00	191,339	195,663	223,728	230,672	240,121	209,208	216,049
<i>Average NW</i>		<i>146,042</i>	<i>152,677</i>	<i>153,231</i>	<i>171,548</i>	<i>166,900</i>	<i>154,268</i>	<i>162,230</i>
NC	04VA00	114,468	127,176	119,276	106,922	121,610	141,758	162,383
	13VA00	59,132	62,369	58,706	57,255	60,458	73,709	74,361
	13VB00	62,500	69,651	70,766	76,974	63,816	81,691	77,003
	13VC00	61,592	45,989	65,598	53,609	59,244	73,110	80,739
<i>Average NC</i>		<i>74,423</i>	<i>76,296</i>	<i>78,587</i>	<i>73,690</i>	<i>76,282</i>	<i>92,567</i>	<i>98,621</i>
OL	34VA00	76,469	91,906	68,939	60,749	34,159	41,592	21,386
	34VB00	82,181	19,024	54,913	04,437	29,677	36,468	79,211
	14VA00	62,899	75,016	72,559	56,505	175,682	96,771	83,438
<i>Average OL</i>		<i>207,183</i>	<i>195,315</i>	<i>232,137</i>	<i>240,564</i>	<i>246,506</i>	<i>258,277</i>	<i>261,345</i>
SW	06VA00	58,873	66,824	62,782	69,269	76,118	07,202	12,871
	06VB00	80,535	93,173	170,424	69,820	92,999	214,816	24,068
	08VA00	80,592	87,016	86,217	91,435	07,135	38,467	27,623
	08VB00	63,554	79,345	67,145	84,575	15,330	215,895	05,625
	21VA00	43,730	37,793	48,494	54,166	60,763	66,879	67,905
	25VA00	73,973	79,326	88,410	94,577	77,192	99,522	74,498
	20VA00	67,543	69,082	74,429	74,043	86,280	92,506	32,574
<i>Average SW</i>		<i>124,114</i>	<i>130,366</i>	<i>128,272</i>	<i>133,984</i>	<i>145,117</i>	<i>162,184</i>	<i>163,595</i>
SC	19VA00	67,564	79,653	96,309	29,587	25,667	34,762	265,373
	19VB00	60,875	67,681	71,198	86,404	94,320	207,857	36,741
	19VC00	94,757	12,269	33,542	50,457	48,809	56,097	65,453
	19VD00	90,135	19,834	98,161	19,236	20,115	39,497	38,970
	19VG00	91,114	88,894	14,364	29,035	23,408	133,905	55,917
	03VC00	90,044	81,769	95,609	86,712	83,068	78,740	84,155
	39VA00	71,718	75,439	73,717	80,198	86,680	83,548	85,137
	39VB00	77,896	79,469	35,441	98,202	78,802	90,716	87,097
	03VA00	150,074	28,097	38,154	17,492	13,757	20,379	26,442
<i>Average SC</i>		<i>110,464</i>	<i>114,789</i>	<i>128,499</i>	<i>133,036</i>	<i>130,514</i>	<i>138,389</i>	<i>149,476</i>
EA	38VA00	90,360	95,477	07,920	04,485	16,821	09,276	09,349
	01VA00	13,030	01,199	11,669	20,373	56,763	09,028	29,927
	01VB00	81,399	76,132	80,393	79,715	03,568	05,680	01,748
	01VC00	15,017	05,875	46,755	23,802	33,435	129,175	34,206
	22VA00	69,461	43,993	58,557	57,039	52,279	55,649	81,913
	22VB00	26,414	17,831	38,924	50,491	32,472	45,004	80,311
	22VC00	60,284	61,377	72,746	77,096	68,448	67,256	80,300
	22DB00	42,702	45,929	38,445	45,008	33,125	43,315	46,950
<i>Average EA</i>		<i>99,833</i>	<i>93,477</i>	<i>106,926</i>	<i>107,251</i>	<i>112,114</i>	<i>108,048</i>	<i>120,588</i>
<i>Average State</i>		<i>121,775</i>	<i>123,231</i>	<i>131,959</i>	<i>138,001</i>	<i>140,185</i>	<i>144,216</i>	<i>152,090</i>

The total annual operations costs of Washington’s SRAs are shown in figure 4.2. These included the annual operations costs of the 39 regular SRAs open in the state of Washington from 2013 to 2019, which were \$4.75 million, \$4.81 million, \$5.15 million, \$5.38 million, \$5.47 million, \$5.62 million, and \$5.93 million, respectively. The total annual cost data and the trend line (with an R-squared value of 0.98) showed that costs increased linearly. Data showed that the total operations costs of SRAs in 2019 were over a 23 percent higher than in 2014. Figure 4.2 also shows the prediction line for this decade. If the trend continues, the total operations costs of the 39 regular SRAs will be over \$7 million in 2025 and \$8 million in 2030. The reasons for the increasing total costs may be the increasing numbers of visitors in the state and the higher rate of labor costs in the state of Washington.

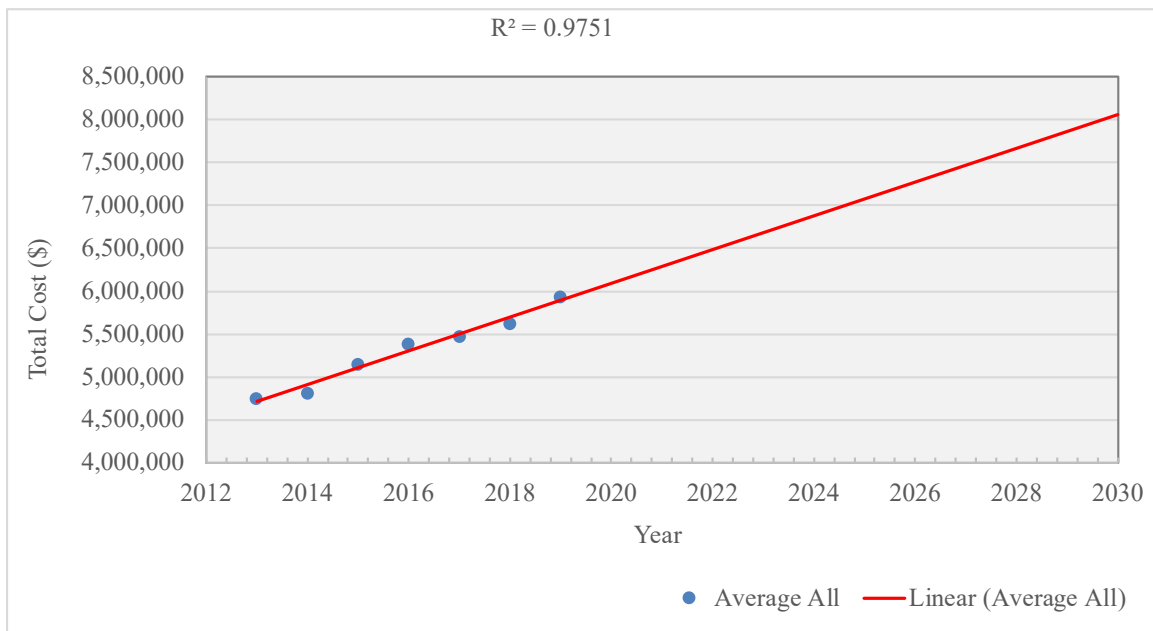


Figure 4.2 Total Washington operations cost of SRAs from 2013 to 2019

The Washington SRA operations costs were divided into four main cost categories. The researchers investigated which cost category was the highest in Washington. Analyzing the cost components (raw data) for each of the 39 SRAs, the cost components were categorized into four main cost categories: Labor, Equipment, Materials and Supplies, and Other Services. By analyzing the cost data for the 39 SRAs from 2013 to 2019, the percentage of expenditures in these four cost categories were calculated and their percentages were computed. Figure 4.3 presents the percentage weight of each cost category. The data analysis showed that Labor was

the major cost component, making up over half of the total cost of operating the SRAs, followed by the Other Services, Materials and Supplies, and Equipment categories. The NCHRP study (1989) also showed the Labor cost category to be the highest expenditure, at 63.9 percent, followed by Other (18 percent), Materials (12 percent), and Equipment (6 percent).

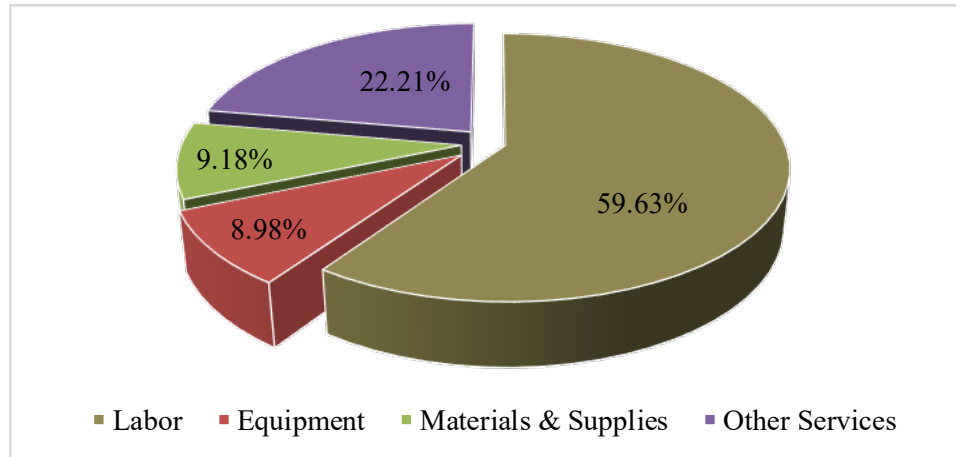


Figure 4.3 The four cost categories of operating SRAs

4.2 National Survey Findings and Cost Comparison

A national survey was conducted to collect SRA operations cost data from various other states. Twenty-one qualified states (as explained in the Research Approach section) accepted the invitation to complete the survey. Of the 21 states, 18 responded and completed the survey, one declined, and two did not respond. When the individual(s) were asked their reasons for not participating in the second phase survey, the key reasons collected were changes in job roles; shortage of staff because of the Covid-19 pandemic; and issues of data access as they were working from home because of the pandemic. Table 4.2 presents the national survey details.

Table 4.2 National survey responses

Detail	Count	Percentage
Number of responses Collected	18	85%
Number of declines	1	5%
Number of non-responses	2	10%
Total 2nd phase survey distributed	21	100%

The survey consisted of three sections with a question at the end. These sections were related to in-house workforce, outsourcing with traditional contracting, and outsourcing with performance-based contracting for operating SRAs. Out of 18 responses, ten states (55 percent) were using an in-house workforce, nine states (50 percent) were using outsourcing with traditional contracting, three states (16 percent) were using outsourcing with performance-based contracting, two states (11 percent) were using both an in-house workforce and outsourcing with traditional contracting, and two other states are using a combination of an in-house workforce and outsourcing with traditional contracting.

From the SRA operations cost data, as well as data related to the number of SRAs in operation, gathered from other states from 2010 to 2020, the average annual operations costs per SRA were calculated for each of the 18 responding states. These costs were adjusted for time and location, as explained in the Research Approach section. The adjusted costs of the responding states are presented in table 4.3. The average annual cost of operating SRAs with an in-house workforce (excluding the Washington state) was \$325,824.30, that of outsourcing with traditional contracting was \$206,209.49, and that of outsourcing with performance-based contracting was \$289,883.09. Table 4.3 presents data for the 18 states and the data from Washington separately. The annual costs were also adjusted for differing costs of labor, equipment, and supplies. In addition, the differing costs for differing locations (various states) were adjusted.

The average annual operating cost of Washington's SRAs was \$148,198.22. Thus, because Washington state used an in-house workforce to operate its SRAs, Washington's operation costs per SRA, in comparison to the costs of other states using the same in-house workforce method, was significantly below the average cost of other states. The average annual operations cost of Washington state was also much less in comparison to the average cost of using private contractors.

However, note that the computed average annual operations costs were not fully normalized for several factors that may play a role in the costs because of a lack of data. Those factors were size and amenities offered at SRAs, total annual visitors per SRA, type of SRA, and quality of operations work delivered.

In the national survey, two important factors (number of visitors to SRAs and site area) about the SRAs were also requested; however, most states did not share these data. Therefore,

this study did not consider these factors while comparing the operations costs of SRAs. This study also did not consider the performance quality of the work when comparing costs. Change in performance quality could occur when different parties (in-house workforce, private contractors) operate SRAs. Shrestha et al. (2019) revealed that the higher the quality of work delivered, the higher the cost. In the future, these factors should be considered for an “apples to apples” comparison.

The question asked at the end of the survey was whether the states had performed an SRA cost comparison study. If they had done so, the research team requested a copy of their study. None of the responding states responded yes to this question.

Table 4.3 SRA operations average costs for states using three common methods

State Code	In-house Workforce	Traditional Contracting	Performance-Based Contracting
001	\$558,212.83	-	-
002	-	\$136,028.61	-
003	\$383,782.29	\$191,459.23	-
004	-	\$347,626.56	-
005	\$182,789.20	-	-
006	\$151,031.71	\$151,031.71	-
007	-	\$333,199.02	-
008	-	-	\$265,431.97
009	-	\$113,089.87	-
010	-	-	\$444,036.56
011	\$320,571.63	\$246,027.57	-
012	\$381,638.16	-	-
013	\$223,643.31	-	-
014	-	\$104,569.85	-
015	\$232,853.02	\$232,853.02	-
016	\$701,441.81	-	-
017	-	-	\$160,180.74
018	\$122,279.02	-	-
<i>Average</i>	<i>\$325,824.30</i>	<i>\$206,209.49</i>	<i>\$289,883.09</i>
Washington	\$148,198.22	-	-

CHAPTER 5: CONCLUSIONS

The key objective of this study was to compute the average annual operations cost of Washington's SRAs and compare that with the costs of other states' programs. This study collected Washington's SRA operations data from the WSDOT Headquarters Office in Olympia, Washington. The collected data consisted of in-depth cost and visitor information for each of the 47 SRAs from 2012 to 2019. Of the 47 SRAs, only the 39 regular SRAs that are open year-round were considered for the average annual cost calculation in this study.

To collect the SRA operations cost data for other states, the research team conducted a national survey. States that used an in-house workforce, traditional contracting, and/or performance-based contracting were invited to participate in the survey. Twenty-one states (excluding Washington) accepted the invitation to participate in the survey. Of the 21 states, 86 percent (18 states) responded to the survey. The national survey data showed a higher number of states were using an in-house workforce method—ten (55 percent) of the 18 states (excluding Washington). Nine (50 percent) states were using outsourcing with traditional contracting, and performance-based contracting was not used widely, as only three states (16 percent) used this method. Two states (11 percent) were using both an in-house workforce and traditional contracting, and two states were using a hybrid combination of an in-house workforce and traditional contracting.

To compare the average annual operations cost of Washington state with those of other states, cost data from 2010 to 2020 were used to calculate the average annual operations cost per SRA for each of the states participating in the survey. The findings showed that the average annual cost of operating SRAs using an in-house workforce was \$325,824.30; similarly using traditional contracting and performance-based contracting cost \$206,209.49 and \$289,883.09, respectively. In the state of Washington, the average annual cost per SRA was \$148,198.22, which was much less than the average annual cost of operating SRAs in the participating states that used an in-house workforce. The findings also showed that in all the 18 responding states, the total costs of operating SRAs were increasing over time.

The calculated average annual costs were normalized for differing costs of labor, equipment, and supplies, as well as for differing costs due to differing locations (various states). However, note that the average annual costs had limitations in regard to generalizing the findings of this study. These limitations included limited responses (18 states), as well as a lack of data

related to factors that may have affected the cost calculation, such as the sizes and amenities offered at SRAs, total visitors per SRA, types of SRA, and quality of operations work delivered.

When a T-test was conducted, Washington's cost was statistically less than those of the other states. With the cost of Washington state, individual cost components were categorized into four categories: Materials and Supplies, Labor, Equipment, and Other Services. An analysis of the cost categories revealed that the major cost category was Labor. The weighted percentage of the Labor cost category was over half of the total cost; therefore, if the rate of labor cost and/or the staffing time duration is altered, it will affect the total cost of SRA operations.

The findings of this study regarding the SRA operations costs of Washington state in comparison to those of other states were based on just 18 states that responded to the national survey. In addition, the cost comparison findings were not based on type and size of SRAs, total number of annual visitors per SRA, services offered at SRAs, age of SRAs, or quality of work delivered. Therefore, the findings derived in this study should not be generalized.

This study collected SRA operations cost data from 18 states to compare their costs with Washington state. For future study, it is recommended that more data be collected from states, as well as in-depth data on factors that may affect the average annual operations cost of SRAs, such as type and size of SRAs, amenities offered at SRAs, total annual visitors per SRA, and quality of operations work delivered for more accurate cost comparisons.

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APPENDIX A: SAFETY REST AREA OPERATIONS - PHASE 1
First Part Survey of Safety Rest Areas' Operation Cost

1. Which state do you represent?

2. How many safety rest areas does your state operate?

3. Which of the following methods is your state using to operate your rest areas? Check all that apply.

- In-house workforce
- Outsourcing through traditional contracting
- Outsourcing through performance-based contracting
- Other (Please specify)

.....

4. Please describe your contracting method.

5. Are you willing to help WSDOT by participating in a follow-up, more detailed survey regarding operating costs? We will gladly share the results with you.

- Yes
- No

6. Contact Information

Name:	<input style="width: 100%; height: 20px;" type="text"/>
Position:	<input style="width: 100%; height: 20px;" type="text"/>
Agency:	<input style="width: 100%; height: 20px;" type="text"/>
Division and Office:	<input style="width: 100%; height: 20px;" type="text"/>
State/Province:	<input style="width: 100%; height: 20px;" type="text"/>
Email Address:	<input style="width: 100%; height: 20px;" type="text"/>
Phone Number:	<input style="width: 100%; height: 20px;" type="text"/>

APPENDIX B: SAFETY REST AREA OPERATIONS - PHASE 2

Second Part Survey of Safety Rest Areas' Operation Cost

Good Afternoon,

I would like to thank you for participating in our first part of the survey on safety rest area operations and agreeing to participate in this second part of the survey.

This second phase of survey asks you to provide detailed information regarding operation cost of rest areas. Specifically, it asks for the number of rest areas in your state, total annual operation cost (direct cost), number of visitors per year, and total combined area of rest areas in your state. If you do not have such information handy in this format, you may want to share raw data so that our research team will calculate that information.

Feel free to contact me if you have any questions. I would like to thank you in advance for your participation.

Sincerely,

Kishor Shrestha, Ph.D., P.E., LEED Green Assoc.
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1. From the existing studies, most state DOTs operate rest areas using three methods: in-house workforce, traditional contracting, and performance-based contracting. Your state may use a combination of three methods, so we have three separate tables for three methods.
 - a. Please fill the appropriate box(es) for operating your rest areas using the **In-House workforce** method. If you do not have the data requested in the Table below, please share your raw data.

Year	In-house Workforce Method*			
	No. of Rest Areas	Total Operating Cost (Direct), (\$)**	No. of Visitors	Total Area of Rest Areas (ft ²)#
2010				
2011				
2012				
2013				
2014				
2015				
2016				
2017				
2018				
2019				
2020				

*Please see the explanation what the In-house Workforce Method is

**Total operating cost includes labor, equipment, and materials and supplies for cleaning and maintaining the rest areas.

Total area of rest areas in your state in square foot.

- b. Please fill the appropriate box(es) for operating rest areas using the **traditional contracting method**.

Year	Traditional Contracting Method*			
	No. of Rest Areas	Total Operating Cost (Direct), (\$)	No. of Visitors	Total Area of Rest Areas
2010				
2011				
2012				
2013				
2014				
2015				
2016				
2017				
2018				
2019				
2020				

*Please see the explanation on the next page what the traditional Contracting Method is

- c. Please fill the appropriate box(es) for operating Rest Areas using the **Performance-based contracting method**.

Year	Performance-based Contracting Method*			
	No. of Rest Areas	Operating Cost (Direct), \$	No. of Visitors	Total Area of Rest Areas (ft ²)
2010				
2011				
2012				
2013				
2014				
2015				
2016				
2017				
2018				
2019				
2020				

*Please see the explanation below what the Performance-based Contracting Method is

4. Did your state perform a cost comparison of rest area operations? If yes, please provide a copy of that study. That would be appreciated.

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Note: **In-house workforce method:** In this method, state DOTs use their resources (workforce and supplies) to operate safety rest areas. As they use their own resources, states plan to operate and maintain their safety rest areas in their own way, and they pay their staff as a regular monthly or bi-monthly basis.

Outsourcing through traditional contracting method: In this method, state DOTs hire private contractor(s) to operate the safety rest areas. Under this method, a contract is granted to the lowest responsive bidder due to the statute law.

Outsourcing through performance-based contracting method: This is a newer method to outsource the works using performance-based specification. This method basically focuses on the outcome or quality delivered by the contractor. Therefore, the contractor’s work output quality is considered important to pay the contractor. The agency pays the contractor usually every month if the contractor meets performance target.

Safety Rest Area Operation: The safety rest area operation means basically perform regular cleaning and maintaining the safety rest areas. It may include cleaning toilets, floors, water fountains, mowing the landscape, and other works in the safety rest areas.

