



**COLORADO**  
Department of Transportation

Office of the Chief Engineer

2829 West Howard Place  
Denver, CO 80204

**DATE:** JULY 19, 2018  
**TO:** TRANSPORTATION COMMISSION  
**FROM:** JOSH LAIPPLY, CHIEF ENGINEER  
JEFF SUDMEIER, CHIEF FINANCIAL OFFICER  
JANE FISHER, OFFICE OF PROGRAM MANAGEMENT DIRECTOR  
**SUBJECT:** MONTHLY CASH AND PROGRAM MANAGEMENT UPDATE

Purpose

To provide a monthly update on cash and program management, including an updated forecast of revenues, expenditures, and cash balance in Fund 400, the State Highway Fund.

Action

Information Only.

Background

Figure 1 below depicts the projected Fund 400 cash balance forecast as compared to established monthly cash balance threshold targets (green shaded area) based on the Fund 400 CY18 construction expenditure target of approximately \$611 million established in February. The current Fund 400 cash thresholds were established by the TC with the goal of limiting risk to a 1/1,000 (1 out of 1,000 months) chance of a cash shortfall. Key revenue assumptions reflected in the forecast include:

- 93% federal obligation limitation, based on the FAST Act.
- \$40 million in annual federal redistribution (consistent with recent years of redistribution)
- Final SB 228 transfer of \$79 million in June 2018.

The Fund 400 cash balance forecast does not currently include anticipated SB 17-267 or SB 18-01 revenues or expenditures. As more information becomes available on the receipt of SB 17-267, revenues and project expenditures will be added to the forecast. The first year General Fund transfer under SB 18-01 totaling \$346.5 million was received on July 6, 2018. First year SB 18-01 revenues and anticipated expenditures will be incorporated into subsequent forecasts.

Summary of Current Fund 400 Cash Forecast

The current forecast includes forecasted construction expenditures under existing and new construction contracts as outlined in Table 1. CY 18 construction expenditures are compiled by the PMO, and are currently estimated at approximately \$585 million, excluding Bridge Enterprise (BE).

**Table 1 – Forecasted Expenditures Under Existing and New Construction Contracts**

|   | CY 2016  | CY 2017  | CY 2018  | CY 2019  | CY 2020  | CY 2021* |
|---|----------|----------|----------|----------|----------|----------|
| <b>Total Expenditures (\$ millions)</b> | \$ 663.8 | \$ 636.1 | \$ 587.7 | \$ 522.7 | \$ 520.2 | \$ 109.0 |

\*CDOT maintains a 36-month cash forecast. As such, the forecasted amounts shown for 2021 reflect only the first five months of CY 2021.

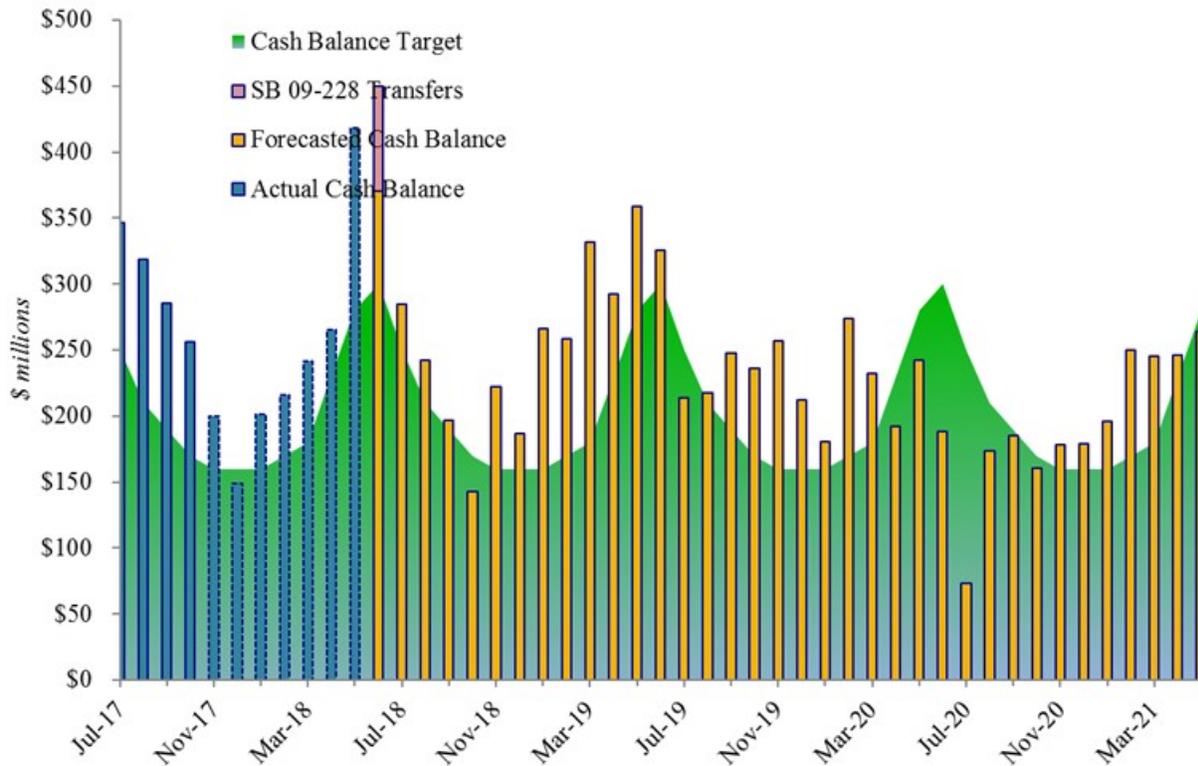


The cash balance as of month end May 2018 is \$418 million, \$138 million above the applicable cash balance target of \$280 million and \$8 million above what was forecasted. Total revenues in April were \$2.4 million or 1% higher than forecasted. The majority of remaining FY 18 Federal aid funding has been fully obligated in May, with some obligation authority retained for any transfer requests, inactive projects or projects coming to close. The above threshold cash balance is the result of turning around the majority of remaining FY 18 Federal aid reimbursement requests this spring. The balance will be drawn back down to threshold over the summer and fall.

Total expenditures in May were \$5.6 million or 4% less than forecasted.

The current Fund 400 forecast indicates a minor risk month in October, although the forecast results in a year end cash balance above the established threshold. An update this month to the timing of the receipt of federal obligation limitation in 2019 and 2020 has resulted in risk months in the summer of 2020. Staff will continue to monitor, although the forecasted cash balance this far out is likely to continue to fluctuate.

Figure 1 - Fund 400 Cash Forecast without SB 17-267 and SB 18-001 Proceeds



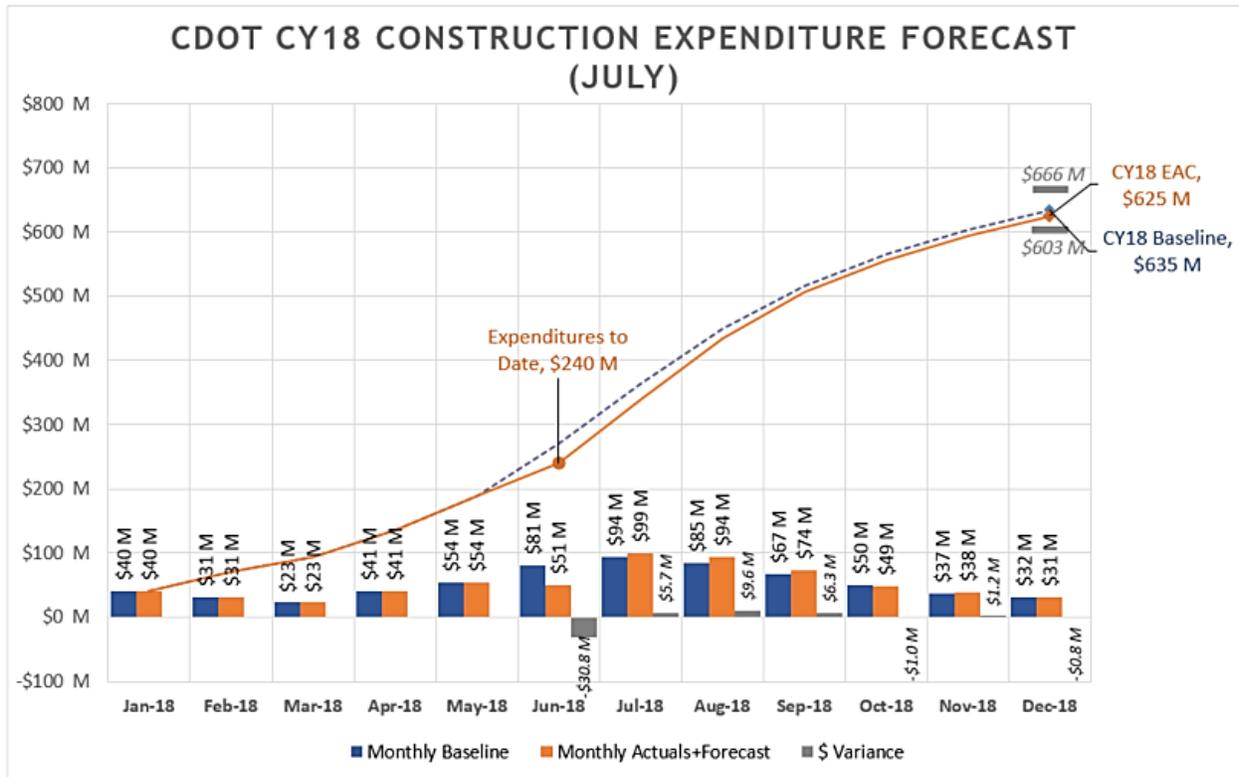
**Calendar Year 2018 Construction Expenditure Forecast**

Construction expenditures as of June month-end financial data are \$240 million. June monthly actual expenditures were \$30.8 million under the June forecast. The updated CY forecast indicates a year-end EAC of \$625 million, which is \$9.8 million (or 1.5%) below the year-end baseline of \$635M. Actual



expenditures are currently 38% of year-end forecast, which is in line with historical expenditures at this point in the year of 35%.

Figure 2 - Calendar Year 2018 Construction Expenditure Forecast (Fund 400 and BE)



**RAMP**

Table 2 details RAMP Partnership and Operations Projects (CDOT and Locally Administered) that have not yet been awarded. There are no RAMP related actions this month. The remaining TC Contingency RAMP Reserve and RAMP Operations Contingency are \$0 and \$315,615, respectively.

Table 2 - RAMP Program Summary (Remaining Projects Yet to Award)

| Project Name                                      | Project Budget | RAMP Request | Local Contribution | Other CDOT Funds | Status                     |
|---|----------------|--------------|--------------------|------------------|----------------------------|
| <b>CDOT ADMINISTERED</b>                          |                |              |                    |                  |                            |
| I-70 Glenwood Canyon Variable Speed Limit Signing | \$5,600,000    | \$2,200,000  | \$0                | \$3,400,000      | Ad in May '18 <sup>1</sup> |
| <b>LOCALLY ADMINISTERED</b>                       |                |              |                    |                  |                            |
| SH 119 Boulder Canyon Trail Extension             | \$5,466,350    | \$4,373,080  | \$1,093,270        | \$0              | Ad in Oct '18 <sup>2</sup> |



<sup>1</sup> Initial Ad in December 2017 had only one bidder. Region conducted constructability review and readvertised in May. Award is anticipated in July; <sup>2</sup> Scope reduction approved by TC, Locals pursuing a COSPR before project advertisement;





**COLORADO**

**Department of Transportation**

Division of Audit

REPORT NUMBER 18-003

# CHANGE ORDERS

## Released Report



June 29, 2018

PERFORMANCE AUDIT

The Colorado Department of Transportation (CDOT) Audit Division is an independent, internal audit function authorized pursuant to Colorado Revised Statutes Section 43-106(12) and reports directly to an Audit Review Committee (ARC). The ARC provides independent oversight of the CDOT Audit Division, thereby ensuring the Audit Division is free from internal and external influences in order to provide objective and independent assessments. The Audit Division is responsible for examining and evaluating CDOT's various operations in order to improve efficiency and effectiveness, as well as to help CDOT achieve its goal of becoming the best Department of Transportation in the country.

#### Audit Review Committee

---

Bill Thiebaut, Chairman, District 10, Pueblo  
Sidny Zink, Member, District 8, Durango  
Kathy Connell, Member, District 6, Steamboat Springs  
Ed Peterson, Member, District 2, Lakewood  
Rocky Scott, Member, District 9, Colorado Springs

#### Audit Division Staff

---

Frank Spinelli, Audit Director, CPA, CIA  
Jim Ballard, Audit Manager, MBA, CPA, CIA, CGAP, CFE  
Daniel Pia, Audit IT Supervisor  
Josh Gosenca, Lead Auditor  
Stephanie Sheetz, Auditor

You can obtain copies of this report (Number 18-003) by contacting us at:



CDOT Audit Division  
2829 W Howard Pl, Denver, CO 80204  
P 303.757.9687



DATE: June 29, 2018  
TO: Transportation Commission  
FROM: Frank Spinelli, CDOT Audit Division Director  
SUBJECT: Released Audit Report: Change Orders

---

The attached audit report presents the results of our review of Colorado Department of Transportation's (CDOT) force account and change order process (project number 18-003). This audit report was reviewed and released by the CDOT Audit Review Committee (ARC) on June 21, 2018. This audit adds value by assisting management with reducing construction cost and ensuring better compliance with state and federal regulations.

We conducted this audit pursuant to C.R.S. § 43-1-106, which authorizes us to conduct internal audits on CDOT. We also performed this engagement in accordance with Government Auditing Standards. This report presents our findings, conclusions, recommendations, and the responses of CDOT management.

If you have any questions or need additional information, please contact Audit Manager Jim Ballard at 303-512-4901.

Frank Spinelli, CPA, CIA  
Director, Audit Division

Attachment

cc: Michael Lewis  
Herman Stockinger  
Amy Ford  
Kathy Young  
Leo Milan

## Objective

The purpose of this engagement was to assess the effectiveness and efficiency of CDOT's force account and change order process.

## Scope and Methodology

We performed a review of force accounts/change orders for the period of 2014 to 2017.<sup>1</sup> We relied on data obtained from SAP, Site Manager and ProjectWise. This engagement was performed in accordance with Government Auditing Standards. In addition, the validity of controls over those systems in which we obtained data were not tested.

Methods used to achieve our objective included, but were not limited to:

- Reviewed 20 projects containing 446 force accounts/change orders. These projects were judgmentally selected based on whether:
  - The force account/change orders were greater than 100% of the bid amount or 20 percent greater than the bid amount for bids over \$10 million.
  - The force accounts/change orders were related to construction disputes or claims.
- Analyzed and trended 461 force accounts/change orders.
- Benchmarked force account/change order usage to other state transportation departments.
- Interviewed appropriate CDOT staff.
- Reviewed CDOT policy and procedures. Specifically:
  - 2014 CDOT Construction Manual, revised May 2017
  - Code of Federal Regulations, Title 49 dated January 8, 2018
  - Change Order Basics User Guide, dated March 3, 2015
  - Construction Manager/General Contractor, Manual dated January 2015
  - Design Build Manual, dated September 2016
  - CDOT Procurement Manual, revised January 2016
  - State Procurement, Manual dated June 2010

---

<sup>1</sup> While not an optimal method, CDOT uses force accounts as a type of change order while most other states do not; therefore, force accounts and change order are occasionally discussed in combination, especially when benchmarking to other transportation departments. This combination is necessary in order to ensure more of an accurate comparison.

## Background

---

Force accounts and change orders are a means to expand construction on awarded projects. Force accounts are intended to be used as a payment method for projects in which either the price cannot be readily determined and/or there is a price disagreement. Conversely, change orders are modifications that allow the awarded contractor to perform additional work outside of the scope of the initial contract.

In addition, total construction costs for the audit period were \$1.8 billion of which force accounts/change orders accounted for \$340 million or 18 percent. Furthermore, the average dollar amount for force accounts and changes orders from 2014 to 2016, were \$515,000 and \$33,000, respectively. [Appendix A](#) details the change order process.

## Conclusion

---

The CDOT Audit Division has assessed the effectiveness and efficiency of CDOT's force account and change order processes, and found them to be sufficient as it relates to executing scope changes within the construction projects of our review. However, we noted four force account/change order process weaknesses that if corrected, could reduce construction cost and ensure better compliance with state and federal regulations. These weaknesses are detailed below along with seven recommendations.

## Weaknesses

---

### 1. Force Account Usage

Force account usage may be excessive based on federal regulations. For example, federal regulations require that force accounts only be used with establishing a method of payment for contract changes or extra work when:

- there is a price dispute
- price reasonableness cannot be determined, and/or
- extent of the work is unknown

Regarding force account usage, we found:

- Of 461 projects, 459 projects (99 percent) used force accounts.
- From 2014 to 2016, force account usage has increased from \$62 million (2014) to \$70 million (2016), an increase of nearly 13 percent. See [Chart 1](#).
- Comparison of force account/change order usage to other state transportation departments also indicated high usage by CDOT. CDOT's change orders accounted for 18 percent of the bid amount as compared to other dots, in which usage accounted for 4 to 12 percent. See [Chart 2](#). Similarly, CDOT's force

accounts/changes orders averaged \$548,000, compared to an average amount of \$117,000 used by other dots. See [Chart 3](#).

- A portion of the force account is used for planned costs relating to incentives, asphalt, fuel, erosion, on the job training and minor contract reviews. These costs should be identified as contingency costs.<sup>2</sup>
- Based on our sample of 20 projects, 18 projects had force accounts based on the difference between the contract not to exceed amount and contract award rather than the required usage to record and monitor price disagreements<sup>3</sup>. In addition, the force account expressed as a percent to the awarded bid amount seems excessive, and varies widely from 4% to 138%. See [Table 1](#) below:

**Table 1: Force Account Calculation**  
Based on Difference Between Contract Not to Exceed and Award Amount\*

| Project #     | Not To Exceed Amount (Initial Amount) | Bid Amount (SAP)     | Diff. Between Not To Exceed and Bid | Force Account Amount | Diff. Between Force Account and Not To Exceed | Force Account % to Bid Amount |
|---------------|---------------------------------------|----------------------|-------------------------------------|----------------------|---|-------------------------------|
| 17083         | \$50,225,048                          | \$42,793,272         | \$7,431,776                         | \$7,431,776          | \$0   | 17%                           |
| 17783         | \$38,074,000                          | \$32,088,000         | \$5,986,000                         | \$5,986,000          | \$0   | 19%                           |
| 17170         | \$29,607,883                          | \$23,723,233         | \$5,884,650                         | \$5,884,600          | \$50  | 25%                           |
| 18149         | \$18,604,080                          | \$13,371,243         | \$5,232,837                         | \$5,232,837          | \$0   | 39%                           |
| 18842         | \$56,751,100                          | \$51,700,000         | \$5,051,100                         | \$5,051,100          | \$0   | 10%                           |
| 15790         | \$14,706,521                          | \$11,734,421         | \$2,972,100                         | \$2,972,100          | \$0   | 25%                           |
| 19029         | \$22,277,122                          | \$19,827,263         | \$2,449,859                         | \$2,449,919          | -\$59   | 12%                           |
| 19202         | \$15,824,477                          | \$13,714,997         | \$2,109,480                         | \$2,109,480          | \$0   | 15%                           |
| 17757         | \$14,095,169                          | \$12,146,269         | \$1,948,900                         | \$1,948,900          | \$0   | 16%                           |
| 19458         | \$18,669,881                          | \$16,988,831         | \$1,681,050                         | \$1,691,050          | -\$10,000                                     | 10%                           |
| 17988         | \$11,885,871                          | \$10,342,346         | \$1,543,525                         | \$1,543,525          | \$0   | 15%                           |
| 17890         | \$10,674,840                          | \$9,561,000          | \$1,113,840                         | \$1,113,840          | \$0   | 12%                           |
| 19500         | \$3,321,290                           | \$2,455,010          | \$866,280                           | \$866,280            | \$0   | 35%                           |
| 18242         | \$8,269,000                           | \$7,463,000          | \$806,000                           | \$806,000            | \$0   | 11%                           |
| 21425         | \$1,785,106                           | \$1,183,106          | \$602,000                           | \$604,000            | -\$2,000                                      | 51%                           |
| 18603         | \$2,443,920                           | \$1,933,919          | \$510,001                           | \$510,001            | \$0   | 26%                           |
| 17070         | \$869,811                             | \$365,720            | \$504,091                           | \$504,091            | \$0   | 138%                          |
| 18221         | \$847,957                             | \$444,007            | \$403,950                           | \$403,950            | \$0   | 91%                           |
| 19869         | \$3,865,000                           | \$3,700,000          | \$165,000                           | \$165,000            | \$0   | 4%                            |
| 19780         | \$954,560                             | \$849,060            | \$105,500                           | \$105,500            | \$0   | 12%                           |
| <b>Totals</b> | <b>\$323,752,636</b>                  | <b>\$276,384,697</b> | <b>\$47,367,939</b>                 | <b>\$47,379,949</b>  | <b>-\$12,009</b>                              | <b>17%</b>                    |

\*Difference amounts of \$59 and \$50 were considered immaterial

<sup>2</sup> Based on our sample, most states treat these types of costs as contingency costs.

<sup>3</sup> CDOT Construction Manual, Section 120.15.3.2 states that a force account should only be used when the project engineer and the Contractor cannot agree on the price for the work (i.e., unit or lump sum), or the nature of the work is such that it is not possible to determine an agreed upon price.

Based on our interviews, many employees did not fully understand the proper use of force accounts. Most respondents claimed that force accounts are used as a budgeting mechanism in order to ensure that all available funds are used to the fullest extent possible.

Chart 1: Force Account Usage Trend



Chart 2: Force Account/Change Order to Bid Amount

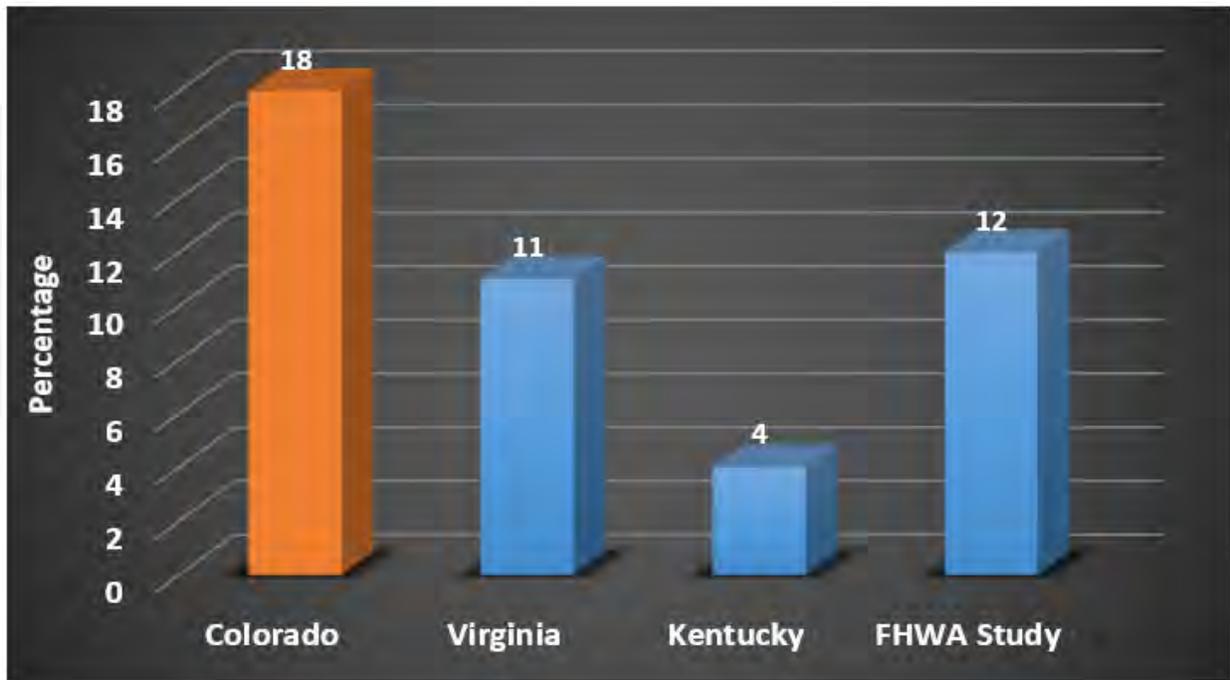
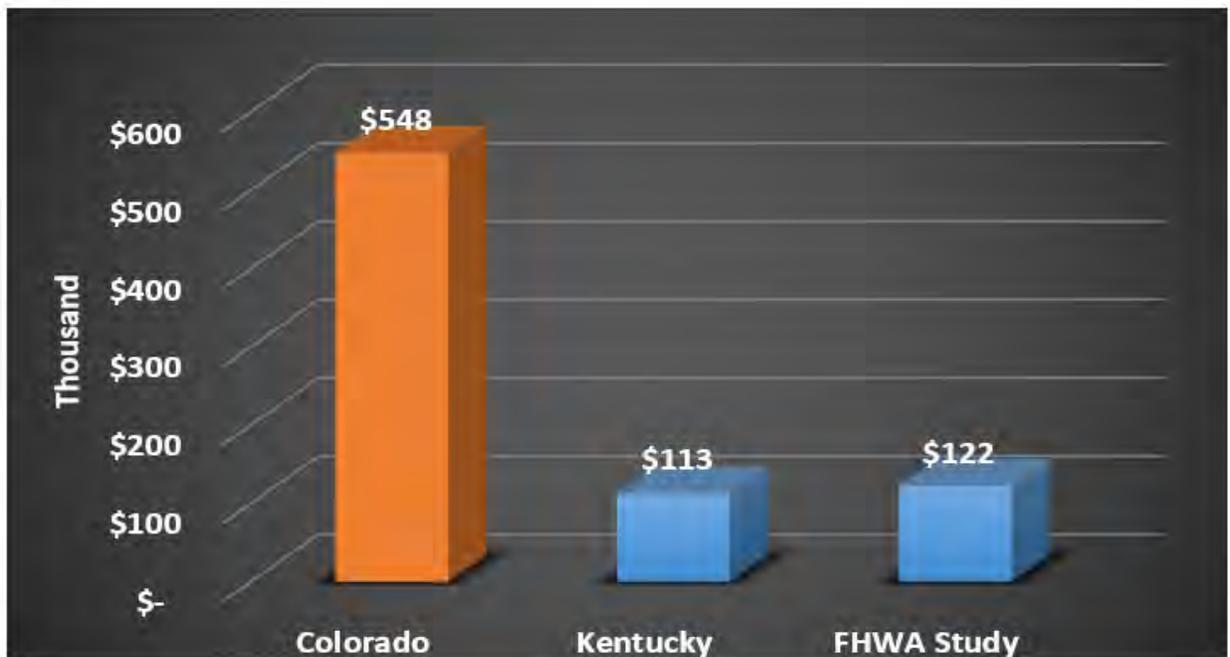


Chart 3: Force Account/Change Order Average Dollar Comparison



Force accounts/change orders can also result in increased construction cost since the additional work is not being competitively bid.<sup>4</sup> A study on the cost of change orders estimated that change orders cost between 7.5 to 14 percent of the award amount.<sup>5</sup> This translates to a higher cost of between \$109 to \$203 million for CDOT for the audit period. CDOT policy also discourages force account usage because it increases costs and removes the contractor's incentive to efficiently complete the work.<sup>6</sup>

Force account usage also has several disadvantages:<sup>7</sup>

- Could result in cost overruns resulting from poor productivity and labor related problems
- Increase level of monitoring
- No incentive for the contractors to control work schedules resulting in time delays
- Could result in poor quality of construction work, since no warranty of work may exist and/or work quality inspections are not timely completed
- Additional administrative costs

Additionally, force accounts may be encumbering funds unnecessarily.<sup>8</sup> Based on a sample of 20 projects, 17 out of 20 project had unused funds totaling \$31 million for projects that spanned over five years.<sup>9</sup> See [Table 2](#) on next page:

---

<sup>4</sup> Federal statute requires that projects be awarded by competitive bid (23 USC 112(b))

<sup>5</sup> Bajari, P; Houghton, S; Tadelis, S; Bidding for Incomplete Contracts: An Empirical Analysis of Adaptation Costs *American Economic Review* 2014. Retrieved from <http://dx.doi.org/10.1257/aer.104.4.1288>.

<sup>6</sup> CDOT Construction Manual, Section 120.15.3.2

<sup>7</sup> These disadvantages were identified by The Texas Department of Transportation, "Construction and Material Tips" (2004), and/or The Texas Department of Agriculture Project Implementation Manual (2015), Chapter 8, "Force Account Labor".

<sup>8</sup> Colorado Office of State Auditor Report, "Collection and Usage of the Faster Motor Vehicle Fees" dated August 2015, identified a similar issue, which found that 23 bridge projects had \$13 million in funds that were budgeted but not used.

<sup>9</sup> Estimated based on payment dates recorded in SAP

Table 2: Force Account Unused Funds

| Project #     | Not To Exceed Amount<br>(Initial Amount +<br>Funding Letter) | Payment Amount<br>(SAP) | Unused Amount       |
|---------------|--|-------------------------|---------------------|
| 17783         | \$38,074,000   | \$26,991,651            | \$11,082,349        |
| 17083         | \$50,225,048   | \$42,139,273            | \$8,085,776         |
| 19869         | \$3,865,000  | \$1,391,797             | \$2,473,203         |
| 18149         | \$18,604,080   | \$16,449,965            | \$2,154,116         |
| 19458         | \$21,577,956   | \$20,094,145            | \$1,483,811         |
| 17170         | \$29,051,104   | \$27,876,902            | \$1,174,201         |
| 17988         | \$11,885,871   | \$10,850,360            | \$1,035,511         |
| 17890         | \$10,274,840   | \$9,396,910             | \$877,930           |
| 17757         | \$14,095,169   | \$13,248,666            | \$846,503           |
| 19029         | \$15,824,477   | \$15,260,783            | \$563,694           |
| 19029         | \$31,792,240   | \$31,237,260            | \$554,980           |
| 18242         | \$8,269,000  | \$8,065,521             | \$203,479           |
| 19500         | \$5,335,090  | \$5,189,426             | \$145,664           |
| 15790         | \$12,784,511   | \$12,734,382            | \$50,128            |
| 18842         | \$65,127,584   | \$65,090,637            | \$36,947            |
| 19780         | \$1,709,560  | \$1,684,017             | \$25,544            |
| 21425         | \$4,683,090  | \$4,666,678             | \$16,411            |
| 18221         | \$847,957  | \$876,782               | \$0                 |
| 17070         | \$869,811  | \$870,584               | \$0                 |
| 18603         | \$2,443,920  | \$4,001,803             | \$0                 |
| <b>Totals</b> | <b>\$347,340,308</b>   | <b>\$318,117,542</b>    | <b>\$30,810,247</b> |

## 2. Change Order Usage

Change account usage appears excessive. Even though there are no specific guidelines regarding usage, CDOT policy states that services over \$150,000 must be competitively bid.<sup>10</sup> With an average force account/change order amount of \$548,000, it seems that many of these change orders should have been advertised and solicited by a competitive bid.<sup>11</sup>

<sup>10</sup>CDOT Procurement Manual dated January 2016, Section 8, states that “All purchases of goods or services over \$150,000 must be purchased through the use of either competitive formal sealed bid (IFB) or competitive formal sealed proposal (RFP)”

<sup>11</sup> Federal Code of Regulations, Section 635.204 states that actual construction work shall be performed by contract awarded by competitive bidding; unless the State Transportation Department (STD) demonstrates to the satisfaction of the Division Administrator that some other method is more cost effective or that an emergency exists. The STD shall assure opportunity for free, open, and competitive bidding, including adequate publicity of the advertisements.

Regarding change order usage, we found:

- Change orders were used on all 461 projects
- Average number of change orders were 8 per project
- Based on our sample of 20 projects, there were 446 change orders and 14% of these change orders were greater than \$150,000, indicating that a separate contract should have been warranted. Change order usage has increased from \$16 million (2014) to \$41 million (2016), an increase of about 158 percent as compared to an increase of 34 percent in contract award amounts. See [Chart 4](#) and [Chart 5](#).

Chart 4: Change Account Usage



Chart 5: Contract Award (Bid) Amounts



Change order usage is due largely to unreliable estimates regarding price, scope and design. For example:

- Based on our review of 413 changes orders, 74% of the change orders were initiated within six months of the Notice to Proceed Date for projects that spanned over 5 years.<sup>12</sup> See [Table 3](#)
- It also appears that the initial scope of the work was not fully evaluated based on a comparison of the construction estimate to the final project cost. For example, 16 of our 20 sampled projects had estimates that were nearly \$51 million or 27% less than the final project cost. This indicates may have expanded from what was originally planned. [See Table 4](#) The other four sampled projects had estimated costs greater than the final actual project cost.
- Construction estimates could be more reliable. Based on FHWA guidelines, estimates should be within +/- 10 percent of the low bid.<sup>13</sup> Based on 364 projects, we found:<sup>14</sup>

<sup>12</sup> 47 projects were excluded because of missing data, such as no Notice to Proceed or change order approval date. One additional project was excluded because the date on the change order was earlier than the date on the Notice to Proceed Date.

<sup>13</sup> Guidelines on Preparing Engineer's Estimate, Bid Reviews and Evaluation, Federal Highways Administration, January 2004

<sup>14</sup> Estimates for 97 of the 461 projects were not available

- 61 projects (17%) had estimates that differed by over 20 percent above the low bid
- 6 projects (2%) have estimates that differed by over 50 percent above the low bid
- Furthermore, 191 projects or 52% had estimates that were higher than the award contract amount indicating that some contractors, upon finding a set of poorly defined plans and specifications, may be purposely bidding low knowing that there will be a need for change orders that will allow them to obtain higher profits.<sup>15</sup> These projects also averaged 7 change order per project providing further evidence that some contractors may be purposely under bidding in anticipation of change orders.

Table 3: Change Orders Initiated Within 3 to 6 Months from Notice to Proceed Date

| Time Lapse          | Number of Projects | Accumulated Percentage |
|---------------------|--------------------|------------------------|
| 0 days - 60 days    | 99                 | 24%                    |
| 61 days - 120 days  | 132                | 56%                    |
| 121 days - 180 days | 74                 | 74%                    |
| > 180 days          | 108                | 100%                   |
|                     | <b>413</b>         |                        |

<sup>15</sup> Construction Management 5<sup>th</sup> Edition Daniel W. Halpin, Bolivar A. Senior, Gunnar Lucko identified this practice.

Table 4: Estimates Compared to Final Project Cost

| Project #     | Engineer's Estimate  | Payment Amount (SAP) | Diff. Between Estimate and Payment | Percentage |
|---------------|----------------------|----------------------|------------------------------------|------------|
| 21425         | \$48,113             | \$4,666,678          | -\$4,618,565                       | -9599%     |
| 18603         | \$1,623,097          | \$4,001,803          | -\$2,378,706                       | -147%      |
| 17070         | \$417,521            | \$870,584            | -\$453,063                         | -109%      |
| 18221         | \$433,980            | \$876,782            | -\$442,802                         | -102%      |
| 19780         | \$869,466            | \$1,684,017          | -\$814,551                         | -94%       |
| 19500         | \$3,000,000          | \$5,189,426          | -\$2,189,426                       | -73%       |
| 19029         | \$21,200,703         | \$31,237,260         | -\$10,036,557                      | -47%       |
| 17988         | \$8,047,175          | \$10,850,360         | -\$2,803,185                       | -35%       |
| 18842         | \$51,700,000         | \$65,090,637         | -\$13,390,637                      | -26%       |
| 17170         | \$22,820,115         | \$27,876,902         | -\$5,056,787                       | -22%       |
| 18149         | \$13,574,123         | \$16,449,965         | -\$2,875,842                       | -21%       |
| 19029         | \$13,053,384         | \$15,260,783         | -\$2,207,399                       | -17%       |
| 18242         | \$7,053,156          | \$8,065,521          | -\$1,012,365                       | -14%       |
| 19458         | \$18,434,496         | \$20,094,145         | -\$1,659,649                       | -9%        |
| 17890         | \$9,058,227          | \$9,396,910          | -\$338,683                         | -4%        |
| 17757         | \$13,000,677         | \$13,248,666         | -\$247,989                         | -2%        |
| <b>Totals</b> | <b>\$184,334,233</b> | <b>\$234,860,439</b> | <b>\$50,526,205</b>                | <b>27%</b> |

Similarly, change orders for emergency construction work may have been used excessively and a separate contract may have been warranted. For example, our review of the change orders for the repair of detour roads relating to the Glenwood Canyon rock fall emergency, found the contractor being in close proximity to the project was one of the reasons the contract was awarded. However, CM, 120.8.4 states that it is not proper to merely issue a CMO to a contractor nearby. If the work was not contemplated by the original solicitation for that contractor, then it is beyond the scope and price agreed to in that contract and a separate contract must be used.

Interviews with CDOT staff corroborated our analysis that change orders may have been used excessively and are due largely to unreliable estimates regarding price, scope and design. Specifically:

- The majority of respondents agreed that CDOT could improve its estimate on construction jobs by involving the project engineer during the scoping estimate.
- Multiple respondents cited instances that project engineer involvement during the scoping estimate could have eliminated the future need for a change order.

### 3. Support Documentation

Our review of central files and ProjectWise found that of the 20 projects sampled, all 20 projects were missing documentation to some extent with 6 projects having no supporting documentation at all. See [Appendix B](#) for a detailed listing of change order missing documentation.

In addition, interviews confirmed that ProjectWise was not consistently being utilized and that project documentation was not always being maintained in central files. Specifically:

- Some respondents stated that they did not have consistent Internet access to allow uploading of documentation.
- The majority of the respondents stated that they maintained files at their office rather than maintaining a centralized file.

### 4. CDOT Policy Compliance

Generally, we did not identify any significant compliance issues associated with force accounts other than the reason for the use of force account was not always documented.<sup>16</sup> However, in our review of change order compliance, several weaknesses were identified. For example, based on our review of 20 projects containing 446 change orders, the following issues were noted. See [Appendix C](#) for details

- FHWA approval for changes orders over \$250,000 as well as residence engineer approvals on Form 90A were not always present
- Form 90A was not always mathematically correct
- Letter of explanations were not always complete with regards to the justification of prices or additional time budget action, work status or basis of payment
- Form 65, Project Financial Status report were not fully completed
- Form 105 not always fully and properly completed

In addition, considering the approval process for a Minor Contract Revision (MCR) is the same as a Contract Modification Order (CMO), there is little to no consequence that 22 out of 23 change orders that were designated as MCRs exceeded the \$25,000 CDOT

---

<sup>16</sup> Federal regulations, 23 CFR §635.120, require that the reason(s) for the use of the force account shall be documented.

limit.<sup>17</sup> The average minor contract amount was about \$96,000, nearly 4 times the established limit.

## Other Matters

---

During the course of our audit, we found opportunities to strengthen approval controls over the change order process as well as improve data reliability.

The change order approval process could be improved by establishing change order policy approval timelines. For example, current policy allows the project engineer to create the change order within SiteManager, prepare the Form 90A, and authorize the work. This change order is subsequently approved by the resident engineer. However, there are no time guidelines as to when the resident engineer needs to approve this change order and in most instances, this approval occurs after the work has been completed. Consequently, the project engineer could be unnecessarily committing CDOT resources to a project without appropriate oversight.

In addition, change order data contained in some of the automated systems may not be reliable. For example, we identified multiple applications involved in the change order process that involved both automated systems (Bid Express, Preconstruction, SiteManager, Shaxam, SAP) and manual entry. See [Appendix D](#) for additional details. In many instances, change order updates made manually are not always reflected in all the automated systems; therefore, change order information may vary among the software systems. Consequently, management may be making decisions without having complete or accurate information.

---

<sup>17</sup> CDOT Procurement Manual revised May 11, 2017 states that the recommended limit for minor contract revision is \$25,000.

## Recommendations

---

Based upon our review, and to improve the force account/change order process, the Audit Division recommends the following:

- 1) Train staff on:
  - a) Estimating construction project costs and ensure that the scope of the work is fully evaluated prior to solicitation.
  - b) Analyzing when a change in the contract should be re-advertised.
  - c) Using force accounts/change orders, as well as on CDOT requirements.
- 2) Ensure that construction work is being solicited and advertised in accordance with state and federal requirements.
- 3) Establish a plan of reducing force account/change order usage and consider using a contingency fund for incentives, asphalt, fuel, erosion, on the job training and minor contract reviews.
- 4) Establish key performance indicators (KPI's) and monitoring processes in order to better track CDOT performance and compliance measurements; KPI's such as:
  - a) Bids that are greater than +/-10% difference between the bid amount and the engineer's estimate amount by project and region.
  - b) Change orders that are greater than 25% individually or 40% on a cumulative basis of the awarded amount for the project.
  - c) Change orders that add time of more than 10% either individually or on a cumulative basis from the total days specified in the contract or any changes in which added time will expand the critical path into a winter season.
  - d) Projects that have 5% more funds budgeted than needed based on a percent of project completion or other method deemed appropriate.
  - e) Force accounts that are more than 5% of the bid amount.
- 5) Establish a monitoring process to better ensure compliance with CDOT policies.
- 6) Ensure that the resident engineer authorizes all change orders initiated by the project engineer prior to any work being performed unless a vital need exists. In addition, the KPIs previously noted should be designed to initiate email alerts to the project, resident, and program engineers regarding change orders that have reached

a specified management criterion target (KPI), which may indicate the need for prompt management action.

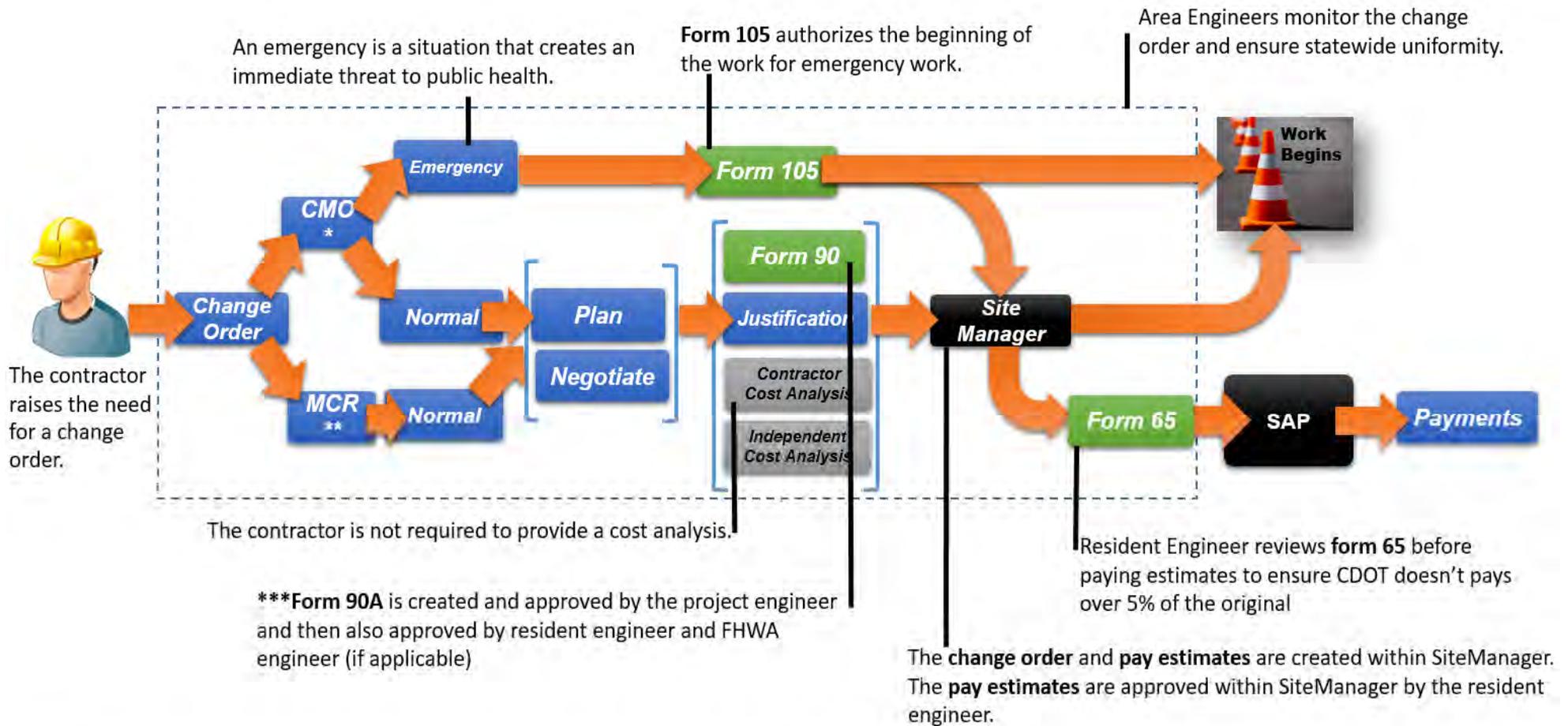
- 7) Continue to strive to automate the change order process by limiting manual adjustments and entries. However, if adjustments are needed then they must be entered directly into the appropriate application to better ensure data integrity amongst the software systems. In addition, there should be a reconciliation mechanism to ensure that correct and consistent information is contained within the various systems.

## Management Comments

---

Management agrees with the findings and recommendations contained in this report. See [Appendix E](#) for details. The Audit Division considers management's comments responsive to the recommendations and corrective actions should resolve the issues identified in this report.

## Appendix A: Change Order Process



\*CMO – Contract Modification Order – type of change order for contract changes greater than \$25,000

\*\*MCR – Minor Contract Revisions – type of change order for contract changes less than \$25,000

\*\*\* Form 90A - In most instances, the resident engineer approves form 90A after the work has been completed. This form is manually entered into SiteManager

## Appendix B: Missing Change Orders

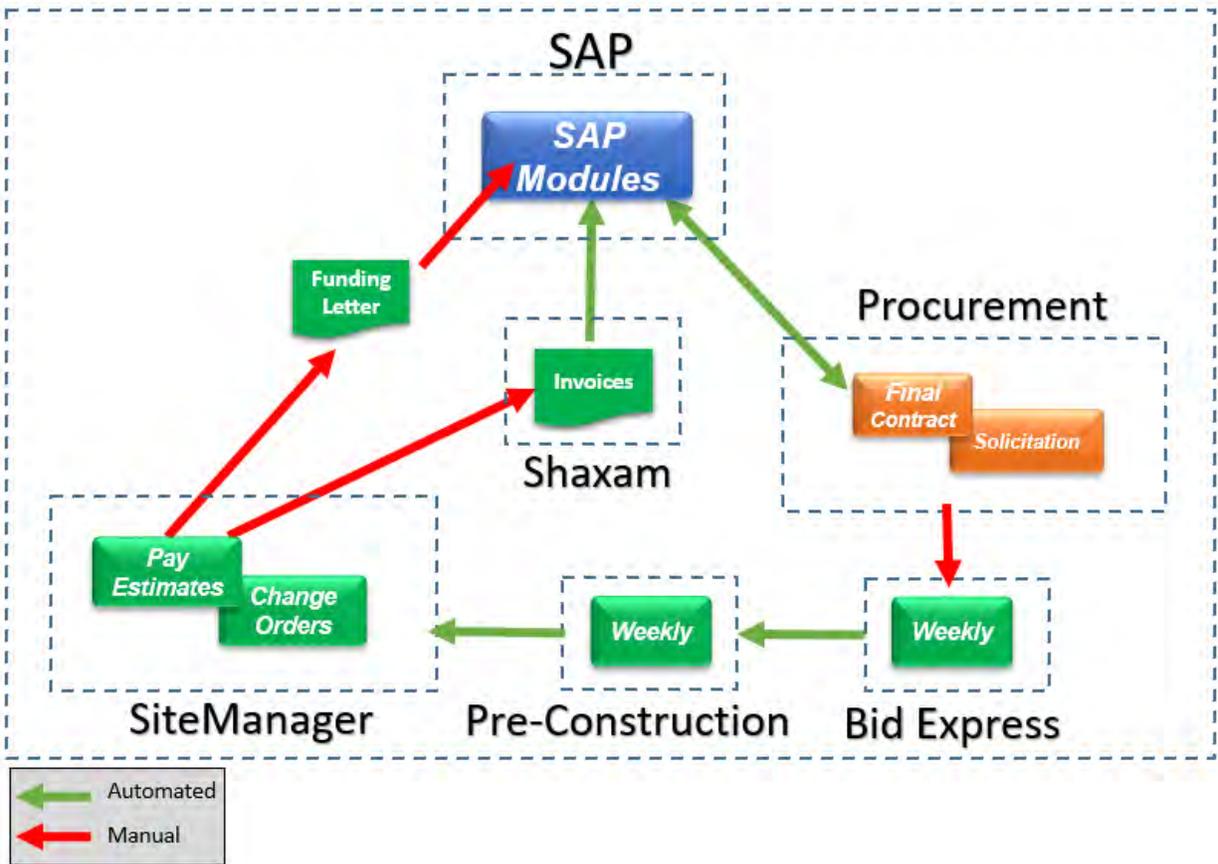
| Project # | Total Number of Change Order | Change Order Tested | Missing Change Order | Type of Project  |
|-----------|------------------------------|---------------------|----------------------|------------------|
| 17170     | 59                           | -                   | 59 (*)               | Construction     |
| 18149     | 46                           | -                   | 46 (*)               | Construction     |
| 17757     | 28                           | -                   | 28 (*)               | Construction     |
| 17988     | 21                           | -                   | 21 (*)               | Construction     |
| 17083     | 45                           | 24                  | 21                   | Construction     |
| 18842     | 25                           | 11                  | 14                   | Construction     |
| 17783     | 75                           | 64                  | 11                   | Construction     |
| 18603     | 21                           | 10                  | 11                   | Construction     |
| 19458     | 16                           | 6                   | 10                   | Construction     |
| 19500     | 21                           | 13                  | 8                    | Construction     |
| 19780     | 7                            | 1                   | 6                    | Emergency Repair |
| 15790     | 20                           | 15                  | 5                    | Construction     |
| 18242     | 10                           | 6                   | 4                    | Construction     |
| 17070     | 3                            | -                   | 3 (*)                | Construction     |
| 19869     | 3                            | -                   | 3 (*)                | Construction     |
| 19029     | 13                           | 11                  | 2                    | Construction     |
| 19202     | 12                           | 10                  | 2                    | Construction     |
| 21425     | 6                            | 4                   | 2                    | Emergency Repair |
| 17890     | 12                           | 11                  | 1                    | Construction     |
| 18221     | 3                            | 2                   | 1                    | Construction     |
|           | <b>446</b>                   | <b>188 (42%)</b>    | <b>258 (58%)</b>     |                  |

(\*) These projects did not contain any change order documentation.

## Appendix C: Percent of Compliance with CDOT Change Order Policy

| Attribute Questions?  | % of Non-Compliance |
|---|---------------------|
| <b>Form 90 – Contract Modification Order (CMO)</b>                                  |                     |
| Was form 90 approved by FHWA Operations Engineer if over \$250k?                    | 25%                 |
| Was form 90 Approved by Resident Engineer?  | 15%                 |
| Was form 90 Approved by Contractor?   | 6%                  |
| Was form 90 Approved by Project Engineer?   | 5%                  |
| Was the form 90 CMO mathematically correct with regards to cost and quantities?     | 3%                  |
| Was form 90 completed?  | 0%                  |
| <b>Letter of Explanation</b>  |                     |
| Did the letter of explanation include status of work?                               | 36%                 |
| Did the letter of explanation include a financial status/budget action?             | 30%                 |
| Did the letter of explanation include a justification of additional time?           | 20%                 |
| Did the letter of explanation include discussions and concurrences?                 | 19%                 |
| Is the Price Justification mathematically correct?                                  | 19%                 |
| Does the Price Justification tie to the cost shown on Form 90?                      | 8%                  |
| Was the letter of explanation completed for each change order?                      | 7%                  |
| Did the letter of explanation include a clear and detailed description of work?     | 7%                  |
| Did the letter of explanation include a detailed explanation of why it is needed    | 7%                  |
| Did the letter of explanation include a Justification of prices?                    | 7%                  |
| Did the letter of explanation include a method of measurement and basis of payment? | 6%                  |
| <b>Form 65 – Project Financial Status Report</b>                                    |                     |
| Was form 65 “Project Financial Status Report” completed by project engineer?        | 46%                 |
| <b>Form 105 – Speed Memo</b>  |                     |
| Did form 105 include the expected duration of the work?                             | 86%                 |
| Did form 105 include the estimated total cost of the work?                          | 82%                 |
| Did form 105 include the estimated quantities?                                      | 69%                 |
| Did form 105 include the basis of payment?  | 63%                 |
| Did form 105 include the method of measurement?                                     | 57%                 |
| Was form 105 “Speed Memo” approved by the contractor?                               | 56%                 |
| Did form 105 include the required time to start work?                               | 55%                 |
| Did form 105 include the scope of work and project limits?                          | 33%                 |
| Was form 105 “Speed Memo” approved by the Project Engineer?                         | 12%                 |

## Appendix D: Applications Involved during The change Order Process



## Appendix E: Management's Comments

### Change Order Audit Report 18-003

|  |   |
|--|---|
| Finding 1 and 2: Force Account and Change Order Usage may be excessive | Agree or Disagree with Audit Finding<br><br>Agree |
|--|---|

#### Narrative for Finding 1 and 2:

CDOT will review F/A and change order usage. It is unclear at this time if other states utilize other methods to provide incentives, scope changes, and inevitable items that will be needed but the amount will vary based upon the Contractor's means and methods. The numbers reported certainly seem to be excessive. We need to understand the reason why so many different project engineers are using them, in order to develop a good solution.

In regards to cost estimating, a major change was undertaken approximately 12 months ago when the development of the 10-year development plan was undertaken. Previously, each office could estimate using their own tools or experience, which lacked statewide consistency in estimating and risk assessment. Since then a standard risk based cost estimating tool was developed. This tool is being used by all regions. We will work to ensure consistent usage.

#### Suggested recommendation to address Finding 1:

1. Train staff on:
  - a. Estimating construction project costs and ensure that the scope of the work is fully evaluated prior to the solicitation
  - b. Analyzing when a change in the contract should be re-advertised
  - c. Using force accounts/change orders, as well as the CDOT requirements
2. Ensure that construction work is being solicited and advertised as appropriate based on state and federal requirements.
3. Establish a plan of reducing force account/change order usage and consider using a contingency fund for incentives, asphalt, fuel, erosion, on the job training and minor contract reviews.
4. Establish key performance indicators (KPI's) and monitoring processes in order to better track CDOT performance and compliance measurements; KPI's such as:
  - a. Bids that are greater than +/-10% difference between the bid amount and the engineer's estimate amount by project and region
  - b. Change orders that are greater than 25% individually or 40% on a cumulative basis of the awarded amount for the project
  - c. Change orders that add time of more than 10% either individually or on a cumulative basis from the total days specified in the contract or any

- changes in which added time will expand the critical path into a winter season
- d. Projects that have 5% more funds budgeted than needed based on a percent of project completion or other method deemed appropriate
- e. Force accounts that are more than 5% of the bid amount

**Narrative for suggested recommendation:**

1. Staff training has already started and will continue on project cost estimating. A standard software tool has been developed and has been used by all regions. A plan to ensure consistent usage will be developed.
2. CDOT will review amounts budgeted/obligated to FA, incentives and change orders and reduce the overall allotment. After analysis to determine the reason behind the number of change orders, a plan will be submitted to reduce the occurrence.
3. CDOT already tracks bid data and analyzes. We will develop metrics and goals around the data. Bids over 10% of the engineer estimate without multiple bidders near the same bid, are automatically rejected unless justified by the cost estimating branch and agreed upon by the Executive Director.

*I believe it is important to add that % should also consider a minimum/maximum dollar amount to be considered as well for change orders.*

*CDOT often utilizes force accounts for inevitable but difficult to estimate items such as railroad flagging. Also, force account includes incentives for the contractor to produce a superior product. Both of these practices will continue, however we will develop guidance to minimize the amount budgeted*

| Target date to complete implementation activities  | Name of specific point of contact for implementation |
|--|--|
| Cost Estimating - 3 Months<br>F/A procedures - 6 Months<br>Change Order Procedures - 9 Months<br>Metrics for Bid analysis - 3 Months | Currently Joshua Laipply, until others are assigned. |

|  |   |
|--|---|
| <p><b>Finding 3 and 4: Compliance with CDOT policy</b></p> <p>Project documentation was not consistently kept in ProjectWise or central files. In addition, project forms were not properly completed or approved.</p> | <p><b>Agree or Disagree with Audit Finding</b></p> <p>Agree</p> |
|--|---|

Narrative for Finding 3 and 4:

Project Documentation must be consistent and complete. Completely agree.

|   |
|---|
| <p><b>Suggested recommendation to address Finding 3 and 4</b></p> <p>5. Establish a monitoring process to better ensure compliance with CDOT policies</p> |
|---|

Narrative for suggested recommendation:

CDOT will develop a process to ensure that project documentation is being completed and maintained.

| Target date to complete implementation activities | Name of specific point of contact for implementation |
|---|--|
| 6 Months  | Joshua Laipply until another has been assigned.      |

|   |  |
|---|--|
| Finding 5: Improve approval controls over the change order process, as well as improve data reliability | <p>Agree or Disagree with Audit Finding</p> <p style="text-align: center;">Agree</p> |
|---|--|

**Narrative for Finding 5:**

CDOT will improve process and data reliability.

|  |
|--|
| <p><b>Suggested recommendation to address Finding 5</b></p> <p>6. Ensure that the resident engineer authorizes all change orders initiated by the project engineer prior to any work being performed unless a vital need exists. In addition, the KPIs previously noted should be designed to initiate email alerts to the project, resident, and program engineers regarding change orders that have reached a specified management criterion target (KPI), which may indicate the need for prompt management action.</p> <p>7. Continue to strive to automate the change order process by limiting manual adjustments and entries. However, if adjustments are needed then they must be entered directly into the appropriate application to better ensure data integrity amongst the software systems. In addition, there should be a reconciliation mechanism to ensure that correct and consistent information is contained within the various systems.</p> |
|--|

**Narrative for suggested recommendation:**

A process will be developed and utilized to track change orders.

Automated controls are being researched right now in the area of electronic invoicing, which would remove a manual step in the process that was identified. Timing is uncertain at this point due to software integration with SAP and OIT gating needed to implement.

| Target date to complete implementation activities                             | Name of specific point of contact for implementation |
|---|--|
| 9 months, consistent with Change order process revisions needed in finding 1. | Joshua Laipply until other assigned.                 |