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TRB Webinar: Successful Approaches to Setting Project Development Budgets

July 1, 2024

12:00 – 1:30 PM



PDH Certification Information

1.5 Professional Development Hours (PDH) – see follow-up email

You must attend the entire webinar.

Questions? Contact Andie Pitchford at TRBwebinar@nas.edu

The Transportation Research Board has met the standards and requirements of the Registered Continuing Education Program. Credit earned on completion of this program will be reported to RCEP at RCEP.net. A certificate of completion will be issued to each participant. As such, it does not include content that may be deemed or construed to be an approval or endorsement by the RCEP.



AICP Credit Information

1.5 American Institute of Certified Planners Certification
Maintenance Credits

You must attend the entire webinar

Log into the American Planning Association website to claim your
credits

Contact AICP, not TRB, with questions

Purpose Statement

This webinar will present improved processes for setting and maintaining project development budgets through improvements in estimation, risk management, and tracking of project development costs.

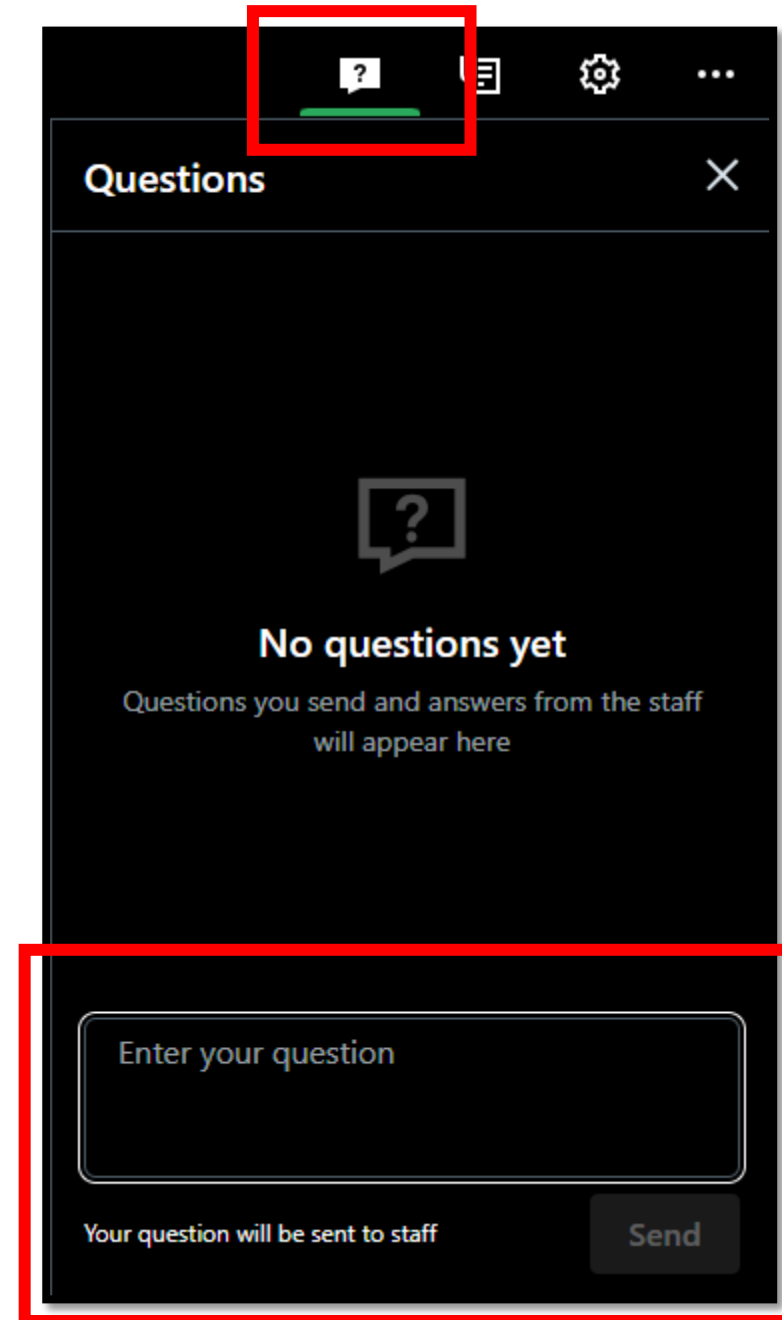
Learning Objectives

At the end of this webinar, you will be able to:

- Identify methods, tools, and processes for estimating, risk management, budgeting, and tracking the cost of project development for transportation projects
- Establish and manage budgets for program delivery using methods and tools implemented by other states

Questions and Answers

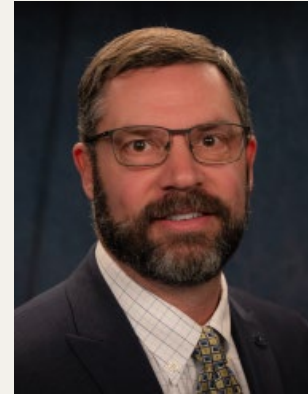
- Please type your questions into your webinar control panel
- We will read your questions out loud, and answer as many as time allows



Today's presenters



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NCHRP
20-68
“US
Domestic
Scan
Program”

Domestic Scan 21-03

**“Successful Approaches to Setting
Project Development Budgets”**

Initial Findings and Recommendations



**Domestic
Scan 21-03
“Successful
Approaches
to Setting
Project
Development
Budgets”**

- This scan is being conducted as a part of NCHRP Project 20-68, the “U.S. Domestic Scan Program”
- The program was requested by the American Association of State Highway and Transportation Officials (AASHTO), with funding provided through the National Cooperative Highway Research Program (NCHRP)

NCHRP 20-68 U. S. Domestic Scan Program

- The Program is a multi year project conducting 3-4 scans per year.
- Each scan is selected by AASHTO and the NCHRP 20-68 Project Panel
- Each scan addresses a single technical topic of broad interest to many state departments of transportation and other agencies
- The purpose of each scan and of Project 20-68 as a whole is to accelerate beneficial innovation by:
 - facilitating information sharing and technology exchange among the states and other transportation agencies
 - identifying actionable items of common interest

NCHRP Panel's General Guidance to the Scan Team

- Procedures for the estimation of construction costs are well established
- Procedures for estimating costs of internal staff and external consultant services for preconstruction activities are less reliable.
 - Scope development
 - Environmental documentations
 - Site investigations
 - Preliminary engineering
 - Final design
 - Public engagement
 - Project management
- These costs can impact the ability to deliver projects within budget



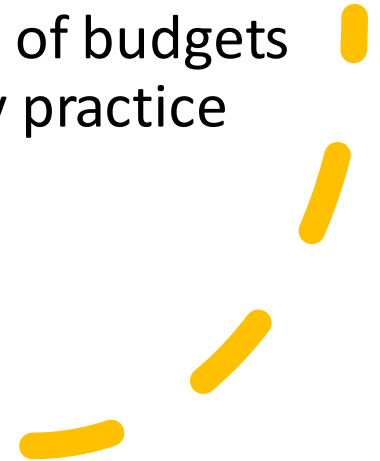
NCHRP Panel's General Guidance to the Scan Team (Cont.)

- Some agencies are viewed by peers as having developed successful procedures for project development budgeting
- The objective of the scan is to document the experience of these leading agencies
 - Best practices
 - Lessons learned



NCHRP Panel's General Guidance to the Scan Team (Cont.)

- Key factors to be investigated
 - How agencies address budgeting project development
 - Process for final project scope development
 - Approach to addressing pre-construction risks
 - Assessment of accuracy of budgets developed using agency practice and lessons



Scan Team

Scott Pedersen, P.E. – Team Chair
Metropolitan District – Resource
Engineer
Minnesota Department of
Transportation

Stephen Bodge, P.E.
Assistant Program Manager for the
Highway Program
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Project and Portfolio Management
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Transportation's Bay Region
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Transportation

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Central Federal Lands
Federal Highway Administration,
USDOT

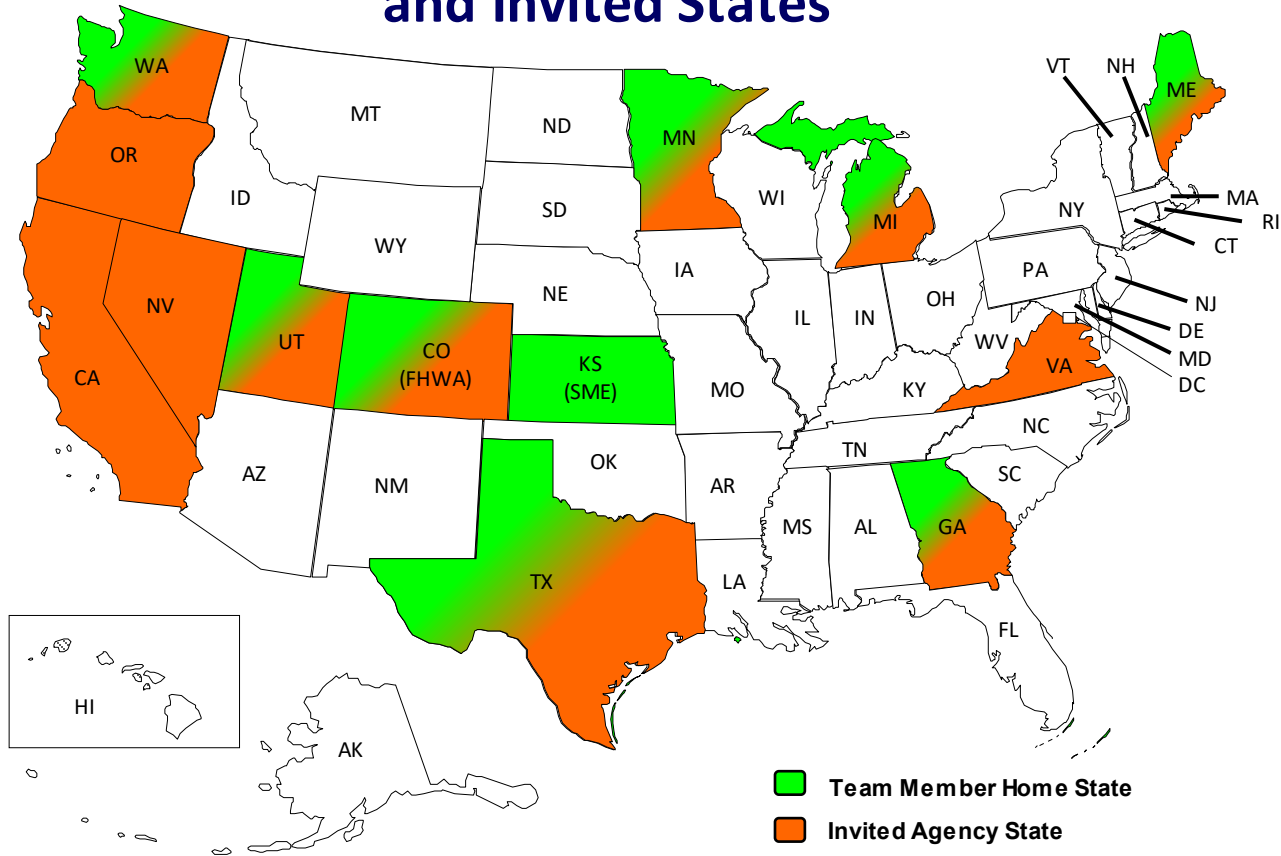
Dean R. Moon, P.E.
Assistant State Design Engineer
Washington State Department of
Transportation

Albert V. Shelby, III
Director of Program Delivery
Georgia Department of
Transportation

Carmen E.L. Swanwick, P.E.
Director of Project Development
Utah Department of Transportation

Dennis R. Slimmer
Subject Matter Expert

Domestic scan 21-03 Team Members' Home States and Invited States



The Scan Process

- Online presentations by 13 transportation agencies
- Following the presentations, the scan team met to identify the most significant findings and recommendations
- Efforts to disseminate findings and recommendations began immediately and continue to this time

Wizard Estimation Tool

Domestic Scan 21-03

**“Successful Approaches to Setting
Project Development Budgets”**

**Wizard Estimation Tool – Nevada DOT
scoping level estimation spreadsheet**



Wizard Estimation Tool

Wizard Tool Overview

- What is the Wizard Tool?
- Who is the program for?
- How does the Wizard Tool work?
 - Inputs
 - Calculations (Costs and Quantities)
 - Outputs
- Results
- Quick demonstration



What is the Wizard Tool

- The Wizard Tool is an Excel Spreadsheet that utilizes drop down boxes and user input cells to develop a high-level project estimate.

| | | | | | | | |
|-----|----------|---|---------|----|----------------|----------------|-----------|
| 178 | 403 6000 | OPEN GRADE ASPHALT | 1,439.0 | TN | \$149.08 | \$214,525.58 | |
| 179 | | | | | | | |
| 180 | 211 0518 | HYDRO-SEEDING | 79,787 | SY | \$17.00 | \$1,356,379.00 | |
| 181 | | | | | | | |
| 182 | | SIGNING & PAVEMENT MARKING | | | | | |
| 183 | 632 1156 | PAVEMENT STRIPING (SOLID) | 4 | MI | \$1,721.27 | \$6,885.10 | |
| 184 | 632 1140 | PAVEMENT STRIPING (BROKEN) | 2 | MI | \$1,184.78 | \$2,369.57 | |
| 185 | 633 0004 | REFLECTIVE PAVEMENT MARKERS | 264 | EA | \$3.31 | \$873.65 | |
| 186 | 633 0000 | NON-REFLECTIVE PAVEMENT MARKERS | 792 | EA | \$2.67 | \$2,117.13 | |
| 187 | 627 0508 | SIGNAGE (1 POST ONLY) (HIGHWAY - LARGE) | 10 | AS | \$2,662.53 | \$26,625.27 | |
| 188 | 627 0508 | SIGNAGE (1 POST ONLY) (URBAN - RESIDENTIAL) | - | AS | \$1,331.26 | \$0.00 | |
| 189 | | | | | | | |
| 190 | 502 0628 | CONCRETE BARRIER RAIL (TYPE A) | - | LF | \$320.06 | \$0.00 | |
| 191 | 618 0528 | GUARDRAIL (PRICE INCLUDES ANCHORS & SHOULDER DIKE) | | LF | \$81.41 | \$0.00 | |
| 192 | 613 0732 | CONCRETE CURB & GUTTER (TYPE 5) (PRICE INCLUDES 6" AGGREGATE) | - | LF | \$29.41 | \$0.00 | |
| 193 | 613 0864 | 4" SIDEWALK (PRICE INCLUDES 4" AGGREGATE BASE) | - | SY | \$55.25 | \$0.00 | |
| 194 | | | | | | | |
| 195 | 616 0712 | 72" CHAIN LINK FENCE | | LF | \$37.09 | \$0.00 | |
| 196 | | | | | | | |
| 197 | | DRAINAGE (OPEN SYSTEM) NEW CONSTRUCTION | 1 | LS | \$1,462,800.50 | \$1,462,800.50 | |
| 198 | 603 0540 | 24" CROSSDRAINS | 1,270 | LF | \$632.04 | ABOVE | \$802,685 |
| 199 | 502 0504 | 24" HEADWALLS (2 / CROSSDRAIN) | 20 | EA | \$3,303.00 | ABOVE | \$66,060 |
| 200 | 609 0068 | PIPE RISER INLET (TYPE 3) | - | EA | \$2,000.00 | ABOVE | \$0 |
| 201 | 203 0540 | EMBANKMENT FOR BERM (3520 CY / SIDE) | - | CY | \$20.55 | ABOVE | \$0 |
| 202 | 203 0508 | EXCAVATION FOR LARGE DITCH (11,733 CY / SIDE) | 23,466 | CY | \$25.32 | ABOVE | \$594,056 |
| 203 | 203 0508 | EXCAVATION FOR SMALL DITCH (3520 CY / SIDE) | - | CY | \$25.32 | ABOVE | \$0 |
| 204 | | | | | | | |
| 205 | | DRAINAGE (CLOSED SYSTEM) NEW CONSTRUCTION | - | LS | \$0.00 | \$0.00 | |
| 206 | 609 0012 | DROP INLETS (TYPE 3) | - | EA | \$4,000.00 | ABOVE | \$0 |
| 207 | 604 2472 | 18" SLOTTED CORRUGATED METAL PIPE DRAINS | - | LF | \$56.90 | ABOVE | \$0 |

Who can use the Wizard Tool

- The Wizard Tool was originally developed for use by Local Public Agencies



Wizard Inputs

- Drop-down menus



ESTIMATE PREPARATION ASSISTANCE

SECTION I - ROADWAY CONSTRUCTION

1- What Primary Type of Project is this?

2- Will the predominant paving type be concrete or asphalt?

3- Will the drainage be primarily an open or closed system?

Roundabout ▼

New Roadway Construction
Roadway Widening
Pavement Preservation
Enhancement / Betterment
Roundabout
Road Safety Audit
Select

Open ▼

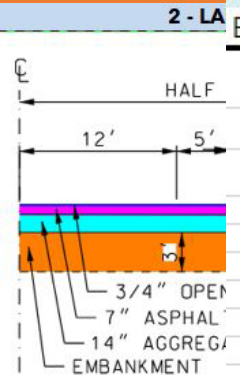
[After answering all 3 questions, press here to go to Primary Type Project and enter typical section lengths.](#)

Wizard Flexibility

- Power User modifications
- Contingency Percentage

SECTION VIII: STANDARD PERCENTAGE ADDERS GUIDELINES

| ADDER | MIN | MAX | EXPLANATION |
|---|-------|-------|--|
| Erosion Control / Temporary Drainage | 0.5% | 1.0% | Includes temporary pollution control, noise abatement, dust control, silt fence, inlet protection and gravel bags. |
| Traffic Control | | | This includes construction signs, barricades, arrow boards, portable concrete barrier walls, detours, temporary pavement, temporary signals, flagging, traffic control supervision and uniformed traffic control officers. |
| Urban - New Construction | 5.0% | 8.0% | New roadway alignment in an urban location, includes crossings of existing roadways. |
| Urban - Widening / Reconstruction | 5.0% | 10.0% | Widening or reconstruction of an existing urban roadway under traffic. Must maintain traffic flow through staged construction or temporary pavement. |
| Rural - New Construction | 1.0% | 5.0% | New roadway alignment in a rural location, includes few crossings of existing roadways. |
| Rural - Widening / Reconstruction | 5.0% | 8.0% | Widening or reconstruction of an existing rural roadway under traffic. Must maintain traffic flow through staged construction or temporary pavement. |
| Urban Expressway - New Construction | 5.0% | 10.0% | New expressway alignment in an urban location, includes bridges over existing roadways. |
| Rural Expressway - New Construction | 2.0% | 5.0% | New expressway alignment in a rural location, includes bridges over existing roadways. |
| Urban Expressway - Widening / Reconstruction | 8.0% | 15.0% | Widening or reconstruction of an existing urban expressway under traffic. Must maintain traffic flow through staged construction or temporary pavement. |
| Rural Expressway - Widening / Reconstruction | 7.0% | 10.0% | Widening or reconstruction of an existing rural expressway under traffic. Must maintain traffic flow through staged construction or temporary pavement. |
| Roadside Safety | 1.0% | 5.0% | Many items typically included under roadside safety, such as guardrail and barrier walls, are included in the typical cost-per-mile. |
| Landscaping | 0.0% | 3.0% | NDOT maximum allowable is 3% |
| Mobilization | 7.0% | 10.0% | Includes mobilizing and demobilizing equipment, office and yard set-up, permitting, bonds, etc. Per NDOT Risk Guidelines, PM approval is needed for mobilization variation from 7% |
| Time Related Overhead | 0.0% | 20.0% | Includes labor supervision, project management, field offices, overhead items where project duration will impact the cost. |
| Contingency | | | |
| Preliminary Estimate | 25.0% | 30.0% | |
| STIP Estimate | 20.0% | 25.0% | This tool is designed to prepare estimates primarily at the STIP level. |
| PAE Estimate | 15.0% | 20.0% | |
| Award Estimate | 3.0% | 10.0% | |
| Final Estimate | 3.0% | 7.0% | |
| Construction Engineering & Inspection | 5.0% | 15.0% | NDOT or NDOT Consultant field inspectors and owner's representatives. See NDOT Risk-Based Cost Estimation & Risk management Guidelines for a complete breakdown. |
| Preliminary Engineering | 6.0% | 10.0% | |



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ANGES

Wizard Pricing

- Pricing. How does the tool account for different costs? There are different prices for quantity size, or urban vs rural, or by District.
- The pricing component is pulled from NDOT's historical bids and selected based on quantity and location

| PAY ITEMS USED TO PREPARE ESTIMATES | | | | | | | | | | | |
|---|----------|--|--------------|-------------|---------|------------------|--|-------------|-------------|-------------|-----------------|
| ITEMS ARE PULLED FROM THE OMAN SYSTEMS' BID TAB PROFESSIONAL DATABASE. IF UNIT PRICE DATA FOR AN ITEM IS MISSING WHEN UPDATING THE UNIT PRICES, A MANUAL PRICE CAN BE INSERTED AS NEEDED. | | | | | | | | | | | |
| Pay Item | | | | | | | | | | | |
| Tutorial | | | | | | | | | | | Dist. Selected> |
| New # | Old # | ITEMS | Total Units | Price Level | MANUAL | 2 Unit Prices | Go To District Selection District 1 | District 2 | District 3 | Statewide | UNIT |
| | | HEAVY CLEARING & GRUBBING | | | 30000 | \$30,000.00 | \$30,000.00 | \$30,000.00 | \$30,000.00 | \$30,000.00 | AC |
| | | LIGHT CLEARING & GRUBBING | | | 10000 | \$10,000.00 | \$10,000.00 | \$10,000.00 | \$10,000.00 | \$10,000.00 | AC |
| 2021040 | 202 0328 | REMOVAL OF DROP INLET | 124 | MID | | \$2,301.40 | \$2,301.40 | \$2,301.40 | \$2,301.40 | \$2,301.40 | EA |
| 2020530 | 202 0356 | REMOVAL OF HEADWALL | 252 | MID | | \$2,501.89 | \$2,501.89 | \$2,501.89 | \$2,501.89 | \$2,501.89 | EA |
| 2020400 | 202 1108 | REMOVAL OF CONCRETE BARRIER RAIL | 15840 | HIGH | | \$25.65 | \$25.65 | \$25.65 | \$25.65 | \$25.65 | LF |
| 2020990 | 202 1152 | REMOVAL OF BITUMINOUS SURFACE (COLD MILLING) | 0 | | | \$2.66 | \$2.22 | \$2.66 | \$2.21 | \$2.45 | SY |
| 2021230 | 202 1272 | REMOVAL OF STORM DRAIN PIPE | 0 | | | \$88.99 | \$51.52 | \$88.99 | \$37.64 | \$47.56 | LF |
| 2021260 | 202 1212 | REMOVAL OF SIDEWALK | 11733.333333 | HIGH | \$25.00 | \$25.00 | \$25.00 | \$25.00 | \$25.00 | \$25.00 | SY |
| 2021070 | 202 1224 | REMOVAL OF CURB AND GUTTER | 31680 | HIGH | | \$26.16 | \$26.16 | \$26.16 | \$26.16 | \$26.16 | LF |
| 2020955 | 202 1292 | REMOVAL OF BITUMINOUS SHOULDER DIKE | 0 | | | \$2.50 | \$2.41 | \$2.50 | \$3.59 | \$3.54 | LF |
| 2020475 | 202 1104 | REMOVAL OF GUARDRAIL | 0 | | | \$7.05 | \$5.65 | \$7.05 | \$5.52 | \$6.25 | LF |
| 2020625 | 202 0428 | REMOVAL OF EMBANKMENT PROTECTOR | 0 | | | \$1,703.47 | \$3,781.59 | \$1,703.47 | \$1,069.13 | \$1,302.05 | EA |
| 2020450 | 202 0076 | REMOVE END SECTION | 0 | | | \$549.69 | \$546.75 | \$549.69 | \$426.00 | \$521.91 | EA |
| 2020965 | 202 1144 | REMOVAL OF BITUMINOUS SURFACE | 0 | | | \$16.78 | \$11.55 | \$16.78 | \$13.43 | \$13.27 | SY |
| 2021230 | 202 5802 | REMOVAL OF STORM DRAIN PIPE | 0 | | | \$88.99 | \$51.52 | \$88.99 | \$37.64 | \$47.56 | LF |
| 2030230 | 203 0540 | BORROW EMBANKMENT | 1520956 | HIGH | | \$20.55 | \$20.55 | \$20.55 | \$20.55 | \$20.55 | CY |
| 2030140 | 203 0508 | ROADWAY EXCAVATION | 372720 | HIGH | | \$25.32 | \$25.32 | \$25.32 | \$25.32 | \$25.32 | CY |
| 2060110 | 206 0500 | STRUCTURE EXCAVATION | 0 | | | \$99.39 | \$28.72 | \$99.39 | \$77.02 | \$60.10 | CY |
| 2070110 | 207 0504 | GRANULAR BACKFILL | 0 | | | \$98.32 | \$78.33 | \$98.32 | \$130.59 | \$88.10 | CY |

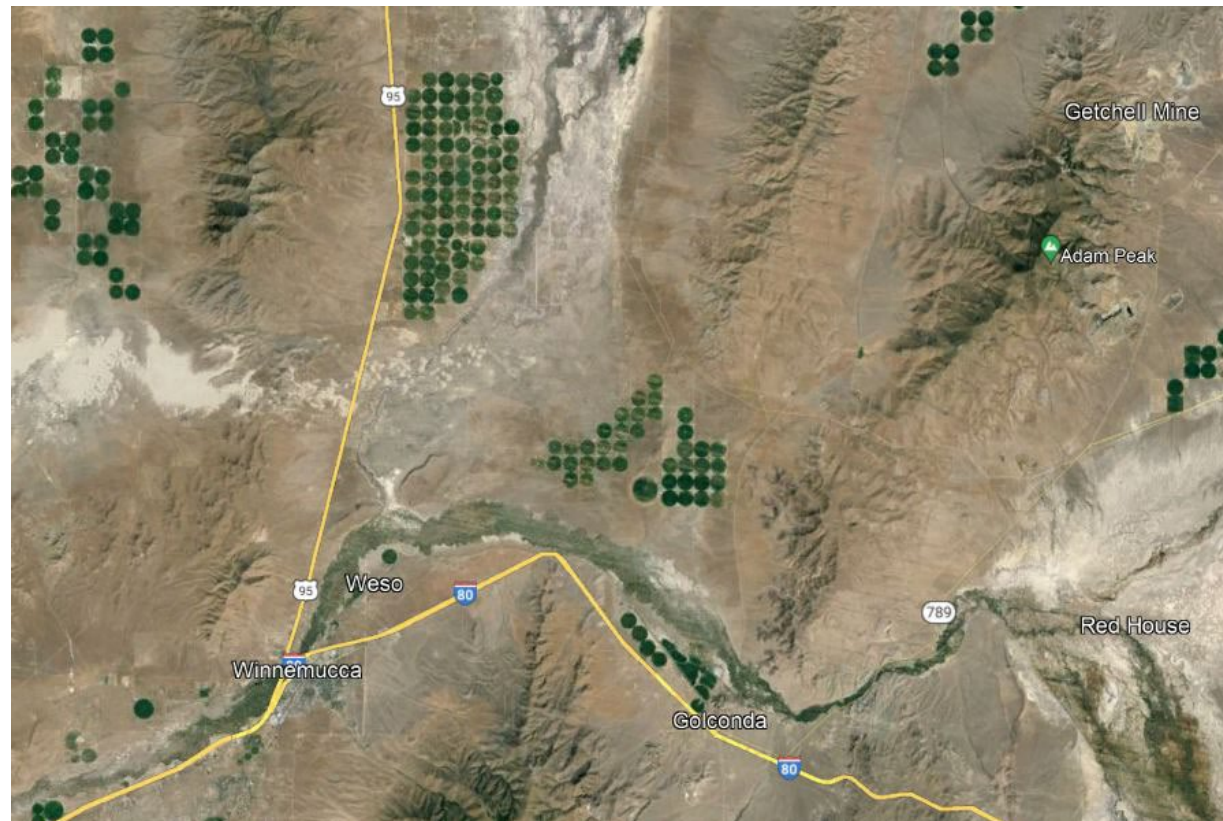
Wizard Summary Reports and Output

- The Wizard summarizes all inputs and calculations into a summary sheet.

| SUMMARY | | |
|--|--------------------------|----------------------|
| ESTIMATED PROBABLE CONSTRUCTION COST | | |
| Lithium Mine Road | | |
| <i>PREPARED BY THE NEVADA DEPARTMENT OF TRANSPORTATION</i> | | |
| SECTION | ESCALATED TO YEAR | TOTAL |
| SECTION I - ROADWAY CONSTRUCTION | | \$130,645,015 |
| SECTION II - BRIDGES | | \$2,302,406 |
| SECTION III - WALLS | | \$0 |
| SECTION IV - TYPICAL INTERCHANGES | | \$0 |
| SECTION V - SIGNAL SYSTEMS AT INTERSECTIONS | | \$0 |
| SECTION VI - DEMOLITION | | \$0 |
| SECTION VII - ADDITIONAL ITEMS | | \$0 |
| SECTION VIII - STANDARD PERCENTAGE ADDERS | | \$72,776,914 |
| TOTAL PRESENT DAY CONSTRUCTION COST | | \$205,724,334 |
| TOTAL ESCALATED CONSTRUCTION COST | 2027 | \$220,680,494 |
| TOTAL CONSTRUCTION & ENGINEERING | 2027 | \$234,362,684 |
| SECTION IX - HYDRAULICS/STORM WATER COSTS | 2027 | \$7,542,026 |
| SECTION X - ENVIRONMENTAL CONSIDERATION COSTS | 2027 | \$2,514,009 |
| GRAND TOTAL PROJECT COST | | \$244,418,718 |

Demo Project

- Let's walk through a demonstration to show how easy the Wizard Tool is to use, and its flexibility to account for non typical situations.



Further
information on
the NDOT
Planning
Department
website,
including a link
to download the
Wizard
Estimation Tool

[Transportation Planning | Nevada
Department of Transportation
\(nv.gov\)](https://www.nv.gov)



Summary of Initial Findings

- General
 - Most agencies don't budget project development costs
 - Most agencies estimate project development costs as a % of construction costs
 - A few agencies do budget and track project development costs



Initial Findings (continued)

- Scope development
 - More time and effort upfront
 - Different methods based on project size and complexity
 - Cross functional teams
 - Early preliminary engineering phase in certain cases
 - One agency stated that occasionally scopes were not consistent with system plans



Initial Findings (continued)

- Tools/Guidance manuals
 - Many agencies have manuals to aid in estimating
 - Some agencies have templates for scheduling
 - Tools and data systems are often developed in-house
 - Tools are often Excel-based
 - Several agencies plan to update or replace legacy systems



Initial Findings (continued)

- Cost estimating
 - Leading agencies have a dedicated cost estimating group
 - Phases of project development are often handled differently
 - More time and effort spent estimating construction costs
 - Some agencies compare final costs against initial planning estimates to improve accuracy
 - Estimating and budgeting programs that automatically apply inflation can be a challenge
 - Review actual percentage costs of project development to determine if adjustments are needed
 - Challenges in rapidly changing market conditions
 - D-B construction creates challenges for data collection



Initial Findings (continued)

- Risk
 - Agencies are incorporating risk-based contingencies
 - Risk workshops to train staff
 - Some agencies using risk contracts
 - One agency developed a risk tool for each phase of project development
 - One agency documents lessons learned and how risks were eliminated or mitigated during closeout

Initial Findings (continued)

- Contractor involvement
 - Consultants and former construction estimators
 - Often limited to projects of higher cost or risk



Initial Findings (continued)

- Tracking/Dashboards
 - Dashboards used to track estimates, budgets, and expenditures
 - Estimated vs actual resource utilization
 - Report to leadership and the public
 - Many are built in-house using Excel
 - Helps to stay on schedule and within budget
 - Helps to establish an owner-operator culture


Initial Findings (continued)

- Communication
 - Use ranges for estimates of risk
 - Definition and meaning of terms
 - Peer exchanges are helpful
- Miscellaneous
 - Earned-value used as a flagging device to monitor
 - Earned-value and other new tools and methods can require significant commitment and institutional change





Initial Recommendations

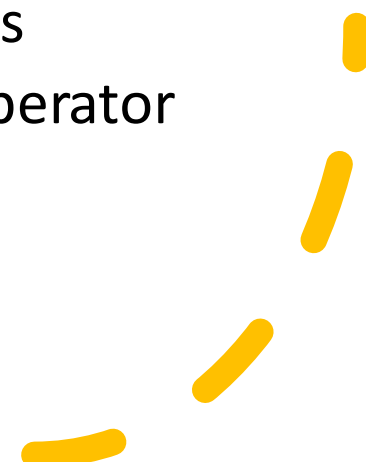
- Scoping/Cost estimating
 - Standard templates, data systems, and tools
 - More focus on 20% of items related to 80% of costs
 - Review statewide plans for consistency of scope
 - Early preliminary planning phase
 - Owner's scope contract
 - Use of former construction estimators or consultants
 - Sharing scoping and estimating tools with local agencies
 - Cost estimating manual and materials
- 

Initial Recommendations (cont.)

- Scoping/Cost estimating (cont.)
 - Cost of project development should be budgeted
 - Use of a flat percentage of construction cost
 - Uniform policy on escalation
 - Cost estimating programs should capture history and assumptions
- Risk
 - Risk-based contingencies to account for unknown risks
 - Approach that is scalable to cost and/or complexity
 - Document lessons learned at closeout
 - Risk contract




Initial
Recommendations
(cont.)

- Budgeting/Tracking
 - Dashboards and tools to track and communicate progress
 - Actual costs compared to planning estimates
 - Change management process
 - Earned-value analysis to tie schedules and resources
 - Mindset of an owner-operator
- 




Initial
Recommendations
(cont.)

- Tools
 - Programs and systems that “talk” with each other
 - Updating and replacing legacy systems
 - Communication
 - Peer exchanges are beneficial
 - Communicating accuracy of estimates
 - Define terms and consistently communicate
- 



Implementation
Actions

- Conferences and meetings
 - Agency, local, state, regional, and national
 - Webinars, workshops, and training
- 

Further information on this scan and the NCHRP 20-68 "U.S. Domestic Scan Program" is available at:

- <http://144.171.11.40/cmsfeed/TRBNetProjectDisplay.asp?ProjectID=1570>
- <http://www.domesticscan.org/>



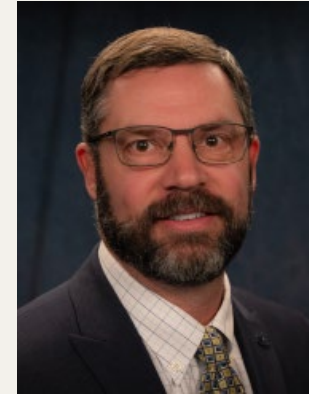
Questions?



Today's presenters



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TRB TRANSPORTATION RESEARCH BOARD

July 29 - August 1 • San Diego, CA

Automated Road Transportation Symposium

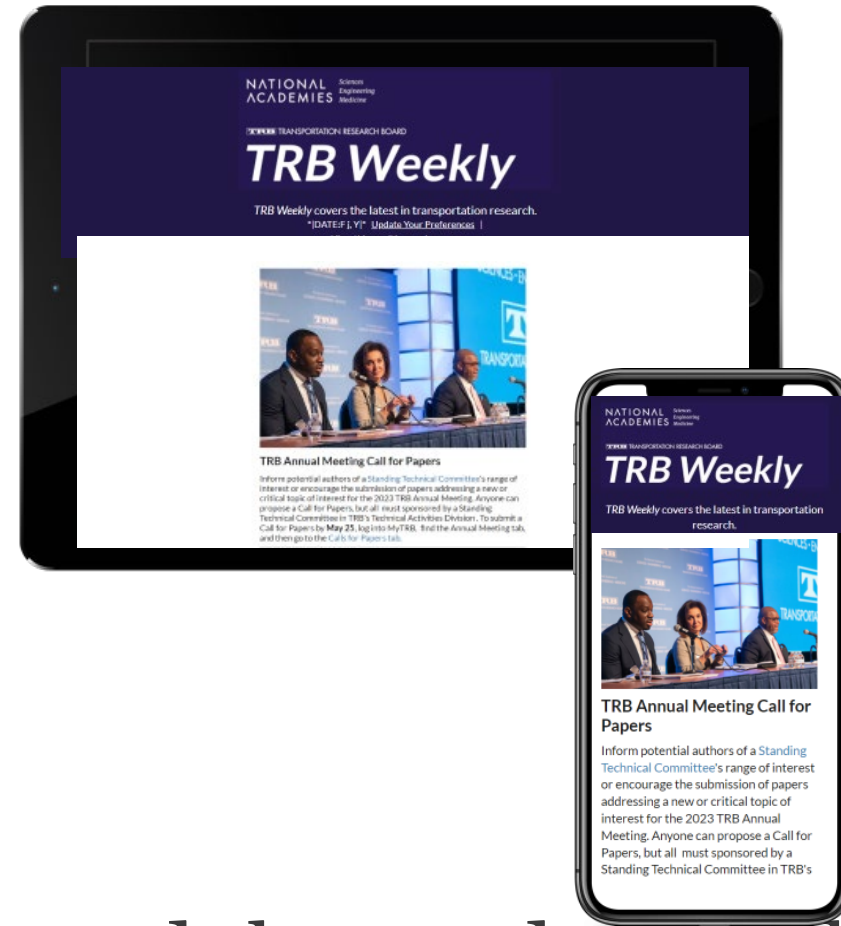
https://www.nationalacademies.org/event/825_07-2024_trb-annual-automated-road-transportation-symposium

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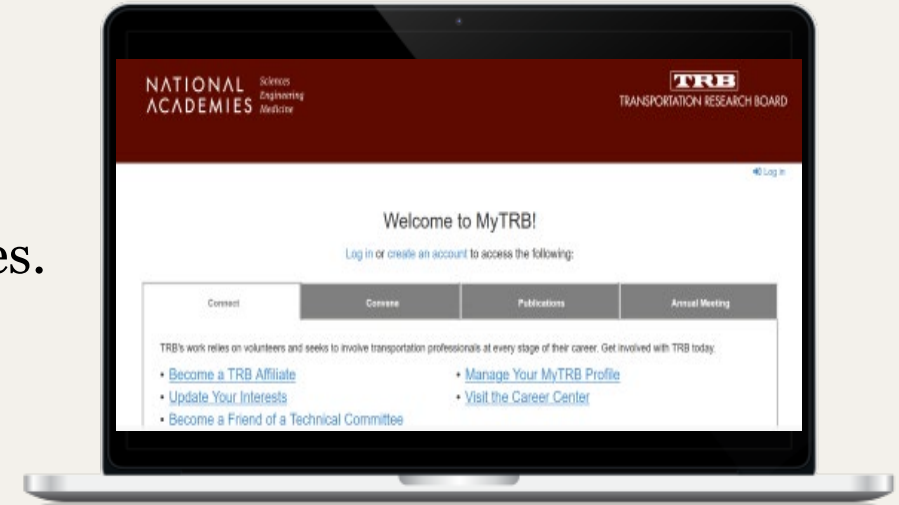


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